



ISVS-2019 COMPENDIUM

43rd Annual Congress of
Indian Society for Veterinary Surgery
and National Symposium on
Recent Advances on Amelioration of
Anaesthetic and Surgical Stress in
Farm and Companion Animals

November 14-16, 2019



Department of Veterinary Surgery and Radiology
College of Veterinary Sciences
Lala Lajpat Rai University of Veterinary and Animal Sciences
Hisar - 125 004, Haryana, India

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ISVS-2019



**43rd Annual Congress of Indian Society for Veterinary Surgery
and
National Symposium
on**

**“Recent Advances on Amelioration of Anaesthetic and
Surgical Stress in Farm and Companion Animals”**

November 14-16, 2019

COMPENDIUM

Editors

**Ashok Kumar
Rishi Tayal
R.N. Chaudhary
Deepak Kumar Tiwari
Neeraj Arora**



**Department of Veterinary Surgery and Radiology
College of Veterinary Sciences
Lala Lajpat Rai University of Veterinary and Animal Sciences
Hisar - 125 004, Haryana, India**



Departmental Activities..... At a Glance



We do not operate the animals, We alleviate their sufferings



ISVS-2019



43rd Annual Congress of Indian Society for Veterinary Surgery and National Symposium on "Recent Advances on Amelioration of Anaesthetic and Surgical Stress in Farm and Companion Animals"

November 14-16, 2019

Technical Programme

November 14, 2019 (Thursday)

S.No.	Time	Events	Venue
1.	07:30 AM to 09:00 AM	Breakfast	Faculty Club
2.	08:00 AM to 09:30 AM	Registration	Veterinary Auditorium
3.	09:30 AM to 11:30 AM	Inaugural Function	Veterinary Auditorium
4.	11:30 AM to 11:45 AM	Inaugural Tea	Veterinary Auditorium
5.	11:45 AM to 12:15 PM	RPS Tyagi Oration Award	Veterinary Auditorium
6.	12:15 PM to 12:45 PM	Theme Session	Veterinary Auditorium
7.	12:45 PM to 01:15 PM	Keynote Lecture	Veterinary Auditorium
8.	01:15 PM to 02:00 PM	Lunch	Faculty Club
9.	02:00 PM to 05:00 PM	Small Animal Surgery Session	Veterinary Auditorium
10.	02:00 PM to 05:00 PM	Anaesthesiology Session	VAHEE Seminar Hall
11.	02:00 PM to 05:00 PM	Equine Surgery Session	Pathology Lecture Hall
12.	06:00 PM to 08:00 PM	Cultural Programme	Veterinary Auditorium
13.	08:00 PM onwards	Dinner	Faculty Club

November 15, 2019 (Friday)

S.No.	Time	Events	Venue
1.	07:30 AM to 09:00 AM	Breakfast	Faculty Club
2.	08:00 AM to 01:15 PM	Ruminant Surgery Session	Veterinary Auditorium
3.	08:00 AM to 01:15 PM	Orthopedic Surgery Session	VAHEE Seminar Hall
4.	08:00 AM to 10:30 PM	Wild and Zoo Animal Surgery Session	Pathology Lecture Hall
5.	10:30 AM to 01:15 PM	Large Animal Poster Session	Veterinary Auditorium Lobby
6.	01:15 PM to 02:00 PM	Lunch	Faculty Club
7.	02:00 PM to 05:00 PM	Radiology and Imaging Session	Veterinary Auditorium
8.	02:00 PM to 05:00 PM	Ophthalmology Session	VAHEE Seminar Hall
9.	02:00 PM to 03:30 PM	Avian Surgery Session	Pathology Lecture Hall
10.	03:30 PM to 05:00 PM	Small Animal Poster Session	Veterinary Auditorium Lobby
11.	07:00 PM onwards	Gala Dinner	Blessings Banquet Hall

November 16, 2019 (Saturday)

S.No.	Time	Events	Venue
1.	07:30 AM to 09:00 AM	Breakfast	Faculty Club
2.	08:00 AM to 11:00 AM	Award Session	Veterinary Auditorium
3.	11:00 AM to 11:30 AM	High Tea	Veterinary Auditorium
4.	11:30 AM to 01:30 PM	Plenary Session & GB Meeting	Veterinary Auditorium
5.	01:30 PM onwards	Lunch	Faculty Club

राष्ट्रीय कृषि और ग्रामीण विकास बैंक

हमारा उद्देश्य- प्रभावी ऋण सहायता, अनुषंगी सेवाओं, संस्थागत विकास व अन्य नवोन्मेषी पहलों से कृषि और ग्रामीण का सतत व साम्यिक संवर्धन ।

1. कृषि, कृषि परिचालनों और ग्रामीण विकास से संबंधित महत्वपूर्ण तत्वों पर शोध एवं विकास, जिसमें प्रशिक्षण के प्रावधान व शोध सुविधाएँ शामिल हैं।
2. कृषि व ग्रामीण विकास के लिये सहायक सेवाओं (नैबकांस) के माध्यम से परामर्श सेवाएँ।

हमारे कार्य-

1. पात्र बैंकों व वित्तीय संस्थानों को प्रॉडक्शन क्रेडिट एवं इनवेस्टमेंट क्रेडिट हेतु ऋण/पुनर्वित्त उपलब्ध कराना।
2. कृषि क्षेत्र संवर्धन निधि (F.S.P.F.), वित्तीय समावेशन निधि (F.I.F.), वाटरशेड विकास निधि (W.D.F.), जनजाति विकास निधि (T.D.F.), आधारभूत सुविधा विकास निधि (RIDF) इत्यादि के माध्यम से विकास कार्य करना।
3. सहकारी बैंकों व क्षेत्रीय ग्रामीण बैंकों से संबन्धित पयवेक्षी कार्य.

“इस पत्रिका/संगोष्ठी की कार्यवाही के प्रकाशन के लिए राष्ट्रीय कृषि और ग्रामीण विकास बैंक (नाबार्ड) की अनुसंधान और विकास निधि से वित्तीय सहायता प्राप्त हुई है जिसके लिए हम नाबार्ड के प्रति आभार व्यक्त करते हैं।”



हरियाणा राजभवन, चण्डीगढ़
Haryana Raj Bhavan, Chandigarh

सत्यदेव नारायण आर्य
SATYADEO NARAIN ARYA



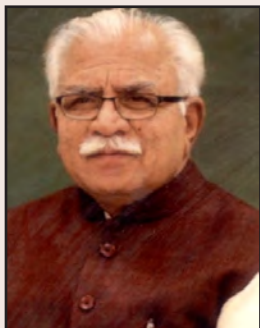
सन्देश

यह अत्यंत हर्ष का विषय है कि लाला लाजपत राय पशु चिकित्सा एवं पशु विज्ञान विश्वविद्यालय, हिसार के पशु शल्य चिकित्सा एवं क्ष: रश्मि विभाग द्वारा “पशुओं में निष्चेतना एवं सर्जरी के प्रभाव को कम करने के आधुनिक तरीकों” पर 14 से 16 नवंबर 2019 तक राष्ट्रीय संगोष्ठी व इंडियन सोसाइटी फॉर वेटनरी सर्जरी के 43वें वार्षिक सम्मेलन का आयोजन किया जा रहा है।

पशुओं में सर्जरी व निष्चेतना से होने वाले प्रभावों का प्रतिरक्षा प्रणाली पर नकारात्मक असर पड़ता है। साथ ही दर्द की संवेदनशीलता भी बढ़ जाती है। इस नकारात्मक असर से पशु का स्वास्थ्य लाभ एवं पुनर्वास भी प्रभावित होता है। ऐसे में पशुओं में शल्य चिकित्सा के दौरान होने वाले तनाव को कम करने की आवश्यकता है। इस राष्ट्रीय संगोष्ठी में उक्त विषय पर प्रख्यात पशु चिकित्सों, वैज्ञानिकों तथा शोधार्थियों द्वारा गहन विचार-विमर्श किया जाएगा। इस संगोष्ठी में पशु चिकित्सा से जुड़े क्षेत्र में वैज्ञानिक व पशु चिकित्सक अपने अनुभव सांझा करेंगे जिससे पशुओं की बीमारियों के इलाज की नई तकनीक व विधि सामने आएगी।

मैं लाला लाजपत राय पशु चिकित्सा एवं पशु विज्ञान विश्वविद्यालय परिवार को राष्ट्रीय संगोष्ठी व वार्षिक सम्मेलन आयोजित करने पर बधाई एवं शुभकामनाएं प्रदान करता हूँ और साथ ही साथ सम्मेलन के सफल आयोजन की कामना करता हूँ।

(सत्यदेव नारायण आर्य)



मनोहर लाल
MANOHAR LAL



मुख्य मन्त्री, हरियाणा,
चण्डीगढ़
Chief Minister, Haryana,
Chandigarh

Message

It gives me immense pleasure to know that the Department of Veterinary Surgery and Radiology, College of Veterinary Sciences, Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar is organising 43rd Annual Congress of Indian Society for Veterinary Surgery and National Symposium on the theme of "Recent Advances on Amelioration of Anaesthetic and Surgical Stress in Farm and Companion Animals" from November 14 to 16, 2019.

I am sure the deliberations in various technical sessions such as Diagnostic Imaging, Anesthesiology, Ruminant Surgery, Equine Surgery, Orthopaedic Surgery, Small Animal Surgery, Ophthalmology, Avian Surgery, Wild and Zoo Animal Surgery session of the Conference will help to refresh recent advances on rectification of anaesthetic and surgical stress in farm and companion animals. Also, the attenuation or amelioration of stress will help in early convalescence and reduce the hospitalization period of the patient thus eventually save the time and money of the farmers. I hope it would be one of the largest national congregations of the academicians, scientists and practitioners in the field of Veterinary Surgery. Such a conference will offer opportunities to exchange scientific ideas to amelioration of stress in animals, which would help to develop suitable strategies to improve health status of animals for the sustainable growth of the livestock sector in Haryana.

I convey my best wishes for the grand success of this conference.

(Manohar Lal)



गिरिराज सिंह
GIRIRAJ SINGH



पशुपालन, डेयरी और मत्स्यपालन मंत्री
भारत सरकार
Minister for Animal Husbandry,
Dairying & Fisheries
Government of India

Message

I am happy to know that the Department of Veterinary Surgery and Radiology, College of Veterinary Sciences, Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, Haryana, India is organizing the 43rd Annual Congress of Indian Society for Veterinary Surgery and National Symposium on “Recent Advances on Amelioration of Anaesthetic and Surgical Stress in Farm and Companion Animals” from November 14-16, 2019.

I hope that deliberations during different scientific sessions will cover various aspects of surgery and amelioration of stress in particular. The technical interactions will go a long way in updating academicians, scientists, field veterinarians, private practitioners and students.

I wish the organizers of the Conference and National Symposium a grand success.

(Giriraj Singh)



डॉ. संजीव कुमार बालियान
DR. SANJEEV KUMAR BALYAN



राज्य मंत्री
मत्स्यपालन, पशुपालन एवं डेयरी मंत्रालय
पशुपालन एवं डेयरी विभाग
भारत सरकार, कृषि भवन, नई दिल्ली-110001
Minister of State for Fisheries,
Animal Husbandry & Dairying
Department of Animal Husbandry & Dairying
Government of India, Krishi Bhawan,
New Delhi-110001

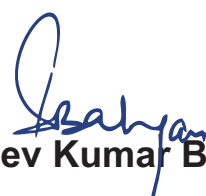
Message

I am delighted to know that the 43rd Annual Congress of Indian Society for Veterinary Surgery and National Symposium on "Recent advances on amelioration of anesthetic and surgical stress in farm and companion animals" is being organised by the Department of Veterinary Surgery and Radiology, College of Veterinary Sciences, Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar (Haryana) from November 14-16, 2019.

Induction of anaesthesia and surgical manoeuvres incite the systemic response to injury and is characterized by activation of the sympathetic nervous system, metabolic, endocrine responses as well as immunological and haematological changes. The farm and companion animals are highly sensitive to routine and environmental changes and may experience high levels of stress during hospitalisation periods. It is well known fact that stress hinders animal welfare and has negative effects on the immune system and increases sensitivity to pain. By observing the signs of anxiety in patients, the attending surgeon can take action immediately to alleviate any stress. Amelioration of stress will improve the welfare of animals helping in early convalescence and eventually saving the time and money of the farmers.

I am sure that, this conference will offer an excellent opportunity for the academicians, scientist, professionals, government veterinary officers and private veterinary practitioners to share their expertise and experiences to alleviate the anaesthetic and surgical stress.

I extend my best wishes for the splendid success of this conference.


(Dr. Sanjeev Kumar Balyan)



DR. GURDIAL SINGH, Ph.D
Vice-Chancellor



लाला लाजपतराय पशु चिकित्सा एवं
पशु विज्ञान विश्वविद्यालय
हिसार-125004 (हरियाणा), भारत

Lala Lajpat Rai University of
Veterinary and Animal Sciences
Hisar-125004 (Haryana), India

Message

I am delighted to know that the Department of Veterinary Surgery and Radiology, College of Veterinary Sciences, Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar is organising the 43rd Annual Congress of Indian Society for Veterinary Surgery and National Symposium on "Recent advances on amelioration of anaesthetic and surgical stress in farm and companion animals" from November 14-16, 2019.

Induction of anaesthesia and surgical manoeuvres prompts the systemic response to injury and is characterized by activation of the sympathetic nervous system, metabolic, endocrine responses as well as immunological and haematological changes. It is well known fact that stress has adverse effects on the immune system, increases sensitivity to pain and hinders animal welfare. Events causing stress can impact on susceptibility to diseases. Stress also has an influence on recovery and rehabilitation after disease, injury, anaesthesia or surgery. A pre-emptive approach to reduce stress will lead to a patient that better tolerate the stressful condition. Appropriate preanaesthetics, anaesthetics and/or combinations, and suitable surgical techniques should be used to reduce the stress to the maximum extent. Attenuation or amelioration of stress will help in early convalescence will reduce the hospitalization period of the patient and eventually save the time and money of the farmers.

I believe that it would be one of the largest national conventions of the academicians, scientists and practitioners in the field of Veterinary Surgery. The theme of the symposium aims to provide the once-in-a-lifetime opportunity to exchange scientific concepts and experiences on amelioration of stress in animals, which would help to develop suitable strategies to improve health status of animals for the sustainable growth of the livestock sector in the country.

I congratulate the entire organizing committee for organising such a great convention. I wish the event a splendid success and a warm scientific and social get together for all delegates.

(Gurdial Singh)



DR. DIWAKAR PRAKASH SHARMA
DEAN



College of Veterinary Sciences
Lala Lajpat Rai University of
Veterinary and Animal Sciences
Hisar - 125 004 (Haryana), India

Message

I am happy to know that the Department of Veterinary Surgery and Radiology, College of Veterinary Sciences, Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar is organising the 43rd Annual Congress of Indian Society for Veterinary Surgery and National Symposium on "Recent advances on amelioration of anaesthetic and surgical stress in farm and companion animals" from November 14-16, 2019.

The stress response includes several changes that may have negative effects on the performance of farm and companion animals. These effects include changes in the immune function and increased susceptibility to disease, decreased feed intake and rumination, inhibition of oxytocin release, and reduced fertility etc. Stress also has an influence on recovery and rehabilitation of the patients after anaesthesia or surgery. A precautionary approach to reduce stress will lead to a patient tolerate the stressful conditions. Balance anaesthesia and suitable surgical procedure should be used to ameliorate the stress to the maximum extent. Amelioration of stress will help in early convalescence and ultimately save the time and money of the farmers.

The theme of the symposium is well conceived and the need of the hour which aims to provide a platform to exchange scientific concepts on amelioration of stress in farm and companion animals.

I congratulate the organizing committee for organizing such a great convention. I extend a warm welcome to all the delegates and participants. I wish the event a superb success.

(Diwakar Prakash Sharma)



DR. GAJ RAJ SINGH, Ph.D
President
Indian Society for Veterinary Surgery
(ISVS)

Message

It is my pleasure and privilege to welcome all the distinguished guests, delegates, faculty and students to the 43rd Annual Conference of Indian Society for Veterinary Surgery and National Symposium on "Recent Advances on Amelioration of Anaesthetic and Surgical Stress in Farm and Companion Animals" being organized at Department of Veterinary Surgery and Radiology, College of Veterinary Sciences, Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, from 14- 16 Nov. 2019.

Amelioration of anaesthetic and surgical stress is highly relevant for both farm and companion animals and has implications for animal welfare and animal productivity. Stress and pain caused by surgery and the risk associated with anaesthesia and analgesia are quite challenging to both clinicians and the patients. Surgical stress occurs, before, during, and after an operative procedure. It arises from psychological stress, tissue injury, and alterations in circulation, anesthetic agents, and postoperative complications including sepsis. The stress response includes several changes that may have negative effects on the recovery and performance of companion and farm animals. These effects include changes in the immune function and increased susceptibility to disease, decreased feed intake, and reduced fertility, among others. The fact that stressors can be deleterious to such an important function as reproduction in farm animals emphasizes that stress is important and should be minimized whenever possible.

I am sure that the deliberations on the topic will be gainfully utilized by the participants.

I congratulate the organizers and the faculty of the Department of Veterinary Surgery and Radiology, College of Veterinary Sciences, LUVAS, Hisar for organizing the conference and wish the conference a grand success.

(Gajraj Singh)



DR. D. B. PATIL
Executive Secretary
Indian Society for Veterinary Surgery
(ISVS)

Director of Research & Dean PG Studies
Kamdhenu University, Gandhinagar, Gujarat

From the Executive Secretary's Pen

Over the past 40 years, ISVS Symposia have become the 'nerve centre' for academic surgeons, surgical scientists, field surgeons and students offering unparalleled opportunities for scientific exchange and networking with peers. ISVS provides combination of cutting edge science, dynamic speakers and erudite mentoring by our Senior Surgical Scientists.

Each year ISVS registration grows and has become diverse with topics in surgical disciplines relevant to academics and field surgery.

The ISVS 2019 and 43rd Annual Congress led by Dr. Ashok Kumar, Prof. & Head, Surgery, LUVAS, Hisar promises to be diverse, vibrant, exciting with strong possibilities of developing new relationships to enhance our goals of performing the highest quality research and improving surgical protocols and care of patients.

ISVS is a place where you can find your passion and go all out..! maintaining the passion with curiosity, perseverance and adaptability.

Looking forward to meet all.

(D. B. Patil)



DR. ASHOK KUMAR

B.Sc. (Medical), BVSC & AH, MVSc, PhD, FISVS

Organizing Secretary-cum-Professor & Head

From the Desk of Organizing Secretary

It is my proud privilege to welcome the delegates and participants from all corners of the country who have come to attend the 43rd Annual Congress of Indian Society for Veterinary Surgery and National Symposium on "Recent advances on amelioration of anaesthetic and surgical stress in farm and companion animals from November 14-16, 2019.

Lala Lajpat Rai University of Veterinary and Animal Sciences has a rich and glorious past. The department is continuously working to safe guard the animal health and alleviates animals' sufferings. We are committed to impart proficient services, quality education, and undertake excellent research. The department is working to evolve safer balanced anaesthetic combinations which can minimize the anaesthetic and surgical stress in farm and companion animals. Thus, this topic of the symposium has been chosen to further strengthen the research in this field.

Anaesthesia and surgery stimulate the systemic response to injury which is featured by activation of the sympatheto-adrenal system, metabolic and endocrine responses. It is well known fact that stress has depressing effects on the immune system and increases sensitivity to pain and thus impede animal welfare. Amelioration of stress will improve the welfare of animals helping in early convalescence and eventually making the philosophy of the department a reality, "We do not operate the animals, we alleviate their sufferings"

I assure everyone that my team has not left any stone unturned to make your stay at the birthplace of ISVS a memorable and I have no doubt that you will cherish the sweet memories of the conference for a long period.

(Ashok Kumar)



ISVS-2019



Indian Society for Veterinary Surgery

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ISVS-2019



43rd Annual Congress of Indian Society for Veterinary Surgery

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2.	Dr. Rishi Tayal	Convener	VSR
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3.	Dr. Deepak Kumar Tiwari	Member	VSR
4.	Dr. Neeraj Arora	Member	VSR

Publication Committee

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2.	Dr. R.N. Chaudhary	Convener	VSR
3.	Dr. Deepak Kumar Tiwari	Member	VSR
4.	Dr. Shalini Sharma	Member	VPB
5.	Dr. Vijeyta Tiwari	Member	VPT

Invitation Committee

S.No.	Name	Onus	Department
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2.	Dr. Rishi Tayal	Convener	VSR
3.	Dr. Sandeep Kumar	Member	VPB
4.	Dr. Renu Gupta	Member	VPHE
5.	Dr. Rajesh Chhabra	Member	CCL
6.	Dr. Aman Kumar	Member	ABT

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5.	Dr. Preeti	Member	VPT
6.	Dr. Anshul Lather	Member	VMC
7.	Dr. Sanjeevna Kumari	Member	VMC
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3.	Dr. Vikas Nehra	Member	VPP
4.	Dr. Sandeep Panihar	Member	VGO
5.	Dr. Vinay Kant	Member	VPT
6.	Dr. C.S. Patil	Member	AGB
7.	Dr. Amandeep Singh	Member	VAN
8.	Dr. Mahavir Singh	Member	CCL
9.	Dr. Yashwant	Member	DSW
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5.	Dr. Neeraj Arora	Member	VSR
6.	Dr. Sonu Kumari	Member	VGO
7.	Dr. Manoj Kumar	Member	AGB
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5.	Dr. Ankit Magotra	Member	AGB
6.	Dr. Vinay Joshi	Member	ABT
7.	Dr. Dinesh Mittal	Member	VPHE
8.	Dr. Y. C. Bangar	Member	AGB
9.	Dr. Gaurav Charaya	Member	VMD
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11.	Dr. Amit Sangwan	Member	VSR
12.	Mr. Dayanand	Member	COVS

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4.	Dr. Neeraj Arora	Member	VSR
5.	Dr. Priyanka	Member	VSR

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4.	Dr. Tej Prakash	Member	VAN

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2.	Dr. R.N. Chaudhary	Convener	VSR
3.	Dr. Neelesh Sindhu	Member	VCC
4.	Dr. Ravi Dutt	Member	VGO
5.	Mr. Bagga	Member	DEE
6.	Mr. Sahil	Member	VPHE

Sitting Plan Committee

S.No.	Name	Onus	Department
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2.	Dr. Sonia Sindhu	Convener	VPB
3.	Dr. Satbir Sharma	Member	VCC
4.	Dr. Akhil Gupta	Member	VMC
5.	Dr. Poonam Ratwan	Member	AGB
6.	Dr. Sunil Kumar	Member	ILFC
7.	Dr. Dinesh	Member	VSR

Excursion Committee

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2.	Dr. Deepak Kumar Tiwari	Convener	VSR
3.	Dr. Amandeep	Member	VAN
4.	Dr. Sandeep Kumar	Member	VSR

First Aid Committee

S.No.	Name	Onus	Department
1.	Dr. Ashok Kumar Chaudhary	Chairman	Campus Hospital
2.	Dr. Deepak Kumar Tiwari	Convener	VSR
3.	Dr. Preeti Malik (Medical Officer)	Member	Campus Hospital
4.	Dr. Neeraj Arora	Member	VSR
5.	Dr. Vijeyta Tiwari	Member	VPT

We are thankful to

1	Indian Council of Agricultural Research
2	Scientific and Engineering Research Board
3	National Bank for Agriculture and Rural Development
4	Haryana Kisan Ayog
5	Council of Scientific and Industrial Research
6	CGS Hospital, Gurugram
7	Veterinary Equipment Technologies, Chandigarh
8	Rajdhani Surgicals, Delhi
9	Pathvets Veterinary Diagnostics, New Delhi
10	Arawali Veterinary College, Sikar
11	Hester Bioscience Ltd.
12	Intas Pharmaceuticals Pvt. Ltd.
13	Farmina Pet Foods
14	International Institute of Veterinary Education & Research, Rohtak
15	Cargill - Provimi Animal Nutrition India Pvt. Ltd.
16	Siora Surgicals Pvt. Ltd.
17	Bayer Pharmaceuticals Pvt. Ltd.
18	Vetoquinol India Animal Health Pvt. Ltd.
19	KARL STORZ Endoscopy India Pvt. Ltd.
20	Globion India Pvt. Ltd.
21	Cessna Lifeline Veterinary Hospital
22	Sushima Pharmaceuticals Pvt. Ltd.
23	Zydus Cadila Animal Health Pvt. Ltd.
24	Virbac Animal health India Pvt. Ltd.
25	Rajesh Trading Company, Hisar
26	Rakesh Pharmaceuticals Pvt. Ltd.
27	Macwell Pharmaceuticals Pvt. Ltd.
28	Carus Laboratories Pvt. Ltd.
29	Vexter Healthcare Pvt. Ltd.
30	Titanic Pharmaceuticals Pvt. Ltd.
31	Revamp Healthcare
32	MCO Hospital Aids Pvt. Ltd.
33	Ortho solutions, Hisar
34	BVP Vet Innovatives
35	Hi-Media Laboratories Pvt. Ltd.
36	Natural Remedies Pvt. Ltd.
37	The Bharat Instruments and Chemicals, Hisar
38	Bovicure Pharmaceutical Pvt. Ltd.
39	Animo Pet Clinic
40	Biodescent Pharmaceutical Pvt. Ltd.
41	Boehringer Ingelheim India Pvt. Ltd.
42	Puran Pharmaceuticals Pvt. Ltd.
43	Digicop Xerographic System, Hisar
44	New Hisar Computers, Hisar
45	Hindustan Interior Furniture, Hisar
46	Wellcon Animal Health Pvt. Ltd.
47	Metro Pet Hospital, Gurugram

About the University

Lala Lajpat Rai University of Veterinary and Animal Sciences was founded on 01.12.2010 in pursuance of the Haryana Act No. 7 of 2010 notified on 7th April, 2010. The new University has been named in the cherished memory of Lala Lajpat Rai, a great patriot, the foremost freedom fighter, a passionate social reformer and a versatile writer popularly known as "Punjab Kesri. Lala Lajpat Rai did his early legal practice at Hisar and also served as a Member and Secretary of the Hisar Municipality. The College of Veterinary Sciences and the College of Animal Sciences, earlier the constituent colleges of CCS Haryana Agricultural University, Hisar has now been incorporated in this newly established University. The College has a glorious history of more than 60 years, since it was shifted to Hisar from Lahore (Pakistan). It is backed by an enviable track record of academic excellence, cutting edge research and rendering quality services to the livestock of the state. An extensive network of alumni occupying important positions throughout the world is a source of inspiration, enthusiasm and commitment to hard work for the faculty and students.

About the Department

The Department started as Department of Medicine and Surgery in 1948, became functioning as full-fledged department of Veterinary Surgery and Radiology in 1966. The department of Surgery and Radiology has the mandate for teaching and research in various disciplines of the subject viz. general surgery, anaesthesiology, radiology, orthopaedics and experimental surgery. The teaching programme of the department have been planned to impart effective practical training to the undergraduate and postgraduate students. Apart from offering courses to the students of B.V.Sc. & A.H. programme, the department offers M. V. Sc. and Ph. D. degree in Veterinary Surgery and Radiology. The department has a well-equipped radiology section to provide diagnostic services for small and large animals. Clinical camps and clinical conferences are held routinely at district level of the Haryana State to provide short courses/refresher training to the field veterinarians and to extract information about the problems. Short term training courses are arranged from time to time for scientists and teachers from other institutes. This department has made landmark achievements in the field of anaesthesia, diagnostic imaging and surgery particularly diaphragmatic hernia in buffaloes. Persons of repute have occupied the chairs of professors or head of the department. The faculty members of this department have always followed time honoured tradition of team work and made collective efforts to maintain high standards of teaching and research. The students and teachers of this department are holding or have held top positions in the institutes/organizations/profession. Many of them have been on foreign teaching assignments. First Ph.D. in Veterinary Surgery and Radiology in India was awarded from this department. First large animal X-ray machine in India was installed in this department in 1967. The idea of forming Indian Society for Veterinary Surgery was mooted in this department and society was formed with headquarters here in 1977.

C O N T E N T S

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RPS Tyagi Oration Award

Meet the Speaker



Dr. Sundararajan Thilagar

Former Vice-Chancellor

Tamil Nadu University of Veterinary and Animal Sciences,
Chennai, Tamil Nadu

Prof. Dr. Sundararajan Thilagar hail from an agricultural family and born in a village called T. Alangulam near Tiruppuvanam town of Sivagangai District. Completed his school studies in Tiruppuvanam and Earned B.V.Sc. in 1978 and M.V.Sc. (Surgery) in 1983 from the Tamil Nadu Agricultural University. Received the doctorate degree from the Tamil Nadu Veterinary and Animal Sciences University (India) in 1993 and Fellow of Indian Society of Veterinary Surgery in 1999. He started his career as a Research Associate in the Department of Clinics, Madras Veterinary College in 1980. He served as academician almost for 33 years worked in various capacities and also as an administrator. Elevated as Professor of Surgery in 1994 and served as Head of the Department of Clinics, Veterinary College and Research Institute, Namakkal and Veterinary University Peripheral Hospital, Madhavaram Chennai, and was instrumental in developing the infrastructural facilities in both the hospitals. Later worked as Professor and Head, Department of Clinics, MVC Chennai from 1999-2003 and worked as Professor of Surgery at University Putra Malaysia until 2008. After returning from Malaysia, he worked as Professor and Head at VUPH, Madhavaram, Department of Clinics, Department of Veterinary Surgery and Radiology, Madras Veterinary College Chennai. He worked as Controller of Examinations of TANUVAS, from 01.06.2010 to 26.07.2011 and assumed the office of the Dean, Rajiv Gandhi Institute of Veterinary education and research , Puducherry from 27.07.2011 to 26.07.2014 and acted as Joint convenor ,UG- Admission committee of Pondicherry UT in the year 2012, 2013, 2014 He joined as HoD Veterinary Surgery and Radiology, Madras Veterinary College, Chennai and retired in the month of October 2014 .He also officiated as Vice Chancellor of TANUVAS from 10.12.2014 to 10.12.2017. He has published more than 100 Research article both in national and international journal Authored 4 books 9 manuals and many booklets. He was awarded with best teacher award of the university in the year 1995 and also Tamil Nadu Scientist award of Govt. of Tamil Nadu in the year 1998 and an appreciation for 30 years meritorious service and many other university and Society awards/medals including appreciation. He has attended many national and international conferences presented more than 100 scientific papers and presented many lead paper. The maiden externship program conducted for Michigan students of USA and Chittagong university Bangladesh in the year 2001 still is on progress and resulted in MoU subsequently he has visited USA for training under

AHRDP. He has conducted 15 research project by obtaining fund from external agency. He was acted as elected member Tamil Nadi Veterinary Council, Member Board of studies TANUVAS and Member Academic Council, Secretary TANUVAS alumini association Member Secretary Hospital management Committee-TANUVAS. He is member in many professional bodies and served many committees at the University and College level. He served as nominated member as VCI, Govt of India and Tamil Nadu, and also as member in many committees at the national level. He is a fellow ISVS and FNAVS. He is well known as Small Animal Surgeon and clinician in the country. He conducted many national and international training programs for the benefits of overseas veterinarian, national and international veterinary students and national veterinarian. As former Executive Secretary and President of ISVS he made many positive contributions for the growth of ISVS.

IMMUNO-MODULATORY EFFECTS OF SURGICAL INTERVENTIONS – WHAT WE CAN LEARN FROM HUMANS

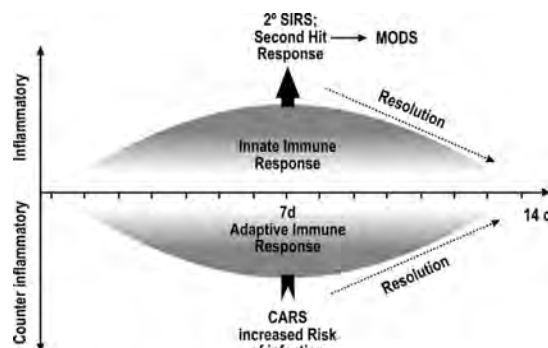
S. Thilagar

Former Vice-Chancellor, TANUVAS, Chennai

Introduction

Surgical interventions alter the metabolic, hemodynamic and immune responses of the patients. Innate and acquired immunity, the two arms of the immune system of the body are affected by trauma that occurs during surgical procedures. The extent of the immune distress during surgical intervention may depend on several factors, like the patient's immune status before surgical procedure, cause of the surgery like cancer, nutritional status, health status of the person which includes the disease status. Immune suppression post surgery combined with poor management can predispose to sepsis that can lead to death if unattended promptly. To avoid complications, post-surgery, surgical procedures are performed with utmost care involving all the aseptic procedures throughout the entire time. These aseptic procedures should be followed post surgery also till the trauma gets healed as at any point of time infection can set due to poor hygienic practices (D'browska and S³otwiński, 2014). Surgery in cancer patients can lead to activation of both pro and anti inflammatory response termed as systemic inflammatory immune response (SIRS) and compensatory anti-inflammatory immune response (CARS). The initial proinflammatory immune response, or SIRS, is mediated mainly by the cells involved in innate immune system. This is followed by a CARS or immunosuppressive phenotype that is mediated by cells of the adaptive immune system and predisposes the host to septic complications. Certain individuals can succumb to this immune regulatory mechanism and multiple organ dysfunction syndrome (MODS) can occur leading to death of the individual (Munford and Pugin, 2001). Post operative care in case of patients with tumour is critical since this not only prevents sepsis but also prevent the problem of metastasis of tumour. Surgical procedures involving graft needs immune suppressive drug for acceptance of graft hence proper care and management of patient is required during and after the operative procedures.

Patients surviving the early SIRS response to major surgery may develop CARS. This is associated with onset of postoperative immunosuppression and predisposes patients to development of opportunistic infection. This may also lead to MODS and death.



Inflammatory response post surgery

Pro-inflammatory response

During the early phase after the surgical trauma, innate immune mechanisms are activated which include neutrophils and monocytes invasion to the site of wound, followed by production of cytokines and chemokines. SIRS and infection post surgery are accompanied by mobilization of massive amounts of immature neutrophils from the bone marrow into circulation (Baumann, Gauldie, 1994). Studies report that though the neutrophils are immature they still perform their immune functions. The inflammatory response responsible for activation of the innate immune mechanism is aimed at elimination of infectious agent thus reducing further tissue damage, scavenging of dead cells and the start of the healing process. Proinflammatory cytokine production during surgery or in the early stages of postoperative period is orchestrated by macrophages and monocytes at the site of injury which is a part of the acute-phase response. Post surgery inflammatory reaction is characterized by massive production of proinflammatory cytokines mainly interleukin (IL)-1 β and tumor necrosis factor α (TNF- α). Later, TNF- α and IL-1 β kindle the production of other cytokines namely IL-6 (Baigrie et al., 1992). IL-6 has role in generation of acute phase proteins like C-reactive proteins which is produced after 4- 7 hours after surgery while its peak production can be expected during 24- 72 hours post surgery (Ohzato et al., 1992). Several other acute phase proteins namely serum amyloid A, haptoglobin, procalcitonin and C3 complement were shown to elevated post trauma or surgical procedures (Dehne et al., 2002). IL-6 is also involved in production of antiproteinases, fibrinogen and neutrophil elastase. Despite similar operating times, it was reported that the serum levels of IL-6 was reported to be higher in patients undergoing abdominal aortic and colorectal surgery than in those patients with hip replacement. Similarly, it has also been reported that the serum level of IL-6 was lower in patients who underwent laparoscopy than patients who underwent open surgery. IL-6 levels have also been elevated in conditions of post operative complications.

Surgical procedures lead to blood loss and this may lead to vasoconstriction of arterioles and venules. Inflammatory response at the local microcirculatory level is characterized by accumulation and adherence of leukocyte to the endothelial lining of blood vessels. This is followed by microvascular permeability that can lead to MODS. This microcirculatory inflammatory response is further complicated by prolonged handling of the tissues. These microvascular changes and its associated inflammatory response are mainly mediated by TNF- α . Studies using the monoclonal antibodies against proinflammatory cytokine during surgery have resulted in reduction of the inflammatory properties. Selectin molecules like leukocytic β 2-integrin CD11b/CD18 and endothelial intercellular adhesion molecule 1 has also been reported to be involved in inflammatory response during trauma (Boldt et al., 2004). Serum levels of E-selectin, P-selectin, intercellular adhesion molecule 1, and vascular cell adhesion molecule 1 along with increased expression levels of leukocytic CD11a and CD11b, endothelial intercellular adhesion molecule 1 and vascular cell adhesion molecule 1 has also been elevated during surgery.

Anti-inflammatory response

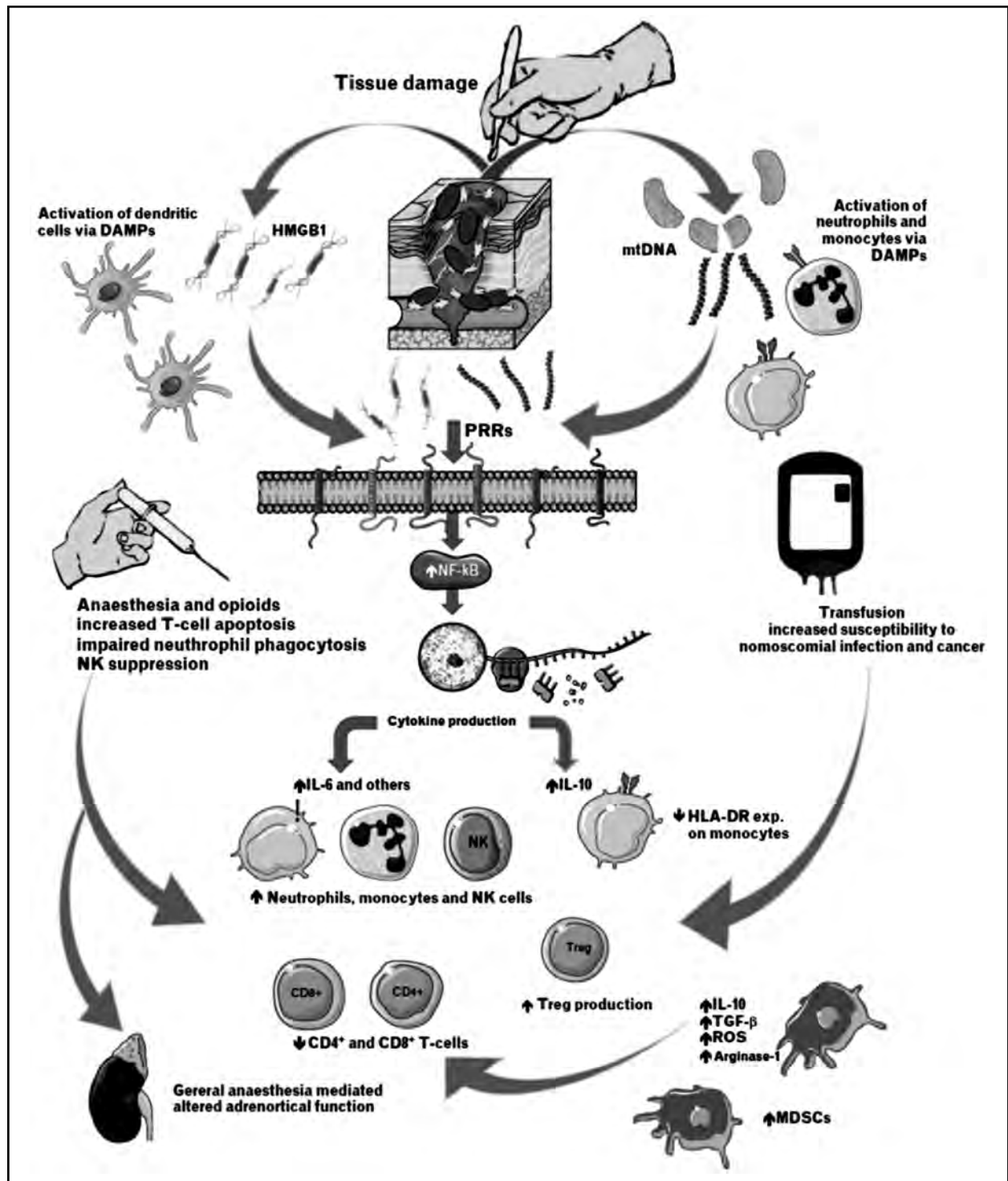
Anti-inflammatory agents like IL-4, IL-10, sTNFR1, IL-1 receptor antagonist (IL-1Ra), transforming growth factor β (TGF- β), cerebrospinal fluid (CSF) are elevated post surgery. Though IL-6 has been acting as proinflammatory mediator, it can also exert anti-inflammatory effects by attenuating TNF- α and IL-1 β activity while promoting the release of IL-1Ra and soluble TNF receptors. IL-6 also induces macrophages to produce prostaglandin E2 (an immunosuppressive agent) which inhibits T-cell mitogenesis, IL-2 production, and IL-2 receptor expression. Prostaglandin E2 also aids in release of IL-10, a major anti inflammatory cytokine. Due to these immunological changes there is an imbalance and this state is called CARS. At this state there are low levels of the proinflammatory cytokines TNF- α , IL-1 β , IL-12, and interferon γ (IFN- γ) and higher levels of anti-inflammatory cytokines IL-6, IL-10, and IL-1Ra. During CARS the patient will be in immunosuppressive state. HLA-DR antigen expression is reduced during the anti inflammatory phase due to the suppression of monocytes which is also linked with the cause of sepsis and the probable outcome of the surgery. Monocyte deactivation or suppression is linked with the IL-10 production. Due to surgical procedures it is also reported that innate immunity is severely affected as there is reduction of CD4+ and CD8+ T-lymphocytes (Dietz et al., 2000). Anti inflammatory response aims at compensating the activity of pro inflammatory or SIRS which may harm the cells. Major drawback of anti inflammatory response or CARS will be immune suppression thereby leading the patients to succumb for secondary bacterial infections and further complications thus paving way for death of the individual.

Initially it was thought that SIRS will be followed by CARS but later studies points that both can co-exist together. There is no clear picture regarding it pattern of immune cascade. Patients in Intensive care unit (ICU) post surgery can undergo a syndrome termed as persistent inflammation, immunosuppression and catabolism syndrome (PICS) where the patient has a clinical sign that include persistent, low intensity inflammation, protein catabolism, loss of lean body mass, impaired wound healing, suppression of the immune system, and recurrent infections (Gentile et al., 2012).

Toll like receptors and surgical procedures

Toll like receptors (TLRs) are involved in innate immunity and are present on neutrophils, macrophages, monocytes, dendritic cells and mast cells. TLR expression has been altered during trauma and also in sepsis as reported in cell culture and animal models. Under septic condition

There is alteration in the TLR 2 and TLR 4 expression on monocytes when compared with normal patients. There was decrease in proinflammatory cytokine production during the alteration of TLR expression in conditions of sepsis. TLRs are mainly regulated during the time of infection but this can also be regulated by alarmins as indicated in case of trauma. TLR 4 is activated by heme (present in hemoglobin). During surgery or trauma there may be presence of heme in the extravascular space which may lead to expression of TLR 4. Heme induces TNF- α production which depends on TLR 4, myeloid differentiation primary response protein (MyD88) and CD14 but not IL-6 production. An important alarmin responsible for TLR



Source: O'Dwyer et al., 2015

expression is non-histone nuclear high mobility group box protein 1 (HMGB1) (Figueiredo et al., 2007). HMGB1 is passively released into the extracellular space during trauma or surgery. When present in the extracellular space HMGB1 alters the production of inflammatory cytokines, manipulates angiogenesis and maturation of dendritic cells. HMGB1 carries out these activities by stimulation of TLRs like TLR2, TLR4 and TLR9 and also by Receptor for Advanced Glycation End Products (RAGE) (Park et al., 2006).

Conclusions and future perspectives

Surgical intervention or procedures affects both humoral and cell mediated immunity which can either aid in earlier wound repair or can lead to sepsis due to impaired immune response. SIRS and CARS can co-exist together and if anti inflammatory response dominates there will be chances of sepsis leading to high probability of mortality. Studies on the aspect of shift between pro-inflammatory and anti-inflammatory response needs to be carried out to prevent further complications post surgery. Use of anesthetics during major surgery can also alter the immune system and these drugs have a major role on the immune status. Similarly, graft rejection is another vast topic which needs special knowledge on the immunology of the body to successfully place an implant into the body.

In Veterinary patients, the effects of surgical procedures or inhalation anesthesia on the immune system are still under investigation and are not well documented. The effect of inhalation anesthesia is further complicated by the difference in the pulmonary immune response among species. The veterinary anesthetists should also consider the immunomodulatory effects of the drugs used to anesthetize their patients and how those effects might affect the patient postoperatively. Neutering is critically important for population control, reduction of reproductive disorders, and offers convenience for owners. Despite these advantages, Sundburg et al. (2016) have shown that neutering is associated with increased risk for certain autoimmune disorders hence the need for owners to evaluate possible benefits and risks associated such a procedure before a decision is made.

References

- Dbrowska, A.M and Slotwinski, R. (2014). The immune response to surgery and infection. *Central European Journal of Immunology*. 39(4): 532- 537.
- Munford RS, Pugin J (2001) Normal response to injury prevents systemic inflammation and can be immunosuppressive. *Am J Respir Crit Care Med* 163: 316-321.
- BaumannH, Gauldie J. (1994) The acute phase response. *Immunol Today*. 15: 74-80.
- Baigrie RJ, Lamont PM, Kwiatkowski D, Dallman MJ, Morris PJ. (1992) Systemic cytokine response after major surgery. *Br J Surg*. 79: 757-760.
- Ohzato H, Yoshizaki K, Nishimoto N, et al. (1992) Interleukin-6 as a new indicator of inflammatory status: detection of serum levels of interleukin-6 and C-reactive protein after surgery. *Surgery* 111: 201-209.
- Dehne MG, Sablotzki A, Hoffmann A, Muhling J, Dietrich FE, Hempelmann C. (2002) Alterations of acute phase reaction and cytokine production in patients following severe burn injury. *Burns*. 28: 535-542.
- Boldt J, Ducke M, Kumle B, Papsdorf M, Zurmeyer EL. (2004) Influence of different volume replacement strategies on inflammation and endothelial activation in the elderly undergoing major abdominal surgery. *Intensive Care Med*. 30: 416-422.

- Dietz A, Heimlich F, Daniel V, Polarz H, Weidauer H, Maier H. (2000) Immunomodulating effects of surgical intervention in tumors of the head and neck. *Otolaryngol Head Neck Surg*. 123: 132-139.
- Gentile LF, Cuenca AG, Efron PA, et al. (2012): Persistent inflammation and immunosuppression: A common syndrome and new horizon for surgical intensive care. *Trauma Acute Care Surg* 72: 1491-1501.
- Figueiredo RT, Fernandez PL, Mourao-Sa DS, et al. (2007): Characterization of heme as activator of Toll-like receptor 4. *J Biol Chem* 282: 20221-20229.
- Park JS, Gamboni-Robertson F, He Q, et al. (2006): High mobility group box 1 protein interacts with multiple Toll-like receptors. *Am J Physiol Cell Physiol* 290: C917-C924.
- Sundburg CT, Belanger JM, Bannasch DL, Famula TR and Oberbauer AM (2016) Gonadectomy effects on the risk of immune disorders in the dog: a retrospective study. *BMC Veterinary Research* 12: 278 DOI 10.1186/s12917-016-0911-5.



Theme Session

Meet the Speaker



Dr. B. V. Shivaprakash, M. V. Sc., Ph.D.

Director of Research

Karnataka Veterinary Animal and Fisheries Sciences University,

Bidar – 585 401

Mobile: +917259023567

Email: drkvafsu@gmail.com, surgeryvcbbidar@gmail.com

Past positions held

1. Professor and Head, Veterinary College, Bidar
2. Director of Student Welfare, KVAFSU
3. Dean, Veterinary College, Bidar

Awards

S.No	Name of Award	Awarding Agency	Year
1	Fellow award	Indian Society for Veterinary Surgery	2009
2	Poster session award, Best paper award, Ruminant Surgery Award /Gold Medal, Appreciation Award, Gold Medal: Orthopaedic Surgery session	Indian Society for Veterinary Surgery	1995 2006 2008 2013 2014 2017 2018
3	Dr. Bhaskar Singh award, Smt. Ramani Chandrachandraiah memorial award		1998 1998
4	Best Veterinarian award	Karnataka Vet. Association	2003
5	Vishesha seva award	Catholic church	2007
6	K.N. Nagegowda Award, Rs10,000 cash prize	Professional trust on Sri Nagegowda, Former minister of Animal Husbandry and Irrigation	2007
7	Independence Day Award	Govt. of Karnataka	2007
8	A.K. Bhargava Award	Professional Journal (National)	2007
9	Best clinical article appreciation award	Professional Journal (National) Pub. by Intas	2008
10	Award in Animal Husbandry	Bharat Vikas Sangam (Bharatiya samskriti utsav-5)	2018

Publications: 80, Abstracts: 120, Popular articles: 35, TV and Radio talks: 20

Trainings programmes of short course organized as Director: 6

Others

1. Performed large number of surgeries especially in large animal with very high survival rate. Performed large number of surgeries at farmer's door step in remote villages free of cost.
2. Designed and Developed unique large animal operation theatre at Bidar
3. Member, National Academy of Veterinary Sciences.
4. Member, Academic Council, KVAFSU, Member Secretary, Research Council, KVAFSU
5. Member, Editorial Board, Indian J. Veterinary Surgery in 2015-17, Frontier J. vet. Sci
6. Accreditation Member, VCI team for Veterinary College, Junagadh Agricultural University
7. Accreditation Committee Member, VCI team for Apollo Veterinary College, Jaipur, Oct 2014, and Veterinary College, Junagadh Agricultural University
8. External Member, Board of Studies, PV Narasimha Rao Veterinary University, Telengana in 2015-17
9. Acted as selection committee member for various universities such as, Telengana Veterinary University, TANUVASChennai, Veterinary university Jabalpur and MAFSU, Nagpur.
10. Chairman/coordinator for University level ICAR accreditation report

AMELIORATION OF ANAESTHETIC AND SURGICAL STRESS IN FARM AND COMPANION ANIMALS

B.V. Shivaprakash

Director of Research, Karnataka Veterinary Animal and Fisheries Sciences University, Bidar

Introduction

The essence of stress was probably first introduced in the 19th century when Claude Bernard expressed his views on complex bodily activities that contributed to sustaining the stability of the internal environment (Bernard, 1878). The terms “stressor and stress response” were introduced to characterize the stimuli capable of affecting the bodily equilibrium and the perturbations thus induced, respectively (Ewbank, 1973, Selye, 1973). Cannon’s works led to the discovery of enhanced sympathetic nervous system activities as body’s response to adverse events (Cannon, 1914, 1928). Based on this, a “flight of fight” response was described that was characterized by increase heart rate, blood pressure, secretion of catecholamine and behavioural alterations to meet the demands of various challenges (Cannon, 1935).

Stress, fear, pain

There is no standard universally accepted scientific definitions for stress, fear or pain in animals. **Fear** has been defined as an emotional response to perceived danger, which plays a crucial role in motivating the animals to avoid harmful situations (Rushen *et al.*, 1999). **Stress** has been defined as a state that occurs when an animal is required to make abnormal or extreme adjustments in its physiology or behaviour in order to cope with adverse aspects of its environment and management (Fraser *et al.*, 1975). In Oxford dictionary (Hornby, 2000) “stressed” is described as too anxious, without an ability to relax; stress is explained as “mental or physical pressure put on an individual.

Moberg (2001) defined stress as “the biological response elicited when an individual perceives a threat to its homeostasis”.

Pain is a complex phenomenon, with sensory, cognitive and emotional components (Vinuela-Fernandez *et al.*, 2007). Pain has been defined by the International Association for the study of Pain as “an unpleasant sensory and emotional experience associated with actual or potential tissue damage (ISAP, 1979).

Trauma and surgery are potent triggers of a neuro humoral stress response in all animals (Kehlet, 1989). This response will allow the injured animals to survive by catabolizing their own stored body fuels. However, it has been argued that the stress response may be unnecessary and even harmful in patients undergoing surgery (Desborough, 2000). In human, perioperative stress response has adverse effects on immune function which may increase susceptibility to infections. Stress can predispose to prolonged ileus, hypercoagulability, increase the risk for ischemic reperfusion injury and determine systemic inflammatory responses (Liu *et al.*, 1995 and Wolf, 2012).

Preoperative Stress

Even before giving anaesthesia and performing surgery, preoperative stress may be experienced.

It is well known in human as 70-80% of them experience anxiety while waiting for the surgical procedure. Anxiety, anticipation of surgery, prolonged hospitalization and preexisting disease are contributing factors to pre-operative stress (Corman *et al.*, 1958 and Ramsay, 1972).

In Veterinary medicine, although a number of studies have investigated peri-operative stress (Benson *et al.*, 2000 and Fox *et al.*, 2000), the pre-operative stress has received little attention.

Vaisanen *et al.* (2005) videotaped the behaviour of 39 dogs before subjecting them for elective ovariohysterectomy. Preoperatively, panting, yawning and oral behaviour were observed to acute stress (Beerda *et al.*, 1997 and Vaisanen *et al.*, 2005). In 13 of the 41 animals studied, no attempts to free, no barking or howling occurred. Whereas, in 13 dogs; such behaviour were vigorous. The behaviours shown may be related to the breed of the dog. Intensive vocalization was observed in all the Doberman pinscher breeds studied. Lower heart rates were recorded in passive animals but such dogs showed panting and yawning. The heart rate of Airedale terrier was among the highest (Mean: 139) but in Golden retriever breed, mean heart rate was 104 per min.

In farm animals, studies are limited when compared to companion animals. However, animals might suffer from preoperative stress due to transport from long distance either by walk or in tempo, lorry on rough roads. International transport is often done using ship. Anxiety, fear, deprivation of water or food and injuries may occur during the transport. During hospitalization, change of place, separation from rest of the herd, lack of adequate feed and water, prolonged fasting advised before anaesthesia and surgery and pre-existing disease might also contribute to preoperative stress in farm animals.

Perioperative stress responses

Stress response in surgery and trauma (derived from human patients)

Neuroendocrine 1. Hypothalamic-pituitary-adrenal(HPA) axis 2. Autonomic nervous system (ANS): activation of sympathetic division of ANS	Increase in circulating concentration of catecholamines (adrenaline, noradrenalin) extremely rapidly, Increase in ACTH, cortisol, ADH(vasopressin), G.H, aldosterone Decrease in insulin
Metabolic liver, kidney, adrenals, pancreas, heart, intestine, thyroid	Increased gluconeogenesis, glucogenolysis, hyperglycemia, decreased thyroxin Increased lypolysis Protein loss Altered fluid and electrolyte balance
Immunological/ inflammatory	Leukocytosis, changes in lymphocyte subpopulations Cytokine production Production of acute –phase proteins
Behavioural	Preoperative fear, anxiety, Postoperative fatigue Cognitive dysfunction, pain Sleep disturbances

*Dosbrough 2000, Johnson *et al.*, 2002, Kehlet and Wilmore, 2002

At the beginning of 20th century, anaesthetic exposure was speculated to affect the immune system (Gaylord, 1916). Cuthbertson (1932) documented metabolic changes associated with body injuries. In 1950's, King *et al.* (1951) reported hypertensive responses in humans due to endotracheal intubation. The emotional aspects of perioperative stress have been emphasised in human medicine (Corman, 1958). The neuroendocrine responses following surgical stress are due to afferent nerve impulses arriving from the site of trauma (Egdahl, 1959) and hypothalamic activities (Hume and Egdahl, 1959). Cytokines secreted by the immune cells have also been viewed as important contributors to surgery related endocrine and metabolic responses (Ferrar and Hall, 1998).

Haematological and immunological responses

Increased white blood cells are mainly due to neutrophilia, whereas, the number circulating lymphocytes and eosinophils generally decrease (Salo, 1992). Alterations in plasma cytokine levels and leukocyte counts can occur within hours of the start of an operation (Byrne *et al.*, 2000). Whereas, increased production of acute-phase protein such as C-reactive protein (CRP), is observed later i.e., after 12 to 24 hours (Hall *et al.*, 2001). The immunological changes can persist for several days, over 7 days after major operations (Hall *et al.*, 2001). Increased blood neutrophils have been noticed at 4 hours following ovariohysterectomy operation with peak levels on the first and second postoperative days (Schmidt and Booker, 1982). Some of the advanced method to detect neutrophil activity includes Neutrophil Chemiluminescence (CL) based on emission of light that occurs in relation to cell activation and generation of reactive oxygen species (ROS) (Allen *et al.*, 2000). Kosaka *et al.* (1996) reported depressed neutrophil CL after halothane anaesthesia and minor surgery. Anaesthetic agents such as halothane, isoflurane, propofol and midazolam attenuated the phagocytosis, chemotaxis and oxidative activities of blood neutrophils (Milkawa *et al.*, 1998 and Nishina *et al.*, 1998).

Metabolic effects of perioperative stress

Due to neurohumoral and inflammatory mediators such as cortisol, catecholamines, insulin and growth hormone, several metabolic changes are seen after surgical interventions. These include protein breakdown, hyperglycemia, lipolysis and fluid and electrolyte imbalance (Hill and Hill, 1998 and Desborough, 2000). The insulin secretion is decreased leading to hyperglycemia. The cortisol is a major contributor for protein breakdown. Inflammatory mediators further modulate hepatic metabolism to favour the production of acute-phase proteins (Gabay and Kushner, 1999). Increased secretion of aldosterone and ADH influence fluid and electrolyte balance, resulting in sodium and water retention (Desborough, 2000).

Behavioural changes due to perioperative stress

In companion animals, several studies on perioperative stress have been documented. In these studies, postoperative behavioural changes such as change in locomotive activities, postures, vocalisation and interactive behaviours have been reported. Many studies have utilised detailed video analysis. In the studies of Hardie *et al.* (1997) and Kyles *et al.* (1998), dogs that had undergone ovariohysterectomy spent more time sleeping and showed diminished interactive behaviour when compared to dogs that had only been anaesthetised. Fox *et al.* (2000) concluded that 166 behaviours could be potential indicators for postoperative pain following ovariohysterectomy in dogs.

Magnitude of anaesthetic or surgical stress or both

In dogs and cats, short-term alterations in plasma cortisol, ACTH and catecholamine concentrations have been recorded for individuals undergoing general anaesthesia alone, but the changes observed have been a lesser degree than those occurring when surgery have been performed (Benston *et al.*, 2000). Kyles *et al.*, (1998) recorded lower cortisol levels in dogs undergoing general anaesthesia when compared to dogs undergoing ovariohysterectomy.

To some extent, the magnitude of stress is related to the type of the operation. In humans, cardiac (Tonnesen *et al.*, 1987) or major orthopaedic surgery (Hall *et al.*, 2001) can result in increased plasma cortisol concentrations for up to 6 days. With minor operations, such as ovariohysterectomy in dogs, plasma cortisol has returned to its preoperative level within 12 to 24 hours (Lemke *et al.*, 2002). Laparoscopic surgeries that result in minor tissue trauma as compared with open abdominal surgeries may not greatly modify the neuroendocrine responses (Kehlet, 1999). In farm animals' surgeries such as dehorning and castration have been investigated and lead to stress. Cox (1987) was of the opinion that caesarean is a biggest masterpiece surgery which involves greatest magnitude of trauma and stress.

Measurement of stress and pain in farm animals

1. Invasive methods
2. Non-invasive methods

The assessment and management of pain in farm animals have been reviewed (Mellor *et al.*, 2000; Rutherford, 2002; Anil *et al.*, 2005; Vinuela-Fernandez *et al.*, 2007). A major issue for animal welfare research is that currently most of the methods used to measure stress or pain are invasive (e.g., blood sampling) and there is a lack of reliable, non-invasive tools (Stewart *et al.*, 2005). Limitations of available non-invasive measures of stress and remote sampling are reviewed. In order to improve animal welfare, new technologies and tools to evaluate the welfare impact of different husbandry practices are necessary.

Measurement of cortisol

In contrast to the rapid sympathetic nervous system (SNS) response to stress, the cortisol response is slower, more persistent and more easily measured. The functioning of the HPA axis and its response to stress have been well-defined and extensively studied in farm animals (Mormede *et al.*, 2007) and cortisol responses to painful stimuli during dehorning (Stafford and Mellor, 2005) and castration (Stafford and Mellor, 2005b) of cattle have been well documented.

Cortisol concentrations in blood are used widely to study HPA activity. This presents some problems related to the invasiveness of blood sampling techniques (Stewart *et al.*, 2005) and alternatives have been used (e.g., urine, saliva, faeces, milk). cortisol response to a noxious stimulus may not persist for the duration of the effects of the stressor and thus may not reflect the overall impact of the stressor on the animal. There is also little evidence that cortisol concentrations vary with the severity of the stressor, as the HPA axis is highly sensitive to a range of stimuli that may not be harmful to the animal (Mormede *et al.*, 2007).

Measurements of stress based on physiological changes

To accurately evaluate the intensity of the response to noxious stimuli, complementary measures, such as behaviour and ANS activity, are necessary. Physiological changes elicited by the ANS (e.g., increased heart rate and plasma catecholamines) may be more useful than cortisol for assessing acute responses to pain or stress because of their quicker response time. The ANS, which is under direct control of the central nervous system, is made up of two branches, the parasympathetic nervous system (PNS) and the SNS. Parasympathetic pathways predominate in the relaxed state and their primary function is to restore energy reserves. The effects of dominant parasympathetic activity include decreased heart rate, increased visceral activity (e.g., digestion) and decreased metabolic rate. Sympathetic pathways predominate when an animal is threatened. These stimulate the release of catecholamines from the adrenal medulla and function to mobilise the body's energy stores required for the 'fight or flight' reaction, a response that occurs in a matter of seconds. This involves increased heart rate and blood pressure, allowing more oxygen to be pumped around the body more rapidly; contraction of the spleen, releasing stored red blood cells to carry additional oxygen; release of stored sugar from the liver for muscles; deepening of respiration and dilation of bronchioles in order to take in more oxygen; dilation of the pupils, possibly to increase visual acuity; increase in the blood's ability to coagulate for sealing wounds; increase in lymphocytes to help repair damage to tissues and vasoconstriction. However, relatively few studies have measured sympathetic-adrenomedullary responses, such as plasma catecholamines, in farm animals. This may be due to the high cost of assays and practical difficulties in collection and measurement of catecholamines, as a result of their low concentrations and short half-life (1-2 min) in plasma (Hjemdahl, 1993).

Generally, Heart rate, respiration rate, rectal temperature, Mean arterial pressure are monitored as physiological changes as stress detectors in clinical practice.

Systemic proteins used as inflammatory and stress markers in cattle and sheep

Acute phase proteins (APP) are part of immune response and are immediately modulated by trauma, stress, inflammation and neoplasia (Ceciliani *et al.*, 2012). Serum Heptoglobin, serum amyloid (SA), serum albumin, plasma paraoxonase 1 (PON 1) are some of the APP that can be measured to assess stress and inflammation (Vioria *et al.*, 2018).

Measurement of stress based on behavioral changes

Measuring emotional processes in animals using cognitive approach has been described (Paul *et al.*, 2005). A method to assess acute pain in lambs has been validated (Moloney *et al.*, 2002). Stratico *et al.*, (2018) used behaviour responses such as foot stamping, /kicking, easing quarters, standing up and lying down, head turning and vocalization and postures such as abnormal lateral or ventral lying, abnormal standing or walking statue standing and tail stretching and also food intake to measure distress 12 hours after castration in lambs. Behavioral responses to a noxious experience have an advantage in that they occur immediately, provide a good indication of the duration and different phases of a painful experience (Mellor *et al.*, 2000) and can be measured non-invasively. Animals typically withdraw from noxious stimuli with protective behaviors that prevent further damage. Factors that influence behavioral responses to pain

are the location of the pain and the type of tissue involved, the intensity of pain and whether it is an acute or chronic pain. However, the measurement and interpretation of behavioral responses can be difficult and the variation in responses can be misleading (Rushen, 2000). Responses may vary depending on the individual's characteristics, previous experience, breed and species. Prey species show fewer outward signs of pain (e.g., vocalizations) compared to species with few or no natural predators. For example, following a painful husbandry procedure, such as castration, calves and lambs may adopt an immobile stance (statue standing), which could be misinterpreted as the animal not experiencing any pain. Therefore, knowledge of selective pressures affecting the species is required for accurate interpretation of behavioral responses. On the other hand, physiological responses to pain vary little among species (Broom, 2001) and may be more useful than behavioral responses for assessing the maximal intensity of a noxious experience (Mellor *et al.*, 2000). Therefore, it is clear that integrating data from behavior observations, physiology, immunology and production is necessary to assess the welfare status of farm animals.

Non-invasive measures of autonomic nervous system activity

- A. Heart rate variability (HRV) :** Traditional measures of sympathetic activity include plasma catecholamine concentrations, pupillary diameter, skin resistance and peripheral blood flow. Measures of heart rate in cattle have been recorded in response to different procedures such as branding (Lay *et al.*, 1992), transport (Kenny and Tarrant, 1987), human handling (Rushen *et al.*, 1999a; Hemsworth, 2003), shouting (Waynert *et al.*, 1999) and electric shock (Lefcourt *et al.*, 1986). Interpretations have mainly been based on the assumption that increased heart rate reflects sympathetic activity, however, heart rate can only be interpreted as the net effects of both divisions of the ANS and is of limited use for assessing sympathovagal regulation. On the other hand, HRV provides a more accurate measure of ANS activity. Methods of HRV analysis use the cardiac interbeat interval (IBI or R-R interval), which is calculated as the time interval between successive R waves of the electrocardiograph (ECG). By using the IBI to calculate HRV parameters in time, frequency and non-linear domains, it is possible to measure the balance between the SNS and the PNS. Time domain measures are the simplest parameters used to analyse HRV. The main time domain measurement used is the root mean square of successive differences (RMSSD), which is determined by calculating the difference between consecutive IBIs before squaring and summing them, the values are then averaged and the square root is obtained (von Borell *et al.*, 2007). The RMSSD is the main time domain parameter used to estimate the high frequency beat-to-beat variations that represent parasympathetic activity (Malik and Camm, 1995). In the frequency domain, HRV is typically analysed using Fast Fourier transformation (FFT). The high frequency (HF) band represents parasympathetic activity (von Borell *et al.*, 2007). The power in the low frequency (LF) band and the LF/HF ratio have been suggested to indicate the level of sympathetic activity (Stewart, 2008).
- B. Infrared thermography (IRT):** IRT is a non-invasive approach to indirectly measure blood flow changes by detecting small changes in skin temperature that are related to alterations in emotional state. Sympathetically-mediated vasoconstriction that occurs during the 'fight or flight' reaction

functions as a protective mechanism to minimise blood loss from vulnerable areas (such as the skin) during injury. However, because short-term requirements of the skin are not crucial during attack or a painful stimulus, blood can be diverted from the cutaneous bed and redirected to organs (e.g., muscles and brain) with more urgent metabolic requirements (Blessing, 2003). IRT has been used to measure blood flow changes in humans during different emotional states. Pavlidis *et al.* (2002) used IRT as a lie detection tool and found that eye temperature increased. Levine *et al.* (2001) found that eye temperature increased and cheek temperature decreased in response to a fright. Stewart (2008) validated its use in cattle to measure stress and pain.

Sheep Grimace scale to detect pain and distress (SGS)

This method employs observing facial expressions using video recording and scored by blind observers. This was found to be having high inter-observer reliability and accuracy of 68.2% in sheep undergoing tibial osteotomy (Hager *et al.*, 2017).

Ameliorating Anaesthetic and Surgical stress:

1. Anaesthetic over dosage

Causes and the stress	Amelioration/management
Miscalculation or nonformality or narrow therapeutic indexes are the reasons.	Over dosage of burbutarates are corrected by ventilation, intravenous fluid therapy and cardiac monitoring. Administration of 0.5-1.00 m Eq/Kg sodium bicarbonate can speed recovery.
This may lead to severe anaesthetic stress, physiological depression and if not corrected, death.	Overdosage of Xylazine: yohimbine Medetomidine: Atipamezole Antagonist Overdosage of m-opioids: Nalaxone is an antidote. Use of nonspecific & stimulant : Doxapram : 1.0 – 5.0 mg/kg B.w.

2. Ventilatory problems

Hypoventilation Causes and the stress	Amelioration/management
One of the most commonly encountered and serious complications in anaesthesia.	Endotracheal intubation Turning off of anesthetic Oxygen during surgery and until endotracheal tube is removed intermittent positive pressure ventilation correction of primary problem
Seen in anaesthetic overdose	
Weakened debilitated animals are more prone for hypoventilation	
may occur secondary to circulatory depression & inadequate perfusion to CNS respiratory centers	
Muscle relaxant drugs Thoracic injury	

3. Circulatory Problems

Hypotension	Amelioration/management
Causes and the stress	
Decreased cardiac output	Reducing anesthetic delivery
Increased capacitance & vasculature	2. Fluid administration-crystalloids
Inadequate blood volume	3. Vasoactive drugs
Vasodilation is very common side effect of many anaesthetics: Acepromazine, Fentanyl, xylazine, volatile inhalant anaesthetics	
Bradycardia : Causes and the stress	Amelioration/management
Xylazine, phenothiazine drugs, Halothane	Administration of Atropine/glycopyrrolate to prevent vagal bradycardia
<ul style="list-style-type: none"> ● Surgical procedures that increase vagal parasympathetic tone 	
<ul style="list-style-type: none"> ● Deep abdominal surgeries, intraocular surgeries 	
<ul style="list-style-type: none"> ● Some surgeries of neck, thorax. 	
Non Vagal bradycardias	Correction of primary cause atropine administration.
<ul style="list-style-type: none"> ● Excess anaesthetic depth. ● Hypoxia, hypothermia, hyperkalemia 	
Tachycardia	Amelioration / management
Causes and the stress	
<ul style="list-style-type: none"> ● Heart rate above 180 in dogs, 200 in cats. 	Compensatory tachycardia is treated with fluid therapy, reducing anaesthetic depth. Administer pre anaesthetic tranquilizers, sedatives. Administer correct dosage of intravenous anaesthetic
<ul style="list-style-type: none"> ● Leads to increased cardiac workload 	
<ul style="list-style-type: none"> ● Due to fear, pain, inadequate depth of anaesthesia, improper or rough induction, hypotension. 	
<ul style="list-style-type: none"> ● Compensatory Tachycardia due to hypovolemia/hypoxia 	
Ventricular Tachycardia	Amelioration/management
Causes and the stress	
It is a much more serious emerge than supraventricular or compensatory tachycardia	2% lignocaine i.v. @ 0.5, 1, 2 ml i.v. for small/medium or large dogs. Cats – Propranolol (drug of choice) 0.04 mg/kg i.v. Lignocaine injections are repeated 2 or 3 times, during 15-20 mts with total dose of 10mg.

Cardiopulmonary arrest	Amelioration/management
Causes and the stress <ul style="list-style-type: none"> No significant improvement in methods of cardiopulmonary resuscitation (EPR). Success rates of CPR are never high Complete recovery from asystole arrest is rare. Entire staff of every veterinary clinic should be trained in CPR 	<ol style="list-style-type: none"> ABC's of CPR <ul style="list-style-type: none"> A – Airway B – Breathing C – Circulation Drug therapy <ul style="list-style-type: none"> Counter Shock External: 1-10 J/kg Internal: 0.1-1 j/kg
Ventricular asystole	Adrenalin 1, 2, 3 ml for small/medium/large dog
Ventricular fibrillation	DC defibrillator

A. Airway – examine oral/laryngeal cavity, place endotracheal tube.

B. Breathing. It is the second priority in CPR

- Provide artificial ventilation using anaesthetic system with oxygen or using Ambu-type resuscitation bag

C. Circulation –

- Open surgery: cardiac massage.
- Chest compression in non-surgical patients, animal in lateral recumbency with one hand on either side of the patient.
- Compressions should be at rapid rate of 90-120 per minute

Drug therapy	Dose	Dog (15 kg)
Adrenaline 1:1000, 1mg/ml	0.1 mg/kg	1.5ml
Atropine, 0.54 mg/ml	0.025 mg/kg	0.6 ml
Lignocaine, 20 mg/ml	1.0 mg/ kg	0.75 ml
Sodium bicarbonate	1.0 m-Eq/Kg	15 ml
Hydrocortisone	30 mg/kg	450 mg

4. Post-Surgical Pain

- Acute post-operative pain is followed by persistent pain in 10-50% of human ; 2-10% have chronic pain (Kehlet et al., 2006)
- Chronic postsurgical pain is primarily neuropathic or less common due to inflammation.

Pain Management

1. Traditional methods: opioid / non-steroidal anti-inflammatory drugs (NSAID)

NSAID	DOSE
Caprofen	4.0 mg/kg i.v./sc.,
Meloxicam	0.2 mg/kg i.v./sc.,
Ketoprofen	2.0 mg/kg i.v., I.M.

Tolfenamic acid	4.0 mg/kg s.c/oral
Dera coxib	3-4 mg/kg oral
Etodolac	10-15mg/kg oral
Firocoxib	5.0 mg/kg orally
Tepoxalin	10-20mg/kg oral

2 **Opioids:** More efficacious for acute pain

Morphine, pethidine, methadone, hydromorphone, naloxone, buprenorphine, Butorphanol.

As Veterinary patients are discharged within a short period of time, longer acting post-operative analgesics are widely used, notably, buprenorphine. Respiratory depression of opioids is less commonly noticed in small animals when compared to humans (Flecknell, 2008).

3. **Alpha₂ adrenergic agonists:** intramuscular or epidural: Xylazine.

4. **Recent analgesic drugs**

1	N-methyl – D-aspartate NMDA antagonists	*Slingsby and waterman-pearson, 2000
2	Tolfenamic acid:	Postoperative and chronic pain Long half life
3	Deracoxib (1-2 mg/kg p.o.)	Specific cox-2 inhibitor Post-operative pain, orthopaedic surgery High oral bioavailability Long duration, every 24 hours.
4	Etodolac, Firocoxib, Tepoxalin	Cox -2 inhibitor Pain of osteoarthritis
5	Gabopentin: 5-25 mg/kg, 8gh P.O.	Neuropathic pain in dogs and cats and pregnant horse (Davis <i>et al.</i> , 2007)
6	Tramadol	Non opioid but opioid like action, adrenergic blocking agent, preemptive analgesic

5. **Local anaesthetics**

- Used as peripheral nerve block (sciatic nerve block) or spinal block in association with general anaesthesia in dogs for orthopaedic surgery with better results to ameliorate pain.
- Used for Lumbosacral epidural block in dogs and cats
- Bupivacaine 0.5%: single injection preoperatively provides intraoperative and postoperative analgesia for 12-24 hours.
- A pilot study in dogs reported that lignocaine given as I.v. infusion during surgery provided some postoperative analgesia.

6. **Alternative techniques for ameliorating pain**

- Acupuncture, Laser treatment

- Herbal therapy
- Homeopathy (Arnica, Rutagravcolen (No studies validate their use)
- Interventional techniques (radiotherapy, rhizotomies, vertebral stabilization)

Amelioration of stress in specific surgeries

1. Surgical stress in Pyometra

- Extreme abnormalities of fluid and electrolyte balance – Alkalosis to acidosis, dehydration, Ketoacidosis, toxemia, vomiting, renal failures may be present.
- Fluid and electrolyte therapy, adrenaline, dobutamine, antibiotics may be necessary.
- Feeding through oesophagostomy, gastronomy tube if normal feeding is not possible

2. Stress of Caesarean in bitches

Higher physiological oxygen demand	5-7 mts of preoxygenation with mark 5-6 ml/min and during surgery
Increased cardiac output and blood volume Anaesthetic requirements less	Reduce the dosage to one third, Avoid prolonged anaesthesia and surgery Vigilant attention to anaesthetic depth
Delayed gastric emptying	Endotracheal intubation, antiemetics, Rapid induction, intubation
Enlarged abdomen	Assist ventilation, oxygen
Hypovolemia, stress	Pre and intra- operative fluid therapy. 10 ml/kg/hr. Post operative fluid therapy

3. Neuromuscular disease

- Alpha- agonists exacerbates weakness and to be avoided
- Low doses of neuromuscular blocking agents
- Removing excessive saliva, ventilation

4. Spinal trauma

- Stabilize pets on a board before transport
- Fluid therapy, analgesia administered
- Cardiopulmonary parameters should be stabilized prior to anaesthesia

5. Paediatric patients

- Sevoflurane is more ideal than isoflurane
- Propofol or ketamine are better alternatives.
- Avoid barbiturates under 8-10 weeks of age.

Surgical pain of Castration in bulls: Burdizzo's method or open surgical method

- Use Local anaesthesia: intratesticular/ into spermatic chord/ scrotal neck/ at incision site.

Bupivacaine provides longer period of pain relief than lignocaine (Stock and Coetzee, 2015).

- An epidural injection using lignocaine before Burdizzo castration reduce cortisol response by 30% for one hour. Epidural xylazine plus flunixin (i.v) also tried. Xylazine and Ketamine i.v. reduced behavioural distress and cortisol concentrations immediately after castration (Animal Welfare division, Am Vet Med Assoc.)
- Non-steroidal anti-inflammatory drug to eliminate acute pain
 - (Ministry of Agriculture, food and rural affairs, Ontario)
- Systemic analgesia with caprofen or ketoprofen appears to be effective in reducing acute pain derived from Burdizzo castration in bulls (Pang *et al.*, 2006 and Ting *et al.*, 2003).
 - Ketoprofen before castration along with local anaesthetic reduced cortisol by 52% and when it was combined with epidural anaesthesia, by 58% (Ting *et al.*, 2003)
- In Veterinary College, Bidar, I used xylazine sedation i.m and lignocaine at the site and observed reduced pain behaviour and this is regularly practiced for castration of adult bulls along with meloxicam.

Castration and dehorning in calves (followed for beef and dairy cattle in Australia)

Combination of buccal meloxicam and topical anaesthetic (ilium Buccalgesic, Troy lab, NSW). This reduced pain related behaviours during a 6-hour period. Overall improvement in weight gain, lying activity were seen (Lomax, 2018 and Van der saag *et al.*, 2018).

Castration in lambs

Stratico *et al.*, (2018) conducted a study in 30 lambs and found that intravenous administration of flunixin and intra-funicular lignocaine was a reliable method for reducing pain and distress during and after castration

Stress of Caesarean in Farm animals

Shivaprakash *et al.*, 2011 adopted following practices and obtained over 90% survival of dams following caesarean in cows and buffaloes.

Preoperative amelioration

Intravenous antibiotics, steroids, fluid therapy, Calcium and magnesium therapy, tocolytic agents such as isoxsuprine, clenbuterol.

Intraoperative management

Providing proper bedding during caesarean, careful selection of anesthetics and surgical approaches and principals, continuation of fluid therapy, injecting oxytocin to uterine musculature.

Postoperative management

Providing drinking water immediately after caesarean, continuation of fluid therapy until animal takes feed, antibiotics and NSAID analgesics.

References

- Brearily J.C., Dobson, H. and Jones, R.S. 1992. The Stress Responses Involved in General Anaesthesia in Cattle. *J. Vet Anaesth.*, **19**: 18-23
- Brearily, J. C., Brearily, M. J., 2000. Chronic pain in animals. In: Klecknell P, Waterman – pearson A, eds. Pain management in Animals. London: W. B. Saundar.
- Bulent K. 2010. Modification of surgical stress response by perioperative melatonin administration. *Dan Med Bull.*, **57(5)**:B4144.
- Davis, J. L., Posner, L/ P., Elce, Y. 2007. Gabapentin for treatment of neuropathic pain in a pregnant horse. *J Am Vet Med Assoc.*, **231**: 755-758
- DeLay, J. 20.16. Perianesthetic Mortality in Domestic Animals: A Retrospective Study of Postmortem Lesions and Review of Autopsy Procedures. *Veterinary Pathology.*, **53(5)**: 1078-1086.
- Desborough, J. P. 2000. The stress response in trauma and surgery. *British J. Anaesthesia.*, **85 (1)**: 109-117.
- Mainau, E., Temple, D., Manteca, X. 2013. Effect of castration on the welfare of pigs. The farm animal welfare fact sheet.
- Eric J. A. 2008. Ruminant Field Anesthesia. *Vet. Clin. Food. Anim.*, **24**: 429–441.
- Eric, J.A. and Abrahamsen, D. V. M. 2013. Chemical Restraint and Injectable Anesthesia of Ruminants. *Vet Clin Food Anim.*, **29**: 209–227.
- Flecknell., P. 2008. Analgesia from a veterinary perspective. *British Journal of Anaesthesia.*, **101 (1)**: 121–124.
- Fletcher, M.C. 2014. Anaesthesia for compromised patients. Proceedings of the Annual Conference of the New Zealand Veterinary Nursing Association, 2014.
- Gabrielle, C. M., Stine, J., Timothy, H. H., Heidi, S. L., Jonathon, S. T., Teresa C., Karina, B. Glerup., Craig. B. J. and Michael, L. 2017. Objective Measures for the Assessment of Post-Operative Pain in *Bos indicus* Bull Calves Following Castration. *Animals.*, **7**: 76; doi:10.3390/ani7100076.
- Gnanasekar, R. and Vijayalakshmi, R. 2016. Oxidative stress response of guaifenesin-ketamine anaesthetized cattle during surgery under detomidine/xylazine premedication. *Int. J. Adv. Res. Biol. Sci.*, **3(11)**: 137-142.
- Guo, X., Kuzumi, E., Charman, S.C. and Vuylsteke, A. 2002. Perioperative melatonin secretion in patients undergoing coronary artery bypass grafting. *Anesth Analg.*, **94**:1085 91.
- Haeger, C., Biernot1, S., Buettner, M., Glage, S., Keubler, L. M., Held, N., Bleich, E. M., Otto, K., Mueller, C. W., Decker, S., Talbot, S. R., Bleich A. (2017) The Sheep Grimace Scale as an indicator of post-operative distress and pain in laboratory sheep. PLoS ONE 12(4): e0175839. <https://doi.org/10.1371/journal.pone.0175839>.

- Hughes, J.M.L. 2008. Anaesthesia for the geriatric dog and cat. *Irish Veterinary Journal.*, **61 (6)**: 380-387.
- HuiChu Lin. 2015. Comparative Anesthesia and Analgesia of Ruminants and Swine. *Veterinary Anesthesia and Analgesia - Wiley Online Library*. (<https://onlinelibrary.wiley.com/doi/pdf/10.1002/9781119421375.ch38>).
- Lemos, T. D., Larraoan, R., Melo, O., Hoetzel, M.J. 2018. Public opinion towards castration without anaesthesia and lack of access to pasture in beef cattle production. *PLoS ONE* 13(1): e0190671. <https://doi.org/10.1371/journal.pone.0190671>.
- Lepkova, R., Sterc, J., Vecerek, V., Doubek, J., Kruzikova, K., Bedanova, I. 2007. Stress responses in adult cattle due to surgical dehorning using three different types of anaesthesia. *Berl Munch Tierarztl Wochenschr.*, **120(11-12)**:465-469.
- Mairi, S. 2008. Non-invasive measurement of stress and pain in cattle using infrared thermography. Ph. D. Thesis. Massey University, Palmerston North, New Zealand.
- Marta, R., Diego, A. P., Gloria, B. and Pablo, E. O. 2016. Stress-related biomarkers in dogs administered regional anaesthesia or fentanyl for analgesia during stifle surgery. *Veterinary Anaesthesia and Analgesia.*, **43**: 44–54.
- Melches, S., Melemma, S. C., Doherr, M. G., *et al.* 2007. Castration of lambs: a welfare comparison of different castration techniques in lambs over 10 weeks of age. *Vet J.*, **173**: 554-563
- Misse, A. M. V., Anna, E. V., Elisa, H., Marja, R. R., and Outi, M. V. 2005. Pre-operative stress in dogs – a preliminary investigation of behavior and heart rate variability in healthy hospitalized dogs. *Veterinary Anaesthesia and Analgesia.*, **32** : 158–167
- Moloney, V., Kent, J. E., McKenrick, I. J. 2002. Validation of method for assessment of an acute pain in lambs. *Appl Anim Behav Sci.*, **76**: 215-238
- Moloney, V., Kent, J. E. 1997. Assessment of acute pain in farm animals using behaviour and physiological measurements. *J Anim Sci.*, **75**: 266-272
- Naguib, M., Samarkandi, A. H. 1999. Premedication with melatonin: a double blind, placebo controlled comparison with midazolam. *Br J Anaesth.*, **82**:875 80.
- Pang, W. Y., Early, B., Sweeney, T. *et al.* 2009. Effect of carprofen administration during banding or burdizzo castration of bulls on plasma cortisol, in vitro interferon- gamma production, acute phase proteins, feed intake and growth. *J. Anim Sci.*, **84**:351-359
- Paul, E. S., Harding, E. J., Mendi, M. 2005. Measuring emotional processes in animal: the utility of a cognitive approach. *Neurosci Biobehav Rev.*, **29**: 469 – 491.

- Reber, A., Huber, P.R., Ummenhofer, W., Gürtler, C.M., Zurschmiede, C., Drewe, J., Schneider, M. 1998. General anaesthesia for surgery can influence circulating melatonin during daylight hours. *Acta Anaesthesiol Scand.*, **42**:1050-1056.
- Sathya, K. C., Danielle, S. H., Christine, V. F. and Craig A. H. 2016 Best-practice guidelines for field-based surgery and anesthesia of free-ranging wildlife. I. Anesthesia and analgesia. *Journal of Wildlife Diseases.*, **52(2)**: S14–S27.
- Stock, M. L., Coetzee, J. F. 2015. Clinical pharmacology of analgesic drugs in cattle. *Vet Clin North Am Food Anim Pract.*, **31**: 113-138
- Stratico, P., Varasano, V., Suriano, R., Massimo, M., Domenico, R., Melania, G., Giorgio, V., Lucio, P. 2018. Analgesic effects of intravenous flunixin and intrafunicular lidocaine or their combination for castration of lambs. *Veterinary Record Open*;5:e000266. doi:10.1136/vetreco-2017-000266.
- Taylor, P. M. 1989. Equine stress responses to anaesthesia. *Br. J. Anaesth.* **63(6)** : 702-709.
- Ting, S. T., Early, B., Hughes, J. M., *et al.* 2003. Effect of ketoprofen lidocaine local anaesthesia, and combined xylazine and lidocaine caudal epidural anaesthesia during castration of beef cattle on stress response, immunity, growth and behaviour. *J. Anim Sci.*, **81**: 1281-1293
- Van der, D. S., Lomax, S., Windsor, P. A., Taylor, C. 2018. Effects of topical anaesthetic and buccal meloxicam on average daily gain, behaviour and inflammation of unweaned beef calves following surgical castration. *Animal.*, **12(11)** : 2373-2381.
- Van der, S. D., White, P., Ingram, L., Manning, J., Windsor, P., Thomson, P., Lomax, S. 2018. Effects of Topical Anaesthetic and Buccal Meloxicam Treatments on Concurrent Castration and Dehorning of Beef Calves. *Animals (Basel)*. **8(3)**: 28: pii: E35. doi: 10.3390/ani8030035.
- Vettorato, E., Schoeffmann, G., Beard, P. and Clutton, R.E. 2011. Postoperative complications in a lamb after major surgery. *Vet Anaesth Analg.*, **38(1)**:63-69.
- Vitoria, G. G. C., Arnaldo, D. V., Augusto, S., Monique, T. R., Paulo, B. D. G., Bernardo, G. G. (2018). Systemic inflammatory and stress markers in cattle and sheep submitted to different reproductive procedures. *Ciencia Rural.*, **48(12)**: 1-11.
- Webster, H. B., Morin, D., Jarrell, V., Shipley, C., Brown, L., Green, A., Wallace, R., and Constable. P. D. 2013. Effects of local anesthesia and flunixin meglumine on the acute cortisol response, behavior, and performance of young dairy calves undergoing surgical castration. *J. Dairy Sci.*, **96**:6285–6300.
- Pain Prevention for Caesarean Section in Ruminants: [wildpro.twycrosszoo.org /S/00Man/PainRumOverviews/PainProc/P08PainPrevCaesarean_Rum.htm](http://wildpro.twycrosszoo.org/S/00Man/PainRumOverviews/PainProc/P08PainPrevCaesarean_Rum.htm)

Aprocedure-specific approach to recovery after surgery: <https://veterinary-practice.com/article/a-procedure-specific-approach-to-recovery-after-surgery>

Anesthesia Guidelines: Ruminants: <https://www.researchservices.umn.edu/services-name/research-animal-resources/research-support/guidelines/anesthesia-ruminants>

Castration of Calves: www.omafr.gov.on.ca/english/livestock/beef/facts/07-029.htm

Literature Review on the Welfare Implications of Castration of Cattle. 2014. American Veterinary Medical Association.

Anesthesia Guidelines: Dogs: <https://www.researchservices.umn.edu/services-name/research-animal-resources/research-support/guidelines/anesthesia-dogs>

AAFP Feline Anesthesia Guidelines. Journal of Feline Medicine and Surgery (2018) 20, 602–634: Doi: 10.1177/1098612X18781391

Anesthesia Guidelines: Ruminants: <https://www.researchservices.umn.edu/services-name/research-animal-resources/research-support/guidelines/anesthesia-ruminants>.

Cats and dogs suffer from post-operative stress : <https://partner.sciencenorway.no/animal-welfare-forskningno-medicine/cats-and-dogs-suffer-from-post-operative-stress/1373238>.



Keynote Lecture

DIAGNOSTICS IN VETERINARY PRACTICE

O.P. Manchanda and Sonu Sharma

PathVets Veterinary Diagnostics

A venture of Dr. Lal Path Labs, New Delhi

India is pre-dominantly recognized as an agrarian economy and similar to agriculture, animal husbandry has been the life line for many rural Households. The contribution of Animal husbandry has very important place in Indian economy as well as the socio-economic development in the country.

The Indian Animal Health Industry has played a vital role in safeguarding the animal husbandry interests of the nation. The Indian animal healthcare (AH) market is estimated to be around Rs. 4200 Cr INR (2014) and is projected to be around Rs. 6000 Cr by 2018. The species share in AH market is 50% for livestock, 40% for poultry, 5% for companion animals and the rest 5% for other animals. Though there is no published data, the contribution of various categories of animal health products is estimated to be 40% for feed supplements, 17% for anti-bacterials, 15% for biosecurity, 13% for anti-parasitics, 5% for hormones and biologicals and 10% for other categories. There are nearly 50 major companies operating in Animal health market in India though the market is dominated by top 10 players. (*INFAH- Indian Federation for Animal Health*).

The above data shows that the veterinary diagnostics doesn't figure as a key contributor and is in its infancy in India. Animal Husbandry in India has undergone significant changes over the years, thanks to the adoption of innovative technologies used for prevention and cure of farm and companion animals. There has been a paradigm shift in the business approach of Animal health companies that have evolved from therapeutics to preventive to productivity enhancement and now to overall healthcare of the animals.

Besides large animals, the companion animal segment is a key factor in driving the animal health business. This is being fuelled by a steady increase in pet humanization. Humanization refers to the treatment of pets like the members of the family. With millennials, the practice of keeping pets for functional purposes is decreasing. Instead, pets are adopted as members of urban families. For instance, most people today do not expect their dogs to sleep outside the house and protect them.

Traditionally, the practice of medicine has been tilted towards 'Opinion Based' than 'Evidence Based'. With the advancement of technology, rising healthcare awareness at patient level, enhancement of affordability, legal liabilities and more importantly desire and increased scientific knowledge at clinician level has led to adoption of diagnostics to a much higher level. The advancement in technology has moved diagnostics from basic chemistry and hematology to advanced chemistry, molecular diagnostics, flow cytometry, cytogenetics etc. The technology has also led to the convergence of *in-vitro* and *in-vivo* diagnostics.

The diagnostics has also moved from Prescriptive to Preventive to Predictive. With better understanding of Human Genome, the diagnostics is now becoming DNA based thereby making the practice

of medicine more personalized. It is now playing a bigger role in monitoring the progression of the disease as well as in deciding the line of treatment.

While in the human medicine, the imperative is to save life at any cost but in veterinary practice the economics tend to come in play therefore the affordability angle always remains of paramount importance. Though the veterinary practice for pets tends to mimic human medicine but for others like large animals, poultry etc economics does play a key role.

India recently became the 5th largest economy in the world. As it grows further, one is very clear that the demand for milk and milk products, meat and meat products and need for companion animals will continue to rise. Therefore, the animal farming will continue to gain scale and will get more and more organized and 'Productivity' will remain the single agenda point for any animal farm. In poultry, the country has made rapid strides, however, we still have long way to go for large animals.

The productivity enhancement means improving the ratio of 'Output and Input'. One of the key enabler to enhance this ratio is the health of the animal. It is not only the treatment of diseases but also the prevention as well as selection of right genetic pool that suits the Indian conditions. The diagnostics can play an important role in all these areas.

Unfortunately, traditionally, diagnostics in veterinary practice has not been adopted to the extent it should have been. There are many reasons behind that -

- i) Para Veterinarians manage a lot of front end interface. Given the lack of knowledge in that curriculum, the practice of veterinary medicine and scientific diagnosis has remained restricted.
- ii) Vets also have been taking an easy way out given the time constraint. Due to farmer expectation for quick results, one tends to take a 360 degree approach to prescribing medicine. At least something will work!
- iii) There have not been many regulations around excessive use of medicine. It is only now one has seen rising consumer awareness that is putting pressure on regulators. Eg. Use of Oxytocin, excessive use of antibiotics that is causing drug resistance in human beings.
- iv) Another important reason is also lack of diagnostics facilities at the point of care. Unlike humans where patient travels to the healthcare institution, in veterinary more often than not the veterinary doctor has to travel to the patient. This would mean the focus has to be on point of care testing (POCT). POCT has at times the issue of scope of testing, affordability and the poor sensitivity and specificity of the diagnostics test.
- v) Lack of efforts on part of the profession to change the way veterinary medicine is practiced.

Diagnosis is an integral part of disease prevention and management as a minor outbreak of the disease can spread quickly and pose a threat to the entire population in the vicinity. Disease diagnosis of an animal forms the connecting link between the cause of the disease and the cure of the disease. There is a requirement for rapid methods that can provide answers related to the disease in terms of its cause and the probable solution.

- The global Animal Health diagnostics market is expected to register a CAGR of around 10% during the period 2018-2022, according to the latest #marketresearch report by @Technavio.
- The overall global veterinary diagnostic market is estimated to be around 5.5 bn USD. Of this approx. 50% is Point of Care Diagnostics. Point-of-care testing allows patient diagnoses in the vet's office/ an ambulance/ home/the field/ in hospital. It is estimated that this segment will continue to be the fastest growing segment for the foreseeable future.

Many veterinary colleges in India has got all major disease diagnostic facilities but the same has not been available as well as accessible to rural farmers unlike pet parents of Urban India, almost 77% plus livestock owners resides at villages and diagnostic facilities still under their wish list.

Another most unorganized and largest non-clinical diagnostic market in India is feed analysis through costly feed analysers to check the exact quality and composition of feed which has direct impact on milk production and meat production in Poultry.

My sense is that we are slowly moving into a phase where the farmers and community at large would demand specific diagnostics and will resist the excessive use of medicine. This coupled with regulation and investment in the infrastructure will drive higher level of adoption.



Anaesthesiology Session

Meet the Speaker



Dr. S. Senthil Kumar, M.V.Sc., Ph.D.

Associate Professor and Head

Veterinary Clinical Complex

Veterinary College and Research Institute

Orathanadu, Thanjavur, Tamilnadu – 614 625

E-mail: ssenthilvet@gmail.com

Educational Qualifications	M.V.Sc., Ph.D.
Field of Specilization	Veterinary Anaesthesiology
Number of Post Graduate Students Guided <i>M.V.Sc.</i> <i>Ph.D</i>	Three
Awards/Honours/Recognitions	Young Surgeon Award of ISVS 2009 TANUVAS Best NCC Cadet 1996 TANUVAS Best Horse Rider 1996 M.N. Menon Medal for Best Doctoral Thesis 2013
Research Schemes	Completed TANUVAS TRCF Project as PI 2016
Scientific Conferences/Symposia/Workshop/ Seminars Attended <i>International</i> <i>National</i>	02 12
Membership of Scientific Societies <i>National</i>	Indian Society for Veterinary Surgery
Publications <i>Full Research Papers</i> <i>Short Communications</i> <i>Clinical Reports</i>	10 5 10
Papers presented and Documented in Seminars/ Symposium/Conferences at National/International Level <i>National Conferences</i>	Presented Five Lead Papers in ISVS Congress
Popular Articles Published in Leading Farm Journals/Magazines	5
Books published by University/National Institutes/Standard Publishers <i>Chapters in Books</i> <i>Practical Manuals</i>	One 10

ANAESTHETIC MANAGEMENT OF CRITICALLY ILL PATIENTS

S. Senthil Kumar

*Veterinary Clinical Complex, Veterinary College and Research Institute,
Orathanadu, Thanjavur, Tamil Nadu*

Critical illness is a life-threatening multisystem process that can result in significant morbidity or mortality. Patients at high risk for actual or potential life-threatening health problems are termed critically ill and need at most care and support. In most patients, critical illness is preceded by a period of physiological deterioration. Correction of life-threatening problems by priority should be considered always. Good outcomes rely on rapid identification, diagnosis and definitive treatment. Recognizing the critically ill patient and instigating appropriate initial management determine the successful outcome. The presence or development of malnutrition during critical illness has been unequivocally associated with increased morbidity and mortality in humans. Recognizing that malnutrition may similarly affect veterinary patients emphasizes the need to properly address the nutritional requirements of hospitalized dogs and cats. Hypoalbuminaemia often occurs in a variety of critical illnesses, and contributes to the development of life threatening complications, including pulmonary oedema, delayed wound healing, feeding intolerance, hypercoagulability, and multiple organ dysfunctions. Unlike human literature, there is a paucity of controlled clinical studies in the literature regarding albumin supplementation in veterinary patients.

Pre-Anaesthetic Considerations in Critically Ill Patients

1. Stabilization of the critically ill animal before anaesthesia is imperative to minimize anaesthetic complications.
2. Anticipate problems and have an appropriate and efficient treatment and therapeutic plan before anaesthetic induction.
3. Consider using a balanced anaesthesia technique to minimize deleterious effects of single drug therapy.
4. Use of positive pressure ventilation with administration of neuromuscular blocking agents in appropriate cases.

In the critically ill patient, a thorough preoperative assessment is necessary to define what type of trauma or compromise the patient is undergoing. The critically ill patient has altered physiology and decreased reserves that will affect the pharmacokinetic and pharmacodynamic behaviour of anaesthetic drugs. These patients benefit from minimizing stress levels and optimizing oxygen delivery. Stabilization of the critically ill patient before anaesthetic drug exposure is essential, because the risks associated with anaesthesia in an unstable patient increase the risks of anaesthetic complications.

Thorough diagnostic tests should be performed before administering anaesthesia, including serial physical examinations, radiography, blood chemistry, complete blood count, coagulation profile, acid-

base status, and blood glucose and lactate levels. A dehydrated or hypovolaemic state along with fluid, acid-base, and electrolyte abnormalities should be corrected before induction of anaesthesia.

Stabilization

Critically ill patients often benefit from having more than one IV catheter, so that multiple agents and fluids can be given during and after the anaesthetic period. Either peripheral or central placement can be used; however, if fluids need to be given at a rapid, shock bolus rate, the widest bore catheter will allow for the most rapid administration (i.e., peripheral cephalic catheter). Blood products should be given through a dedicated catheter; no other fluids or drugs should be administered in that line during the transfusion because of concerns for possible contamination and potential for bacterial growth.

An arterial catheter will allow for direct arterial blood pressure measurement and can be used to collect blood samples for blood gas analysis. A packed cell volume (PCV) greater than 25% is necessary for adequate oxygen carrying capacity and oxygen delivery. During anaesthesia the PCV can decrease by 3% to 5%; therefore, even a small volume of blood loss during surgery may be significant and may warrant a blood transfusion. Similarly, hypoproteinaemic patients (total protein 3.5 g/dl or less and/or an albumin 2 g/dl or less, or both) may benefit from colloids to help maintain normal colloid osmotic pressure (COP) and to prevent edema formation or vascular leak. Measurement of COP before anaesthesia is helpful in determining the need for colloid support and to help determine when to terminate colloid therapy. If patients are hypoproteinaemic, options include hydroxyethyl starch, dextran-70, 25% human serum albumin, or even oxyglobin. If the patient is small, hypocoagulable, or hypoalbuminaemic, fresh frozen plasma (FFP) given at 6 to 20 ml/kg is warranted. Unfortunately, size, dosing, and cost become limiting factors for the use of FFP to treat hypoalbuminemia in larger patients, because a dose of approximately 45 ml/kg of FFP is required to increase the albumin by 1.0 g/dl. Hydroxyethyl starch and dextran-70 can both cause a dosage-dependent coagulopathy. Administration of these products should be limited or avoided in patients with known coagulation defects, and the total amount given to any one patient should ideally be limited to less than 20 ml/kg per 24 hours.

In patients with liver disease, anaesthesia protocols and monitoring may be affected by decreased glucose production, decreased albumin production, altered drug metabolism via cytochrome P-450 enzymes, and decreased production of clotting factors. Patients with heart disease may be less able to compensate under anaesthesia, and fluid overload should be avoided. Blood pressure should also be carefully monitored, because anaesthesia-induced hypotension may result in decompensation. Pre-existing drug therapy, such as nonsteroidal anti-inflammatory drugs (NSAIDs), diuretics, anticonvulsants, and cardiac medications if any should always be considered.

Finally, patients should be evaluated carefully for underlying metabolic disease before anaesthesia, because this may affect the selection of anaesthetic protocol. Patients with renal insufficiency may require a higher fluid rate to maintain renal perfusion and urine output (UOP) should be monitored carefully during anaesthesia. In addition, renal drug excretion may be delayed, so anaesthetic agents should be used cautiously

(e.g., ketamine in cats).

Premedication

Premedication may not be necessary unless the animal is in extreme pain or is vicious. If the critically ill patient would benefit from premedication, opioids such as morphine, hydromorphone, or oxymorphone in combination with a tranquilizer such as midazolam or low-dose acepromazine can be given intramuscularly to provide analgesia and sedation. In the animal that is in extreme pain or is vicious, the α -agonist can be combined with the Alpha_2 -agonist, medetomidine (5 to 10 $\mu\text{g/kg}$ IM) for enhanced analgesia, sedation, and restraint.

Critically ill patients are often depressed, lethargic, and require minimal drug therapy for induction. Anticholinergic agents are not used routinely unless there is a need to treat bradycardia. Protocols should be implemented to minimize the amount of time the animal is under anaesthesia; therefore, preparations such as preclipping the surgical site while the animal is still awake should be performed if possible. Preoxygenation will allow for additional time to intubate the animal; this is especially helpful for those animals in respiratory distress or those with an airway that may be difficult to intubate. Finally, electrocardiography (ECG) and blood pressure monitoring should be in place before induction to detect arrhythmias, hypotension, or cardiovascular collapse that may occur during induction.

Anaesthetic Induction and Maintenance

In the compromised critically ill patient, anaesthetic drug dosages often can be reduced to half of that for a normal, healthy patient. Induction drugs should be titrated slowly intravenously to effect, and the minimal amount necessary to intubate the patient should be used. In addition, a balanced anaesthetic technique will help to minimize the side effects that can occur with a single agent. Using local anaesthetic blocks and epidurals, if appropriate, to decrease the amount of general anaesthesia that is required.

Intubation should always be performed to control the airway, to provide the ability to ventilate the patient, and to protect the airway from aspiration. One should be ready to implement intermittent positive-pressure ventilation (IPPV) if the patient hypoventilates, becomes apneic, or is to undergo a thoracic procedure.

The patient in respiratory distress will require a rapid-sequence intubation to gain control of the airway and provide ventilation with 100% oxygen. A rapid-sequence induction can be accomplished with agents that have a short onset, such as thiopental or propofol. Their duration is also short, with thiopental lasting 10 to 15 minutes and propofol lasting 5 to 10 minutes; propofol may be the preferred agent because of its shorter duration of action. Both of these drugs can be used in combination with diazepam or midazolam to improve relaxation and to decrease the overall dosage needed. Both agents are capable of inducing cardiac arrhythmias, hypotension, and apnea; hence, IPPV may be necessary. Neither agent will provide analgesia, so analgesics must be given before the surgical procedure is begun.

In the critically ill patient with a stable respiratory status, a more gradual induction can be performed.

This may be accomplished with neuroleptanalgesic techniques using hydromorphone, oxymorphone, or fentanyl with diazepam or midazolam, with the addition of either propofol or ketamine to facilitate induction. The use of multiple agents (e.g., hydromorphone, diazepam, ketamine, and lidocaine) is an example of balanced anaesthesia. This will have a slower onset, but will provide analgesia and is less stressful to the cardiovascular system. Ketamine may be used to enhance analgesia and will increase heart rate and blood pressure.

Bowel Obstruction

Patients with bowel obstruction, ischemia or perforation may develop complications due to electrolyte, acid base and fluid imbalance. Enlarged viscera may compress the vena cava causing circulatory and vascular compromise. Respiration may be compromised by viscera displacing the diaphragm cranially

Urinary Obstruction

Electrolyte (hyperkalemia) and acid base abnormalities in patients with urinary obstruction should be corrected prior to anaesthetic induction. Hyperkalemic patients are treated with 0.9% saline and if serum potassium is normal balanced electrolyte solution should be administered. Ketamine should be avoided in cats with renal compromise.

Hypotension during surgery may cause renal vasoconstriction, decreased blood flow and subsequent renal damage. Hypotensive drugs (acepromazine) should be avoided in animals with renal impairment.

Trauma Patients

Anticholinergics are not routinely recommended for trauma patients because they may increase heart rate and oxygen consumption and predispose to arrhythmia.

Anaemic Patients

Anemic patients should be given oxygen before induction and during recovery

Peritonitis/Hepatic Dysfunction

Animals with peritonitis are often endotoxic and /or hypotensive.

Hypotension in dogs is associated with intense portal vasoconstriction which causes breakdown of intestinal mucosal barrier allowing increased endotoxin to be absorbed from the intestine.

Animals with total protein less than 4.0 g/dL or albumin 1.5 g/dL may benefit from perioperative colloid administration.

Dobutamine or dopamine may be given during surgery for inotropic support. Dobutamine is less arrhythmogenic and chronotropic than dopamine and is preferred if the patient is hypotensive and anuric. If the patient is anuric and normotensive low doses of dopamine 0.5 to 1.5 microgram per kg per minute intravenously plus furosemide 0.2 milligram per kg intravenously may be preferable. These patients should be monitored for arrhythmia or tachycardia.

Hepatic necrosis occurs during sepsis and causes reduced liver function

Acepromazine should not be used in animals with peritonitis if severe hepatic dysfunction is suspected.

Diazepam plus an opioid are useful premedicants in patients with hepatic dysfunction. Diazepam should be used with caution in hypoalbuminaemia patient.

Most opioids have little or no adverse effect on the liver. However, intravenous morphine should be avoided in dogs with hepatic dysfunction because it may cause histamine release resulting in hepatic congestion and hepatic vein spasm.

Gastric Dilatation and Volvulus (GDV)

Diazepam-opioid-Etomidate may be given. Etomidate is a good choice for induction because it maintains cardiac output and is not arrhythmogenic. Alternatively, a combination of lidocaine and thiobarbiturate may be used if arrhythmia is present.

Nitrous oxide should not be used in dogs with GDV.

Isoflurane is the inhalant agent of choice because it is less arrhythmogenic than halothane.

Once the animal is intubated, anaesthesia can be maintained via an inhalant agent such as isoflurane or sevoflurane. These two agents are the most commonly used, but both cause cardiovascular and respiratory depression. Both agents have a rapid onset and recovery time, allowing for rapid change in anaesthetic concentration.

Monitoring during Anaesthesia

Critically ill patients require careful and constant monitoring to preserve cardiovascular function and avoid excessive anaesthetic depth.

1. The ECG should be monitored closely for changes in heart rate, rhythm, and for the presence of arrhythmias, which may be more prevalent with trauma, splenic disease, septic peritonitis, hypoxia, or gastric dilatation-volvulus. Additional monitoring during the maintenance phase includes maintaining the mean arterial blood pressure (MAP) higher than 60 mm Hg to maintain renal perfusion. Physical indicators of perfusion, such as the capillary refill time (CRT), mucous membrane color, and pulse quality, should be monitored continuously.
2. Depth of anaesthesia should be assessed frequently by monitoring eye position, pupil size, jaw tone, response to stimulus, heart rate, blood pressure, and respiratory rate.
3. Pulse oximetry will add information on hemoglobin (Hb) saturation and oxygenation. An accurate pulse oximeter reading of anything less than 100% in a patient breathing 100% oxygen indicates a serious problem and should be treated as an emergency. Arterial blood gas monitoring may be necessary as the gold standard in critically ill anesthetized patients.

Arterial blood gas values will provide oxygenation, ventilation, acid-base and electrolyte information.

4. Capnography allows monitoring of the adequacy of ventilator function and provides an indication of cardiac output (CO). Capnography will also monitor for signs of esophageal intubation, breathing circuit disconnection, and cardiac arrest, where it will read zero carbon dioxide (CO₂).
5. Urine output should be monitored carefully, and a normal range of 1 to 2 ml/kg/hr should be achieved. Consider using an indwelling urinary catheter for precise measurement in patients with renal impairment or inadequate blood volume. Fluid overload can be assessed by measuring the body weight both preoperatively and postoperatively.
6. Central venous pressure (CVP) measurement will help guide fluid therapy (normal 0 to 10 cm H₂O) and volume overload, but reflects only the right side of the heart. In addition, CVP monitoring may not be accurate during IPPV as a result of changes in thoracic pressure.
7. Colloid osmotic pressure should be monitored frequently to help determine the oncotic status of the patient and aid in fluid therapy choices. Blood glucose levels should be monitored closely in animals that are paediatric, septic, diabetic, or have severe liver disease. Finally, body temperature should be monitored continuously, because anaesthetic drugs disrupt normal thermoregulatory mechanisms, and hypothermia leads to prolonged recovery.

Common complication in Critically ill patients are often hypotension during anaesthesia, a mean blood pressure lower than 60 mmHg or a systolic pressure lower than 90 mm Hg requires prompt treatment to maintain adequate organ perfusion. The initial step should be to decrease the administration of inhalant anaesthetic agents because of their depressant and vasodilatory properties. Next, a fluid bolus should be initiated. Either a crystalloid, without potassium supplementation in the fluids, at a rate of 10 to 20 ml/kg IV over 15 to 20 minutes or a colloid bolus of 5 to 10 ml/kg IV over 10 to 20 minutes should be given. If there is no effect, multiple small boluses can be attempted, keeping in mind the total volume of fluids that have been given.

If hypotension persists despite fluid therapy, there may be a need for vasopressor and/or inotropic support in the form of dopamine or dobutamine. These agents are given as a CRI because of their short half-lives, 2 to 10 µg/kg/min IV. If the animal continues to remain hypotensive even following appropriate fluid therapy and inotropic support, it may be necessary to consider discontinuing the inhalant anaesthetic agent to eliminate its hypotensive effects and continuing anaesthetic maintenance with injectable drug therapy. This may consist of a CRI of a μ -agonist such as fentanyl or morphine, in combination with ketamine and lidocaine. Some patients may need only fentanyl as an intermittent IV bolus or as a CRI. Research suggests a lidocaine CRI should not be used in the anesthetized cat because of the cardiovascular depressant effects it produces.

Recovery

In critically ill patients, continuous cardiovascular support, monitoring, supportive care and analgesia are imperative during the recovery period. The recovering patient may still require vasopressor support, which should be continued in the intensive care unit. The patient should be kept dry and warm, and should recover in a quiet, stress-free place where it can be continuously and carefully monitored. A shivering animal has greatly increased demands for glucose and oxygen, and oxygen supplementation and heat support should be given until the animal is no longer shivering. Acid-base status, electrolyte values, and blood glucose levels should also be monitored in the recovering and shivering animal. Forced warm air/heating blankets will help to treat hypothermia. Analgesics are imperative in painful, critically ill patients. Although these patients may not exhibit classic pain responses because of their debilitated states, they should be carefully and appropriately treated with analgesics. Pain can lead to catabolism and complications such as delayed wound healing, sepsis, and nosocomial disease.

Conclusion

Critically ill patients that need to be anesthetized should be stabilized aggressively before anaesthesia. Appropriate monitoring should be performed at all times to ensure that these delicate patients survive emergency surgery. Postoperative care includes continued vasopressor and inotropic support, aggressive colloid and/or crystalloid therapy, analgesia, antibiotics, oxygen, blood pressure monitoring, and nursing care to improve survival and successful anaesthetic outcome.

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ANS-1

EFFECTS OF SUBANAESTHETIC DOSES OF KETAMINE GIVEN PRIOR TO PREMEDICATION ON TOTAL INTRAVENOUS ANAESTHESIA (TIVA) FOR SHORT-TERM SURGICAL PROCEDURES IN HORSES

Pallvi Sharma, **Aswathy Gopinathan**, Kiranjeet Singh, Sherin, B. Sarangom, Chelladurai
Sowbharenaya, Christina John and Med Ram Verma

Division of Surgery, Indian Veterinary Research Institute, Izatnagar, UP

The study was conducted to find the effect of subanaesthetic doses of ketamine given prior to premedication on quality of anaesthesia, recovery and postoperative pain in horses. Eighteen horses were randomly recruited into three equal groups, S, LK and HK wherein saline, ketamine at 0.2 mg/kg bwt and 0.4 mg/kg bwt were given, respectively, i.v. for 30 minutes as continuous rate infusion (CRI). Horses were premedicated with xylazine at 1 mg/kg bwt i.v. and butorphanol at 0.05 mg/kg bwt i.v. after 30 minutes. Anaesthesia was induced using ketamine and midazolam and was maintained with ketamine at 2 mg/kg/hr as CRI and bolus doses of i.v. thiopental 5% solution was given whenever necessary. Preemptive ketamine infusion clinically enhanced the quality of sedation and enabled smooth induction with significantly ($P < 0.05$) higher sedation and post-infusion ataxia and shorter down time ($P < 0.05$) in group HK. Physiological, haematological, serological and vital parameters remained within normal limits. All the horses recovered well without any adverse effects and stood in less than 2 hours after surgery. Fluctuation in pain scores at one hour and two hours after the end of surgery was minimum in group HK.

ANS-2

MIDAZOLAM AND ACEPROMAZINE AS PREANAESTHETIC TO PROPOFOL ANAESTHESIA FOR OOPHORECTOMY IN PIGS

H. Bayan, B. Konwar and B. Saikia

*Department of Veterinary Surgery and Radiology, College of Veterinary Sciences and A.H.,
Central Agricultural University, Selesih, Aizawl, Mizoram*

The clinical study was conducted in twelve female pigs of 2-4 months of age undergoing oophorectomy procedure. The animals were randomly divided into two groups (Group AP and MP) comprising six animals in each group. The animals of AP group were injected acepromazine @ 0.1 mg/kg, IV and the animals of MP group were injected midazolam @ 0.5 mg/kg followed by butorphanol @ 0.2 mg/kg, IV in both the groups. Anaesthesia was induced and maintained with propofol. Induction time, duration of anaesthesia and recovery time, analgesia and muscle relaxation were recorded in all the animals. The heart rate, respiratory rate, rectal temperature, systolic pressure, diastolic pressure and arterial oxygen saturation were recorded at 0 (before treatment), 5, 30, 60 and 90 minutes after induction. There was no

significant difference in the induction time, duration of anaesthesia and recovery time was longer in AP group. Analgesia and muscle relaxations were adequate in both the groups. The changes in the physiological parameters remained within the physiological limits. Both the anaesthetic combinations were found to be safe and effective for pigs except for a longer recovery time in AP group.

ANS-3

DEXMEDETOMIDINE-NALBUPHINE-MIDAZOLAM - KETAMINE ANAESTHESIA IN GERIATRIC DOGS - A STUDY OF THREE CASES

Anjana Satheesh, Sooryadas S, Reji Varghese, Jinesh Kumar N.S,
Dinesh P.T. and Anikshit Verma

*Department of Veterinary Surgery and Radiology,
College of Veterinary and Animal Sciences, Pookode, Kerala*

Anaesthesia in geriatric patients requires proper planning with appropriate selection of anaesthetics to avoid complications and to increase success rates. Nalbuphine is an agonist-antagonist opioid analgesic that has been shown to cause minimal cardiac workload and respiratory depression. The present paper reports Nalbuphine-Midazolam-Dexmedetomidine-Ketamine anaesthesia in three geriatric dogs that have undergone surgical correction for hip dislocation, mammary tumor, and mast cell tumor respectively. All three animals were calm and docile. Preoperative resting measurements of heart rate, pulse, respiratory rate, rectal temperature was obtained. Intravenous administration of combined bolus of Dexmedetomidine @3µg/kg bodyweight, Midazolam @0.2mg/kg bodyweight, Nalbuphine @ 1mg/kg body weight and Ketamine @ 3mg/kg bodyweight was given. Time taken for induction and ease of intubation was recorded. Subjective and objective assessment of cardiovascular, respiratory and neurological parameters were done intra-operatively. Recovery parameters were also monitored. Rapid induction and easy intubation were achieved in all three cases. Cardiovascular and respiratory parameters were maintained within the normal range throughout the surgery. All the animals showed rapid recovery with delirium and vocalization which was controlled using midazolam. Observations from the three cases suggests that this protocol, having minimal cardiovascular and respiratory side effects can thus be considered safe for geriatric patients.

ANS-4

COMPARATIVE EVALUATION OF XYLAZINE WITH DEXMEDTOMIDINE AS PREANAESTHETIC IN BUFFALOES SUFFERING FROM DIAPHRAGMATIC HERNIA

Satbir Sharma, Ashok Kumar, Rishi Tayal, R. N. Chaudhary, Deepak Kumar Tiwari, Neeraj Arora and Pooja Yadav

Department of Veterinary Surgery and Radiology, College of Veterinary Sciences, Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, Haryana

The study was conducted on twenty buffaloes suffering from diaphragmatic hernia, which were divided in to four groups (n=5). After pre- medication with glycopyrrolate(0.01 mg/kg), dexmedetomidine(1.0 µg/kg)/xylazine(0.01 mg/kg)-pentazocine (0.75mg/kg) were injected and then induced with Propofol(1.30 mg/kg) and maintained with sevoflurane/ isoflurane. Hemato-biochemical, physiological, hemodynamic and behavioral study parameters were noted at various time intervals. No significant change was recorded in rectal temperature, heart rate and respiration and non-invasive blood pressure during the entire period of anaesthesia within all the groups. Dexmedetomidine induced with Propofol and maintained with isoflurane and sevoflurane (GDPPI and GDPPS) had significantly lower values of weak time and down time from all the other groups. Scores for premedication, induction, maintenance and recovery were good while scores for sedation, analgesia and muscle relaxation were fair in all the groups without any significance difference between them. No significance was observed in any biochemical parameters was observed in any group. However, when compared between groups significance was observed in values of LDH, ALP, GGT, Triglycerides, Cholesterol, Calcium, Phosphorus, Total protein, Albumin, Sodium, Chloride and Cortisol at different time interval of study. On the basis of study, it was concluded that xylazine and dexmedetomidine have similar degree of muscle relaxation and sedative effects in buffaloes suffering from diaphragmatic hernia.

ANS-5

EVALUATION OF PROPOFOL AND ETOMIDATE AS INDUCTION AGENT WITH DIFFERENT ANAESTHETIC COMBINATIONS IN BUFFALOES

Satbir Sharma, Ashok Kumar, Rishi Tayal, R. N. Chaudhary and Deepak Kumar Tiwari, Neeraj Arora and Pooja Yadav

Department of Veterinary Surgery and Radiology, College of Veterinary Sciences, Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, Haryana

The study was conducted on forty buffaloes suffering from diaphragmatic hernia. Animals were randomly divided into eight groups having five animals each. After pre-anaesthetic medication with

glycopyrrolate, and dexmedetomidine/xylazine (Four groups for each drug out of eight groups), each animal was restrained in lateral recumbency for induction of anaesthesia. Before induction, pentazocine was given intravenously. Propofol/etomidate was used as induction agent in four groups of each including two groups of Glycopyrrolate-Xylazine and two groups of glycopyrrolate-dexmedetomidine as anticholinergic and sedative drugs respectively and sevoflurane/ isoflurane as maintenance anaesthetic agents. Scores for premedication, induction, maintenance and recovery were good while scores for sedation, analgesia and muscle relaxation were fair in all the groups without any significance difference between them. No significant change was recorded in rectal temperature, heart rate and respiration and non-invasive blood pressure during the entire period of anaesthesia within all the groups. Significant difference was observed in the group GDPES from rest all groups at the time interval before rumenotomy, before drug administration and at 30 minutes of inhalation with the values 361.6 ± 131.26 , 438.4 ± 94.39 and 418.2 ± 80.71 , respectively ($\times 10^3/\text{mm}^3$) and also in hematocrit value before rumenotomy. No significance was observed in any biochemical parameters was observed in any group. However, when compared between groups significance was observed in values of LDH, ALP, GGT, Triglycerides, Cholesterol, Calcium, Phosphorus, Total protein, Albumin, Sodium, Chloride and Cortisol at different time interval of study. On the basis of study, it can be concluded that etomidate had lesser cardiopulmonary depression effects than propofol and buffaloes anaesthetized with etomidate had lower cortisol level than the buffaloes anaesthetized with propofol undergoing diaphragmatic herniorrhaphy suggests adrenocortical suppression by etomidate up to 24 hours of recovery. Haemodynamic parameters (blood pressure) were lesser affected in buffaloes anaesthetized with etomidate than propofol. All the anaesthetic combinations were found effective as well as safe for buffaloes undergoing diaphragmatic herniorrhaphy.

ANS-6

EVALUATION OF KETAMINE-GUAIFENESIN AND ISOFLURANE FOR DIAPHRAGMATIC HERNIORRHAPHY IN BUFFALOES

Kherkar T.T., Pitlawar S.S., Badgujar C.L., Chaudhari K.S. and Agivale S.M.

*Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences,
Udgir, Latur, Maharashtra*

The study was conducted on twelve female buffaloes weighing 313-442 kg and age between 4-9 years to evaluate ketamine-guaifenesin and isoflurane anaesthesia for diaphragmatic herniorrhaphy. In Group I and group II, induction of anaesthesia was carried out with double drip of ketamine-guaifenesin (2 mg/mL of ketamine and 50 mg/mL of guaifenesin) @ 1.5 mL/kg b.wt. Maintenance of anaesthesia was done by double drip @ 2.5 mL/kg/hr in Group I and with 2 % isoflurane in Group II. The quality of maintenance was assessed by analgesia, muscle relaxation, reflexes, eyeball position. Corneal and palpebral reflexes were intact in Group I and abolished in Group II. Excellent to good muscle relaxation with adequate analgesia was observed in both groups. Group I animals showed smooth but fast to prolonged recovery.

Group II animals showed smooth and fast recovery. The combination was found suitable for diaphragmatic herniorrhaphy in buffaloes.

ANS-7

BIOCHEMICAL EVALUATION OF KETAMINE-GUAIFENESIN AND ISOFLURANE IN BUFFALOES UNDERGOING DIAPHRAGMATIC HERNIORRHAPHY

Kherkar, T.T., Pitlawar, S.S., Chaudhari, K.S., Badgujar, C.L. and Sanap, M.J.

Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences, Udgir, Latur, Maharashtra

The present study was conducted in twelve female buffaloes undergoing diaphragmatic herniorrhaphy divided into two groups. Induction of anaesthesia was done by using ketamine-guaifenesin (1000 mg of ketamine, 25 gm of guaifenesin in 500 ml 5% Dextrose) @ 1.5 mL/kg b.wt. in both the groups. Maintenance of anaesthesia was done by double drip of ketamine-guaifenesin @ 2.5 mL/kg/hr in group I and by 2 % isoflurane in group II. Significant increase was observed in mean ALT in both groups whereas, significant increase in mean AST within and between groups was observed. Significant decrease was observed in alkaline phosphatase within groups. Non-significant increase was noticed in mean serum blood urea nitrogen and creatinine in Group I also, non-significant change was observed in BUN and creatinine in group II. The biochemical changes were within acceptable limits. The results revealed limited effect of anaesthetics on biochemical parameters in buffaloes undergoing diaphragmatic herniorrhaphy.

ANS-8

CLINICAL EVALUATION OF CONTINUOUS RATE INFUSION OF 2% LIGNOCAINE IN DOGS DURING GENERAL ANAESTHESIA

Sukti Naryal, Amit Kumar, Adarsh Kumar, S.P Tyagi and Mansi

*Department of Veterinary Surgery and Radiology,
Dr. GC Negi College of Veterinary and Animal Sciences, CSKHPKV, Palampur, HP*

The present work was conducted in 12 animals presented at TVCC, Palampur for various surgical procedures. Animals were randomly divided into two groups i.e. Group A and B, each consisting of 6 animals. General anaesthesia was induced in group A with butorphanol (0.2 mg/kg body weight), atropine (0.02-0.04 mg/kg body weight), diazepam (0.5 mg/kg body weight), propofol (to effect, varying from 2-5 mg/kg body weight) and maintenance was done by isoflurane as gas anaesthesia. Whereas in group B along with general anaesthetic combination used in group A, an additional intravenous injection of 2% lignocaine with loading dose @ 1 mg/kg body weight followed by constant rate infusion @ 30 µg/kg/minute. The paper carries detail of clinical and haemato-biochemical changes and usefulness of intravenous 2% lignocaine in decreasing isoflurane maintenance dose and better management of perioperative pain.

ANS-9

CLINICAL EVALUATION OF DEXMEDETOMIDINE AND XYLAZINE AS PREANAESTHETIC WITH PROPOFOL ANAESTHESIA IN DOGS**Narendra Singh**, Sakar Palecha, P. Bishnoi, A. K. Bishnoi and M. Tanwar*Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Science, Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan*

The study was conducted on 16 healthy dogs to evaluate the dexmedetomidine and xylazine as preanaesthetics with propofol anaesthesia. The dogs were divided into 2 groups viz. group DEX, (dexmedetomidine @ 20µg/kg) and group XYL (Xylazine @ 1 mg/kg) intramuscularly, based on the sedative used. Anaesthesia was induced with propofol and maintained by isoflurane. Sedation score, induction and recovery quality were statistically evaluated. In group DEX, sedation score (12 ± 0) was significantly higher than group XYL (7.88 ± 0.23). The dose of propofol ($3.19 \pm 0.16 \text{ mg kg}^{-1}$) in group DEX was significantly decreased than group XYL ($6.09 \pm 0.31 \text{ mg kg}^{-1}$). The mean isoflurane MAC (0.65 ± 0.07 %) in group DEX was significantly lower than group XYL (1.56 ± 0.11 %). The recovery was significantly prolonged in group DEX. Cardiovascular and haemato-biochemical variables were also recorded at various time intervals. In conclusion, superior sedation and dose sparing effect of dexmedetomidine accounts for its clinical usefulness as effective sedative agent in dogs.

ANS-10

COMPARATIVE STUDY ON SEDATIVE EFFECT OF DIAZEPAM AND MIDAZOLAM IN SURGICAL MANAGEMENT OF UROLITHIASIS IN BULLOCKS**Abdul Khyum, N.M.**, Pitlawar S.S., Chaudhari K.S. and Borakhede S.S.*Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences, Udgir, Latur, Maharashtra*

Sedative effect of diazepam and midazolam was studied in 12 cases of bullocks presented to Teaching Veterinary Clinical Complex, College of Veterinary and Animal Sciences, Udgir with the history of anuria. On per rectal examination intact urinary bladder was revealed in all the cases. The site of obstruction in all the cases was in post scrotal region the urethrotomy was carried in by post scrotal approach in lateral recumbency. In group I animals the diazepam was administered at the dose rate of 0.2 mg/kg body weight as preanaesthetic intravenously and in group II animals midazolam was administered at dose of 0.4 mg/kg body weight intravenously. The time of administration of pre anaesthetic, sternal recumbency, muscle relaxation, duration of anaesthesia, analgesia, respiration rate, heart rate and rectal temperature was recorded. Post operatively antibiotics and analgesics were administered for seven days, animals recovered uneventfully. The study showed sedative effect of diazepam was prolonged than midazolam. Heart rate and respiration

rate was significantly decreased in group I animals during operation after 30 min of administration. Muscle relaxation was profound in group II animals. Midazolam administered animals showed significantly increased the respiratory rate and slight decrease in heart rate.

ANS-11

CLINICOPHYSIOLOGICAL AND HAEMATOBIOCHEMICAL STUDIES OF KETAMINE, PROPOFOL AND SEVOFLURANE ANAESTHESIA IN DEXMEDETOMIDINE PREMEDICATED DOGS

I.A. Pal, P.V. Parikh, J.K. Mahla, R.R. Anjana, Aswath S.N. and K.P. Patel

Department of Veterinary Surgery and Radiology, College of Veterinary Science and Animal Husbandry, Anand Agricultural University, Anand, Gujarat

The study was carried out on 12 clinical dogs, which were randomly divided into two groups (n=6) each. All dogs were premeditated with Atropine (0.04 mg/kg, SC) & dexmedetomidine (10 µg/kg, IM). Fifteen min later anaesthesia was induced by ketamine in group-A and Propofol in group B. Maintenance of anaesthesia was done by sevoflurane followed by intubation. Various parameters along with physiological and haemato-biochemical parameters were recorded & analysed. The mean induction time was 58.5 ± 4.5 and 52.6 ± 2.18 second, duration of anaesthesia 61.33 ± 1.68 and 60.16 ± 1.44 min, complete recovery time 15.36 ± 0.33 and 20.56 ± 0.62 min in group A and B respectively. The sitting and complete recovery time was significantly ($p < 0.05$) shorter in propofol group. The results showed minimal and transient adverse effects of the anaesthetics on different physiological and haemato-biochemical parameters. Advantage of dose sparing effect of dexmedetomidine premedication on ketamine, propofol and sevoflurane reported. Dexmedetomidine-propofol-sevoflurane combination resulted into shorter recovery time as compared to dexmedetomidine-ketamine-sevoflurane combination. Sevoflurane produced excellent quality of maintenance and recovery of anaesthesia in both the groups of anaesthetics used in dogs.

ANS-12

KITTY MAGIC ANAESTHESIA FOR CATS

Adarsh Kumar, Amit Kumar, Mansi Bajaj, Sukti Naryal and S.P. Tyagi

Department of Veterinary Surgery and Radiology, Dr. G.C. Negi College of Veterinary and Animals Sciences, CSK Himachal Pradesh Agriculture University, Palampur (HP) 176 062

The anaesthetic combination “Kitty Magic” was used to for anaesthetic study on 10 client owned cats presented to TVCC, Palampur for various surgical procedures like chemical restraint, castration, spaying, orthopaedic surgeries, FLUTD, tom urinary catheter fixation and various traumatic wounds. All the animals were administered Kitty Magic, a combination of butorphanol (0.44mg/kg), dexmedetomidine (22.2mg/kg), and ketamine (4.4mg/kg) mixed in a single syringe by intramuscular route. The

onset of anaesthesia occurs within 2 to 3 minutes followed by complete induction of anaesthesia within 6 to 8 minutes and allows 40 to 45 minutes of surgical plane of general anaesthesia. The animals were intubated and maintained on supplemental 100% oxygen throughout the procedure. This combination can be used to achieve sedation/anaesthesia and analgesia suitable for mild, moderate and extremely painful or invasive procedures to varying dose rate accordingly. The effect of this anaesthetic combination on various sedative, clinical and haematological parameters in cats were studied and were found to be satisfactory.

ANS-13

EVALUATION OF FENTANYL AND BUTORPHANOL AS PREANAESTHETICS FOR OVARIOHYSTERECTOMY IN CATS

M.Vigneswari, A.Kumaresan, S. Kathirvel, P. Mekala, P.Sankar,
K. Jayakumar and S.Vigneshwaran

*Department of Veterinary Surgery and Radiology, Veterinary College and Research Institute,
Tamil Nadu Veterinary and Animal Sciences University, Namakkal, Tamil Nadu*

To determine the preanaesthetic effects of fentanyl or butorphanol in cats subjected for ovariohysterectomy. Eighteen healthy queen cats were randomly divided into three groups. In group I, dexmedetomidine was administered at the dose rate of 10 µg per kg BW intramuscularly as a premedicant and served as a control group. In group II and III, butorphanol and fentanyl was administered at the dose rate of 0.2 mg per kg and 5 µg per kg BW intramuscularly, respectively followed by dexmedetomidine at the dose rate of 10 µg per kg body weight as a premedicant 15 minutes prior to induction of anaesthesia. In all the three groups, anaesthesia was induced with IM administration of ketamine at the dose rate of 5 mg per kg body weight and maintained with isoflurane anaesthesia. Ovariohysterectomy was performed in all the animals as per the standard techniques. Preanaesthetic effect, isoflurane sparing effect, physiological and cardiopulmonary parameters and pain scores were evaluated. There was no significant difference in heart rate between three groups during different stages of anaesthesia. There was a significant decrease in respiratory rate in group III compared to I and II during different stages of anaesthesia. The isoflurane utilization in group II and III were significantly lower compared to group I. It was concluded that each treatment resulted in adequate sedation and muscle relaxation during anaesthesia. The quantity of isoflurane utilized in fentanyl-dexmedetomidine-ketamine combination had greater isoflurane sparing qualities than other anaesthetic protocols. The duration of postoperative analgesia was found shorter for fentanyl compared to butorphanol.

ANS-14

PROLONGED VISCERAL BLOCKADE USING BUPIVACAINE ALONE AND IN COMBINATION WITH TREMADOL FOLLOWING OVARIOHYSTERECTOMY IN BITCHES FOR PAIN MANAGEMENT

Tazayunimtiyaz, D.M., Makhdoomi, M.M. Ansari, Mohsin Ali Gazi and Shakeel Ahmed
*Department of Veterinary Surgery and Radiology, Faculty of Veterinary Science & A.H.
 SKUAST-K, Srinagar, J&K*

In our study on Twenty-four (24) healthy dogs which were randomly divided into four groups of six animals each and in usual manner the ovaries and uterus was removed by key hole incision method on linea alba. Postoperatively Bupivacaine alone and in combination with Tremadol was given intra-peritoneally to reduce the postoperative pain and duration of hospitalization. Efficacy of treatment was evaluated by physiological parameters, chemical parameters and Compared by Melbourne Pain scale and Glasgow pain scales. Animals were observed after every 6, 8, 12 and 18th postoperatively for various physiological changes. It was observed that instillation of Bupivacaine and Tremadol provided effective analgesia in dogs under going ovario hysterectomy and duration of post-operative hospital stay was reduced.

ANS-15

EVALUATION OF PHYSIOLOGICAL PARAMETERS DURING KETAMINE-GUAIFENESIN AND ISOFLURANE ANAESTHESIA FOR DIAPHRAGMATIC HERNIORRHAPHY IN BUFFALOES

Kherkar T.T., Pitlawar S.S., Badgujar C.L., Chaudhari K.S. and Jadhav R.K.
*Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences,
 Udgir, Latur, Maharashtra*

The study was undertaken on twelve buffaloes divided into two groups by using ketamine-guaifenesin in group I and 2% isoflurane in group II for diaphragmatic herniorrhaphy. Anaesthesia was induced by double drip of ketamine-guaifenesin (2 mg/mL ketamine and 50 mg/mL guaifenesin) @ 1.5 mL/kg body weight in both groups. Maintenance of anaesthesia was carried by double drip @ 2.5 mL/kg/hr in group I and by 2 % isoflurane in group II. Physiological parameters like rectal temperature, heart rate, respiratory rate, saturation of peripheral oxygen (SpO₂) were recorded before induction, during maintenance at 0, 15, 45, 60 min and after recovery. Heart rate increased significantly in Group I as compared to Group II. Respiratory rate decreased after induction in both groups which was further maintained by IPPV. Rectal temperature decreased and SpO₂ was well maintained in both groups. Both anaesthetic combinations were found suitable with minimal acceptable changes in cardio-pulmonary functions.

ANS-16

COMPARATIVE EVALUATION OF MAINTENANCE OF ANAESTHESIA USING ISOFLURANE AND SEVOFLURANE IN XYLAZINE-BUTORPHANOL-KETAMINE PREMEDICATED RABBITS

Soumya R., Devanand. C.B., Sudheesh, S. Nair, John Martin, K.D., M.K. Praveen., B. Lavanya., Sharat Joshi, Manasa, M.R., Salumol, S. and Lekshmi, S.L.

Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences, Kerala Veterinary and Animal Sciences University, Mannuthy, Thrissur, Kerala

This study was conducted in 24 rabbits presented to University Veterinary Hospital Mannuthy, KVASU which were subjected to studies on bone augmentation properties of various bone implant materials. the animals were divided into two groups of 12 individuals each to compare the maintenance of anaesthesia using isoflurane (group I) and sevoflurane (group II) under xylazine-butorphanol-ketamine preanaesthesia. All the animals were premedicated with xylazine (5 mg/kg BW) butorphanol (0.1 mg/kg BW) and ketamine (35 mg/kg BW) intramuscular. After adequate sedation, group I animals were maintained using isoflurane and group II using sevoflurane by mask. Both isoflurane and sevoflurane maintained proper depth of general anaesthesia. Results revealed preanaesthetic combination of XBK produced good to excellent quality of sedation. Group II animals exhibited breathholding during induction of anaesthesia and the quality of muscle relaxation was better in group II animals than group I. Quick recovery was noticed in group II animals. Overall observations revealed satisfactory results of balanced anaesthesia in both group of animals.

ANS-17

CLINICO-PHYSIOLOGICAL AND HAEMATO-BIOCHEMICAL EVALUATION OF ATROPINE-MIDAZOLAM-KETOFOL ANAESTHESIA IN GOATS

A.S. Sengar, S.K. Tiwari, Rukmani Dewangan, R. Sharda, M.O. Kalim, M.S. Maravi and Ashok Patel

Department of Veterinary Surgery and Radiology, College of Veterinary Science & A.H., Anjora, Durg, Chattisgarh

The study was conducted on six healthy non-descript goats of either sex weighing between 20-25 kg by administrating atropine sulphate (0.04 mg/kg I/M) followed by midazolam (0.4 mg/kg I/M) and 15 min. later followed by induction of anaesthesia with ketofol (5mg/kg I/V). Sedation with protrusion of tongue from buccal cavity was noticed after onset of anaesthesia (0.83±0.02 min.). Eyes remained partially closed throughout anaesthesia. The corneal, palpebral and conjunctival reflexes were sluggish. The anal pinch reflex was abolished completely. Extent of muscle relaxation was good. The duration of anaesthesia was 33.71 ± 1.08 min. and recovery was smooth, free from excitement which occurs within 62.14 ± 1.53

min. Involuntary movements of limbs were noticed at the time of recovery in three animals. A non-significant decrease in the rectal temperature was recorded whereas a significant ($P<0.01$) increase in heart rate was observed up to 30 min. There was significant ($P<0.01$) decrease in respiration rate up to 30 min. Non-significant decrease in Hb, PCV and TLC was observed. Neutrophils showed significant increase upto 120 min. with significant decrease in lymphocyte count up to 60 min. Serum glucose level showed significant ($P<0.01$) increase up to 60 min post anaesthesia. Serum urea nitrogen, creatinine and ALT values showed non-significant changes at various time intervals whereas serum AST values showed a significant ($P<0.05$) increased up to 60 mins. All the parameters were within normal physiological limit. Therefore, it can be concluded that atropine-midazolam-ketofol combination may be safely used as general anaesthesia in goats for short duration.

ANS-18

ANAESTHETIC EVALUATION OF VARIOUS COMBINATIONS OF ACEPROMAZINE, BUTORPHANOL AND PROPOFOL IN DOGS

Rohit Prabhat, Manjul Kandpal, N.S. Jadon, Deepti Bodh, Jyotsana Bhatt,

Saikat Kundu and Arun Kumar

*Department of Surgery and Radiology, College of Veterinary and Animal Science,
G.B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand*

Eighteen adult dogs (requiring various clinical procedures) used in this study were randomly divided into three groups viz; A, B and C. All the dogs were premedicated with injection atropine sulphate @0.04mg/kg body weight intramuscularly. Thereafter, acepromazine @ 0.05mg/kg, butorphanol @0.4 mg/kg and combination of acepromazine @0.05mg/kg and butorphanol @0.4 mg/kg body weight intramuscularly, were administered in group A,B and C, respectively. Induction dose (IV) of propofol in group A,B and C was found to be, 6.13 ± 2.50 mg/kg, 4.84 ± 1.97 mg/kg and 3.49 ± 1.42 mg/kg, respectively. The effectiveness of anaesthesia was evaluated by observing various clinical, haematological and biochemical parameters before and after administration of various combinations of anaesthetic drugs. On the basis of the various parameters observed in this study it was revealed that there was quicker induction, better analgesia and muscle relaxation in the animals of Group-C as compared to the animals of other groups.

ANS-19

EFFECTS OF GENERAL ANAESTHESIA WITH XYLAZINE HYDROCHLORIDE AND KETAMINE HYDROCHLORIDE ON RESISTIVE AND PULSATILITY INDICES OF DOGS

Sunita Meher, Indramani Nath, Biswadeep Jena, Kautuk Kumar Sardar, Sidhartha Sankar Behera, Prasana Kumar Rath and Sagar Sahoo

Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H. Odisha University of Agriculture and Technology, Bhubaneswar, Odisha

The Aim of the study was to clinically compare physiological, haemodynamic, haematobiochemical and ultrasonographic parameters with special focus on Pulsed Wave Indices of abdominal aorta and renal arteries before and after induction of general anaesthesia with Xylazine hydrochloride and Ketamine hydrochloride in adult healthy canine patients presented for elective surgeries. Our study recorded significant decrease in Peak Systolic Velocity (PSV) in renal arteries, End Diastolic Velocity (EDV) and Pulsatility Index (PI) of abdominal aorta. There was also significant increase in Pulsatility Index (PI) of renal arteries. Although there was no correlation established in our study with the values of Pulsed Wave Indices with other physiological, haemodynamic, and haematobiochemical parameters. Although Xylazine hydrochloride and Ketamine hydrochloride combination for general anaesthesia preserved cardiovascular compensatory mechanism but it might exacerbate renal functionality as evident by significant changes in Pulsed Wave Indices.

ANS-20

EVALUATION OF THE EFFICACY OF 2% LIGNOCAINE HCL AS INTRATHECAL ANAESTHESIA IN OPEN METHOD CASTRATION IN BUCKS

Suresh Kumar, A.K. Bishnoi, Mohan Lal, Ruchi Patwa, Hemant Kumar, Sakar Palecha and P. Bishnoi

Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Science, Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan

2% Lignocaine HCl @ 4 mg/kg b.wt. was administered intrathecally at the lumbo-sacral intervertebral space for achieving analgesia to perform castration by open method in 6 bucks. The sensory and motor blockade produced by the anaesthetic in the animals was evaluated on the basis of change in clinical, physiological and haemato-biochemical parameters noted in the peri-operative period. Onset and duration of analgesia was evaluated by pin prick method at tail, perineum, thigh, inguinal, umbilical, flank and caudal thoracic region at regular intervals. Motor incoordination and duration of analgesia were observed within 2 to 3 minutes and 60 to 90 minutes, respectively. All animals recovered uneventfully from intrathecal anaesthesia without any complications.

ANS-21

ANAESTHETIC EFFICACY OF PROPOFOL AND KETAMINE-PROPOFOL ADMIXTURE WITH BUTORPHANOL AS CONSTANT RATE INFUSION USING FLUID BAG TECHNIQUE IN DOG

N.P. Bhave, M.G. Thorat, S.D. Chepte, F.A. Fani, R.K. Fulsunge, S.R. Vaidya,
G.D. Khatal and K.N. Tayade

*Department of Veterinary Surgery and Radiology,
Post graduate Institute of Veterinary and Animal Sciences, Akola, Maharashtra*

The study was conducted on 12 clinical canine patients presented for elective ovariohysterectomy. These cases were divided into two equal groups. In group A propofol @4 mg/kg b.wt was given for induction while in group B admixture of Ketamine-Propofol (1:1) was given @ 4 mg/kg b.wt. by bolus intravenously, both sedated with Xylazine @ 2 mg/kg b.wt IM. Maintenance was carried out by constant infusion of anaesthetic drugs at 6mg/kg/hr at 5ml/kg/hr flow rate in both the groups with fluid bag technique. Depth of anaesthesia was satisfactory in both groups however dogs from group A showed longer recovery time. Rectal temperature, heart rate and respiration rate showed statistical difference ($p < 0.05$) between the groups but were within normal limits. Haematological and biochemical parameters were within normal limits. It was concluded that, constant rate infusion using ketamine-propofol-butorphanol as a balanced anaesthesia was found satisfactory for maintenance of anaesthesia in canines.

ANS-22

ANAESTHETIC EFFICACY OF THIOPENTAL- PROPOFOL ADMIXTURE AND PROPOFOL AS TOTAL INTRAVENOUS ANAESTHESIA IN DOG

R.K. Fulsunge, M.G. Thorat, S.D. Chepte, F.A. Fani, N.P. Bhave, S.R. Vaidya,
G.D. Khatal and A.A. Mitra

*Department of Veterinary Surgery and Radiology,
Post graduate Institute of Veterinary and Animal Sciences, Akola, Maharashtra*

The present study was conducted on 12 clinical canine patients presented for various surgical interventions. These cases were divided in two equal groups irrespective of age, sex and breed. In group A admixture of Thiopental-Propofol 1:1 V/V was used @ 7mg/kg body weight and in group B Propofol was used @ 4 mg/kg body weight, in xylazine (1.1mg/kg b.wt) premedicated patients. Quality of anaesthesia was comparatively better in group A. The cardiopulmonary stability was better in group A as compared to group B whereas rectal temperature was significantly lower in group A. Haematological studies exhibited a decreasing trend with Neutrophilia and lymphopenia in both groups. Biochemical parameters were increased in group A whereas Group B showed significantly increased level of Glucose. On the basis of

observations, the admixture of thiopental sodium and propofol 1:1 V/V can be safely implemented as general anaesthesia for various surgical interventions in dogs.

ANS-23

XYLAZINE-KETAMINE INDUCTION AND XYLAZINE-KETAMINE-GUAIFENESIN TRIPLE DRIP CRI MAINTENANCE FOR OBSTRUCTIVE EQUINE COLIC SURGERY

D. Vishnugurubaran, S. Dharmaceelan, S. Kokila, A.R. Ninu, M. Bharathidasan,
S. Senthil Kumar and R. Ramprabhu

*Department of Veterinary Surgery and Radiology, Veterinary College and Research Institute,
Tamil Nadu Veterinary and Animal Sciences University, Tirunelveli, Tamil Nadu*

A one and half years old Marwari horse weighing about 271kgs was presented to the VCC, VCRI, Tirunelveli with an anamnesis of anorexia, abdominal distension and not defecated for past 3 days along with severe colic signs. Owner also reported that the animal had vices of taking umbrella wastes. Clinical examination revealed elevated heart rate and respiratory rate, increased capillary refill time, congested CMM and change in the degree of gut sounds on auscultation. Rectal examination revealed empty rectum with traces of mucous coated dung with putrefied odour. Haemato-biochemical examination revealed increased packed cell volume and leucopenia. The case was tentatively diagnosed as colic and treated with aggressive fluid therapy, antibiotics and analgesics for few days. Since the condition persisted even after the aggressive treatment, the horse was subjected to Exploratory Laparotomy. The anaesthesia was induced with xylazine @ 1.1mg/kg body weight and Ketamine HCL @ 2.2 mg/kg body weight intravenously. The animal was casted in dorsal recumbency and jugular catheterization was done using 18G needle. Anaesthesia was maintained with triple drip continuous rate infusion contains xylazine HCL, Ketamine HCL and Guaifenesin 50 mg/kg body weight in 5 % dextrose normal saline was administered at the dose rate of 2.2ml/kg body weight intravenously. Indices of cardiac and respiratory functions were recorded for every 5 minutes. The surgery lost for 1.35 hours and the animal returned to unassisted standing position after 32 minutes of surgery.

ANS-24

CONTINUOUS RATE INFUSION ANAESTHESIA IN DOGS WITH DEXMEDETOMIDINE-LIGNOCAINE-MIDAZOLAM-KETAMINE COMBINATION: A USER-FRIENDLY CHART FOR EASY PRACTICE

Anikshit Verma, Sooryadas S., Dinesh P.T., Jinesh Kumar N.S. and Reji Verghese

*Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences,
Kerala Veterinary and Animal Science University, Pookode, Wayanad, Kerala*

Six dogs of different age, sex, breed and size, categorised as ASA class I and II, for elective

surgeries were anaesthetised with dexmedetomidine-butorphanol-midazolam-ketamine combination and given intravenous loading dose of lignocaine and maintained with continuous rate infusion of dexmedetomidine-midazolam-lignocaine-ketamine in normal saline using a syringe pump. The anaesthetic protocol provided quick and smooth induction, excellent maintenance and uneventful recovery. Based on this study, a user-friendly chart was prepared for carrying out continuous rate infusion anaesthesia with this protocol using paediatric and adult drip infusion sets, in dogs weighing 5-50 kg. The CRI protocol and the user-friendly chart are very easy to practice and a good alternative to inhalant anaesthesia maintenance where high skill and knowledge of both inhalant anaesthetics' use and functioning of gas anaesthesia machine is otherwise needed.

ANS-25

SURGICAL MANAGEMENT OF INTUSSUSCEPTION UNDER REGIONAL ANAESTHESIA – A REVIEW OF 10 CASES

P. Sankar, S. Kathirvel, **C. Saranya**, S. Vigneshwaran, A. Kumaresan, M. Vigneswari,
R. Vinilkumar and K. Monikakrish

*Department of Veterinary Surgery and Radiology, Veterinary College and Research Institute,
Tamil Nadu Veterinary and Animal Sciences University, Namakkal, Tamil Nadu*

Ten cattle aged between four to eight years were presented to VCC, Veterinary College and Research Institute, Namakkal with the history of not passing dung and signs of colic were selected for the study. On clinical examination, all the vital parameters were within the normal range except mild tachycardia. Rectal examination in all the cases revealed distended intestinal loops and mucus smeared gloved hand. Based on the history, clinical and rectal examination the cases were tentatively diagnosed as intussusception. Right flank laparotomy was advised and surgical site prepared aseptically. In all the animals right proximal paravertebral nerve block was employed. After incising the peritoneum 2% lignocaine mixed with 200 ml of normal saline was administered at the dose rate of 2 mg/kg b.wt. intra-peritoneally. After 10 minutes of administration exploration of the abdominal cavity was performed. Affected portion was removed by enterectomy and enteroanastomosis was performed using Vicryl No. 1 (Polyglactin 910) by simple interrupted suture pattern after application of crushing and non-crushing clamps. Muscles and skin were closed as per standard protocol after ensuring there is no leakage from intestine. Incorporation of intra-peritoneal lignocaine administration along with regional anaesthetic protocol favored gentle handling of intestine by minimizing the pain. Fluid therapy, antibiotics and analgesics were administered for five days with appropriate wound care. Recovery was uneventful in all the animals selected for the study.

ANS-26

STANDARDISATION OF GLYCOPYRROLATE-MIDAZOLAM-KETAMINE-ISOFLURANE ANAESTHETIC PROTOCOL IN RABBITS UNDERGOING EXPERIMENTAL MODEL OF ISCHEMIC REPERFUSION RENAL SURGERY

R.S. Bisla, **Sandeep Potliya** and Ankit Kumar

Haryana Pashu Vigyan Kendra,

Lala Lajpat Rai University of Veterinary and Animal Sciences, Karnal, Haryana

Six healthy New-Zealand White rabbits of body weight 2 kg were subjected to Glycopyrrolate-Midazolam-Ketamine-Isoflurane anaesthesia for experimental model of ischemic reperfusion renal surgery. First of all, Glycopyrrolate (@ 0.1 mg/kg Body wt.) and Midazolam @ 1.5 mg/kg body wt. (after standardization) were given intramuscularly. After 5 min., Ketamine was given @ 30 mg/kg body wt. intramuscular (after standardization). Anaesthesia was maintained by Isoflurane 0.5-1.5% via face mask. After proper maintenance of anaesthesia, rabbits were undergone renal ischemia and reperfusion surgery lasting about 1 hour. Evaluation of surgical anaesthesia and cardiac parameters were assessed during anaesthesia; making Glycopyrrolate-Midazolam-Ketamine-Isoflurane anaesthesia safe and effective in rabbits undergoing ischemic reperfusion renal surgery.

ANS-27

EVALUATION OF EFFICACY OF BUPRENORPHINE-PROPOFOL AS AN ANAESTHETIC COMBINATION IN ATROPINIZED GOATS

Rukmani Dewangan, **M.S. Maravi**, S. K. Tiwari, M. O. Kalim, R. Sharda,

A.S. Sengar and Ashok Patel

Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H., Anjora, Durg, Chattisgarh

The experiment was conducted on six healthy non-descript goats of either sex weighing between 20-25 kg by administering atropine sulphate @ 0.04 mg/kg I/M followed by buprenorphine @ 10 mg/kg I/M and 10 min. later followed by induction of anaesthesia with propofol @ 5mg/kg I/V. After buprenorphine administration, lowering of head was observed in all the animals within 8.20 ± 0.58 min. After propofol injection, there was rapid and smooth onset of anaesthesia (0.50 ± 0.55 min). Swallowing reflex, corneal and palpebral reflexes abolished within 3 min after onset of anaesthesia which remained throughout the period of duration of anaesthesia. The anal pinch and pedal reflexes were fully abolished alongwith complete muscle relaxation of jaw, tail, anus sphincter and limbs which was good but for short duration. The mean duration of anaesthesia was 31.33 ± 1.20 min. and lasted by raising of head. The mean returned to sternal recumbency was 43.45 ± 2.50 minutes. All the animals tried to stand with ataxia at 51.20 ± 1.50 and complete recovery i.e. animals stand without ataxia took 60.00 ± 2.58 minutes after propofol administration.

Rectal temperature did not show any significant variation whereas heart and respiration rate showed significant ($P<0.05$) decrease after buprenorphine-propofol administration and returned to near base value by 180 min. Hb, PCV and TLC showed non-significant decrease at 60 min. however, the following values showed increasing trends at different time intervals of observation and returned to near base value by 6 hrs. There was significant ($P<0.05$) increase in neutrophils with significant ($P<0.05$) decrease in lymphocyte values. Serum glucose showed significant ($P<0.05$) elevation at 60 min. after atropine-buprenorphine-propofol administration whereas non-significant increase in serum urea nitrogen, serum creatinine, AST and ALT were observed at different time intervals. However, these changes were within normal physiological limits. Therefore, it can be concluded that buprenorphine-propofol combination may be safely used for short duration anaesthesia in atropinized goats.

ANS-28

EFFECT OF ATROPINE-MEDETOMIDINE-KETOFOL ANAESTHESIA ON CLINICO-PHYSIOLOGICAL AND HAEMATO-BIOCHEMICAL PARAMETERS IN GOATS

A.S. Sengar, S.K. Tiwari, Rukmani Dewangan, R. Sharda, M.O. Kalim,
M.S. Maravi and Ashok Patel

*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H.,
Anjora, Durg, Chattisgarh*

The study was conducted on six healthy non-descript goats of either sex weighing between 20-25 kg by administering atropine sulphate (0.04 mg/kg I/M) followed by medetomidine (10 μ g/kg I/M) and 15 min. later followed by induction of anaesthesia with ketofol (5mg/kg I/V). Marked sedation with protrusion of tongue from buccal cavity, profuse salivation was noticed after onset of anaesthesia (0.78 \pm 0.02 min.). The corneal, palpebral and conjunctival reflexes alongwith anal pinch reflex was abolished completely throughout the period of duration of anaesthesia. Complete muscle relaxation of jaw, tail, anus sphincter and limbs which was excellent for long duration. The duration of anaesthesia was 85.42 \pm 2.31 min. and recovery was smooth, free from excitement which occurs within 132.85 \pm 3.24 min. Rectal temperature showed a non significant decrease upto 30 min. post anaesthesia. A significant ($P<0.01$) decrease in heart rate and respiration rate was observed up to 20 min. and 60 min. respectively. There was non-significant decrease in Hb, PCV and TLC. Neutrophils showed significant ($P<0.05$) increase with significant ($P<0.05$) decrease in lymphocyte count upto 60 min. Serum glucose level showed highly significant ($P<0.01$) increase upto 60 min. Serum urea nitrogen, creatinine and ALT values showed non-significant changes at various time intervals. Serum AST values showed a significant ($P<0.05$) increased upto 60 mins. These parameters fluctuated and remained within normal physiological limits, thus can be safely used as anaesthetic combination in goats for longer duration.



Avian Surgery Session

MEET THE SPEAKER



Dr. R.V. Suresh Kumar

M.V.Sc., Ph.D. M.A., LLB, FA, GE, FISVS, FSAB

Professor & University Head

Department of Surgery and Radiology

College of Veterinary Science, SVVU, Tirupati

Dr. R. V. Suresh Kumar was born to Late Sri R. Raja Gopal Sastry and R. Parvathi. He took B.V.Sc. & A.H. from College of Veterinary Science with second position in the batch. He stood first University first in PG Entrance examination and obtained M.V.Sc. majoring in Surgery and Radiology in 1989 with university first rank, and Ph.D. in 1994 with university first rank under the guidance of Dr. O. Rama Krishna. He was the recipient of National merit scholarship, national Hindi merit scholarship, ICAR scholarship, ICAR JRF, and CSIR Senior research fellowship. He has bagged Andhra bank gold medal, Hyderabad race club medal BEST Ph.D. Thesis medal, Late K. Bhaskar singh gold medal for best article in IVJ, gold medal for best paper presentation in radiology session, appreciation award in small animal surgery session, and Gold medal in Ruminant surgery session. He started his career as Veterinary Assistant Surgeon and worked in University as Assistant and Associate professor and presently working as Professor and University Head. So far he has guided 20 M.V.Sc. 2 Ph.D. Students as Major Advisor, 47 M.V.Sc. and 12 Ph.D. students as Minor Advisor, Presently He is guiding 2 Post graduate students and 2 Doctoral students. He has published about 250 research, clinical and popular articles in Various journals of national and international repute. He is the referee for 15 national level scientific journals. He is a regular paper setter and examiner for Undergraduate, and post graduate students of different universities including 3 other traditional universities. He is member of Institutional animal ethics committee for different universities. He is an External Expert and Co Content developer for two UG Courses of TANUVAS. He is member and Chairman of Institutional Ethics committee, and Expert for Board of Ph.D. studies, External Expert for MBBS Admissions, for Sri Venkateswara Institute of Medical Sciences (SVIMS) Tirupati. He has organized national level ICAR sponsored 10 days training programme, DBT sponsored 14 days training programme for the faculty and many training programmes for field veterinarians. He is a life member of Veterinary Council of India, Andhra Pradesh veterinary council, Indian Society for Veterinary Surgery, Indian Society for Advancements of Canine Practice, Society for Biomaterials and Artificial organs of India. He is a fellow of academy of General Education, Indian Society for Veterinary Surgery and Society for Applied Biotechnology. He has attended many national and international level conferences, presented lead papers, acted as chairman rapportier and co chairman for many scientific sessions. He was Zonal Secretary and Vice-President of ISVS and organized three National Conferences on Cancer including 41st ISVS at Tirupati. Apart from veterinary profession he also took M.A. (Sociology) degree and LLB from S.V. University. He is a Lyric and Drama writer in telugu and gave many performances in All India Radio. He is a National Level Judge to literary competitions (All India inter universities) in 2010. He has represented school, college, university, district, and south zonal level Cricket and Hockey teams as Captain. He won many awards in literary and cultural events. He was recipient of Meritorious Teacher ward from university State Best Teacher award. His area of research interest is surgical oncology and Biomaterials.

CURRENT TRENDS IN AVIAN SURGERY

R.V. Suresh Kumar

*Department of Surgery and Radiology, College of Veterinary Science,
Sri Venketeshwara Veterinary University, Tirupati, Andhra Pradesh*

Avian surgery, a specialized branch of veterinary surgery has become highly advanced field in the recent years. Avian subjects are small, delicate, have high metabolic rate, high ratio of body surface to body volume, prone to hypoglycemia, hypotension, and limited access for surgery. Advancement of science in field of Blood transfusion, blood gas analysis, anesthesia monitoring systems, Imaging techniques, operating microscopes, radio operating systems, electrocardiographic, endoscopic techniques and magnification facilities *etc* facilitated avian surgery more safe and successful. Though basic surgical principles are similar to animal and human surgery, avian species have certain anatomical and physiological differences compared to animals which should be considered for administering anesthetic drugs and performing surgery. Similar to pet dogs and cats Birds are being reared in houses even in Indian conditions. In the villages backyard poultry farming is very common. Various species of birds are being utilized for different purposes.

Commonly Encountered Clinical Conditions in Birds

Eye: clinical conditions like ectropion, entropion, glaucoma, cataract, corneal ulcers, uveitis, periocular and conjunctival masses, optic neuropathy are reported in birds necessitating appropriate surgical interventions.

Skin and Appendages: Feather cysts, toe necrosis, xanthomas of wing tips, benign and malignant growths, uropygial gland affections, Bumble foot and procedures like Pinioning, wing amputation, trimming of spurs, dubbing of combs and cropping of wattles are commonly reported clinical conditions in birds.

Gastrointestinal Tract: Different procedures like pharyngostomy, Inguvotomy, coeliotomy, Proventriculotomy, foreign body removal, enterotomy, cloacotomy, cloacopexy, Gizzardectomy abdominal hernioplasty, cloacal prolapse crop fistula repair, surgical excision of intestinal growths are being performed by avian surgeons to correct different conditions in birds.

Respiratory System: Few conditions reported in birds requiring surgical / medical interventions are Rhinoliths, tracheal stenosis, Devocalization, Pneumonectomy, foreign body removal, fungal sacculitis, lung fibrosis mycobacterial pneumonia etc.

Cardiovascular System: Vegetative endocarditis, atherosclerosis, aortic rupture, epi/pericarditis, congestive heart failure, are few clinical conditions reported in avian species.

Reproductive System: Ovocentesis, orchidectomy, egg related peritonitis, salpingohystrectomy, egg binding, removal of gonads, deutectomy, resection of oviduct, caponization are the surgical procedures routinely performed in avian practice.

Tumors/Neoplasms: Similar to humans and animals, tumors or neoplastic conditions do occur in birds. Clinical examination, fine needle aspiration biopsy, and other imaging techniques diagnose these conditions. Papillomas, lipomas, liposarcomas, squamous cell carcinoma, ovarian carcinoma, pancreatic adenocarcinoma, cholangio sarcoma, rhabdo myosarcoma, fibro sarcoma, adenocarcinoma, hemangiosarcoma, malignant melanoma, mesothelioma lympho sarcoma leukemia and osteosarcoma are some of the tumors reported in avian species. Aggressive surgery (excision/ amputation) or chemotherapy after confirmatory diagnosis is advocated either to cure the condition or as a palliative measure to prolong the life of the bird.

Orthopedic Conditions: Fractures/dislocations are common in birds also. Since the bones differ anatomically and physiologically special attention is required regarding procedure, selection of implant etc. External cooptation methods using bandages, splints and slings are used to stabilize fractures. Internal fixation methods like intra medullary pins, rush pins, cerclage wires, external skeletal fixation, cross pinning and plating in large size birds are used depending upon the condition. In majority of the occasions external immobilization is preferred with lighter weight material splints.

DIAGNOSTIC METHODS EMPLOYED IN AVIAN SURGERY

Clinical Examination

Should be conducted to identify any injuries, wounds, swellings, obstructions, painful lesions, fractures, dislocations bleeding points, necrotic areas external parasites foreign bodies etc.

Laboratory Examinations

Blood, serum, faecal material skin scrapings, discharges, feed material examination etc should be carried out to get the information regarding disease in question for necessary treatment.

Radiographic Examination

Used to diagnose conditions related to skeletal system (fractures, dislocations) and gastro intestinal tract (obstructions, foreign bodies). This can be performed with proper restraint and in some cases under anesthesia in exited birds. Excess pressure at thoracic region leads to respiratory arrest and shock and hence digital radiographic techniques started to replace conventional systems in many veterinary practices.

Ultra Sound Scanning

Non-invasive diagnostic modality used routinely in veterinary practice can also be used in avian medicine to diagnose conditions related to gastro intestinal tract gonads and abdomen like ascites and intra-abdominal masses. Ultrasonography is complimentary to radiographic examination which gives additional information on soft tissue structures and space-occupying processes. It has special importance for the examination of the cardiovascular and urogenital system as well as the liver parenchyma. Typical findings are cardiomegaly, hydropericardium, neoplasia, cysts, egg binding, laminated eggs, and organ congestion. Sonographically guided (fine needle) biopsies are standard procedures in birds.

Echocardiography is one of the most important imaging techniques for diagnosing cardiovascular disorders. To determine normal and abnormal echocardiographic values in birds, it is important to have a standard protocol for the ultrasonographic examination. In most patients, B-mode echocardiography can be performed without sedation or anesthesia. Due to the birds' sensitivity for circulatory suppression, avian patients should be examined in a partially upright position.

Endoscopy; Endoscopy is most commonly employed technique to visualize internal organs and tissues, perform tissue biopsies, collect samples for culture, remove accessible foreign bodies, remove granulomas and monitor treatment response. It is possible to approach coelomic cavity to visualize gonads, air sacs, liver, lungs, spleen, kidneys, ventriculus and proventriculus and also, oropharynx, choanal slit, trachea, crop, cloaca, external ear canal and nares. The endoscopy procedures are generally associated with anesthetic complications, hemorrhage, trauma to internal structures, infection, and herniation at the entry point however proper precautions can overcome these in practice.

Laproscopy

Avian surgeons use this diagnostic modality mainly for determining sex of the bird however the advantage has been extended to visualize lesions in abdominal cavity and other internal organs like spleen, kidneys, liver intestines etc.

Computed Tomography Scan

Expensive imaging technique but accurate diagnostic modality regarding evaluation of skeletal as well as soft tissue lesions which are otherwise refractory and inconclusive to other diagnostic methods. The main indications for performing a CT examination on an avian patient currently are abnormalities of the skeletal system and the respiratory tract which includes spinal fracture or other changes in this region, fractures in the cranium, especially the hyoid bone and beak apparatus, as well as soft tissue alterations in the head, like upper respiratory apparatus or any respiratory infection. It is the most reliable and sensitive method for the diagnosis of lung disease in birds. The lung parenchyma, the trachea and the primary and secondary bronchi, the large pulmonary vessels and the air sacs can be assessed in individual scanning planes.

Magnetic Resonance Imaging

is rarely used in the avian patient. The main limitation is higher costs and long examination time, and the problematic anesthesia during the examination. The small size of the patients and the high respiratory and heart rates make it difficult to obtain images of diagnostic quality. It is mainly used to diagnose soft-tissue changes in the parenchymal organs as well as the Central nervous system including t

Anaesthetic Considerations

Birds should be monitored during anaesthesia and surgery carefully. Anesthetic selection is as critical as that of surgical procedure since body reaction differ from bird to bird. Anaesthetic drugs should provide pain free condition and muscle relaxation. Few avian surgeons prefer local anesthetics whereas

majority prefer general anaesthesia since even simple struggle and excitement leads to shock/ death. Overdose of local anaesthetics results in excitement initially followed seizures, depression, respiratory arrest, cardiovascular collapse and death. Inhalant anaesthetics where facilities are available should be preferred due to rapid clearing action in respiratory system however injectable preparations rapid administration and less equipment requirement. Prolonged recovery is noticed with injectable anaesthetics. Dosages for specific anaesthetics should be calculated for each species prior to administration. Maintenance of body temperature during after surgery and Post anesthetic oxygen administration is important. Ketamine, xylazine, diazepam, midazolam, and medetomidine are commonly used injectable drugs whereas isoflurane and sevoflurane with oxygen are commonly used volatile anaesthetics for various surgical procedures. Avoid fasting for longer periods. The birds usually to be placed on thermal support device like mattresses with warm water, mild heating pad to maintain body temperature.

Future: This field of specialization is slowly developing in Indian scenario. As the value of the Birds is increasing (fighting Birds, Love birds, show birds, Rare exotic Birds) along with awareness of the people there is demand for specialty treatment. The veterinarian also should be equipped with knowledge and utilize the facilities available to do the best to the avian species. Many of the teaching hospitals are working on different clinical conditions observed in birds. Research should also aim at reducing the cost of the diagnosis and treatment of avian diseases to reach more proximity to the public. Similar to the situation abroad Indian veterinary institutions should encourage veterinarians to undergo special training in the field of Avian surgery.

MEET THE SPEAKER



Dr. Pineshkumar Vasantlal Parikh

Professor and Head

Department of Veterinary Surgery and Radiology,
College of Veterinary Science and Animal Husbandry
AAU, Anand (Gujarat)

Dr. Pineshkumar Vasantlal Parikh born on 28-06-1964 at Vadali, Dist. Sabarkantha, Gujarat state, completed graduation from College of Veterinary Science and Animal Husbandry, S.K. Nagar (GAU) in 1986 and obtained his Masters degree from the same Institute in year 1989. He completed his Doctoral studies with Honors from GBPUA&T, Pantnagar in the year 1995. He has contributed immensely in the field of Veterinary Surgery and Radiology as Academician, Researcher, Planner and Extension worker. He was awarded with Vice-chancellor's Gold Medal and Best Student Award for being adjudged the best outgoing under graduate student. Dr. M.D. Patel Award for securing highest O.G.P.A in the subject of Animal Genetics and Breeding. He was also recipient of ICAR Junior Research Fellow and Senior Research Fellow for M.V.Sc and Ph.D. degree, respectively. He was awarded A.K. Bhargav Memorial Gold Medal for Best Research Paper published in ISVS journal in the year 2004, Hari Ohm Ashram Prerit Shree Bhaikaka Inter University Smarak Trust Award for the year 1997-98 for the Best Research Paper. He was awarded with 5 Gold medals and 10 Appreciation awards for ISVS paper presentation till date in the conference. He has delivered many lead papers, expert lectures, keynote address etc. in different training programmes and symposia. He had served as a Veterinary Officer for 3 years, Assistant Professor for 9 years, Associate Professor for 8 years, Professor for 13 years and presently working as Professor and Head since last 4.5 years in the Department of Surgery and Radiology, College of Veterinary Science and Animal Husbandry, AAU, Anand (Gujarat). Besides the vast exposure and experience in the clinical practice and teaching Dr. Parikh has guided 35 M.V.Sc. and 4 Ph.D. students. He is popular for his contribution in the field of Veterinary Surgery and Radiology by publishing more than 100 scientific articles in the National and International Journals, more than 50 popular articles, 2 booklets, 18 Manuals and 30 presentations in different conferences. He has handled several Research Projects as PI and Co-PI and also acted as course director for advance trainings for Veterinary surgery and Radiology for field Veterinarians. He is known for arranging Bird Treatment Camps in the entire Gujarat state during Kite Flying Festival and for organizing surgical camps for Gaushala and Panjarapoles. Looking to his contribution, he was awarded Fellow of Indian Society for Veterinary Surgery.

INHALATION ANESTHESIA IN BIRDS

P.V. Parikh, J.K. Mahla and R.R. Anjana

*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H,
Anand Agricultural University, Anand, Gujarat*

Introduction

The term anesthesia, derived from the Greek term *anaesthesia*, meaning “insensibility” or “loss of sensation”. Anesthesia is induced by drugs that depress the activity of nervous tissue locally, regionally or within the central nervous system (CNS).

General principles of inhalation anesthesia “Atmospheric concentration of inhalation agent inhaled, there is absorption across the alveolar membrane into the pulmonary circulation and blood then carries into the central nervous system where part of the total blood concentration crosses the blood brain barrier to produce anesthesia”.

Inhalation anesthesia is an anesthetic gas or vapors are inhaled in combination with oxygen. Inhalation anesthesia is an important and challenging aspect of avian medicine and surgery because of smaller trachea & different respiratory system as compare to mammals, which is more prone to develop shock during handling/restraining.

Inhalation anesthesia is more preferred over injectable anesthesia in clinical avian practice, due to limited availability of injectable antidotes. Advantages of inhalation anesthesia includes rapid & smooth recovery, rapid and frequent adjustments, anesthetic depth, minimal organ toxicity, minimal cardiorespiratory effects, quick elimination through the lungs and lower incidence of death.

Injectable anesthetics are more preferred in field condition due to non-availability of anesthesia machine. Disadvantages of injectable anesthesia includes: Dose-dependent cardiovascular depression, significant interspecies and intra-species variability in response, requirement for significant renal and hepatic biotransformation for clearance, prolonged and rough recovery, need for an accurate weight for appropriate dosing and relatively narrow margin of safety, despite of that injectable anesthetics are preferred more because of its cost effectiveness. Following injectable anesthetics are commonly used in birds include Propofol, Ketamine + Diazepam and Ketamine + Midazolam combinations.

Anatomy and Physiology

Birds have unique anatomical and physiologic features that have an important impact on anesthesia. The avian trachea is longer and larger diameter than small mammals. All birds have **complete tracheal rings**. Most birds have nine air sacs, four paired and one unpaired. The four paired air sacs include the cervical, cranial and caudal thoracic and abdominal. The unpaired air sac is the clavicular air sac which is located dorsal and caudal to the crop. Air sacs do not contribute significantly to gas exchange because they are relatively avascular. The gas exchange component of the avian respiratory system is the parabronchial

lung. **Birds do not have a diaphragm**, therefore breathing (inspiration and expiration) is an active process requiring muscular activity (Miller and Buttrick, 1999).

Inspiration occurs when the inspiratory muscles (external intercostals) contract causing the pressure within the air sacs to decrease below atmospheric pressure and allowing air to flow into the respiratory system. During inspiration 50% of the inspired air enters the lung and cranial air sacs while the other 50% enters the caudal air sacs. When the expiratory muscles (internal intercostals and abdominal) contract, air that was in the caudal air sacs move into the lung while the air in the lungs and cranial air sacs move out the trachea.

Inhalation Anaesthetic

Inhalation anesthetics introduced for widespread clinical use. In the first 100 years of anesthesia use, no anesthetic contained fluorine; Whereas, all anesthetic introduced after 1950 contain fluorine, with the exception of propyl methyl ether and ethyl vinyl ether. Presently six inhalational agents, nitrous oxide, halothane, enflurane, isoflurane, desflurane and sevoflurane are commercially available in the majority of the world (Delgado-Herrera *et al.*, 2001). Isoflurane and sevoflurane are the most common inhaled anesthetics used in avian anesthesia (Gunkel & Lafortune, 2005).

Isoflurane: It is a halogenated ethyl methyl ether (1-chloro-2,2,2-trifluoroethyl difluoromethyl ether) and **geometric isomer of enflurane**. It is a clear, colourless, volatile liquid with a pungent odour (Thompson *et al.*, 2019). It has traditionally been the inhalant anesthetic of choice in the avian species (Granone *et al.*, 2012) because of rapid induction and recovery times, limited organ toxicity, and less pronounced cardiopulmonary depressant effects than most injectable agents (Hernandez-Divers *et al.*, 2005). It is faster onset of action and recovery because of its relatively low blood solubility compared with other inhalational anesthetic. It is required 3-4% for induction and 1-2.5% for maintenance in birds (Degernes, 2008). Isoflurane are minimally metabolized so, it is considered the drug of choice for use in patients with hepatic disease (Ludders, 1992). Isoflurane has been associated with second and third degree atrioventricular block in pigeon and bald eagles (Balko and Chinnadurai, 2017).

Sevoflurane: It is a polyfluorinated isopropyl methyl ether (fluoromethyl-2,2,2-trifluoro-1-ethyl ether) (Thompson *et al.*, 2019). **It is an excellent, albeit more expensive option for bird.** Characteristics of sevoflurane includes: inherent stability, low flammability, non-pungent odor, lack of irritation to airway passages, low blood gas solubility allowing rapid induction and emergence from anesthesia, minimal cardiovascular and respiratory side effects, minimal end-organ effects, minimal effect on cerebral blood flow, low reactivity with other drugs, and a vapor pressure and boiling point that enables delivery using standard vaporization techniques. It is required 4-6% for induction and 3-4% maintenance in avian patients (Degernes, 2008). It is preferable for induction as it is less irritating to mucous membranes, but cost is significantly higher than for isoflurane (Kubiak *et al.*, 2016). It causes minimal cardiac depression and does not produce tachycardia. It causes muscle relaxation and potentiation of neuromuscular blocking drugs (Ghatge *et al.*, 2003).

Physical Examination

- ☐ In general, quietly observing a bird in its cage provides a great deal of information.
- ☐ Awareness and attention to its surrounding environment.
- ☐ Body form and posture, feather condition and respiratory rate all provide clues to a bird's physical condition.
- ☐ Examination of heart and lungs.
- ☐ Sharpness of the keel should be determined, as this is a good indicator of muscle mass and body condition (Doneley, 2010).

Body condition scoring system

Score	Condition	Description
1	Emaciated	Keel bone very sharp
2	Thin	Keel bone easy to palpate and sharp
3	Ideal	Keel bone easy to palpate not sharp
4	Overweight	Keel bone difficult to palpate
5	Obese	Keel bone impossible to palpate

Risk Assessment Values

Status	Condition of birds
Class I	Young, healthy patients, undergoing elective procedure
Class II	Young, healthy patients, undergoing non-elective procedure, or healthy patients undergoing elective procedure
Class III	Patient with an ongoing health problem undergoing any procedure
Class IV	Patient with a major, unstable health problem undergoing a procedure
Class V	Emergency to save patient's life

Preparation of the Patients

In many cases, patient's preparation is more important to survival than the surgical procedure itself. It is often difficult to judge the optimal time for surgery; therefore, all attempts should be made to improve the status of critically ill patients. Few surgeries are immediate emergencies, so time should be spent addressing concurrent potentially dangerous issues such as hypovolaemia, anemia and infection (Lennox, 2015).

Fasting: Preanesthetic fasting can be controversial in avian practice (Degernes, 2008) because birds have a high metabolic rate and relatively poor hepatic glycogen stores compared with mammals, there is a higher risk of hypoglycemia when prolonged periods of fasting are imposed (Gunkel and Lafortune, 2005). A

general guideline for fasting birds before anesthesia is 8 to 12 hours for medium or larger birds (>300 gm) and 3 to 6 hours for smaller birds (Degernes, 2008).

Stabilization: Fluid and nutritional therapies may be required to stabilize a patient before anesthetic induction. The choice of fluid type is determined by the status of the patient. Most avian patients suffering from trauma or disease can be assumed to be at least 10% dehydrated. Following equation can be used to calculate the bird's fluid requirements:

$$\text{Fluid Required} = \frac{\text{Normal body weight (grams)} \times 0.1 (\% \text{ of dehydration})}{\text{Fluid deficit in milliliters}}$$

Dose for maintenance fluids is estimated at 50ml/kg/day (Miller and Buttrick, 1999). Lactated Ringer's solution with 2.5% to 5% dextrose is commonly administered to prevent hypoglycemia (Gunkel and Lafortune, 2005). Administration of multi-vitamin injection or drops (Miller and Buttrick, 1999). Bird place in a quite warm environment to decrease stress. Optimal temperatures for ill birds are 85°F to 90°F (29°C to 30°C). Birds with head trauma or hyperthermia require cooler surroundings, approximately 75°F (23°C). Minimize handling of ill birds. Provide oxygen therapy to bird with respiratory sign. Antibiotics are administered when a bird is severely depressed or immune-compromised or when septicemia is suspected. Furosemide or mannitol may be used to aid in the control of cerebral edema. (Rupley, 1998).

Preanesthetic Medication

Preanesthetic helps in minimizing the stress from forceful restrain ensuring safety, ease of induction of anesthesia and decreasing the dose of general anesthesia thus minimizing hypotension due to the use of large doses of an anaesthetic (Hinchcliff *et al.*, 1991). It is sedatives and other drugs are rarely used in birds, with the exception of analgesics opioids (butorphanol, buprenorphine) (Degernes, 2008) and benzodiazepines (midazolam, diazepam) commonly used in birds. Anticholinergic drugs such as atropine, are not routinely administered to birds because thickened respiratory tract secretion increase the risk of airway or endotracheal tube occlusion (Degernes, 2008). Anticholinergic (atropine, glycopyrrolate) are only used in patients with a history of bradyarrhythmias (Gunkel and Lafortune, 2005).

Positioning

Due to the unique anatomy of the avian patient's respiratory system, it is vitally important that the ribcage can move freely, otherwise hypoxia will develop. Common positions include lateral or dorsal recumbancy. Dorsal recumbancy may be a problem in larger species where the digestive/abdominal contents may press on the air sacs when the bird is in this position, so increasing respiratory effort and eventually leading to apnoea during longer procedures. Positioning the bird in lateral or sternal recumbancy should be considered or intermittent positive pressure ventilation will be required. Smaller species generally do not suffer from this problem and may be positioned according to need (Girling, 2009).

Induction

Induction of general anesthesia can be achieved by a variety of drugs and technique (Flecknell, 1989).

	Induction	Maintenance
Induction Protocol	Injectable Anesthesia	Inhalation Anesthesia
	Inhalation Anesthesia	Inhalation anesthesia

Common technique for induction of inhalation anesthesia in birds

- ❑ **Face mask:** Face mask induction with inhaled anesthetics is to be performed, appropriate size face masks that facilitate inductions with inhaled anesthetics and produce less environmental pollution than ill-fitting mask. Before the induction of anesthesia with a face mask, a period of pre-oxygenation is ideal (Gunkel and Lafortune, 2005).
- ❑ **Anesthetic chamber:** Anesthetic chamber method is used for induction. Certainly for all birds above about 300 g in body weight. In smaller birds a mask may have to be used (Coles, 2007).
- ❑ **Intraosseous cannulation:** It is a method of induction by introsseous cannulation. This is not common technique and not normally recommended (Miller and Buttrick, 1999).

There are two methods of anesthetic induction using inhaled anesthetics.

- **Low-to-high-protocol:** In this method incremental increase of the inhalant over time. This method has the advantage of a reduced risk of overdose but has the disadvantage of a longer induction and excitement phase, which can be detrimental in a stressed and debilitated bird. Premedicated and sedated bird may accept this technique well.
- **High-to-low-protocol:** This technique involves the initial administration of a high percentage of inhalant (4-5% isoflurane or 6-8% sevoflurane in 1-2 L/min of oxygen) for induction. This initial high concentration of inhalant is then followed by a lower concentration that is used for maintenance of anesthesia (2-3% isoflurane and 4-5% sevoflurane). This technique requires close attention to the animal during induction and a timely decrease in anesthetic concentration to avoid overdosing. Higher concentrations during induction reduce the length of any period of excitement, potentially making this method of induction a safer protocol, even for debilitated birds.

After the induction of anesthesia with either technique, the face mask is removed, and intubation with an endotracheal tube of an appropriate size can be performed.

Endotracheal intubation

Uncuffed endotracheal tubes should be used for avian intubation because avian trachea has complete tracheal rings and a fragile mucosa, which is easily damaged by the excessive pressure. Such damage may lead to fibrosis of the tracheal mucosa which can narrow the tracheal lumen, leading to respiratory

complications. This complication may not become evident until 3 to 7 day after intubation. Advantages of Intubation are short procedure, ability to provide manual ventilation, better control of anesthetic depth and prevention of aspiration.

Maintenance

During the maintenance period, it is important to position the bird in a manner that facilitates the surgical procedure, avoids impairing cardio-respiratory function, and facilitates monitoring (Gunkel and Lafortune, 2005). Breathing system is an assembly of components which connects patient's airway to anaesthesia machine. It delivered gas to the patient, removes expired gas and controls the temperature and humidity of the inspired mixture. It allows spontaneous, controlled or assisted respiration (Kaul and Mittal, 2013).

Non-rebreathing circuits such as Ayre's T-piece or Bain's coaxial circuit are most commonly used in birds weighting less than 7 kg. The recommended fresh gas flow for the Bain system is 150 to 200 mL/kg/min with a minimum flow of 500 ml/min, whereas for an Ayre's T-piece, the flow should be about 400 ml/kg/min. Advantages of using these systems compared with circle-breathing circuits include faster changes in the anesthetic gas concentration and anesthetic depth, reduce dead space, less resistance, and convenient handling. Disadvantages include higher gas consumption rates and cooling and dehumidification associated with these higher gas flow rates. The placement of the rebreathing bar and pop-off valve on the Ayre's T-piece can be inconvenient. High gas flow rates and a lack of dispensability of the breathing circuit can quickly lead to barotraumas, decreased venous return and cardiac arrest, should the pop-off valve be inadvertently closed (Gunkel and Lafortune, 2005).

Monitoring

The key to effective anesthesia monitoring is a dedicated anesthetist who is assigned to monitor the patient throughout the anesthesia period. Monitoring will help determine depth of anesthesia as well as level of immobilization and analgesia.

Basic Parameters: Heart and respiratory rates and rhythms should be monitored using a stethoscope and visual observation. The bell of the stethoscope should be placed under the feathers in direct contact with the skin. For heart auscultation, suitable places to listen with minimal sound muffling include the keel bone, the thoracic inlet, the axillae, and the back on either side of the spine. Heart rates may be difficult to count in small birds and very widely between species. The length and depth of anesthesia also affect heart and respiratory rates.

Central Nervous System: Assessment of certain reflexes can assist in determining the anesthetized patient's plane of anesthesia. Pain reflexes (i.e., toe pinch or feather pluck) are lost when the bird is in a medium (surgical) plane of anesthesia. Palpebral reflexes are usually lost by a medium plane of anesthesia, but corneal reflexes persist until the deep plane of anesthesia. Heart and respiratory rates increase when the bird is experiencing pain or when the depth of anesthesia is too low & these rates may decrease in the deep plane of anesthesia.

Circulatory System

- **Ultrasonic Doppler Monitoring:** It is an excellent device for monitoring heart rate and rhythm. Ultrasonic Doppler flow detectors can also be used for indirect blood pressure (BP) monitoring. Direct BP monitoring is difficult in most birds because of their small, relatively inaccessible arteries. Indirect BP measurements are a useful, inexpensive alternative and can provide systolic BP values and trend changes during anesthesia.
- **Esophageal Stethoscope Monitoring:** A simple esophageal heart rate monitor may be substituted for stethoscope monitoring in birds that have simple crop anatomy (i.e., waterfowl, raptors, most aquatic and wading birds), but not in parrots and pigeons. The monitor is placed in the portion of the esophagus caudal to the thoracic inlet.
- **Electrocardiography:** It is recording heart rates that are too rapid to count manually and providing specific information about cardiovascular abnormalities or arrhythmias that may be present in the anesthetized patient. Electrodes are positioned at the patagium and inguinal skin web locations using flattened alligator clips, or small hypodermic needles are passed through the skin and attached to alligator clips.

Respiratory System and Ventilator Status

- **Capnography:** Side stream monitors are recommended for use in birds and other small patients. An ETCO_2 of 30 to 45 mm Hg should indicate adequate ventilation during inhalation anesthesia in most parrots and approximates a normal physiologic range of 25 to 40 mm Hg for PaCO_2 for awake birds. ETCO_2 level exceeds approximately 45 mm Hg, increasing the ventilatory rate should facilitate a return to the normal range, assuming that the endotracheal tube is patent and the trachea is not obstructed. If the bird's respiratory rate is normal but its breaths are shallow, the bird can become hypercapnic and should be ventilated at least once or twice per minute or as needed to maintain the ETCO_2 within the normal range. At the other extreme, excessive ventilation can "blow off" CO_2 , resulting in an ETCO_2 that is below the recommended range. Failure to maintain ETCO_2 below the upper limit of the normal physiologic range may result in development of respiratory acidosis.
- **Pulse oximetry:** Pulse oximetry is a noninvasive method of estimating arterial oxygen status.

Temperature: The patient's body temperature should be monitored throughout anesthesia via a cloacal or esophageal temperature probe. Avian esophageal and cloacal temperatures are well correlated in studies that compared the two sites; however, cloacal temperature probes are prone to being dislodged or recording a cooler temperature if they are not secured appropriately within the cloaca (Degernes, 2008).

Recovery

Recovery is a critical period in avian anesthesia (Gunkel and Lafortune, 2005). Patients recovering from isoflurane and sevoflurane are usually perching and ready to eat within an hour. Patients recovering

from ketamine may experience some seizures-like activity, so it is best to keep the bird wrapped up in a towel to prevent wing flapping and self-inflicted trauma. Recovery from injectable anesthesia should be expected to be long and violent. Administration of reversal agents may be required if recovery is taking too long. Monitoring the patient until complete recovery is the best way to assure patients survival (Miller and Buttrick, 1999).

Anesthetic Complications & Emergencies

If spontaneous respiration does not occur in approximately three to five minutes, 5 to 10 mg/kg of Doxapram may be given IM or IV route. Effective cardiac massage must be applied during cardiac arrest; attempts should be made to compress the sternum at a rate of 60 to 100 compressions/min. During cardiac emergency, drugs including epinephrine (1:1000; 0.5 to 1.0 mg/kg IM, IV, IO, or intratracheal), atropine (0.5 mg/kg IM, IV, IO, or intratracheal) and doxapram, should also be administered (Degernes, 2008). Surgical equipment such as electrocautery units are available to minimize the amount of blood loss (Miller & Buttrick, 1999).

Conclusion

In conclusion inhalation anesthetic management of birds are one type of an art & science. Anatomical and physiological considerations are prerequisite for induction of anesthesia in birds. In birds, inhalation anesthesia is more advantageous than the injectable anesthesia. Pre-anesthetic stabilization should be carried out for successful anesthesia. Monitoring of vital parameters are very important to evaluate stage of anesthesia as well as successful surgical outcome.

References

- Baldrey, V. (2014). Assessment of alfaxalone as an anesthetic agent in mute swans (*Cygnus olor*). Dissertation Submitted to the Royal College of Veterinary Surgeons, England, UK.
- Balko, J. A., & Chinnadurai, S. K. (2017). Advancements in evidence based anesthesia of exotic animals. *Veterinary Clinics: Exotic Animal Practice*, **20**(3), 917-928.
- Coles, B. H. (2007). Essential of Avian Medicine and Surgery. 3rd Edition, Blackwell Publishing, UK. Pp. 124-142.
- Degernes, L. (2008). Anesthesia for companion birds. Compendium of CE articles. Pp. 1-11, assessed on <https://pdfs.semanticscholar.org/b441/002276e902ea0f213e8fda6f6d6592aa3d1c.pdf>.
- Delgado-Herrera, L., Ostroff, R. D., and Rogers, S. A. (2001). Sevoflurane: approaching the ideal inhalational anesthetic a pharmacologic, pharmacoeconomic, and clinical review. *CNS DrugReviews*, **7**(1), 48-120.
- Doneley, B. (2010). Avian Medicine and Surgery in Practice: Companion and Aviary birds. 1st Edition, Manson Publishing Ltd., UK. Pp. 245-255.
- Flecknell, P. A. (1989). Laboratory Animal Anaesthesia. San Diego: Academic Press.

- Ghatge, S., Lee, J., & Smith, I. (2003). Sevoflurane: an ideal agent for adult day-case anesthesia. *Acta Anaesthesiologica Scandinavica*, **47**(8), 917-931.
- Girling, S. J. (2009). Avian Anesthesia. *Anaesthesia for Veterinary Nurses* 2nd edition. Welsh E. Blackwell Publishing, Oxford, 336-353.
- Grenone, T. D., Francisco, O.N., Killos, M. B. Quandt, J. E. Mandsager, R. E. & Graham, L. F. (2012). Comparison of three different inhalant agents (isoflurane, sevoflurane, desflurane) in red-tailed hawks (*Buteo jamaicensis*). *Veterinary Anaesthesia and Analgesia*, **39**(1), 29-37.
- Gunkel, C., & Lafortune, M. (2005). Current techniques in avian anesthesia. In *Seminars in Avian and Exotic Pet Medicine*, **14** (4), 263-276.
- Hernandez-Divers, S. M., Schumacher, J., Stahl, S., & Hernandez-Diver, S. J. (2005). Comparison of isoflurane and sevoflurane anesthesia after premedication with butorphanol in the green iguana (*Iguana iguana*). *Journal of Zoo and Wildlife Medicine*, **36**(2), 169-176.
- Hinchcliff, K. W., Jernigan, A. D., Upson, D. W., & Constable, P. D. (1991). Ruminant pharmacology. *Veterinary Clinics of North America: Food Animal Practice*, **7**(3), 633-649.
- Kaul, T. K., & Mittal, G. (2013). Mapleson's breathing systems. *Indian Journal of Anesthesia*, **57**(5), 507-515.
- Kubiak, M., Roach, L., & Eatwell, K. (2016). The influence of a combined butorphanol and midazolam premedication on anesthesia in psittacid species. *Journal of Avian Medicine and Surgery*, **30**(4), 317-324.
- Lennox, A. M. (2015). Avian Anaesthesia and Surgery-keeping Them Alive. In: European Veterinary Conference, Voorjaarsdagen, UK.
- Ludders, J. W. (1992). Advantages and guidelines for using isoflurane. *The Veterinary Clinics of North America: Small Animal Practice*, **22**(2), 328-331.
- Miller, W., Buttrick, M. (1999). Current anesthesia recommendations for companion birds. *Iowa State University Veterinarian*, **61**(2), 3.
- Rupley, A. E. (1998). Critical care of pet birds: procedures, therapeutics, and patient support. *Veterinary Clinics of North America: Exotic Animal Practice*, **1**(1), 11-42.
- Thompson, J., Moppett, I., & Wiles, M. (2019). Smith and Aitkenhead's Textbook of Anaesthesia. 7th Edition, Elsevier health Sciences. Pp. 49-65.

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AVS-1

INTRAMEDULLARY PINNING FOR MANAGING DIAPHYSEAL FRACTURE OF HUMERUS IN A BLACK KITE (*MILVUS MIGRANS*)

Sharun Khan, Mohammed Arif Basha, Kalaiselvan Elangovan, Naveen Kumar Verma,
Mohar Singh, Rohit Kumar, A.M. Pawde and Amarpal
*Division of Surgery, ICAR-Indian Veterinary Research Institute
Izatnagar, Bareilly, Uttar Pradesh*

Fracture management in birds is a challenging task due to its low success rate. This is mainly because of the fact that avian bones have thinner, more brittle cortices and have pneumatic bones which are connected to air sacs. A Black Kite (*Milvus migrans*) was presented to Referral Veterinary Polyclinic, Indian Veterinary Research Institute, Izatnagar with the history of injured left wing. Clinical and radiographic examination identified an open transverse fracture at the mid-diaphyseal area of humerus. Anesthesia was performed by administering xylazine at 5 mg/kg body weight intramuscularly which was followed by ketamine at 15 mg/kg body weight intramuscularly. Following the aseptic preparation of surgical site, a 1.5mm K-wire was inserted in a retrograde manner to fix the fractured bone fragments into apposition. Muscle and skin incisions were closed in standard manner. Post-operatively the wing was immobilised by bandaging. The bird was treated with antibiotics and anti-inflammatory drugs for five days. The Kite recovered uneventfully.

AVS-2

SURGICAL MANAGEMENT OF TRAUMATIC CROP FISTULA IN PET BIRDS

Ashok R. Unni, Laiju M. Philip, Dileep Kumar K.M., John Martin K.D.,
Syam K. Venugopal and C.B. Devanand
*Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences,
Kerala Veterinary and Animal Sciences University, Mannuthy, Thrissur*

The study was conducted in six clinical cases of crop fistula in pet birds presented at University Veterinary Hospital, Kokkalai, Kerala Veterinary and Animal Sciences University, to assess the efficacy of surgical correction of traumatic crop injuries. Routine clinical examination revealed skin wound on neck region contaminated with feed particles. After confirming crop fistula using contrast radiography, birds were selected irrespective of species, breed, sex and age. Surgical correction with informed consent from the owners was performed under general anaesthesia. The surgical site was prepared for aseptic surgery and the skin adhesions with crop were separated. Wound on the crop was repaired in double layers of simple continuous sutures and skin edges were apposed by simple interrupted sutures using polyglactin 910 size 6-0 suture. Postoperatively oral antibiotics were administered for seven days and sutures removed

on 10th postoperative day after ensuring complete wound healing. The birds recovered uneventfully following restricted feeding for a week.

AVS-3

SURGICAL REPAIR OF RUPTURED CROP IN A PIGEON

Bhagavantappa B., Dilip Kumar D., Jahangirbasha Doddamani, B.V. Shivaprakash,
C.N. Vijay Kumar, Kartik Bidari, Neelkanth, Pallavi, Karan Hosmani, Kumarswamy,
 Swaroop L., Tokappa, Birappa and Venkatgiri

Department of Veterinary Surgery and Radiology, Veterinary College, Bidar, Karnataka

A female pigeon was presented with a history of traumatic injury at the neck region. On clinical examination pigeon was active, matting of the feathers was observed at neck and dropping of food grains from the ruptured crop. The pigeon was anaesthetized using Inj Ketamine hydrochloride @ 40 mg / kg i/ m. Normal saline was irrigated to clear the debris around the wound and site was prepared for aseptic surgery. Synthetic absorbable suture material poliglecaprone no 3-0 was used for suturing of crop with simple continuous pattern and nylon was used for suturing of skin with criss-cross pattern. Post-operatively liquid Cephalexin and Inj meloxicam were administered for 5 days and 3 days respectively along with vitamin and mineral supplement. Liquid feeding advised for 2 days. Skin sutures were removed on eighth day post-operative and pigeon recovered uneventfully.

AVS-4

SUCCESSFUL SURGICAL MANAGEMENT OF FEMORAL FRACTURE IN AN INDIAN ROSE RINGED PARAKEET (PSITTACULA KRAMERI)

Rukmani Dewangan, Raju Sharda, Devendra Yadav, M.O. Kalim, S.K. Yadav and M.V. Kamble
*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H.,
 Anjora, Durg, Chattisgarh*

A rose ringed parakeet (*Psittacula krameri*) weighing 400 gm was brought with complaint of unable to bear weight on right pelvic limb. Physical examination of the affected hind limb revealed open injury. Radiographic examination confirmed a transverse fracture of right femur bone. Parakeet was anaesthetized with ketamine and fractured was corrected using intramedullary pinning technique in retrograde manner. The muscles were sutured using chromic catgut no. 2/0 in continuous suture pattern and skin sutured using nylon in interrupted suture pattern. Post-operatively, inj. Taxim 30 mg for 5 days and dexona 0.1 ml as well as meloxicam 0.1 ml was given for three days. The wound was dressed with betadine ointment and three layered bandage was done. Skin sutures were removed on 10th postoperative day. The K-wire was removed after 6 week following surgery. The parakeet showed uneventful recovery with complete weight bearing on affected hind limb without any complication.

AVS-5

REPAIR OF TIBIOTARSAL BONE FRACTURE WITH INTRAMEDULLARY PINNING IN A GOOSE-A CASE REPORT

R.V. Suryawanshi; G. S. Ubhare, Pande Gauri and A.H. Ulemale

*Department of Surgery and Radiology, KNP College of Veterinary Science, Shirwal, Satara
Maharashtra Animal and Fishery Sciences University, Nagpur, Maharashtra*

A four-year-old male goose was presented to teaching veterinary clinical complex with history of dog bite wound and right limb limping. On clinical examination, goose had abrasion over mandible and beak area with ocular discharge. Physical examination revealed crepitation and swelling on tibiotarsal region and with haematoma. Radiographic examination of limb showed transverse fracture of midshaft of tibiotarsal bone. Haematobiochemical values of bird were in normal range and kept on antibiotic, anti-inflammatory and temporary splinting of fractured limb aiming to minimize swelling for a week. After ten days, bird was anaesthetized with combination of Xylazine (@2 mg/kg), Ketamine (@25 mg/kg) and Diazepam (@0.5 mg/kg). The surgical site was prepared by plucking of feathers, scrubbing and restrained on left lateral recumbency. The skin incision was made latero-cranial aspect of tibiotarsal site and fractured bone was exposed by draining haematoma. Intramedullary pin (5mm thickness) was inserted into marrow via retrograde method and fractured fragments were reduced near to anatomical position without ankylosing proximal and distal joint. Surrounding muscle and fascia was sutured with chromic catgut no.3-0 and skin was sutured with nylon. Postoperatively, operated limb was supported with additional splint bandage to immobilize fractured fragments with parental Cefotaxime @ 75 mg/kg and meloxicam @5mg/kg for 5 days orally and started bearing weight on fractured limb on 10 days. Clinical callus was observed at site of fracture site on 28th postoperatively and bird assumed normal movement.

AVS-6

INTERNAL FIXATION OF TIBIA AND FEMORAL FRACTURES BY INTRAMEDULLARY PINNING IN POULTRY HENS

Shivangi Diwedi, Rajnish Kumar, P. Bishnoi, A.K. Bishnoi, Anita Kumari, K. Kachawa,
Raj Kumar and Kuldeep

*Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Science,
Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan*

Two indigenous poultry hens were presented in TVCC, RAJUVAS, Bikaner with the clinical finding of non-weight bearing in one of the pectoral limb. The cases were of complete tibia and femur fracture as evidenced by clinical and radiographic finding. Fracture of both the bones were immobilized by internal fixation using intramedullary pinning. After induction with ketamine hydrochloride @15 mg/body weight and maintenance with inhalant anaesthetic isoflurane (2-2.5%), Intramedullary pinning was done by

using k-wire in both birds. Post-operatively, external support was provided by application of bandage and paper tape over the limb. Also, antibiotic, NSAIDs, multivitamins preparations were administered. The weight bearing was observed on 4th post-operative day and sutures were removed on 10th post-operative day in both the birds without any complication.

AVS-7

SUCCESSFUL REPAIR OF TRAUMATIZED HUMERUS IN INDIAN SPOTTED EAGLES(*Clanga hastata*)

Jayakrushna Das, Benudhar Mahanand and Prabir Mohapatra

*Department of Veterinary Surgery and Radiology, College of Veterinary Science & A.H.,
Odisha University of Agriculture and Technology, Bhubaneswar, Odisha*

Three Indian spotted eagles (*Clanga hastata*) were presented at different times with fracture and hanging of one wing by the animal helpline personnel. From history these were rescued in lameness and fractured condition in different occasions that the birds were seen falling at the roadside near an electric pole etc. From physical examination these were revealed as lameness, fracture of wing, swelling crepitation and hanging of wings with external wound at the fractured site. On C-Arm and radiography examination these were confirmed as the humerus has been fractured at different sites, in some, the distal one third obliquely fractured with exposing of distal fractured fragment to outside. The birds were controlled and provided with glucose water orally. The birds were injected with injection Ceftriaxone sodium and meloxicam prior to preparation for surgery. These were anaesthetized using ketamine and routine surgical preparation was done for intramedullary fixation. Under strict aseptic measures the fractured wound site was extended and steimann's pin of 1mm was introduced to the proximal fracture site, then it was fixed to the distal fragments. The extraneous portion of the pins were cut and removed and the surgical wound was closed routinely. The sites were wrapped with sterilized bandage and the wing was immobilized by folding the wing with 1 inch size micopore. The accompanying persons were advised to maintain post-operatively with oral antibiotics, analgesics, multivitamins and calcium oral drops along with glucose and normal feeding. After 20-25 days these were examined regarding healing of fractured fragment and then the pin was removed and dressed surgically. It was then handed over to forest personnel.

AVS-8

SURGICAL MANAGEMENT OF TORN CROP IN A PIGEON

R.B. Kushwaha, Pankaj Gupta, D K Dwivedi and Ankur Sharma

*Division of Veterinary Surgery and Radiology, Faculty of Veterinary Sciences and A.H.,
SKUAST-J, R S Pura, Jammu, J&K*

A seven-month-old pigeon weighing approximately 250 gm was brought to the clinics with the history of fresh bite injury at the crop region by an eagle and grains and water were coming outside from torn crop. Upon clinical examination, it revealed full thickness tear in the crop. For further diagnosis, the

pigeon was anaesthetized by 10 mg (0.2 ml) of ketamine intramuscularly and infant feeding tube size FG 10 was passed into the esophagus via oral cavity; the tip of which coming outside from torn crop. The tear in the crop was repaired in double-layer using 1/0 catgut in Lambert and Cushing pattern followed by skin repair with nylon suture. Post-operatively, analgesic and antibiotic drops were administered orally for 5 days. Wound was healed in about a week and pigeon resumed normal grain and water intake, and activities.

AVS-9

USE OF HYPODERMIC NEEDLE IN MANAGEMENT OF FRACTURE UNDER C-ARM GUIDANCE IN BIRDS

Manjunatha, D.R., Nagaraju, N., Basavaraju B Balappanavar and Ranganath, L.

Department of Veterinary Surgery and Radiology, Veterinary College, Hassan, Karnataka

Fracture management in birds is challenging because of hollow bone, in present paper different fracture management in different birds were presented. A two non-descript Pigeons were presented with the case history of bird's right limb was struck within the cage; since then it was not able to bear weight on the right limb in both the cases. Radiography of tibiotarsus of right limb in both the case on Latero-medial view revealed it's an simple, Complete, Oblique, Over-riding, diaphyseal fracture. Two Indian kite were presented with history of not able to fly and hanging of left wing and not able to bear a weight on right hind leg. Clinical examination revealed crepitation near left humerus region in one case and right tibiotarsal region in another case. Radiography of humerus of left wing on medio-lateral view revealed it's a simple, complete, transverse, proximal 1/3rd diaphyseal fracture of humerus and mid diaphyseal transverse fracture of tibiotarsal bone in another kite. The birds were anesthetized with Inj. Diazepam (0.2mg/kg BW) and Inj. Ketamine (10mg/kg BW) combination of General Anaesthesia was used and fracture was surgically corrected by closed method of normograde intra-medullary pinning using body of 21 gauge Hypodermal needle in pigeons for tibiotarsal bones and 18 gauge spinal needle for humerus and tibiotarsal bone of Indian kite as intra-medullary pin with External coaptation using Ice-cream sticks. The birds were recovered without any complication.

AVS-10

ZIP TIE TECHNIQUE IN MANAGEMENT OF TUMOR IN OSTRICH

Manjunatha, D.R., Girish, B. C. Nagaraju, N. and Ranganath, L.

Department of Veterinary Surgery and Radiology, Veterinary College, Hassan, Karnataka

A one-year-old female Ostrich (*Struthio camelus*) was presented to Department of Veterinary Clinical Complex, Veterinary College, and Hassan with the history of growth near left hock joint (ankle) which was progressively increasing in size causing slight lameness. Clinical examination revealed a rough surfaced circular mass tightly adhered to skin involving joint surface on postero-medial aspect of hock and was highly vascularized. Surgical excision of mass through incision was difficult because of joint involvement

and tough skin, hence it was decided for zip-tie application. The ostrich was physically restrained by hood, sedation was induced with Inj, Xylazine @ 2.5 mg/kg B.Wt IM, 2% lignocaine was infiltrated around the mass and zip-ties were applied around the base of the mass. The zip-ties were tightened daily, entire mass sloughed off on eighth day. Wound management was done with povidine iodine ointment and water soluble cephalixin powder @ 22 mg/kg B.wt was used orally until recovery. Patient recovered without any complications in fifteen days. Upon histopathology the mass was confirmed as fibrosarcoma. No reoccurrence was found upon six-month follow-up.

AVS-11

SURGICAL MANAGEMENT OF COMPOUND TIBIO-TARSAL FRACTURE IN A PARROT

Sandeep Saharan, **Amit Kumar**, Ribu Vergese Mathew, Robin, Ankit Dangi and Dinesh

*Department of Veterinary Clinical Complex, College of Veterinary Sciences,
Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, Haryana*

A 6 months old male parrot weighing 90 gram was presented to Veterinary Clinical Complex with a history of left limb injury due to unknown reason. On presentation, the bird was unable to bear weight on left pelvic limb. During physical examination, a crepitus was felt on palpation at tibio-tarsal region with exteriorization of bone fragment. Radiographic examination confirmed a compound complete proximal third oblique fracture of left tibia. Bird was anaesthetized with ketamine and maintained on isoflurane. An 18 gauze orthopaedic wire was introduced intramedullary for stabilization of fracture fragments. Immediate post-operative radiographs revealed appropriate approximation and reduction. Bird recovered uneventfully with complete weight bearing on affected limb and the wire was removed 8 weeks after surgery. The post-operative follow up radiograph after 3 months was taken and complete bone union was observed. In summary, it is concluded that an orthopaedic wire can also be used as an intramedullary fixation in parrot's long bone fractures under general anaesthesia.

AVS-12

SURGICAL CORRECTION OF COMPOUND HUMERAL FRACTURE IN A DOMESTIC PIGEON (*Columba liviadamestica*)

Sarkar A.

Veterinary Polyclinic, Siliguri, Animal Resources Development Department, Govt. of West Bengal

A domestic pigeon (*Columba liviadamestica*) was presented to Veterinary Polyclinic, Siliguri, with a complain of inability to fly and dropped left wing. Physical and radiographic examination revealed mid shaft fracture of left humerus with exposure of fracture fragment at medial aspect of the wing. This report describes intramedullary pinning of humerus using k-wire (1.2mm). After surgical preparation the pigeon was anesthetized using ketamine HCl @ 30 mg/kg body weight. The fracture site was approached

using the open wound to minimize soft tissue handling and a k-wire of 1.2 mm size was introduced into the medullary cavity in retrograde followed by normograde fashion. After successful post-operative management including regular dressing, antibiotic, analgesics and calcium, vitamin D supplementation the fracture healed and the pigeon was able to fly after three months of surgery with mild abduction of left wing.

AVS-13

RECONSTRUCTIVE SURGERY PERFORMED TO RESTORE COMPLETE FLYING ABILITY OF THREE PELICANS (*PELECANUS*) WITH PATAGIUM AND PRO-PATAGIUM LACERATION

Ushma Patel, A. Mishra, Rohit Gangwal, Abhishek Narayanan, Piyush Sashtri, Rani Thomas, Koundinya, Chetan Patond and Shalaka Salvekar

Department of Veterinary Surgery and Radiology, Nagpur Veterinary College, Maharashtra Animal and Fishery Science University, Nagpur, Maharashtra

Two Dalmatian pelicans and one Rosy pelican, on three consecutive days, were presented with deep wing lacerations due to Chinese manja. The rescuers applied pressure bandage for haemostasis in the field before transporting them to the bird treatment camp. On clinical examination, one bird had hyperthermia which was managed by cold water enema. Second bird had hypothermia which was counteracted with orthopaedic heating pad. All the birds were catheterised and given intravenous fluids for rehydration. Anti-inflammatories, styptics and antibiotics were administered. Each bird was induced with isoflurane by mask followed by endotracheal intubation for maintenance of anaesthesia. The surgical site was scrubbed, plucked and prepared aseptically. The anatomical restoration of the patagial and propatagial ligament was undertaken. Muscles, skin and associated soft tissues were sutured. An '8'-figure bandage was applied to the wing. The birds were given clindamycin @ 50mg/kg P/O and meloxicam @ 0.3mg/kg P/O drugs for one week. The birds were supported by tube feeding and passive physiotherapy during post-op period. They were shifted to larger enclosures one week post operatively for flight practice fitted with different coloured bands on their leg for identification. After complete assessment with respect to their feeding, flight and health, the birds were released back successfully after 25 days. This is the first such case reported from India.

AVS-14

SURGICAL MANAGEMENT OF CROP FISTULA IN A PIGEON

Rajesh Kumar, Neha Sharma, Pipelu W., Manjusha K.M. Aakanksha, Prakash G.V. and M. Hoque

Division of Surgery, Indian Veterinary Research Institute, Izatnagar, Bareilly, Uttar Pradesh

The crop is a muscular pouch which extent from oesophagus in the birds. Crop allows birds to eat large amount food in a single sitting. When the crop is full of food, it is often susceptible for trauma.

Penetrating wounds can result in formation of fistula in the crop. A pigeon was reported to Referral Veterinary Polyclinic of Indian veterinary research institute izatnagar having history of wound at the neck region. It occurred due to traumatic injury with ceiling fan and contents oozed out from the fistula. Based on history and clinical examination, it was diagnosed as a case of crop fistula and decided for surgical repair. General anaesthesia achieved by Ketamine 50.0 mg/kg body weights intramuscularly. The ruptured crop edges were freshened and closed by using no. 1-0 vicryl. Skin was closed routinely with polyamide by horizontal mattress suture. Bird fully recovered after 8 days without any complication.

AVS-15

RADIOGRAPHIC EVALUATION OF HEALING OF TARSOMETATARSAL FRACTURES IMMOBILISED WITH MODIFIED ALTMAN SPLINT IN BIRDS

Ashok R. Unni, Laiju M. Philip, Dileepkumar K.M., John Martin K.D.,
Syam K. Venugopal and Devanand C.B.

*Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences,
Kerala Veterinary and Animal Sciences University, Mannuthy, Thrissur, Kerala*

The study was conducted in twelve clinical cases of closed fracture of tarsometatarsus in birds presented at University Veterinary Hospital, Kokkalai, Kerala Veterinary and Animal Sciences University, to evaluate healing of fracture by radiography. Routine clinical examination followed by radiography was done for diagnosis. After confirming diaphyseal fracture of tarsometatarsus, birds were selected irrespective of species, breed, sex and age. All the birds were subjected to closed fracture reduction and immobilization of affected limb with modified Altman splint. Orthogonal survey radiographs of the treated fractured bone were recorded on the day of presentation (0th day) and on 4th, 8th, 12th, 16th, 20th, 24th and 28th day post-fracture-reduction. The immediate post-fracture-reduction radiograph revealed adequate apposition and alignment of fragments. Endosteal callus was noticed by 4th day post-fracture-reduction and periosteal callus formation was noticed from 8th day which progressed along the length of the bone by 12th day and was found crossing the fracture line by 16th day. Medullary canal was re-established by 20th day and bone remodelling was evident from 20th and 24th days. In the present study, it was concluded that closed avian tarsometatarsal fractures healed faster than in mammals and modified Altman splint was ideal for treatment of such fractures.

AVS-16

SUCCESSFUL SURGICAL MANAGEMENT OF CROP FISTULA IN A KARAN PARROT

Raju Sharda, Rukmani Dewangan, Sanjay Yadav and Devendra Yadav

Department of Veterinary Surgery and Radiology, College of Veterinary Science & A.H., Anjora, Durg, Chattisgarh

Six month old medium sized Karan parrot (*Psittacula krameri*) was reported to the department of Veterinary Surgery & Radiology with the history of traumatic injury through chest on the crop leading to fistulation. Feed and water following consumption was drained out from the fistula opening of the crop. It was decided to repair the defect under sedation and local infiltration. The site of the wound was prepared aseptically. Local infiltration, debridement of the wound and crop adhesions separation was done carefully. The crop was sutured by continuous lock stitch pattern using 3-0 polyglactin 910 suture. The skin was sutured separately with silk in simple interrupted pattern. Post operatively the parrot was treated with analgesics and antibiotics for four days along with antiseptic dressing till healing. The parrot started consuming feed and recovered uneventfully.

AVS-17

CHRONIC NON-RESPONSIVE PANOPHTHALMITIS AND ITS SURGICAL MANAGEMENT IN AN ASEEL COCK

S.Senthil Kumar, P.Tamil Mahan, M. Vijayakumar, A.Preethi and A.Arun Prasad

Veterinary Clinical Complex, Veterinary College and Research Institute, Orathanadu, Thanjavur

A 4 years old Aseel cock was presented to VCC, VCRI, Orathanadu with the history of persistent swelling and discharge from left eye, vision impairment and gradual loss of body condition since it sustained injury to left eye during rooster fight 6 months back. The bird was treated at local veterinary dispensary intermittently and since there was no improvement the bird was referred for further treatment. Clinical examination revealed conjunctivitis, swelling, purulent discharge, pain and vision loss of left eye. Radiography was done and it revealed soft tissue swelling within the bony orbit suggestive of chronic inflammation. Based on radiography and clinical examination the case was tentatively diagnosed as chronic non-responsive panophthalmitis and transpalpebral exenteration was advocated. The eye was prepared for aseptic surgery. Xylazine @ 5mg /kg of bwt and ketamine @ 20mg /kg of bwt were administered to induce anaesthesia. Endotracheal intubation was done and anaesthesia was maintained with isoflurane. Non rebreathing Bain Co-axial system was used to maintain anaesthesia. Transpalpebral exenteration was carried out and orbital contents removed completely. The wound margin was closed employing simple interrupted suture using 2-0 PGA. Routine postoperative wound care and antibiotic therapy resulted in an uneventful recovery.

AVS-18

INGLUVIOTOMY FOR REMOVAL OF METALLIC FOREIGN BODY FROM THE CROP OF A SIX MONTH OLD DOMESTIC TURKEY (*MELEAGRIS GALLAPAVO*): A CASE REPORT

Sooryadas S., **Souljai J.S.**, Dinesh P.T., Gisha G. Nair, Jinesh Kumar N.S.

Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences, Kerala Veterinary and Animal Sciences University, Pookode, Kerala

A six-month old domestic turkey was presented with a history of swallowing a fishing hook. On physical examination, pain was elicited on palpation of crop. The survey radiograph confirmed a metallic foreign body within the crop. Inguvotomy was resorted to. The bird was anaesthetized using Xylazine @15 mg/kg and Ketamine @ 20 mg/kg. Upon sedation, the bird was intubated and maintained on 2% isoflurane. A vertical skin incision was made at the distended portion of the crop. The crop was approached and incised. Contents of the crop were removed. The fishing hook was visualized and carefully removed from the crop, after which the crop was washed thoroughly and examined for ruptures. Incisions were apposed and post-op care was followed. Sutures were removed on the tenth post-operative day. The bird had an uneventful recovery.

AVS-19

SURGICAL MANAGEMENT OF EXTRAMURAL CROP ABSCESS IN A MACAW - REVIEW OF TWO CASES

S. Kathirvel, P. Sankar, A. Kumaresan, **C. Saranya**, S. Vigneshwaran,
K. Monika Krish and R. Vinil Kumar

Department of Veterinary Surgery and Radiology, Veterinary College and Research Institute, Tamil Nadu Veterinary and Animal Sciences University, Namakkal, Tamil Nadu

An eight-month old blue yellow macaw and a four-month old scarlet macaw were presented to Veterinary Clinical Complex, Namakkal with the history of abrupt swelling in the ventral neck for past one week. On Clinical examination swelling over the crop region was found, soft in consistency without any open wound. Clinical and hematobiological parameters were within normal range except neutrophilia. Ventrodorsal and lateral radiography showed soft tissue engorgement at extramural esophageal space in both the birds. Under isoflurane anaesthesia affected area was prepared aseptically after plucking all the feathers. The mass located adjacent to crop wall was incised and deep seated inspissated abscess material was removed in both the birds. After copious lavage with normal saline, muscle and skin were closed as per standard procedure. The microbiological analyses of pus material in both cases were positive for multiple drug resistant Avian Pathogenic *E. coli* (APEC). Following five days of post-operative care regimen with APEC sensitive antibiotic, analgesic and managemental modification, both the birds made

an uneventful recovery.

AVS-20

MANAGEMENT OF LONG BONE FRACTURE IN BIRDS BY INTERNAL FIXATION

Pramod V.S., Randhir Singh, Apra Shahi, Shobha Jawre, Apoorva Mishra,
Nidhi Gupta and Amol Rokde

*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H.,
Nanaji Deshmukh Veterinary Science University, Jabalpur, Madhya Pradesh*

Birds have several anatomical and physiologic characteristics that impede to consider anaesthesia in birds a trivial aspect. High calcium content in avian bones makes them more brittle and susceptible to fracture. The present study was conducted on twelve clinical cases of birds to evaluate the efficacy of isoflurane anaesthesia along with comparative evaluation of intramedullary stainless steel K- wire and stainless steel threaded K- wire in long bone fracture repair. The birds were randomly divided into two groups, consisting six birds in each. In first group internal fixation of fracture by stainless steel K- wire was done while in second stainless steel threaded K- wire was used. Post-operatively, the birds were evaluated for fracture healing for 60 days. The study concluded that Isoflurane provided adequate depth of anaesthesia with minimum complications and fracture healing was earlier and enhanced with the use of threaded k-wire.

AVS-21

A CLINICAL CASE OF PARAPHIMOSIS IN AN OSTRICH AND ITS SURGICAL CORRECTION

Manjunatha, D.R., Girish, B.C. and Nagaraju, N.

*Department of Veterinary Clinical Complex, Veterinary College, Hassan
Karnataka Veterinary Animal and Fisheries Sciences University, Bidar*

A five year old male Ostrich (*Struthio camelus*) was presented to Department of Veterinary Clinical Complex, Veterinary College, Hassan with the history of pink color protruding mass hanging near cloacal region from morning. Detailed clinical examination revealed hanging of penis from the cloaca which was not able to be retrieved back, based on history and clinical sign the case was diagnosed as paraphimosis. The Ostrich was restrained physically with the help of hood, penis was washed thoroughly with diluted potassium permanganate solution and applied lignocaine jelly with glycerin and was gently pushed back to normal position. The reoccurrence of paraphimosis was observed after two days. The ostrich was physically restrained by hood and was sedated with Inj, Xylazine @ 2.5 mg/kg B.Wt IM, 2 % lignocaine was infiltrated around the cloaca and purse string suture was applied. Wound management was

done with povidine iodine ointment and water soluble cephalixin powder @ 22 mg/kg B.Wt was used orally until recovery in drinking water. Patient recovered without any reoccurrence.

AVS-22

SUCCESSFUL SURGICAL MANAGEMENT OF UNUSUAL BILATERAL RUPTURE OF ESOPHAGUS IN A DUCK

Manjunatha, D.R., Nagaraju, N. and Ranganath, L.

Department of Veterinary Surgery and Radiology, Veterinary College, Hassan, Karnataka

A six months old duck was presented to Department of Veterinary Clinical Complex, Veterinary College, Hassan, with a history of leaking food material at the lateral neck region from wound site due to infighting. Clinical examination revealed that the duck was active, taking feed and water normally, lacerated wound was found on dorsolateral neck region with outflow of food material from the two sites of the wound, based on history and clinical examination the case was tentatively diagnosed as bilateral esophageal tear. Under Xylazine and Ketamine dissociative anesthesia the wound site was lavaged and debrided, the through and through damaged esophagus was sutured with no.3-0 polyglactin-910, with simple interrupted suture pattern and the muscle, subcutaneous tissue, skin was sutured in routine manner. On administration of normal saline, esophagus was intact. Post operatively advised for semisolid diet along with antibiotic therapy and wound dressing was done on alternate days. Duck recovered uneventfully.



Equine Surgery Session

MEET THE SPEAKER

**Dr. Arun Anand***Professor*

Department of Veterinary Surgery and Radiology, College of Veterinary Science
Guru Angad Dev veterinary & Animal Sciences University, Ludhiana, Punjab

E-mail: arunanand135@yahoo.com

Academic Qualifications

Degree	Subject	University	Year
BVSc&AH	Veterinary & Animal Sciences	PAU, Ludhiana	1996
MVSc	Veterinary Surgery & Radiology	PAU Ludhiana	2001
PhD	Veterinary Surgery & Radiology	GADVASU, Ludhiana	2013
ECFVG	Cleared ECFVG programme to practice in North America	American Veterinary Medical Association	2006

1. Registered with Canadian Veterinary Medical Association and American Veterinary Medical Association.

2. Registered member with Michigan State board of Veterinarians, USA

1. **Title of the Thesis**

Ph.D. “Clinical studies on abdominal and perineal affections in equine”

M.V.Sc. “Comparative evaluation of scrotal and post scrotal urethrostomy in dogs”

2. **MVSc Students Guided as Major Advisor** : 04

3. **Research Awards/Honours/Peer recognitions** : 19

4. **International assignments**

- Fellowship awarded by Farmer’s commission Mohali to attend two months externship/training from June 1 to July 30, 2015 on equine medicine and surgery at Fox Run Equine Center , Pennsylvania USA.
- Appointed as external resource person in an international assignment at Chittagong Veterinary & Animal Sciences University, Chittagong Bangladesh to train fifteen Veterinarians in a training program named “Hands on Training on Veterinary Surgery for major abnormalities of cattle and goats, Clinical anesthesiology, ultrasound and radiographic imaging” from 24-28 February, 2019 sponsored by Krishi Gobeshona Foundation (KGF) of Bangladesh.

5. **Research Projects (Working as PI in two projects entitled)**

1. Development and clinical application of biomaterials for root canal treatment and crown therapy in dogs funded by DBT New Delhi.

2. Clinical studies on diagnosis and surgical management of abdominal and reproductive disorders in equine funded by RKVY-ICAR New Delhi.
3. Completed/working in four extramural projects.

6. Publications

1. Full research Paper : 28
2. Research notes : 2
3. Short Communications : 13
4. Clinical reports : 21

7. Other Teaching/Extension Activities

- Invited / Expert Lectures delivered during training courses : 36
- Paper poster presented in conference / symposia/workshop : 17
- Development of teaching aids, laboratory manual/compendium for trainings : 22
- Extension Publications / Popular Articles : 23
- Invited Extension lectures including radio talks : 13

RECENT TRENDS IN EQUINE COLIC SURGERY

Arun Anand

*Department of Veterinary Surgery and Radiology, College of Veterinary Science,
Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, Punjab*

Colic is still considered the most common cause of death in adult horses and accounts for a large proportion of emergencies for horse owners and veterinarians. It has been reported that approximately 920,000 horses in US suffer an episode of colic each year, and more than 64,000 horses will face potentially life-threatening problems due to colic. Another report cites the incidence of colic at about 11 cases for every 100 horses per year. The word *colic* is a vague term that indicates clinical signs of pain in the abdominal cavity. It is not a specific disease but rather a combination of signs that signal the presence of abdominal pain in horses. These signs can range from mild to severe and can rapidly become a life-threatening situation.

Although there are numerous causes of colic, including non-intestinal causes, the gastro-intestinal tract of the horse is fundamentally a highly complex system. The digestive tract consists basically of a long muscular tube (about 100 feet) made up of six basic parts- the esophagus, the stomach (small, 4-gallon maximum capacity), the small intestine (about 70 feet), the cecum (a large digestion vat shaped like a giant comma about 4 feet in length), the large colon (about 15 feet in length with multiple bends and turns), and the small colon (the final 10 feet leading to the rectum, small in diameter compared with the large intestine).

The horse's digestive tract has become well adapted over millions of years to grazing small amounts of grass nearly continuously. Cellulose, a major component of grass, is poorly digestible and horses have adapted in two important ways to aid in its breakdown to usable nutrients. First, the total length of the intestinal tract prolongs the time that food stays in the body so there is a longer time to digest the cellulose. In addition, a population of bacteria living in the digestive tract, particularly the cecum and large colon, help break down the cellulose so the horse can absorb nutrients. Because of this evolution and adaptation to continuous grazing, the horse is very susceptible to disruptions of digestive function caused by modern-day management practices.

Colic is usually related to a problem in the abdominal cavity. These problems can generally be broken down into four groups, each of which will be discussed later in more detail. The four groups are:

Distension: No physical blockage but the digestive tract cannot move material along normally so that distension of the intestine becomes painful. Can be rapid and severe or slow and mild. Examples are gas colic, spasmodic colic and thromboembolic colic.

Simple obstruction or blockage: Material cannot move down the digestive tract due to an obstruction. Usually causes mild to moderate pain and relatively slow progression. Examples are feed impaction, parasite impaction, enteroliths, sand, foreign bodies, and entrapments.

Obstruction or blockage with partial or complete shut-off of the blood supply: Usually this causes constant and severe pain with rapid development of shock because of intestinal death and subsequent release of toxins and bacteria into the bloodstream. Examples are *torsions* (abnormal twisting of the intestine), *twists*, *lipomas* (fatty tumors), *epiploic foramen incarceration* (the epiploic foramen is a natural opening between the portal vein, the caudal vena cava, and the caudate lobe of the liver and can be the site of intestinal incarcerations where a loop of intestine passes through this opening and results in swelling, obstruction and closing off the blood supply), and *intussusception* (tubular displacement of one segment of intestine into another segment).

Enteritis/colitis or inflammation of the bowel wall: Causes stasis of the intestine due to inflammation and subsequent distension of the intestine. Examples are *Salmonella* diarrhea, Potomac horse fever, anterior enteritis, *Clostridium* diarrhea, and gastric ulcers.

Colics are also categorized according to the type of treatment required: medical or surgical. Colics due to impactions, parasites, and inflammation, for example, are commonly treated medically whereas obstructions, torsions and severe impactions often require surgery. Some types of colics can be treated initially with medical therapy, but if there is no improvement surgery may be required.

Although, some colics are relatively simple gastrointestinal disturbances that require a mild analgesic, some can only be managed surgically. *How do you tell the difference between a mild and severe colic?* Individual horses tolerate and exhibit pain to different degrees, some being more stoic than others. With such a wide range in the potential causes of colic and the severity of specific diseases, it is apparent that determining the specific cause of the pain can be difficult and why veterinary intervention is so important.

Prompt veterinary care can make all the difference in the outcome, especially with a serious colic. Time lost with home remedies, home treatment, or reluctance to call your veterinarian may result in deterioration of a horse's condition, such that even with surgical treatment the horse may not survive.

A veterinarian will perform a thorough physical exam consisting of rectal temperature, pulse, gut sounds and mucous membrane color. The exam may also include an evaluation via stomach tube to determine whether intestinal contents are flowing from the small intestine back into the stomach - a sign of intestinal obstruction. A rectal exam would reveal the presence of distension, malpositioning of abdominal organs (e.g., spleen), and the presence or absence of manure. All of these factors would provide a general picture of the underlying problem and form the basis for recommended treatment.

Specific Problems in the Intestinal Tract

Some of the more common problems:-

Gas accumulation in the colon and cecum is the most common cause of abdominal pain in horses. This can be produced by a decrease in normal motility or accumulation of feed in the bowel. Often horses may show some pain and get better without treatment or after some minutes of hand-walking or trotting. Other

times, an analgesic or anti-spasmodic agent is required to relax the bowel and allow the gas to start passing out.

Feed impactions in the large or small colon are also common problems that produce abdominal pain in horses. Impactions can be produced by poor dental health (not being able to adequately chew the hay), lack of water in cold weather, dehydration from exercise, decreased motility in the bowel, and poor-quality (coarse) hay. Clinical signs produced by feed impacts are usually similar to gas colic since the impaction will also prevent the passage of gas. Generally, an impaction is suspected if the horse has not produced feces in the last few days or if the feces appear dry, very small or covered by mucous. Impactions tend to resolve after aggressive medical treatment, but in severe or prolonged cases surgery may be required to prevent the colon from rupturing. Treatment includes the use of analgesics, intravenous fluids, and water combined with electrolytes, mineral oil or Epsom salt via nasogastric intubation. Analgesics for treating impactions should be given with caution because they may mask early signs of deterioration and the need for other treatment options such as surgery.

Sand impactions are a common problem if the horse is fed on the ground in sandy areas. The impaction may consist of fine, coarse sand or gravel that obstructs the large or small colon. The sand can also rub and irritate the mucosa of the bowel and produce inflammation (enteritis or colitis) and sometimes diarrhea. Treatment is similar to that for impaction colic with the addition of psyllium powder or pellets. Although sand impactions can be treated medically, surgery may be indicated for severe cases. Early surgery may be less expensive than several days of unsuccessful medical treatment and may reduce both the duration of pain and the chances of intestinal rupture. The use of psyllium on a regular basis may help clear the intestine of sand before the horse develops an impaction.

Enteroliths are mineral accumulations around a nidus (a piece of metal, plastic or gravel) that form a rock inside the bowel. Usually, they are made of magnesium-ammonium-phosphate (struvite), forming round, triangular or flat shapes. They form in the large colon of horses where they can remain for some time until they move and cause an obstruction in the large or small colon. Enteroliths form as a result of certain diets (for example, feeding alfalfa hay exclusively), genetic predisposition, and/or management practices. Some horses have a history of passing stones in the feces without showing signs of colic. Clinical signs vary depending on the size and number of enteroliths and the part of the bowel where they are located. Horses with a single large enterolith in the large colon often have a history of chronic, intermittent colic. Horses with smaller-size stones that can move and become lodged within the small colon may have more acute signs of colic.

A definitive diagnosis for enteroliths can be achieved either by radiographs (x-rays) or through surgery. The ability for the radiographs to confirm the presence of stones will depend on the size of horse, the contents of feed inside the bowel and the radiographic equipment used. Early diagnosis is important, because an enterolith obstructing the bowel has the potential to rupture it with fatal consequences. The only

successful treatment for horses with colic due to enteroliths surgical removal.

Colon displacement is usually associated with colon tympany (an abnormal accumulation of gas). The displacement can occur due to the accumulation of gas or to alterations in motility rather than from the horse rolling. There are two main types of displacement of the colon: to the right and to the left. When the displacement is to the left, the colon moves lateral and dorsal and becomes entrapped in a normal space between the left kidney and the spleen. The diagnosis of this problem is done by rectal exam and by the inability to observe the left kidney in the abdominal ultrasound. This type of displacement can be treated initially with medical therapy or by rolling the horse. Medical treatment consists of injecting an intravenous agent that shrinks the spleen, followed by exercising the horse. The idea is that by reducing the size of the spleen and trotting the horse, the colon will be able to move out from the entrapment. Another treatment for this type of displacement is to anesthetize the horse and roll them until the colon is free from the entrapment.

The second type of colon displacement (to the right of the abdomen) often involves the cecum. Clinical signs usually include severe gas distension and pain. The ability to feel tense bands of the colon through rectal examination usually confirms that this is the problem. The treatment for this type of colon displacement is surgical, with a good outcome in about 80 to 90% of the cases.

Colon torsions cause a severe form of colic where the colon and often the cecum displace and twist around, obstructing blood flow to the tissue. There appears to be an age-related risk of torsions in horses around 7 years and in mares (65% of torsions occur in mares). Broodmares are often affected near or after parturition. Although the exact cause of the torsion is not known, we suspect gas distension of the ventral colon followed by floating of the ventral colon dorsal and medial. Abnormal movement of the bowel due to gas production is also believed to be involved in the causes. The colon can be twisted from 180 to 720 degrees. The more tightly the twist, the less blood the colon will receive and the sooner the colon will die.

Clinical signs in these patients are severe gas distension with acute and severe pain, not responding to analgesics. If a horse is suspected to have a colon torsion, the sooner it is referred for treatment the better the chances for recovering.

Usually these horses deteriorate extremely rapidly if the torsion is not corrected by surgery. The treatment consists of aggressive medical treatment to stabilize the patient followed by emergency surgery and intensive post-operative treatment. At surgery, the colon is untwisted and evaluated. If the colon does not regain blood circulation or looks nonviable a *colon resection* (removal of a segment of the colon) may be indicated. The survival rate in these cases has improved from 50% in the past to approximately 70% in recent years. The increases in survival rates are due to early referral, improvement in intensive care medicine, and resection of the colon in severe cases. Some horses may have a recurrence of the problem, in which case a colon resection or surgical fixation of the colon to the abdominal wall (colopexia) may be indicated.

Strangulations of the small intestine. The two most common strangulations of the small intestine of

horses include strangulating lipomas and incarcerations of the bowel in the epiploic foramen. Lipomas are benign tumors of fat, commonly present in the belly of many old horses. As the tumors enlarge, they tend to form a long rope-like stalk from their attachment to the abdominal wall. These tumors may live in the abdomen without causing any problem for years until the bowel (usually a segment of the small intestine) gets entrapped and forms a knot with the stalk of the tumor. The epiploic foramen is a small opening between the liver and the pancreas. Sometimes the small intestine migrates into this opening by its normal movement but becomes trapped when the bowel fills with fluid and the intestine cannot exit. It is believed that horses that suck air are predisposed to this problem due to an increase in intra-abdominal pressure with this vice. The end result of strangulating lipomas and incarcerations of bowel in the epiploic foramen is a decrease in blood flow to the bowel, followed by death of the affected segment. Treatment of these problems requires emergency surgery, release of the strangulation, and evaluation of the bowel. Since the bowel cannot live without blood and oxygen for more than a few minutes, a resection of the affected segment is commonly required. Twenty years ago, the survival rate for these problems was approximately 40%. Extensive research and advances in surgical techniques and intensive care during the last 20 years have shown very positive results to improve the survival rate of these patients. Currently, approximately 70 to 80% of patients that have surgery for these types of lesions are discharged from the hospital. As with all surgical colics, an early referral improves the chances for survival.

Colic Work-up

During the colic workup, one or more intravenous catheters may be placed to allow the administration of intravenous fluids and other medications to help stabilize and treat the horse. Diagnostic tests that may be used to evaluate colic include:

1. Physical Examination and History

A complete physical examination is performed with special attention to the gastrointestinal tract. The cardiovascular and respiratory systems are closely evaluated for signs of shock or systemic compromise. More in-depth examinations of other body systems are performed as needed to localize the source of colic. A thorough medical history is obtained to identify possible risk factors and underlying conditions that may be important to the current colic problem. The progression of the horse's colic signs and the response to previous treatments are helpful for diagnosis and treatment recommendations.

2. Passage of a Nasogastric Tube

This procedure involves the passage of a long, hollow tube up the horse's nose, into the esophagus and down into the stomach to check for the presence of excess fluid in the stomach. This procedure is especially important in horses because they are unable to vomit and are prone to rupturing their stomach. If the stomach is not distended with feed or fluid, treatments such as fluids or laxatives may be administered through the tube as a part of the management for colic.

3. Rectal Examination

Rectal examination is useful for evaluating the abdominal organs that are within arm's reach of the rectum. Abnormalities that may be detectable include impactions, gas or fluid distension of the large or small intestine, displaced intestines, masses or abscesses, and problems in the renal or reproductive organs. Some horses may not be candidates for rectal examination due to their size or temperament or to safety considerations for the horse and veterinarian.

4. Blood Tests

A variety of blood tests may be performed to determine whether the horse is dehydrated or in shock and whether there is inflammation or organ dysfunction. Although these tests may not specifically diagnose the problem, they are helpful in determining the overall condition of the horse, directing treatment decisions, and predicting complications. Laboratory tests can be performed to assess the cardiovascular status of the patient. **Packed Cell Volume (PCV)** is a measure of hydration status, with a value 45% being considered significant. Increasing values over repeated examination are also considered significant. The total protein (TP) of blood may also be measured, as an aid in estimating the amount of protein loss into the intestine. Its value must be interpreted along with the PCV, to take into account the hydration status.

5. Abdominocentesis

This diagnostic test, also known as a "belly tap," involves the collection of a sample of abdominal fluid by inserting a small, blunt-ended cannula into the abdominal cavity. Normally there is a small amount of clear, pale-yellow fluid that bathes and lubricates the intestines. During some types of colic, the color or consistency of the fluid can change, reflecting the health and status of the intestine. The amount and appearance of the fluid are assessed while the fluid is being collected, but additional laboratory tests are performed on the fluid to measure cell count, total protein, and other values.

6. Abdominal Ultrasound

Abdominal ultrasound is a quick, noninvasive method for evaluating the intestines and other abdominal organs. The abdominal ultrasound examination can identify the amount and character of the abdominal fluid, the presence of intestinal distension or wall thickening, the degree of motility in the intestine, the location of abdominal structures, and the appearance of the liver, spleen, and kidney. The ultrasound can evaluate areas of the abdomen that are beyond the reach of rectal examination, but the large size of the horse's abdomen and the presence of gas in the intestine and air in the lung prevent complete evaluation of all abdominal structures.

Once the colic examination is complete, the surgeons evaluate the results of the tests in association with the horse's condition to determine the appropriate treatment plan and discuss the treatment options with the owner. If emergency colic surgery is needed to correct the underlying problem, surgery team

quickly get the horse into surgery.

If surgery is not needed to treat the colic, the horse is usually admitted to the Equine Intensive Care Unit for monitoring and intravenous fluid therapy. Should the horse's condition change, the horse is re-evaluated by the emergency surgery team, repeating any tests as needed, to determine if surgical intervention or adjustments to the treatment plan are necessary.

Surgical management:

Requirements: Equine surgical table, Facility of hoist, large animal anaesthesia machine with ventilator, suction apparatus, colon tray, surgical instruments, sleeves etc.

Anaesthesia: General anaesthesia induced with intravenous agents and maintained with halothane/isoflurane etc is indicated. Where muscle relaxants are used, positive pressure ventilation is mandatory.

Positioning: Dorsal recumbency with adequate protection for head and limbs to avoid post operative complications.

Surgical approach: Ventral celiotomy through midventral incision is standard surgical approach. Other approaches such as flank approach is also used for some conditions. After opening of abdomen, the gas from the intestine must be removed by suction needle making a valve at the band or the mucosal surface. Systematically the intestine should be explored to locate the obstruction. It is preferred to open the cecum and drain the contents. The obstructing mass or fecolith can be removed. The intestine may be sutured with inversion sutures with synthetic absorbable suture material. The small intestine can be resected and end to end anastomosis or side to side anastomosis to give more lumen for passage of intestinal contents may be preferred. The LDDLC or RDDLC can be corrected by bringing the colon to its normal anatomical position. The abdomen can be closed by continuous sutures in two or more parts or interrupted sutures. Intestine should be thoroughly washed with saline and abdomen lavaged adequately before closure of abdomen. The horse should be placed in a well padded stall with soft bedding during recovery and monitored for smooth recovery. Antibiotic cover and NSAIDs should be administered. A foley's catheter is left in abdomen upto 72 hours to facilitate drainage of peritoneal fluids. The abdominal cavity can be lavaged with saline through this catheter.

Post operative management: Once the surgery is completed, the horse is transferred to a padded recovery stall to recover from anesthesia, during which time it is continually monitored by the surgery and anesthesia team. Post operative management includes regular monitoring of vital parameters, administration of fluids (balanced solution without lactate), antibiotics, NSAIDs, padded bedding. Use of lignocain to stimulate the motility of intestine is recommended. Exercise as walk should be started after 24 hours of surgery. Combination of B-complex, Vitamin C, Vitamin E, Zinc and blood thinners may be administered orally to boost immune response and prevent post operative complications. A secure abdominal bandage is mandatory to prevent wound related complications. Ultrasound examination of abdomen for peritoneal

fluid accumulation is recommended. Concentrates may be avoided during recovery, however greens preferably grass hay can be given. Major complications of equine colic surgery include peritonitis, recurrence, laminitis and complications related with wound and recovery of animal from anaesthesia.

Prevention

Altering few management practices can help in preventing or lowering incidence of colic in horses:-

- Establish a set daily routine for feeding and exercise schedules and stick to it. Regularity of feed. Regularity of exercise. Make any changes in feed or exercise gradually over several days.
- Feed a high-quality diet comprised primarily of roughage (high-quality, mold-free hay). Do not feed horses a 100% alfalfa hay diet because of the risk of developing enteroliths.
- Feed two or more smaller feedings of grain or supplements rather than one large one to avoid overloading the horse's digestive tract. Hay is best fed free-choice.
- Set up a regular parasite control program & have fecal samples tested to determine the effectiveness of the parasite control.
- Provide exercise and/or turnout on a daily basis. Change the intensity/duration of an exercise regimen gradually.
- Provide fresh, clean water at all times. In winters provide water that is warmed so that the horse will consume adequate amounts. A reduced water intake, combined with increased forage consumption can lead to a greater incidence of impaction and colic. Water should be maintained between 45 and 65°F.
- Observe your horse each and every day. How much has it eaten vs. how much has it passed?
- Avoid the consumption of sand by feeding off the ground over rubber mats.
- Inspect hay, bedding, pasture and environment for potentially toxic substances such as blister beetles, noxious weeds, and other ingestible foreign matter.
- Reduce stress. Horses experiencing changes in environment or workloads are a high risk of intestinal dysfunction.
- Pay special attention to animals when transporting them or changing their surroundings, such as at horse shows, trail rides, or other competitive events.
- Observe mares before and after foaling for any signs of colic. Carefully watch any horse that has had a previous bout of colic as they may be at greater risk.
- Maintain accurate records of management, feeding practices and medical health history.

Suggested Readings:

Pascoe, P.J., McDonnell, W.N., Trim, C. M. And Gorder, V. 1983. Mortality rates and associated factors in equine colic operations- A retrospective study of 341 operations. *Candian Vet J.* **24**:76-85.

- Baxter, G.M. 1992. The steps i assessing a colicky horse. *Vet. Med.* 1012-1018.
- Baxter, G.M. 1992. Recognizing and managing the post operative complications of equine abdominal surgery. *Vet. Med.* 1012-1018
- Giffen, James M. and Tom Gore. ‘Horse Owner’s Veterinary Handbook., 2nd ed. New York: Howell Book House, 1989, 1998.n ISBN 0876056060.
- K.J. Chandler, M.C.Collins, S.Love. Efficacy of a five-day course of fenbendazole in benzimidazole-resistant cyathostomes. *Vet. Rec.* (2000) **147**, 661-662.
- Proudman, C.J., Smith, J.E., Edwards, G.B. and French, N.P. 2002. Long tern survival of equine surgical colic cases. ParI: Pattern of mortality and morbidity. *Equine Vet. J.* **34(5)**: 432-437.
- Oke, Stacy. “Research Ongoing for Tapeworm, Colic Link.” *The Horse* July 2008: 20.
- Blikslager, A. “Avoiding Colic Through Management.” *The Horse* July 2008: 47-54.
- Morton, A.J. 2009. Advances in management of large intestinal colic. Proceedings of 55th Annual Convention of the American Association of equine practitioners. Las Vegas, Nevada, USA. 212-217.
- Blikslager, A. 2009. Critical decisions in in colic. Proceedings of 55th Annual Convention of the American Association of equine practitioners. Las Vegas, Nevada, USA. 25:201-206.
- Blikslager, A. 2009. Advances in management of small intestinal diseases causing colic. Proceedings of 55th Annual Convention of the American Association of equine practitioners. Las Vegas, Nevada, USA. 207-211.
- Kelmer, G. 2009. Update on recent advances in equine abdominal surgery. *Vet. Clin North Am. (equine)* **25**:271-282.
- Plummer, A.E. 2009. Impactions of the small and large intestines. *Vet Clin North Am. (equine)* **25**:317-327.
- Pierce, R.L. 2009. Enteroliths and other foreign bodies. *Vet Clin North Am. (equine)* **25**:329-340.
- Klohn, A. 2009. New perspectives in post operative complications after abdominal surgery. *Vet Clin North Am. (equine)* **25**:341-450.

MEET THE SPEAKER



Dr. Neralla Sridhar

Chief Veterinary Surgeon

Equine & Canine Practitioner

Paws N Tails, Visakhapatnam, Andhra Pradesh

Dr. Neralla Sridhar born on 14-10-1972 at Vizianagaram, Andhra Pradesh state, completed graduation from Orissa Veterinary College, OUAT, Bhubaneswar in year 1998 and obtained his Masters degree from Anand Veterinary College, GAU, Anand in year 2001. He was awarded best indigenous innovative research paper (in Student Category) during the year 2006 – 2007 in the category of animal Science. He had served as a Veterinary Surgeon for 2 years in a Non Government Organizations (CUPA, DIYA) in Bangalore, worked as a Contractual Teacher in Bangalore Veterinary College for 2 years, worked as Veterinary Assistant Surgeon Government of Andhra Pradesh for 2 years and he relocated to Middle Eastern Countries worked for 10 years (Kingdom of Bahrain and Kingdom of Saudi Arabia as Equine Veterinarian for Endurance Club, worked as Deputy General Manager, Veterinary Services for Royal Calcutta Turf Club, Kolkata for 2 years and now has moved to Visakhapatnam and started own practice Paws N Tails both equine and companion animals since 2 years. He has set up a state of the art old facility equine hospital at Royal Calcutta Turf club with all modern facilities within the budget and time frame. He is also a member doing social services and right now Vice President for the Rotary Chapter of Visakhapatnam Port City.

EMERGING TRENDS IN EQUINE SURGERY PERTAINING TO RACE HORSES

Neralla Sridhar

Paws N Tails, Practicing Veterinary Surgeon, Visakhapatnam

Equine practitioners are responsible for guarding the welfare of horses and upholding ethical practices, especially concerning animals in competitions. The veterinarians work with horse breeders, ranchers and competitive horse owners.

This presentation is an attempt to explore the emerging trends with regard diagnostic equipment and surgical interventions pertaining to soft tissue surgeries with regard to race horse. I have been an equine practitioner for 10 years working mainly with race horses in India and Middle East and this narration is based on my experience gained, recently past 3 years moved back to companion animal practice.

In race course the veterinarians work as Track Vets, Hospital Vets and Regulatory Vets. Track veterinarians observe horses during morning workouts, inspect entries in the paddock area before each race, and closely monitor the starting gate area when horses are loaded. They remain on call during live racing to attend to any injuries, emergencies, or late scratches in the paddock or gate area. They also notify the racing stewards and racing secretary of any horses that are not in proper condition for competition by placing them on the “Vet’s List.” Track vets also oversee the collection and testing of blood and urine samples used for random pre-race and post-race drug analysis. They also observe horses after each race for signs of lameness or exercise-induced pulmonary hemorrhage (nasal bleeding). All data on injuries and other medical issues are then entered into a computerized database.

Left Laryngeal Hemiplagia

This condition arises due to damage to the recurrent laryngeal nerve paralysis of the dorsal cricoarytenoid muscle. This muscle would normally abduct the arytenoids cartilage and doing so pull the vocal chords of the way when inhaling. This nerve when no longer functional for various reasons the vocal folds get sucked into the lumen and decrease the diameter of the larynx impeding the flow of oxygen. This causes a significant drop in the performance in horse at maximal exercise like racing. Clinical signs consist of the production of abnormal sounds during exercise layman term called as “Roarer”.

Diagnosis

The tele- view dynamic equine endoscope is easy to use method of analyzing upper airway restriction problems during exercise. The endoscope system is lightweight and harness mounted and can give dynamic endoscopic results in as little as 30 minutes. For the TV-506 articulating model, the insertion tube starts in straight position when it is placed into horse’s nasal cavity. After placement, it is then articulated down with the camera tip positioned above the larynx. This placement gives an excellent view of the epiglottis and larynx, both at rest and during workouts. The system utilizes a high definition, wide angle sensor to record a high quality video. A microphone in the recording camera also records the horse breathing during the workout. The audio and video is then saved to the SD card.

Surgical Procedure

This condition is corrected by procedure laryngeoplasty “Tie-back” procedure. Two strong sutures are placed through the arytenoids cartilage and attached to one of the laryngeal cartilage. The sutures help to abduct the artinoid cartilage opening the air way.

Latest technique has been developed by Dr Gutierrez – Nibeyro and his team funded by the Morris animal foundation, “toggle technique” instead of suturing directly into the cartilage and run sutures from one end of tunnel to the other. They use a stainless steel button, or toggle, to anchor one end of the sutures, providing a larger more stable connection for holding open larynx.

Dorsal Displacement of Soft Palate (DDSP)

This is another performance limiting condition of upper respiratory tract which occurs during fast exercise when the soft palate moves above the epiglottis (part of larynx) creating functional obstruction within the airway. This restriction of airflow to the lungs causes a sudden loss of performance or gurgling noise.

Surgical Procedure

Horses on dorsal recumbency through a 10 cm long cutaneous incision created on the ventral midline 1 cm caudal to cricoids cartilage and lateral to rostral aspect of the lingual process of the basi hyoid bone, extended through the paired sternohyoideus muscle to expose larynx and basi hyoid bone. After transecting the tendon insertion of right side sternohyoideus muscle, a suture of No 7 metric polyester is passed through the left lamina of the hyoid cartilage ventral to the level of the tendon of sternohyoideus muscle and suture on the right side. The dorsal limb of the suture on the right and ventral limb of the left passed dorsal to basi hyoid bone adjacent to the right surface of the lingual process of that bone.

Pleuropneumonia

This disease in horses typically involves underlying viral or bacterial infections of the lung parenchyma with subsequent extension to the pleurae. The plural response to the inflammation is transudation or exudation of the fluid into pleural space, resulting in accumulation of marked volume of effusions. Other causes of fluid in pleural spaces include neoplastic effusions, transudation of the fluid secondary to acute or severe hypoalbuminemia and penetrating thoracic wounds.

Diagnosis

Ultrasonography non invasive method of diagnosis the pulmonary tissue usually has abnormal appearance that may involve abscess formation broad to coalanse comet tail artifacts, anechoic to echogenic fluid accumulated in the pleural cavity this promptly confirms the presence of pleural effusions and distinguish between unilateral or bilateral pleural effusions. This method is very helpful for determining the optimum site of drainage tube placement.

Surgical Procedure

Sedate the horse and aseptically prepare the area of the placement determining with ultrasonography. Block the skin and the chest wall with local anesthetic at the site of placement. Stab incision with scalpel

insert the chest drainage in the incision and carefully advance it into the pleural cavity having the depth marker on USG. Clamp the trochar with sterile forceps after fluid stops draining. Secure the tube with purse string suture and affix a hemilich valve (or a condom) at the tip with an electrical tape.

Tendon Injuries (Superficial or Deep Digital) by PRP (Platelet Rich Plasma)

Strain induced tendon or ligament injuries are all too common consequence of athletic endeavor in racing horses. The most common injuries structures are the weight bearing digital flexor tendons especially SDFT & DDFT which lie on the palmar aspect of the metacarpus.

The main growth factor typical for the alpha granules of thrombocytes is Platelet derived growth factor; it has been observed healing of SDFT & DDFT after repeated application of PRP into the lesion has significantly positive effects on the biochemical, biomechanical and histological characteristics of the healing process.

Diagnosis

Ultrasonography to determine the status of the injury in particular tendon.

Surgical Procedure

The place of application was scrubbed, aseptically prepared, horse mildly sedated with detomidine. PRP was aseptically aspirated into the syringe 0.1 ml calcium to 1 ml PRP. The interlesional application was performed aseptically under direct ultrasound guidance.

To conclude a career in equine veterinary medicine requires marketing and business skills in order to successfully run and promote a private practice.

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EQS-1

REMIDIAL HOOF TRIMMING: A CURATIVE MEASURE FOR THRUSH

Abhishek, M. Patel, P.B. Patel, A.M. Patel, P.T. Sutaria, J.B. Patel and R.K. Chaudhari
*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H.,
S.D. Agricultural University, Sadar Krushinagar, Gujarat*

The study was conducted on twelve thrush affected horses, which were grouped as Group A (trimming with medicinal treatment, n=6) and Group B (Medicinal treatment alone, n=6). The effectiveness of trimming was assessed with measurements of hoof before and after treatment. Statistical analysis revealed apparently less median recovery time (8.5 Vs. 11 days) and significant increase in frog size in horses treated with trimming. Results showed that therapeutic trimming helped in recovery of thrush by reducing time and also improved development of frog area by correction of hoof balance.

EQS-2

SURGICAL EXCISION OF HAEMANGIOMA FROM THORACIC MUSCLES IN HORSE

G.S. Ubhare, R.V. Suryavanshi, S.P. Salvekar and A.H. Ulemale
*Department of Veterinary Surgery and Radiology, KNP College of Veterinary Sciences,
Shirwal, Satara, Maharashtra*

An 8-year-old male Kathewadi horse was presented at TVCC of KNPCVS with history of hard swelling present at left lateral thoracic wall from the time of purchase. After thorough clinico-hematological examination the mass was operated under sedation and local infiltration. The mass was dissected from its base with simultaneously controlling haemorrhages by ligation and surgical wound was closed keeping opening at dependent part. Postoperatively horse was given antibiotics and painkillers for 5 days with daily dressing of wound by changing seton and drainage of fluids. The mass was tentatively diagnosed as benign tumour in nature and after histopathology was confirmed as capillary haemangioma.

EQS-3

SUCCESSFUL CLINICAL MANAGEMENT OF BULLET INJURY SUSTAINED BY MARE DURING CROSS BORDER INDO-PAK FIRING AT R.S. PURA-ARNIA INTERNATIONAL BORDER IN J&K

Ashwani Kumar
Department of Animal Husbandry, Government of Jammu and Kashmir

A 4-year-old 270 kg Mare was presented at Veterinary Hospital Sai, Department of Animal Husbandry, District: Jammu, J&K, from a village Jeora farm at LOC with the history of bullet injury on the nasal bone due to Indo-Pak cross border firing. Clinical examination revealed bullet wound on the frontal

bone with clear entry and exit of the bullet close to mandible. The fresh blood was oozing out from the wound and the animal was dull and depressed. The animal was sedated with xylazine @1.1mg/kg b.wt.i/v. The passage of bullet wound was cleaned and dressed with Povidone iodine, then sprayed with scavon. Post-operatively animal was given antibiotic inj. IntacefTazo 3375.5 mg OD for 7 days and inj. Maxxtol 20ml OD for 5 days and the wound was dressed on alternate days with 5 % Povidone iodine topical solution and betadine ointment. Following 45 days Post –operatively animal shows uneventful recovery.

EQS-4

SURGICAL MANAGEMENT OF OBSTRUCTIVE COLIC IN A MARWARI HORSE

**S. Dharmaceelan, D. Vishnugurubaran, S. Kokila, A.R. Ninu,
M. Bharathidasan and R. Ramprabhu**

*Department of Veterinary Surgery and Radiology, Veterinary College and Research Institute,
Tirunelveli, Tamil Nadu Veterinary and Animal Sciences University, Tamil Nadu*

An one and half years old Marwari horse weighing about 271kgs was presented to the VCC, VCRI, Tirunelveli with an anamnesis of anorexia, abdominal distension and not defecated for past 3 days along with severe colic signs. Owner also reported that the animal had vices of taking umbrella wastes. Clinical examination revealed elevated heart rate and respiratory rate, increased capillary refill time, congested CMM and change in the degree of gut sounds on auscultation. Rectal examination revealed empty rectum with traces of mucous coated dung with putrefied odour. Haemato-biochemical examination revealed increased packed cell volume and leucopenia. The case was tentatively diagnosed as colic and treated with aggressive fluid therapy, antibiotics and analgesics for few days. Since the condition persisted even after the aggressive treatment, the horse was subjected to Exploratory Laparotomy. Under triple trip general anaesthesia, a ventral midline incision from umbilicus to pubis was made. On exploration of abdominal cavity, the impacted mass was found in the necrosed and adhered small colon with seepage of ingesta. Enterotomy was performed to remove the foreign body and the incision was closed with PGA 1 by simple interrupted suture pattern. Abdominal muscles were closed as per the standard operating procedure. Post operatively animal was treated with antibiotics, anti-inflammatory, analgesics and fluids. Animal voided semi-solid dung 2 hours after the surgery. Post operative colic signs were observed on the 4th post operative day and the animal collapsed. Animal was subjected to Post Mortem examination which revealed Peritonitis.

EQS-5

DIAGNOSIS AND SURGICAL REMOVAL OF GRANULOSA THECA CELL TUMOUR IN MARES

Arun Anand, Simrat Sagar Singh, Devendra Pathak, Jasmeet Khosa, Rahul Udehiya, Shashi Kant Mahajan and Vandana Sangwan

Department of Veterinary Surgery and Radiology, College of Veterinary Sciences, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, Punjab

Five mares were presented to hospital with a history of aggressive behaviour, prolonged heat cycles or constant cycling (nymphomania). All mares were ages between 5 to 8 years of age. On per-rectal examination left ovary in all mares were enlarged and right side ovary was very small and inactive. After preoperative evaluation surgical removal of affected ovary was decided. Left side ovariectomy was done in standing mares. All mares were sedated with Xylazine @ 0.5mg/kg and surgical site was locally desensitised by local infiltration with 2% lignocaine. Surgical removal of affected ovaries was performed through left flank laparotomy. Biopsy sample was evaluated histopathologically and all samples showed granulosa cell theca tumour. All mares showed uneventful recovery and started cycling normally.

EQS-6

SURGICAL MANAGEMENT OF A FOAL WITH A TRAUMATIC LATERAL LUXATION OF THE PATELLA

Beenish Qureshi, Arun Anand, Vinod Shukla and Deepti Sharma

Department of Veterinary Surgery and Radiology, College of Veterinary Sciences, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, Punjab

A one-month-old foal with a bodyweight of 70 kg was presented for examination with sudden onset of marked lameness in left hindlimb since one week. Foal was kicked by its mother. Seven days of box rest and NSAID medication had been administered but the lameness showed no response. A physical examination revealed a diffuse amount of swelling associated with the soft tissue structures of the left hind stifle. On palpation the stifle area was painful and the patella was luxated laterally. Manual reduction of the patella was not possible. Preoperative radiographs were taken to assess the affected joint and surgery was then planned. Surgery was done under general anesthesia. Trochleoplasty followed by lateral release of tight tissues resulted in reposition of patella in trochlear groove and medial imbrication further provided adequate patellar stability. Postoperatively antibiotics and analgesics were administered for five and three days respectively. The animal showed uneventful recovery in gait and wound healing.

EQS-7

SURGICAL MANAGEMENT OF INTESTINAL OBSTRUCTION IN MARES

V.S. Dabas, D.N. Suthar, S.K. Jhala, R.H. Bhatt and S.K. Tyagi

*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H.,
Navsari Agricultural University, Navsari, Gujarat*

Two Marwari mares aged between 8 to 10 years were presented with history of anorexia, abdominal discomfort and cessation of defecation. Clinical examination revealed mild to moderate abdominal distension and colic signs. Per-rectally, the rectum was empty and the intestinal loops were gas filled. The cases were diagnosed as intestinal obstruction and both the animals were subjected to exploratory celiotomy under general anesthesia using Xylazine-Ketamine and isoflurane combination. Following enterotomy, the faecoliths were removed and the wounds were closed in routine manner. Postoperatively fluid therapy, antibiotics and analgesics were given in prescribed doses. Both mares recovered uneventfully.

EQS-8

5-FLUOROURACIL: AN ADJUNCT THERAPY TO SURGICAL EXCISION OF SQUAMOUS CELL CARCINOMA IN MARES

A.M. Patel, R.K. Gosai, J.B. Patel, P.B. Patel, P.T. Sutaria, H.M. Barot, Abhishek M. Patel,
K.R. Chaudhari, and U.H. Prajapati

*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H.,
S.D. Agricultural University, Sadar Krushinagar, Gujarat*

Squamous cell carcinoma is second most common cutaneous neoplasm in horse and most common malignant tumour. Eleven mares with perineal Squamous cell carcinoma were studied of which seven mares with vulval growth were surgically operated under epidural anaesthesia. Adjunct chemotherapy with intra lesional 5-fluorouracil was performed. In two mares reoccurrence was noticed after 8 months.

EQS-9

CLINICAL MANAGEMENT OF ACHILLES TENDON INJURY WITH TENDON GAP DEFECT IN A HORSE: A CASE REPORT

Wahengbam Pipelu, Rekha Pathak, A.M. Pawde, Mudasir Ahmad Shah, Naveen Kumar Verma,
Rajesh Kumar, Swapna, C.R. and Sasikala, R.

Division of Surgery, Indian Veterinary Research Institute, Izatnagar, Bareilly, Uttar Pradesh

A 3 years old horse was presented to Referral Veterinary Polyclinic I.V.R.I with history of traumatic injury on left hind limb with lameness. The case was examined and diagnosed as crushed rupture of Achilles tendon with tendon gap defect. With proper anaesthetic protocol and aseptic measures, the

tendon grafting was performed using tissue engineered bubaline derived tendon grafts to reconstruct the tendon. Postoperatively the limb was immobilized with fiberglass cast and antibiotic coverage along with analgesic and anti inflammatory with routine dressing was done. However, infection developed after few days, which might be due to open wound, leading to the removal of the remaining graft. The fiberglass cast with splint were removed 20 days post surgery since constant irritation due to immobilization caused cutaneous tissue injury. Moderate weight bearing while standing on the affected limb was noticed. Further treatment of the tendon defect and wound was attempted with bubaline tendon derived collagen sheet resulting to progressive healing. The animal regained its weight bearing and made an uneventful recovery.

EQS-10

REPAIR OF COMMUNUTED METACARPAL FRACTURE IN A HORSE UNDER GENERAL ANAESTHESIA USING FIBER GLASS CAST

Bhagavantappa, B., Dilipkumar D., Jahangirbasha Doddamani, B.V. Shivaprakash,
C.N. Vijay Kumar, Kartik Bidari, Neelkanth, Pallavi, Karan Hosmani, Kumarswamy,
 Swaroop L., Tokappa, Birappa, Venkatgiri, S.M. Ustarge
*Department of Veterinary Surgery and Radiology, Veterinary College,
 Karnataka Veterinary Animal and Fisheries Sciences University, Bidar, Karnataka*

A five-year-old male horse weighing around 200 kg was presented with the history of automobile accident and showing non weight bearing lameness on forelimbs. On clinical examination, crepitations could be felt at left metacarpal bone. Radiographic examination revealed comminuted metacarpal fracture. The horse was restrained under general anaesthesia using a combination of InjXylazine hydrochloride @ 0.7 mg / kg i/v, Inj Diazepam @ 0.05 mg / kg i/v and Inj ketamine hydrochloride @ 2 mg / kg i/v. Bamboo splints reinforced fiber glass cast was applied in order to immobilize fracture fragments. Lameness grade improved immediately after application of fiber glass cast. Inj Amoxicillin + Cloxacillin @ 10 mg / kg i/v along with Inj Meloxicam @ 0.2 mg / kg i/v were administered for 7 days. The cast was removed at two months. The horse showed gradual improvement in weight bearing.

EQS-11

CIRCUMFERENTIAL POSTHECTOMY TO MANAGE PREPUTIAL SQUAMOUS CELL CARCINOMA IN A KATHIAWAR HORSE

S. Senthil Kumar, P. Tamil Mahan, M. Vijaya Kumar, S. Vigneshwaran,
 D. Vishnugurubaran and A. Arun Prasad
*Veterinary Clinical Complex, Veterinary College and Research Institute,
 Orathanadu, Thanjavur*

A 12 years old male Kathiawari horse was presented to VCC, VCRI, Orathanadu with an ulcerated gradually increasing mass on the prepuce for the past 2 months. Clinical examination revealed ulcerated

mass protruding from the lateral side of prepuce. The mass with irregular edges was hard in consistency with tendency to bleed on palpation. The urination behavior of the animal was apparently normal. Radiography revealed no signs of metastasis. Based on clinical examination the case was tentatively diagnosed as tumor involving prepuce and tumor excision with circumferential posthectomy was advocated. Pre operative stabilization of the patient was carried out. Preputial area was prepared for aseptic surgery. Anaesthesia was induced with xylazine@1.1mg/kg intravenously followed by ketamine@2.2 mg/kg intravenously and was maintained using “triple drip” administered intravenously “to effect”. Circumferential posthectomy along with tumor excision was carried out after ligating the blood vessels supplying the tumor mass. The wound edges were sutured using No.1. PGA employing simple interrupted suture pattern. Routine post operative wound care resulted in an uneventful recovery. Histopathology results showed proliferative epithelial cells and keratin pearl suggestive of squamous cell carcinoma.

EQS-12

SURGICAL REPAIR OF UMBILICAL HERNIA IN EQUINE BY OPEN AND CLOSED METHOD

N. Umeshwori Devi, **R.K. Udehiya**, S.S. Singh, J. Khosa, T. Singh, P. Verma, and J. Mohindroo

Department of Veterinary Surgery and Radiology,

COVS, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana

The present study was conducted on 6 clinical cases of equine (Five foals and one young mule). Out of six animals 4 were male and two were female. All the cases were presented with the history of soft and fluctuating swelling at umbilical region since birth and size of swelling was gradually increasing. On physical examination, the swelling was diagnosed as umbilical hernia. The herniorrhaphy was performed in all the animals under general anaesthesia using induction by Xylazine and Ketamine and maintained with 1-2% Isoflurane. The herniorrhaphy was performed by either open (n=4) and closed (n=2) technique. In closed technique, the hernial ring was sutured without opening the hernial sac and the ring was sutured using cross mattress suture by using number 1 loop Polydioxanone. Whereas, in open technique, simple interrupted suture pattern was used for closing the ring by using number 1 loop Polydioxanone. All the animals were administered Ampicillin @ 10mg/kg bodyweight intravenously bid for 5 days and injection Meloxicam @ 0.6 mg/kg bodyweight intramuscularly once daily for 3 days. During the post-operative period abdominal bandage was applied to prevent contamination and to reduce abdominal pressure on the incision site. Telephonic follow-up was done up to 4 month and uneventful recovery was recorded in all the cases operated by open method. While in closed technique one animal died post-surgery and one showed excellent recovery. The open technique is recommended for repair of umbilical hernia in equine.

EQS-13

SURGICAL INTERVENTIONS UNDER VARIOUS NERVE BLOCKS IN EQUINES

V.S. Dabas, S.K. Jhala, D.N. Suthar, S.K. Tyagi, R.H. Bhatt and C.F. Chaudhari

*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H.,
Navsari Agricultural University, Navsari, Gujarat*

Fifty horses of different breed, sex, age suffered with various surgical diseases of genital tract, integuments and eye were presented to college clinics from January, 2011 to June, 2019. All were treated surgically under various nerve blocks with variable degree of success. The regional nerve blocks provided sufficient analgesia, prevented the anaesthetic risk and stress to the patients and were cost effective too.

EQS-14

SURGICAL MANAGEMENT OCULAR SETARIASIS IN EQUINE – A REVIEW OF FOUR CASES

S. Kathirvel, S. Vigneshwaran, P. Sankar, K. Jayakumar, S. Senthil Kumar, and A. Kumaresan

*Department of Veterinary Surgery and Radiology, Veterinary College and Research Institute,
Tamil Nadu Veterinary and Animal Sciences University, Namakkal, Tamil Nadu*

Three to five years old Kathiawari stallions was presented to Veterinary Clinical Complex, Veterinary College Research Institute, Namakkal with history of corneal opacity and impaired vision. Clinical examination of affected eye revealed, diffuse corneal opacity, lacrimation and all the physiological parameters were within the normal range. Detailed ophthalmic examination revealed movement of thread like worm in the anterior chamber of eye. Under general anaesthesia, induction with xylazine and ketamine the animals were positioned in lateral recumbency with affected eye upwards. Maintenance of anaesthesia was done by triple drip solution containing guaifenesin, xylazine and ketamine. Surface anaesthesia was achieved by instillation of proparacaine 0.25%. A 5ml syringe half filled with a balanced ophthalmic irrigating solution fitted with 16G hypodermic needle was introduced between 12 - 3'o clock position through the limbus. By gentle aspiration the live worm was sucked out from the anterior chamber and identified as *Setaria sp.* Post-operatively all the horses were treated with topical instillation of antibiotic and anti-inflammatory eye drops. All the animals were dewormed with ivermectin to avoid reoccurrence. After two to three weeks the vision of the affected eye regained normalcy. One month later all the animal recovered uneventfully without any complications.

EQS-15

SUGICAL MANAGEMENT ENTEROLITH IN A THOROUGH BRED MARE

S. Vigneshwaran, B. Gowrishankar, Parth Verma, Mukesh Tiwari, S. Senthil Kumar,
S. Dharmaceelan and S. Kathirvel

Equine Hospital, Royal Calcutta Turf Club, Kolkatta, West Bengal

A seven-year-old thorough bred mare with history of signs of colic was called for Equine Hospital. During examination animal showed signs of colic. On Clinical examination elevated heart rate (61/min), congested mucous membrane was observed with slightly elevation in body temperature. Rectal examination revealed empty rectum, hard palpable mass with distended intestinal loops. Surgical intervention was advised. Under general anaesthesia, induction using xylazine and ketamine the animal was positioned in dorsal recumbency. Maintenance of anaesthesia was achieved by administration of triple drip solution containing guaifenesin, xylazine and ketamine. Surgical site was prepared aseptically and about 30 cm mid-ventral laparotomy incision was made caudal to umbilicus. On exploration of abdominal cavity revealed distended intestinal loops and hard mass in the ileo-cecal junction. Enterotomy was performed and enterolith weighing around 800 gms was removed. Enterotomy incision was done using synthetic absorbable suture material poly glactin 910 No. 1 by simple continuous followed by cushing suture pattern. Laparotomy incision and skin was closed using synthetic non-absorbable material polyester No. 5 by horizontal mattress suture pattern. Ad libitum water was provided 24 hrs after surgery. Post operatively adequate fluid therapy, antibiotic and analgesics were administered for 7 days. Sterile abdominal bandage was applied after regular dressing of surgical wound for 10 days. Animal passed pellety dung 24 hrs after surgery and made an uneventful recovery.

EQS-16

VULVAR AFFECTIONS IN MARES: REVIEW OF 8 CASES

B. Bharti, Anuj P. Singh and Shailendra Singh

Government Veterinary Hospital, Satna, Madhya Pradesh

Eight cases of vulvar affections in mares were recorded during August 2014 to July 2019. Four types of affections were identified viz leiomyoma, squamous cell carcinoma, proud flesh and other problems. All the cases were managed surgicotherapeutically. The incidence of leiomyoma was recorded in highest number (3 cases, 37.50%), followed by squamous cell carcinoma (2 cases, 25%), other problem (2 cases, 25%) and proud flesh (1 case, 12.50%). Recurrence was observed in cases of squamous cell carcinoma and remaining cases were recovered completely.

EQS-17

THERAPEUTIC EFFECTS OF AUTOLOGOUS PLATELET RICH PLASMA IN EQUINE LAMENESS DUE TO TENDON AND LIGAMENT AFFECTIONS

Dishant Saini, Ribu V. Mathews, Deepak Tiwari, Gaurav Kumar and Akshay Tikoo
*Department of Veterinary Surgery and Radiology, College of Veterinary Sciences,
Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, Haryana*

Equine regenerative medicine includes the use of stem cells, Interleukin receptor antagonist proteins and platelet rich plasma to stimulate and work with immune system to promote healing. Platelet rich plasma (PRP) is a concentrate of platelets having a platelet count level (approximately 5 times the baseline) above than of whole blood. The present study was conducted to evaluate the use of PRP in equine tendon and ligament injuries. Three stallions were presented to Veterinary Clinical Complex, LUVAS, Hisar with the complaint of progressive lameness not responding to medical treatment. Clinical examination of the affected limb revealed stiffness and pain on palpation at the palmer area of fetlock joint suggestive of tendinopathy which was confirmed using palmer digital nerve block and ultrasonographic examination. Under anaesthesia ultrasound guided autologous PRP was infused on the site of tendinopathy. Animal were kept on rehabilitation programme for 12 weeks and recovery was uneventful. Therefore, it was concluded that autologous PRP could be a new and appropriate therapeutic major in treatment of equine lameness occurring due to tendon and ligament affections.



Ophthalmology Session

MEET THE SPEAKER



Dr. S.P. Tyagi

Professor

Department of Veterinary Surgery and Radiology
DGCNCOVAS, CSKHPKV, Palampur, HP
sptyagivet@gmail.com

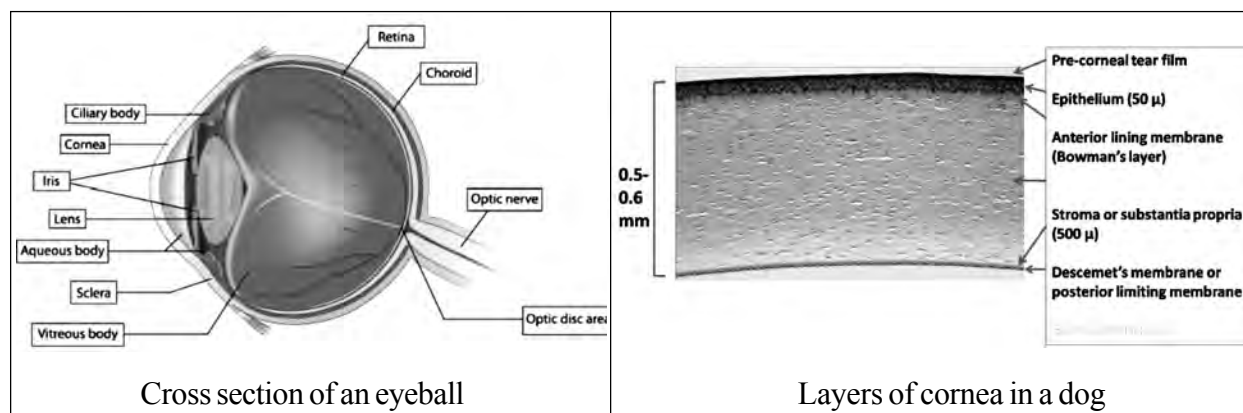
Born in 1972, Prof. S.P. Tyagi, is working in the Department of Veterinary Surgery and Radiology, College of Veterinary Sciences, Palampur since 1998. Dr S.P. Tyagi excelled in studies right from the beginning and has a distinguished academic record. He graduated with honours from “The GB Pant University of Agricultural and Technology, Pantnagar in the year 1993 at a very young age of 21 years. He earned his master’s degree in Veterinary Surgery and Radiology with honours in 1997 from the illustrious Veterinary Deemed University, “The Indian Veterinary Research Institute (IVRI)”, Izatnagar, India. He joined as an Assistant Professor in his present institute the “CSKHPKV”, Palampur, India in 1998. Earlier, in the intervening period, he also served as Government Veterinary Officer, Large and Small Animal Practitioner as well. He earned his PhD degree again with honours from CSKHPKV in 2005. He is widely known for his academic excellence, clinical skills, and devotion to duty, dedication to veterinary profession and for his amiable nature. He had a special interest in veterinary ophthalmology, orthopaedics and diagnostic imaging and contributed significantly in developing one of the best requisite infrastructure in India pertaining to these fields in his department. His clinical expertise in these fields is widely known and recognized by animal owners and veterinary professionals alike. He regularly delivers lectures, conduct and actively participates in Continuing Education (CE) workshops on these topics nationally as well as internationally. So far, he has conducted 9 CE programmes pertaining to Veterinary Ophthalmology in different parts of India besides actively participating in another 28 CE programmes for field vets and professional faculty. He is also a dedicated researcher and handled fifteen research projects so far either as PI or Co-PI. He has either guided or guiding 26 PG/PhD students as a major advisor; he has 66 research and clinical publications to his credit besides contributing in 25 professional books/manual/compendium or bulletins. He was instrumental in designing the present physical infrastructure of his department in the new hospital complex of his college that is considered one of the best in India at present. He had not only won accolades in the form of appreciation certificate and medals from Vice Chancellor at his Institute but also has been bestowed with gold medals and appreciation awards multiple times by the Indian Society for Veterinary Surgery (ISVS) for presentation of papers in conferences and National and Excellence Awards by Indian Seabuckthorn Association at National level in recognition of his research work on gastric ulcers. He is constantly doing his bit for upliftment of veterinary services in India by a direct and proactive involvement in improving the standards of teaching, research and animal treatment at his as well as other institutions.

AN OVERVIEW OF THE COMMON SURGICAL CONDITIONS OF THE CORNEA IN ANIMALS AND THEIR MANAGEMENT

S.P. Tyagi

*Department of Veterinary Surgery and Radiology
DGCNCOVAS, CSKHPKV, Palampur, HP*

The cornea is the transparent portion of the outer fibrous tunic of the eyeball forming the anterior most refractory surface of the ocular optics. Its primary function is to contribute in refraction of light rays, that come towards the eye after being reflected from any object in the sight, so that to focus them on to the retina for perception of a clear image of that object. The cornea contributes up to about 70 % of the total refractive power of the ocular optics put together. Even at the level of cornea, it is the pre-corneal tear film, where greatest refraction of light rays takes place and hence, the tear film is considered an integral functional layer of the cornea. The large surface area of cornea also helps in gathering light in sufficient quantity and its curved surface helps in bending the light rays in a uniform manner from any part of its surface to improve visual acuity. The cornea also maintains a tough, physical, and impermeable barrier between the eye and the environment to keep the internal ocular optics safe. Therefore, despite exposure to environmental hazards, the cornea must maintain its transparency, smooth outer surface as well as its shape to continue helping in image formation. The intricate anatomy of cornea and homeostasis of aqueous humour to nourish the cornea ensure corneal transparency; whereas, maintenance of healthy tear film is the primary function of different components of lacrimal system, however, the continuous replacement of the corneal surface epithelium also aids in keeping the outer surface of cornea smooth and clear.



Histologically, the cornea is composed of five layers namely-anterior epithelium, anterior limiting membrane (Bowman's layer), stroma (substantia propria), posterior limiting membrane (Descemet layer) and endothelium. The overall average thickness of cornea is about 0.6 mm in dogs, 0.7 mm in equine and 1.05 mm in bovine. The dog's cornea is slightly thinner in the centre (587/640 μm) like that of humans whereas, the bovine and equine cornea is thinner peripherally (1100/1000 μm in bovine and 818/685 μm in equine). The bulk of corneal thickness (>90%) is provided by the stroma which is composed of tiny collagen fibrils stacked closely in lamellar pattern and interfibrillar ground substance, both of which are produced and maintained by specialized fibrocytes, the keratocytes. Whole of the cornea is maintained in a relative state of dehydration (Deturgescence) against an overwhelming concentration gradient of aqueous

humour contained in adjacent anterior chamber of the eye by a single layer thick endothelium utilizing energy-dependent fluid pump. Any transient or permanent, physical or functional damage to endothelial layer can hinder the corneal deturgescence leading to ingress of fluid in stroma (Oedema) and loss of corneal transparency (bluish haze). The irony is that such an important layer of cornea, 'the endothelium' has zero to almost negligible capacity to regenerate unlike other corneal layers. Therefore, any defect arising in endothelial layer due to disease process or trauma is covered by expansion of existing endothelial cells rather than by forming new ones. As, the animals are born with finite number of endothelial cells and some of which are in any case constantly lost over the period during normal aging, the capacity of this layer to repair itself is very limited. If their numbers go down a critical level (<400 cells/mm²), the corneal deturgescence and thereby its transparency can no longer be maintained. Therefore, any disease process involving this layer should be given utmost importance to limit the loss of precious endothelial cells and similarly any ocular surgery has to be carried out meticulously to limit such damage. Moreover, as the lack of cells, pigment, stratified epithelium and blood vessels are other factors contributing in corneal transparency, any disease process capable of changing such state should be addressed immediately to maintain optimum corneal function.

The cornea can heal either by a vascular or vascular responses. When, vascular healing has to take place as in cases of deep and large wounds, the ensuing corneal vascularization impacts the corneal transparency adversely in many ways. The presence of blood vessels themselves, the subsequent fibrous tissue at wound site as well as the deposition of melanin pigment in the healing tissues in certain cases, all factors reduces corneal transparency. Corneal wound healing *per se* is a complex process that depends upon transformation of fibroblasts; intercellular signalling *via* cytokines, neuropeptides, growth factors, and chemokines; tissue remodelling by the action of matrix metalloproteinase (MMPs); and protection of tissue from free radical damage. The chances of wound-healing complications are always lurking like the excessive activity of MMPs *vis-a-vis* their inhibitors present in tears can lead to undesirable level of breakdown of stromal collagen (keratomalacia) threatening the corneal integrity; continuous movement of eyelids over cornea physically damage the healing tissue being formed; the corneal epithelial injuries are very painful and results in exaggerated movements of the eyelids (blepharospasm) and thus exacerbating the damage; the healing of cornea in any case is slower than other connective tissues in the body because of its a vascularity. Therefore, any wound of the cornea is termed as 'Corneal ulcer' and must be treated as efficiently as possible in keeping with the principles of corneal therapeutics.

The cornea is also considered the window of eye pathologies and a thorough and proper examination of eye can provide an insight that whether the affection is a primary corneal problem or is secondary due to any other underlying ocular or systemic disease. More often than not, the corneal conditions in animals are secondary in nature and thus the overall management requires simultaneously addressing primary ocular problems as well. Besides direct traumatic corneal injuries, the majority of clinically important corneal conditions manifest as one or more of the following major corneal pathologic reactions, each of which is associated with a characteristic colour, border, and visual "texture": corneal oedema (blue and "fluffy"; indistinct borders), corneal vascularization (red, often linear, and generally well-defined borders), corneal fibrosis or scar formation (grey and "feathery" with indistinct borders), corneal melanosis (black or brown

with discrete borders), stromal infiltration with white blood cells (yellowish-green with indistinct borders), accumulation of an abnormal substance within the cornea (usually lipid or mineral with distinct borders and sometimes a pearly, punctate, granular/spicular appearance) or over the endothelial surface (the keratic precipitates), keratomalacia (stromal “melting” with a soft gelatinous appearance) and corneal ulcers (superficial epithelial defects to deep stromal or altogether perforated ones usually with prolapse of uveal tissue through it, ‘the staphyloma’). Identification of each one of them is important as the timely diagnosis of corneal pathology, determining their severity and the urgency of situation as well as ascertaining their relation with other ocular tissues are fundamental to devising a successful treatment plan.

This requires a sound subject knowledge, good clinical observation and proper interpretation. Analysis of the case-history, detailed general body and ophthalmic examination and neuro-ophthalmic tests are the cornerstone of basic ophthalmic diagnosis. Whereas, for specific diagnosis of corneal lesions, a thorough close ocular examination using slit lamp bio-microscopy and if need be, employing vital dye (Fluorescein-sodium, Lissamine-Green and Rose-Bengal) staining techniques are usually sufficient in majority of cases. Specialized examination techniques like ultrasound biomicroscopy (UBM), Anterior segment optical coherent tomography (AS-OCT), *In vivo* confocal microscopy and non-contact specular microscopy can be utilized in specific cases to gain more information but such advanced facilities are largely unavailable in veterinary profession in India at present. Besides, Schirmer tear test (STT) and tear-film breakup time (TBUT) are important diagnostic tools to assess the tear production and status of corneal tear film. Microbial culture and cytology are important while choosing topical or systemic antibiotics and to assess the corneal sensitivity, ‘Corneal Aesthesiometer’ can be used.

The corneal conditions are quite common in animals and most of them can be treated successfully by medical, surgical, or a combination of these methods. A range of topical medicinal agents with diverse actions are available for such purpose; these include antimicrobials, anti-inflammatory drugs, antihistaminics, lacrimo-mimetics, lacrimo-stimulants, immuno-suppressants, oculo-hypotensives, irido-cycloplegics, mydriatics, miotics *etc.* Besides, many drugs can also be used systemically, sub-conjunctively and intra-camerally alone or in combination with topical agents for ocular therapeutics; their doses and frequency of administration differs from case to case. Basic surgical manoeuvres for corneal affections include suturing, surgical debridement, grid or punctate keratotomy, superficial keratectomy, thermal cautery, third eyelid flap (TEF), conjunctival grafting and temporary tarsorrhaphy, paracentesis of the anterior chamber *etc.* The successful management of a given case depends on the knowledge, experience and familiarity of attending veterinarian with these options while keeping their scope and limitations in mind.

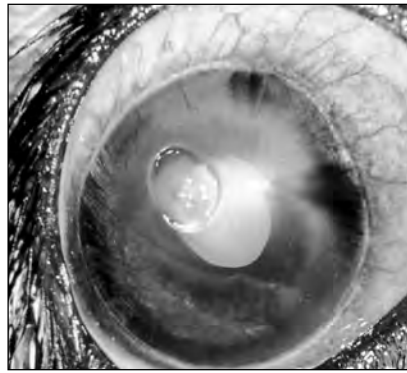
Some of the commonly occurring corneal conditions in animals that often require surgical interventions are briefly discussed below-

1. Corneal ulcers: A defect of variable thickness in cornea is termed as corneal ulcer.

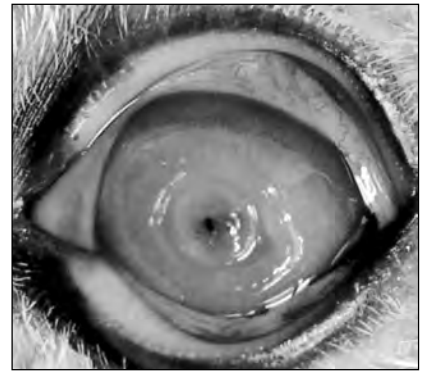
It may result due to endogenous causes (Like Trichiasis, distichiasis, entropion *etc.*) or exogenous causes (Like trauma, foreign body in conjunctival fornix). Based on the involved thickness of cornea, these can be classified as superficial, deep and perforated ulcers. As cornea is richly supplied by nerves, the corneal ulcers are very painful and incite reflex anterior uveitis, iridocyclitis and blepharospasm.



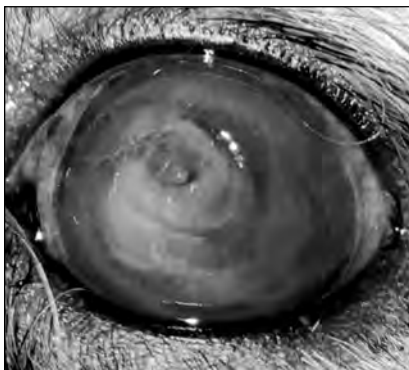
Perforated corneal ulcer with fibrin seal at puncture site



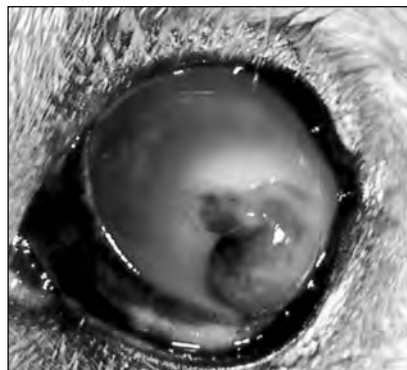
Perforated ulcer with staphyloma



Indolent/Boxer ulcer/SCCED



Perforated corneal ulcer with fibrin seal at puncture site



Perforated ulcer with staphyloma



Indolent/Boxer ulcer/SCCED

Clinical signs: Signs of intense ocular pain (in most cases) like-

- Epiphora
- Blepharospasm
- Photophobia
- However, Boxer ulcers/Spontaneous chronic corneal epithelial defects (SCCED)/Indolent ulcers/Refractory corneal ulcers may be non-painful at times.

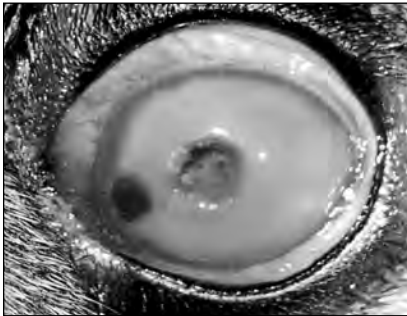
SCCED occurs because of failed union between corneal epithelial basement membrane and anterior stroma; these are characterized by chronically loose epithelium and mild corneal oedema. Sometimes they remain non-ulcerated (negative fluorescein uptake).

Treatment: The basic medicinal and ancillary treatment of un-complicated simple small corneal ulcers comprises of-

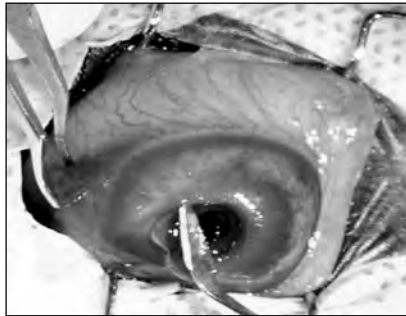
- Topical broad-spectrum (BS) **antibiotics** (qid-q3h)
- Topical **cycloplegics** like 1% Atropine (sid-tid)
- Topical **tear substitute** (q4h)
- **Use of tissue adhesive** like Cyanoacrylate (In case of uncomplicated, non-infective superficial small corneal ulcers)

- **Therapeutic contact lens application** using either Extended-wear or bandage contact lens
 - **Temporary tarsorrhaphy** (In case of uncomplicated, non-infective superficial small corneal ulcers)
 - Protection from self-mutilation (Elizabeth collar)
 - Systemic antibiotics and NSAIDs or Opioid analgesics should also be given for initial few days.
- If the corneal ulcer is large, deep (>half of corneal thickness) and chronic, the medicinal treatment is often used in conjunction with surgical management which mostly comprises one or more of the following-
- **Primary closure of corneal defect** (In case of uncomplicated deep corneal ulcer <3 mm diameter): Placement of simple interrupted sutures with or without horizontal mattress can be therapeutic; the resultant distortion of corneal curvature is usually transient.
 - **Conjunctival pedicle grafting** (In case of deep corneal ulcer larger than 3 mm in diameter)
 - **Corneo-conjunctival grafting** (In cases of deep and large central corneal ulcers where sufficient transparent healthy cornea is available peripherally for centrifugal advancement)
 - **Corneal transplant** (In cases of chronic complicated corneal ulcers where corneal transparency and structural integrity is badly affected)-Many kinds of biologic and synthetic corneal transplantation have been described but all kind of such procedures in animals are associated with high degree of complications and thus have questionable long-term utility at present.

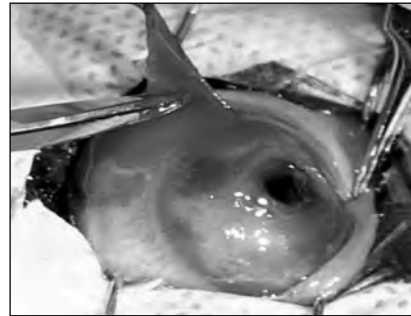
Conjunctival pedicle grafting for deep corneal ulcer



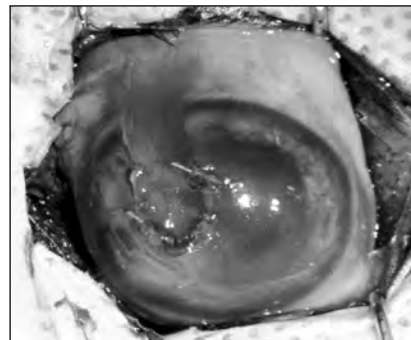
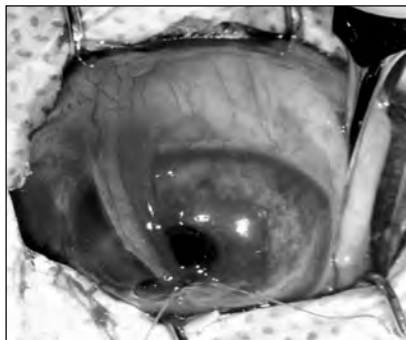
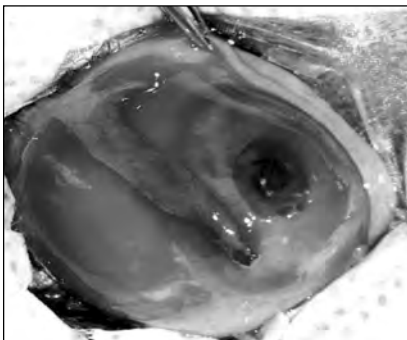
A deep corneal ulcer



Debride the ulcer gently and remove conjunctiva up to 1 mm around the crater



Separate a thin bulbar conjunctival pedicle slightly larger than corneal defect

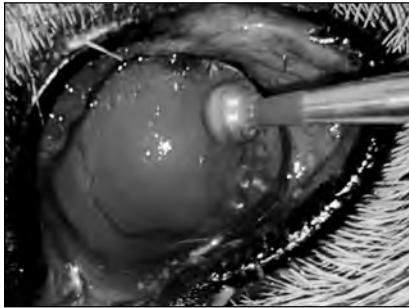


Attach the graft to the ulcer bed using 6-0 absorbable sutures 1 mm apart from each other leaving only the pedicle base un-sutured

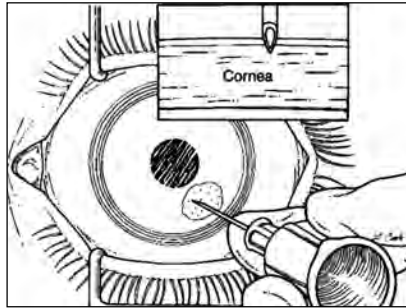
In case of SCCEDs, first treat the eye with topical antibiotics for a few days followed by-

- **Ulcer debridement** either manually or by Diamond burr superficial keratectomy (DBSK) technique
- **Keratotomy** either by multiple stromal puncture or by Grid-keratotomy techniques
- **Application of corneal bandage/extended-wear contact lens**
- **Temporary partial tarsorrhaphy**

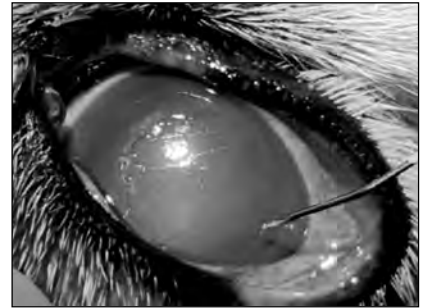
Hypertonic eye drops (5% sodium chloride) q4hr if corneal oedema is marked



Corneal epithelial debridement by DBSK



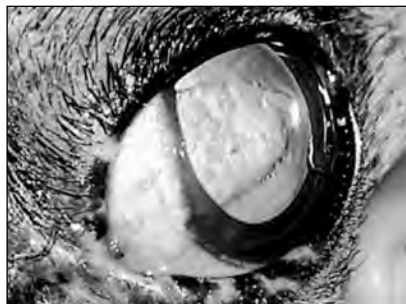
Multiple stromal puncture using 25 G needle making 0.2-0.3 mm deep punctures 1 mm apart



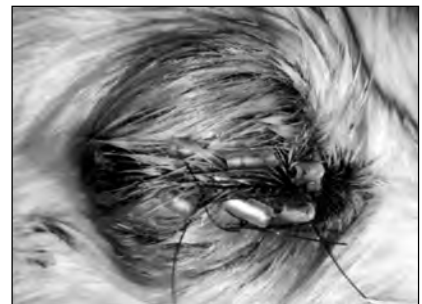
Grid keratotomy using 25 G needle making 0.2-0.3 mm deep grid lines 1 mm apart



Extended-wear contact lens



Contact lens application

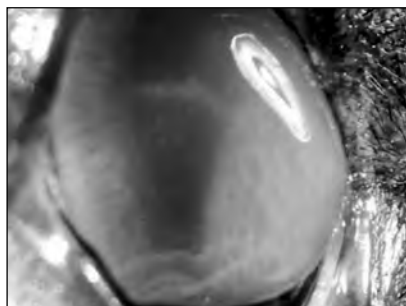


Temporary tarsorrhaphy

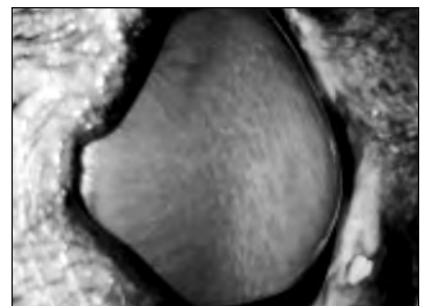
Melting corneal ulcers: Certain corneal ulcers gets complicated and undergo progressive keratomalacia which may be caused by infection due to collagenous or protease-producing bacteria such as *Pseudomonas* or simply as a result of increased proteinase activity in the tear film of a damaged cornea by naturally occurring Matrix metalloproteinases (MMPs) in the tears.



Severe keratomalacia in a calf due to infection (Stromal abscess)



A non-infected melting corneal ulcer in a dog before and few hours after treatment



Such melting corneal ulcer should be treated as an emergency to prevent rapid loss of stroma and

impending corneal perforation. Apart from regular medicinal treatment, such cases should be subjected to use of specific MMP-inhibitors like-

- Undiluted autologous serum
- 5-10% N-acetyl cysteine
- 0.1% Doxycycline/Tetracycline
- 0.2% EDTA

Frequency of treatment may be as high as q1-2h in the first few days which should be gradually decreased to tid-qid in the next 7-10 days.

2. Pigmentary keratitis: It is characterized by the development and spread of the pigment 'Melanin' across the otherwise transparent corneal surface.

It is grossly appreciated as a black-brown discolouration of the cornea. It is a common and often underdiagnosed condition, generally appreciated by the animal owners only when a significant portion of the cornea gets covered with pigment and start affecting vision.

Dogs are the most susceptible to this condition among all species and birds are the least. In dogs, the breeds like Pug, Shih-Tzu, Lhasa Apso, Pekingese, Bulldog, German Shepard, Boxer, Beagle are predisposed to corneal pigmentation owing to the anatomy of the skull and a more than usual melanotic limbus. Most common etiologial factors of pigmentary keratitis are prolonged corneal exposure (because of lagophthalmos, facial nerve dysfunction, macropalpebral fissure, etc.), frictional irritation (caused by districhiasis, entropion and trichiasis, etc.), tear-film abnormalities (especially kerato conjunctivitis sicca [KCS]), or chronic immunologic stimulation such as Chronic superficial Kerato conjunctivitis (CSK)/Uberreiter disease/Corneal pannus.

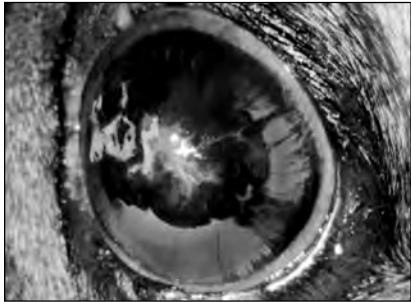
In dogs, it is by far most common in Pugs as a sequel to unattended Brachycephalic ocular syndrome (a conundrum of eyelid disorders viz. macropalpebral fissure, medial caruncle trichiasis, medial lower eyelid entropion, prominent eyeball with shallow orbit, lagophthalmos, nasal/facial fold trichiasis and KCS). The constant corneal irritation in such cases results in a low-grade chronic keratitis and a vascular healing response. The corneal vascular ingrowth arising from adjacent deeply pigmented limbus and conjunctiva brings along 'Melanin' pigment and deposit it in to the healing tissues. The more heavily melanotic limbus, the denser would be the corneal melanosis. The melanosis mostly remains limited to epithelium and superficial stromal layers of cornea and depending upon its location in cornea, it results in variable degree of visual deficit.

Treatment :

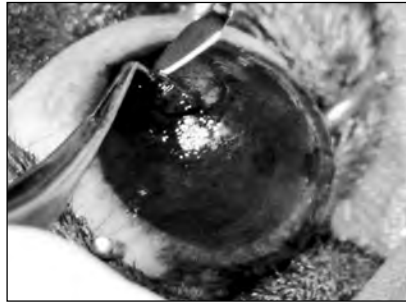
Correction of all primary problems followed by removal of pigment by superficial keratectomy (manually or by DBSK) and partial conjunctivectomy of adjacent melanotic area.

The DBSK is the most simple and effective way of achieving this. It can be done by using 3 mm dental diamond burr mounted on a high-speed drill. Some degree of recurrence of corneal melanosis is generally seen over a period of time in most cases where large area of cornea is subjected to superficial keratectomy and/or where long term supportive medicinal treatment is not followed postoperatively.

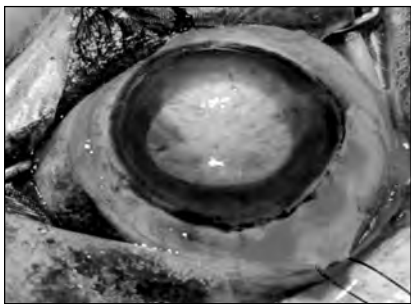
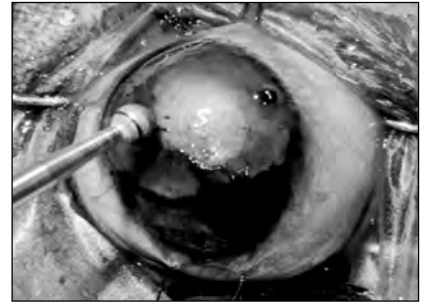
The treatment of primary conditions vary a lot as per specific need - Immunomodulatory therapy (using Cyclosporine/Tacrolimus/eyedrops) in Chronic superficial keratitis (CSK) and KCS to reduce vascular healing response and ingress of pigment as well as to improve tear formation; surgical correction of cilia and eyelid disorders if they are causing corneal irritation; parotid duct transposition in cases of refractory KCS; Medial canthoplasty in cases of macropalpebral fissure and medial entropion as part of Brachycephalic ocular syndrome.



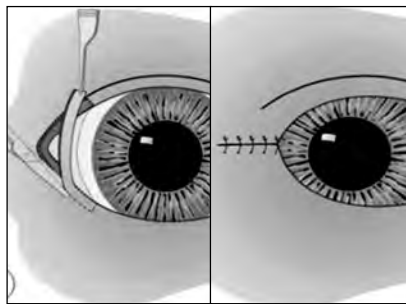
Chronic superficial pigmentary keratitis (CPK)



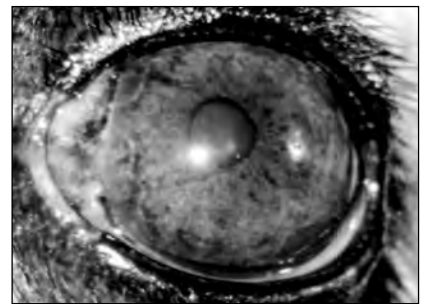
Removal of corneal pigment by superficial keratectomy either manually or by DBSK



Corneal surface after SK



Followed by medial canthoplasty



After 9 months

3. Keratoconjunctivitis sicca (KCS)

It is the chronic inflammation of cornea as well as conjunctiva secondary to deficiency of pre-corneal tear film (PTF). Mostly, it is the quantitative deficiency of PTF because of less production of aqueous part of the tears (Primary KCS) but, sometimes it can be qualitative deficiency of PTF, in which there is either the mucin or the lipid layer of tears is lacking.

The most common etiology of primary KCS is immune-mediated lacrimal adenitis and the clinical symptoms arise due to increased corneo-conjunctival friction and malnutrition of cornea.

Clinical signs:

- Conjunctival hyperemia characterized by thick, velvety and reddish appearance
- Sticky, mucoid, ropy ocular discharge
- Blepharospasm
- Lusterless cornea
- Corneal vascularization and melanosis

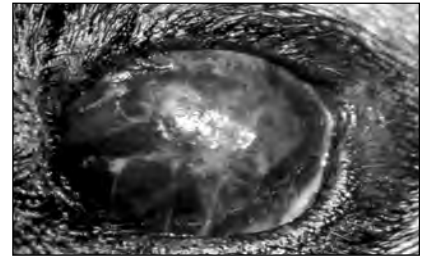
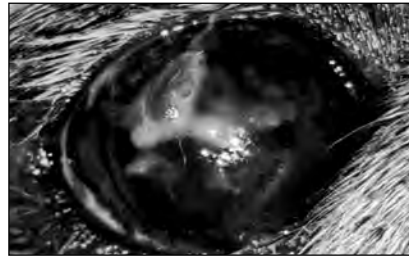
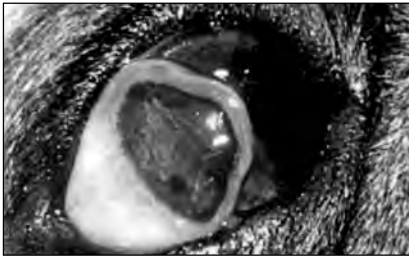
- Dry nostril on the affected side (Found in cases of unilateral neurogenic primary KCS)
- Corneal ulceration and occasional staphyloma

Diagnosis:

- **Schirmer Tear Test:** STT-1 value < 5mm is indicative of quantitative KCS.
- **Tear-film break-up time:** TBUT values < 10 seconds indicate rapid evaporation of tears due to inadequate lipid component.
- **Corneo-conjunctival cytology:** Neutrophils and devitalized epithelium with reduced goblet cells population are found in certain qualitative KCS resulting due to reduced mucin component.

Treatment:

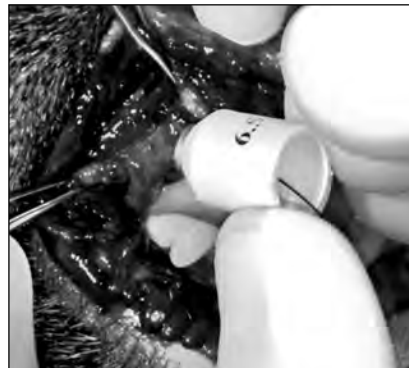
- **Topical lacrimomimetics/Artificial tear therapy:** Like 0.5%-1% methyl cellulose; 0.5% hydroxyl ethyl cellulose; 0.5% hydroxyl propyl methyl cellulose. (qid-q4h)
- **Topical/systemic lacrimo-stimulant:** Like 2% Pilocarpine systemically (1 drop/10 kg of BW mixed in food) or topically bid (In cases where parasympathetic denervation of lacrimal gland is suspected and is effective only if some functional lacrimal gland remains).
- **Immunosuppressant:** In cases of primary immune-mediated KCS, topical or/and systemic immunosuppressants like 0.2% Cyclosporine (CsA) or 0.03% tacrolimus sometimes help in improving lacrimal gland's function. Long term therapy (sometimes life-long) is required in such cases. (bid-tid). CsA is the first line of treatment and more potent Tacrolimus is to be considered if no appreciable improvement occurs after 3 months of CsA therapy.
- *These agents also reduce corneal pigment even if they fail to stimulate tear-production and therefore, if corneal melanosis is present, these should be continued for long periods with or without STT normalization.*
- **Topical antibiotics:** Can be used to treat secondary bacterial infections. If no corneal ulceration, topical antibiotics with corticosteroids are more beneficial. (q4-6h)
- **Topical mucolytics:** Like 5-10% acetyl cysteine is helpful to dissolve thick ocular discharge. (q4-6h)
- **Parotid duct trans-positioning:** Normally indicated when tear production remains inadequate even after three months of continuous medicinal therapy. It can be done by closed as well as open method; the former is preferred as being cosmetically more acceptable. In this surgery, the parotid duct is separated from oral mucosa along with its papilla, dissected and transposed to inferior cul-de-sac of the eye to lubricate the corneo-conjunctival surface with saliva.
- **Removal of corneal pigment:** DBSK can be employed for this in selected cases where the pigment is affecting the central visual axis and the corneal epithelium is relatively healthy, but chances of recurrence of melanosis are always there.



Persistent ropy or mucoid ocular discharge and dry lusterless cornea in cases of KCS



Identify parotid duct papilla and cannulate the duct with 1-0 monofilament Polyamide suture



Create a circular incision around the papilla using a corneal trephine (6.5 mm)



Separate the parotid duct from masseter muscle attachments by gentle blunt dissection up to its smaller divisions



Establish a subcutaneous tunnel from buccal cavity to lateral conjunctival fornix



Attach the papilla duct to the conjunctiva using 6-0 absorbable sutures



Moist and glistening eyeball 2 weeks postoperatively

MEET THE SPEAKER**Dr. Kasturi Bhadsavle***Founder & Director*

The Eyevet

A Unit of Vivet Multispeciality Clinics Pvt. Ltd.

Mumbai

Dr. Kasturi Bhadsavle decided to be a vet early on. After graduating from Bombay veterinary college in the year 2004, she worked at the racecourse to gain more experience with horses. Dr. Kasturi joined masters program in veterinary surgery at Bombay veterinary college in 2004. During her masters, she developed a keen interest in veterinary ophthalmology and she pursued this field further. With the help of a renowned Human ophthalmologist, she completed her thesis in cataract surgery in dogs. She trained further in veterinary ophthalmology in Israel and USA in the year 2007. In 2009 Dr. Kasturi Bhadsavle migrated to Australia, where she practiced in a general practice for four years. After few years in Australia, she started her own veterinary ophthalmology practice in Melbourne Australia. Later in 2017 Dr Kasturi Bhadsavle moved back to India and had a consulting veterinary ophthalmology practice for 2 years. In March 2019 Dr. Kasturi Bhadsavle has opened up India's first purely Veterinary ophthalmology clinic in Mumbai and Pune.

SURGICAL MANAGEMENT OF OPHTHALMIC COMPLICATIONS ASSOCIATED WITH BLOOD PARASITE INFESTATION IN DOGS

Bhadsavle, K. and Kelkar P.

The Eyevet

A Unit of Vivet Multispeciality Clinics Pvt. Ltd., Mumbai

In dogs, tick-borne parasites namely Babesia, Ehrlichia, Hepatozoon canis, Anaplasma spp., Mycoplasma spp. have a wide-spread occurrence in a tropical country like India. These diseases can manifest as sudden vision loss, chronically mildly inflamed eyes, chronic corneal oedema, painful red eyes or loss of vision. Some of these cases need surgical management for conditions like acute glaucoma which is non-responsive to medical management; acute focal corneal oedema and deep corneal ulcers. In this paper we discuss multiple surgical modalities for management of these painful ophthalmic complications keeping in mind the multi-organ involvement and anaesthetic safety.

Diagnosis:

These dogs present to us with sudden or chronic vision loss in one or both eyes, mild ocular changes like mild corneal edema, red eyes etc. These ocular changes are usually associated with blood parasite infestation or some other systemic illness like neoplasia, bacterial, fungal or viral infection, or systemic inflammatory conditions.

Early diagnosis of tick fever is made with changes in the blood tests like presence of blood parasite on the blood smear, anemia, low platelet count, high globulin and low albumin, Snap test or PCR tick panel.

Identification of the parasite or parasites involved is very important in treating the condition optimally. Each parasite can cause a different ocular pathology and can also vary in terms of severity of the symptoms; but uveitis or pan-uveitis is a constant feature in these affected dogs. At presentation, along with uveitis, retinal detachment, hyalitis, hyphema, secondary glaucoma, corneal edema, corneal ulceration or episcleritis/scleritis/ conjunctivitis can be present. Even though glaucoma is not present initially, secondary glaucoma can suddenly happen in these patients at any stage and the antiglaucoma therapy should be initiated even if the intraocular pressure is normal.

Ocular ultrasound should be performed in all these patients to rule out intraocular neoplasia and to identify the degree of intraocular damage. With the ultrasound findings, prognosis can be given to the owners.

Treatment:

The first step in effective management of this condition is early and accurate diagnosis and treatment of the blood parasite or parasites. Ocular disease is treated symptomatically with medical management but most of these dogs need surgical management to either save vision or relieve the patient from ocular pain.

Surgical management should be opted after careful evaluation of the patient with preoperative tests, as these are high risk anesthesia patients.

Mild to chronic uveitis without corneal ulcer is treated with topical prednisolone acetate 1% drops TID- QID, Atropine sulphate 0.01% drops BID for 3 days, Artificial tears TID, Antibiotic eyedrops (ciprofloxacin, Tobramycin, Moxifloxacin) TID, topical dorzolamide and timolol combination eyedrops BID, systemic anti-inflammatory like corticosteroids @ 0.5mg/kg body weight (in absence of liver disease) and pain killer like Gabapentin @ 5-10mg/kg body weight BID or buprenorphine @ 0.02mg/kg body weight BID. NSAIDs should be avoided in cases of low platelet counts.

In case of **corneal ulceration**, the above treatment should be followed without topical prednisolone acetate eyedrops. If the corneal ulcer is superficial indolent ulcer with loose epithelial edges, cotton bud debridement or Alger brush debridement and bandage contact lens should be done under topical anesthesia with or without sedation. If the superficial ulcer does not respond to the above treatment, application of tissue adhesive like Amcrylate or fibrin glue after debridement under general anesthesia can be tried. If the ulcer doesn't heal with any of these treatments then superficial keratectomy with bandage contact lens under general anesthesia is performed with a high success rate; but this involves longer general anesthesia.

In **stromal corneal ulcers or descemetocoels** tissue adhesives can effectively treat the ulcer if the width is less than 3mm.

Stromal corneal ulcers, Descemetocoels or ruptured corneal ulcers with iris prolapse are treated with various corneal grafting techniques like conjunctival graft, corneo-conjunctival trans-positioning graft, bioabsorbable materials like Biosis, Amnion, Acell grafts or combination of the two grafting techniques.

Glaucoma usually leads to permanent blindness and severe ocular pain. On presentation if the intraocular pressure in the affected eye or eyes is more than 20mm/Hg, patients are immediately started on antiglaucoma eyedrops like dorzolamide and timolol combination BID, Brimonidine eyedrops TID and prostaglandin analogues BID like latanoprost eyedrops. Once the IOP is below 15mm/Hg, prostaglandin analogue eyedrops are stopped and the rest of the drops are continued along with the uveitis management.

Systemic antiglaucoma medications are not recommended due to systemic effects they can have in these already compromised patients.

Uncontrolled glaucoma is managed surgically using different end stage techniques which involve ablation of the eyeball.

Intravitreal gentamicin injection causes chemical ablation of the ciliary body which produces aqueous humor. Injection gentamicin is injected in the vitreous through scleral port given @ 5mg/kg body weight or 40mg in a medium to large dogs using 22G needle, after aspirating equal amount of vitreous through the same port.

This is a great technique to be used in systemically compromised dogs where maximum of 10mins of general anesthesia is required and minimal bleeding is encountered. This procedure cannot be performed in case of intraocular neoplasia or infection or anterior luxation of the lens. After successful control of the glaucoma the eyeball may become very small and there is always a possibility of chronic low grade pain in these patients.

Intrascleral prosthesis is performed in patients where it is important for the owners to maintain the asthetic appearance of their pet. It involves evisceration of the intraocular structures of the eyeball keeping the sclera and cornea intact; then inserting a silicon ball inside the eyeball. Postoperative pain in this technique is less than enucleation and the eyeball is maintained. In some cases, the operated eye may develop dry eye and since the cornea is natural, any injury can cause corneal ulceration.

Enucleation is removal of the painful globe and adenexa. This procedure shouldn't be performed when the platelet count is low as it risks uncontrolled bleeding.

Low grade **corneal edema** is managed medically by controlling uveitis and topical application of hypertonic saline solution (Hypersol 6%) three times daily. In some cases though corneal edema is so severe that it doesn't allow the eyelids to close over the cornea. If a corneal ulcer develops in such a compromised cornea, corneal rupture or a melting corneal ulcer can happen leading to loss of the eye. Third eyelid flap is performed if there is no corneal ulcer, under GA with 4-0 soft suture material like 4-0 Mersilk. If the corneal ulcer is present conjunctival graft would be indicated followed by temporary tarsorrhaphy.

Retinal detachment in these patients is an exudative detachment with either blood and or inflammatory exudate accumulating behind the retina. In very few cases, retina can reattach by medical management of the systemic disease, systemic anti-inflammatories, management of uveitis and topical antiglaucoma eyedrops (dorzolamide and timolol eyedrops)

Conclusion:

Blood parasite infestation is a systemic condition but it can lead to multiple ophthalmic conditions. Detection and treatment of the root cause early and accurate management of the ocular symptoms is the key to save vision in some of these patients.

In some patients, the condition of the eyes is so severe that the recovery of vision is not possible, but making the patient pain free and helping the owners understand and to cope with the blindness of their pets is the plan in these cases.

OPHTHALMOLOGY SESSION

ISVS-2019

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OPH-1

CLINICAL EVALUATION OF DECELLULARIZED PORCINE SMALL INTESTINE SUB-MUCOSA (DPSIS) FOR REPAIR OF CORNEAL ULCER IN KCS AFFECTED DOGS

Sowbharenya Chelladuraai, **Aswathy Gopinathan**, Kiranjeet Singh, Ravi Kant Agrawal,
Swapna C.R. and Sasikala R. Akshay Kumar

Division of Surgery, Indian Veterinary Research Institute, Izatnagar, Bareilly, Uttar Pradesh

The present study evaluates the use of decellularized Porcine small intestine sub mucosa (DPSIS) for repair corneal ulcer developed due to Keratoconjunctivitis Sicca (KCS) in dogs. Clinical evaluation of DPSIS for the repair of corneal defects was followed by anterior lamellar keratoplasty of cornea. Sixteen client-owned dogs presented in RVP cum TVCC with corneal ulcer were subjected to thorough general and ophthalmic examination and were grouped as corneal ulcer due to KCS group B and corneal defects developed due to reasons other than KCS (group A). Group A consisted of seven dogs with corneal defect due to injury/ dermoid. Group B consisted of nine pugs with corneal ulcer due to KCS. The corneal defects were repaired by suturing the scaffold on the recipient ulcer bed after debridement and anterior lamellar keratoplasty. Temporary tarsorrhaphy was performed in all the animals of both the groups. The animals were observed for the evidence of corneal healing by serial subjective evaluation of cornea at 15, 30 and 60 days postoperatively based different ophthalmic tests. On the basis of results of present study, it was concluded that decellularized porcine small intestinal submucosa (DPSIS) promotes healing of partial / full thickness corneal defects following anterior lamellar keratoplasty in both groups but corneal pigmentation was a major complication observed after grafting in KCS affected dogs.

OPH-2

STUDIES TO INVESTIGATE THE EFFECT OF TIMOLOL (0.5%) IN HEALING OF CORNEAL EPITHELIAL DEFECT DEVELOPED DUE TO KCS IN PUGS

Sasikala R., **Aswathy Gopinathan**, Swapna C.R., Akshay Kumar and Kiranjeet Singh

Division of Surgery, Indian Veterinary Research Institute, Izatnagar, Bareilly, Uttar Pradesh

Effect of Beta adrenergic antagonist Timolol (0.5%) in healing of corneal epithelial defect developed due to Keratoconjunctivitis Sicca (KCS) in dogs was evaluated. Animals with corneal defects were divided into two groups C1 and C2 with six animals in each. Group C1 were treated with eye drops Gentamicin, Flurbiprofen and Sodium chloride (5%) and group C2 animals were treated with Timolol 0.5% eye drops along other drops mentioned above. Corneal ulcer healing was evaluated based on subjective evaluation of different ocular parameters like menace reflex, conjunctival hyperemia, ocular discharge etc. along with Schirmer's tear test on days 7, 14 and 28th post treatment. Clinical improvement in corneal healing was observed in group C2 except for parameters like corneal pigmentation and corneal pigmentation density. Digital photographic assessment of corneal healing corroborated the clinical findings. Beta-adrenergic receptor antagonist Timolol (0.5%) enhances corneal wound healing but enhances the migration of melanocyte in corneal ulcer due to Keratoconjunctivitis sicca in dogs.

OPH-3

ROLE OF TEAR CYTOKINES IN THE ONSET AND PROGRESSION OF KERATOCONJUNCTIVITIS SICCA IN DOGS

Akshay Kumar, **Aswathy Gopinathan**, Kiranjeet Singh, Sasikala R. and Swapana, C.R.

Division of Surgery, Indian Veterinary Research Institute, Izatnagar, Bareilly, Uttar Pradesh

The study was conducted to evaluate the role of tear cytokines in the onset and progression of keratoconjunctivitis sicca (KCS) and to evaluate the effect of tacrolimus 0.1% ointment on the cytokines level in the KCS affected dogs. A total 14 KCS cases diagnosed with KCS were divided into two groups A1 and A2 having 6 and 8 animals, respectively. Animals of group A1 were treated with eye drops carboxy-methyl-cellulose and gentamicin. In group A2 ointment Tacrolimus 0.1% and drop gentamicin was given 3 times a day continuously for 28 days. The tear production was significantly ($P > 0.05$) improved in A2 (Tacrolimus 0.1%) group as compared to group A1. Western blot analysis showed that expression of MMP-9 was more in group A1 post treatment than group A2. The concentration of the IL-8 and IFN- γ was found to be decreased significantly ($P > 0.05$) in A2 (Tacrolimus 0.1%) group post treatment than group A1. From the results of present study, it was concluded that cytokines interferon- γ (IFN- γ) and MMP-9 up-regulates in early and late stages of KCS. Application of Tacrolimus (0.1%) ointment decreases the level of cytokines IL-8, IFN- γ and MMP-9 in early and late KCS cases.

OPH-4

VISION RESTORATION AFTER PHACOEMULSIFICATION WITH IMPLANTATION OF FOLDABLE ACRYLIC IOL IN DOGS

Babita Das, Apra Shahi, V.P. Chandrapuria, Shobha Jawre and Randhir Singh

Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H., Nanaji Deshmukh Veterinary Science University, Jabalpur, Madhya Pradesh

The present study was conducted on 24 eyes in 24 dogs to evaluate feasibility of implantation of different types of foldable intraocular lenses after phacoemulsification cataract extraction in dogs. Detailed ophthalmic examination, ultrasonography, STT, IOP and neuro-ophthalmic tests were conducted for diagnosis of cataract and to exclude other ocular pathology. Dogs were divided in four groups having 6 eyes each viz. Group I phacoemulsification with square edge hydrophilic IOL. Group II phacoemulsification with round edge hydrophilic IOL. Group III phacoemulsification with square edge hydrophobic IOL. Group IV phacoemulsification with round edge hydrophobic IOL. Dogs were operated under general anesthesia along with peribulbar nerve block. Cataractic lenses were removed by phacoemulsification. The visual outcome in dogs of all treatment groups were assessed by neuro-ophthalmic tests. The marks obtained differed non significantly among various groups for tests. Functional vision was achieved in 50% dogs in Group-I and group II, 66.66% dogs in group III and 50% in group IV. It was observed that better (100%) success rate was achieved in dogs with immature cataract, followed by (50.00%) in those with mature and (28.57%) in dogs with hyper-mature cataract. A Non-significant difference was observed in vision restoration after implantation of different IOL.

OPH-5**INTRA-OPERATIVE COMPLICATIONS AND THEIR MANAGEMENT DURING PHAECOEMULSIFICATION PROCEDURE IN DOGS****Babita Das, Apra Shahi, V.P. Chandrapuria, Shobha Jawre and Randhir Singh***Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H.,
Nanaji Deshmukh Veterinary Science University, Jabalpur, Madhya Pradesh*

The study was conducted on twenty-four eyes, diagnosed for cataract and divided into four equal treatment groups for different intra ocular lense implantation. Preoperatively, detailed ocular examinations, ultrasonography, STT, IOP and neuro-ophthalmic tests were done for ascertaining cataract and associated ocular pathology if any. The phacoemulsification procedure was performed under general anesthesia along with peribulbar nerve block. During the surgical procedures, Pupillary constriction (Miosis) was recorded as 66.66% in Group-I, 50.00% in group-II and III each, whereas in group-IV only 33.33% cases showed pupillary constriction. The miosis was managed by instilling 1:1000 adrenaline. Chemosis was observed in the range of 16.66% in each group. Chemosis do not interfere with surgery and usually resolve spontaneously within a few hours. Iris bleeding occurred in 16.66% eyes of Group-I and IV. Whereas, in group-II and III, no incidence of iris bleeding was noted. During surgical process, bleeding was reduced by flushing the blood out of the anterior chamber and quickly filling the eye with BSS or OVS, raising the pressure high for some time. Vitreal prolapse and Iris bulging were not observed in any case in all four groups.

OPH-6**EVALUATION OF SUPERFICIAL KERATECTOMY AND KERATOPLASTY FOR MANAGEMENT OF CORNEAL AFFECTIONS IN DOGS****Beenish Qureshi, Mahajan S.K., N. Umeshwori Devi, J. Mohindroo
and Harmanpreet Singh Sodhi***Department of Veterinary Surgery and Radiology, College of Veterinary Sciences,
Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, Punjab*

The present study was conducted on 20 clinical cases presented to Department of Veterinary Surgery and Radiology, GADVASU, Ludhiana with various corneal affections over a period of two years. The animals were divided into two groups according to the surgical technique. Group I comprised of keratoplasty which was further subdivided into lamellar (n=8) and penetrating keratoplasty (n=4). Lamellar keratoplasty group was further subdivided into Autogenous Sliding lamellar grafts and Homologous lamellar corneal grafts. Group II (n=8) comprised of superficial keratectomy in which a superficial layer of cornea was removed. The cases were followed-up for a period varying from 3 months to 18 months. The complications associated with the cases and the outcome in relation to restoration of the vision was recorded periodically. To conclude, lamellar keratoplasty had a better outcome as compared penetrating keratoplasty. Superficial keratectomy had good outcome but recurrence of the keratopathy was a major complication recorded in all the cases.

OPH-7

B-MODE OCULAR ULTRASONOGRAPHY FOCUSED ON CANINE GLAUCOMA: REVIEW OF 82 CASES

Laiju Philip, M., John Martin, K.D., Syam K. Venugopal., Anoop, S.,
Dileepkumar, K.M. and Devanand, C.B.

*Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences,
Kerala Veterinary and Animal Sciences University, Mannuthy, Thrissur, Kerala*

Diagnostic ocular ultrasound is used to determine pathological alterations, when opaque refractive media prevent the assessment of the posterior segment of the eye. Eighty-two dogs of different ages presented to University Veterinary Hospital, Kakkala, diagnosed for glaucoma were evaluated. Animals suffering from chronic glaucoma with ocular and intraocular opacities were subjected to detailed ophthalmic examination. Conventional ocular ultrasound was performed with B mode ultrasonography equipped with 8.5- 10 MHz micro convex transducer using trans corneal approach after instillation of 0.5% proparacaine. Ultrasonographic findings of these ocular pathologies and biometry of glaucomatous eye were obtained. The clinical manifestations were categorized as corneal ulcer, anterior synechiae, corneal opacity, epithelial dystrophy, hyphema, miosis, keratoconjunctivitis sicca, pigmentary keratitis, cataract and lens luxation. Ultrasonographic observations were opacification of lens (20.73 per cent), globe enlargement (14.63 per cent), anterior lens luxation (4.87 per cent), posterior lens luxation (3.65 per cent), globe reduction (2.43 per cent), retinal detachment (6.09 per cent) and vitreous humour opacity (2.43 per cent). The results obtained were used for monitoring efficacy of therapy and for predicting the prognosis of the treatment.

OPH-8

SUCCESSFUL SURGICAL CORRECTION OF CHERRY EYE CONDITION IN RABBIT

Amol T. Yamgar, D.U. Lokhande, G.U. Yadav and P.S. Dakhane

*Department of Veterinary Surgery and Radiology, Mumbai Veterinary College,
Parel, Mumbai, Maharashtra*

A case of 'Cherry eye' unilateral presented in rabbit of age 2 years at OPD, BSDPHA affiliated with Mumbai Veterinary College, Parel, Mumbai-12. Rabbit was apparently healthy with temperature, respiration & Heart rate within normal limits. Clinical signs manifested were ocular discharge, conjunctivitis & protrusion of bright red mass along the medial canthus of eye. Ophthalmic examinations included Schirmer's Tear Test and direct ophthalmoscopic examination. Preoperatively animals were treated for 2-3 days with Tobramycin- Dexamethasone eye drops instilled b.i.d. to rule out ulcer and reduce inflammation of eye. Preanaesthetic, Inj. Atropine sulphate @ 0.05 mg/kg s/c and Anesthesia, Ketamine @ 20-50 mg per kg body weight and inj. Xylazine @ 1-5mg per kg body weight. The rabbit was managed by Morgan's Pocket technique. Post-operative management included instillation of 2- 3 drops of Tobra-D eye drops b.i.d., cyclosporine ointment application and Tab. Carprofen @ 2.2 mg/kg BW PO s.i.d. for 3-5 days. Rabbit showed uneventful recovery.

OPH-9

DIAGNOSIS AND MANAGEMENT OF CORNEAL ULCER IN DOGS

Kuldeep, Shivangi Pandey, Gaurav Sharma, Vidya Meena, Shivangi Dwivedi,
Vilas D. and S.K. Jhirwal

*Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences,
Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan*

Corneal ulcer is one of the most common eye affection in dogs which leads to blindness. The present study was conducted on six dogs of different sex, age and breed, turned to Veterinary Clinical Complex, College of Veterinary and Animal Science, Bikaner with history of epiphora, blepharitis and localized or complete corneal opacity with partial to complete loss of vision. Corneal ulcer was diagnosed by fluorescein dye test and other ophthalmic examination of eye. Corneal ulcers were treated by eye drops atropine, eye drops of broad spectrum antibiotics and non-steroidal anti-inflammatory drug. In 2 dogs out of 6 topical serums was also instilled to manage it while in another 2 dogs deep corneal ulcers were managed by cauterization with povidine iodine swab. Out of 6, 4 dogs were found to recover vision successfully, while in 2 dogs; vision recovered till 3 weeks.

OPH-10

ORBITAL MUCOCELE IN NEW BORN CALVES

Priti Patel, Rohini Gupta, **Jatin Khurma**, Vaibhav Bhardwaj and Prem Singh

*Department of Veterinary Surgery and Radiology,
International Institute of Veterinary Education and Research, Bahu Akbarpur, Rohtak, Haryana*

Four new born buffalo calves with age of 7-15 days were admitted with the history of bulging of left eye since from the birth however there was no swelling over the right eye. The eyelids of the bulged eye were clearly demarcated and only congested conjunctiva was visible. The milk intake, defecation and urination was normal in these calves. On clinical examination, two calves had continuous oozing of mucoid discharge from the left eye. The rectal temperature, respiration and the heart rate was normal. Blood report of these calves showed haemoglobin values between 12-14 gm%, TLC count 12-14 thousands/mm³ and neutrophil count 55- 65%. For ultrasonographic examination, the calves were sedated with xylazine and restrained in lateral recumbency with left eye upward. There was anechoic fluid image toward dorsal side with echogenic granules of thick mucus toward ventral side of the bulging. The eye ball was pushed toward lateral side due to pressure of the fluid. Microscopic report of mucus material revealed clear fluid without any presence of blood cells. Cultural sensitivity report in one calf revealed growth of streptococcus and staphylococcus sensitive to penicillin, gentamicin, chloramphenicol, ceftriaxone and neomycin. The eye was washed with 2% boric acid/normal saline solution followed by injection of prednisolone and gentamicin into the orbit on alternate days five times. Ciprofloxacin (ceflox) eye drops were instilled into the eye two times a day for 14 days. After 20 days follow up showed complete recovery in three calves while in fourth calf vision couldn't be restored.

OPH-11

BILATERAL OCULAR DERMOID IN TWO SAHIWAL MALE CALVES AND ITS SURGICAL CORRECTION

Rukmani Dewangan, M.O. Kalim, Raju Sharda and Devendra Yadav

*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H.,
Anjora, Durg, Chattisgarh*

Two sahiwal male cow calves about one-month old were brought to the Department of Veterinary Surgery and Radiology with a history of abnormal haired mass on both the eyes since birth. It was diagnosed as congenital bilateral conjunctival dermoid based on history and clinical examination. The animals were restrained in lateral recumbency and auriculopalpebral nerve block was done using 2% lignocaine hydrochloride. Both the dermoids were removed from the underlying tissue by superficial flap resection and simple interrupted sutures were applied using 3-0 chromic catgut. Postoperatively, Inj. Intacef 1.0 g for 5 days and Inj. Meloxicam 2 ml IM for 3 days were administered. Oflox-D eye drops were instilled 4 drops thrice daily for 10 days. The calf showed uneventful recovery was re-examined after two months did not reveal any recurrence of dermoid.

OPH-12

SUCCESSFUL TREATMENT OF A DESCEMETOCELE USING CYANOACRYLATE GLUE IN A PUG

Thomas E.G., Bhadsavle K., Ubale A.S., Dalal L.R. and Kelkar P.

Pet Zone Veterinary Clinic, Mumbai, Churchgate, Maharashtra

Pugs very commonly get corneal ulcers which can progress rapidly and cause corneal ruptures. We describe a case of a 4-year-old Pug who developed a descemetocoele (2 mm) along with a superficial corneal ulcer surrounding it. Under general anesthesia, the superficial ulcer was debrided with an Alger brush II followed by application of bandage lens and a partial tarsorrhaphy. Since a descemetocoele can easily rupture, Pet Zone Veterinary Clinic in collaboration with The Eye Vet treated the small descemetocoele with a drop of corneal glue (cyanoacrylate) followed by a partial tarsorrhaphy covering the affected portion of the cornea under general anesthesia. The patient was at ease post the procedure and the cornea healed well with minimal scarring and tested negative with the fluorescein dye test one week later. Cyanoacrylate offers a convenient and effective option in the treatment of small corneal defects in canines.

OPH-13

SURGICAL MANAGEMENT OF EYE INJURY IN AN INDIAN EAGLE OWLET- A CASE REPORT

Ankur Sharma, R.B. Kushwaha and Nawab Nashiruddullah

*Division of Teaching Veterinary Clinical Complex, Faculty of Veterinary Science and A.H.,
R.S. Pura, SKUAST-J, Jammu, J&K*

An Indian eagle owlet (*Bubonic bengalensis*) weighing 100 gms was presented to TVCC, SKUAST-

J, RS Pura, Jammu by a bird lover with the history of right eye injury. On clinical examination the right eye tube with its adjacent structures were damaged completely along with both torn eyelids at the lateral aspect. Ketamine anaesthesia was administered @ 50mg/kg b.wt i/m and the owl was placed in left lateral recumbency. The eyelids were repaired to their normal anatomical position and extirpation of eye tube was performed. Post-operatively, oral antibiotics were administered for 5 days and daily antiseptic dressing was suggested, but the owner reported that the owl died on 8th post-operative day.

OPH-14

STUDIES ON INCIDENCE AND CLINICAL MANAGEMENT OF KERATOPATHIES IN DOGS

K.G. Bodat, S.K. Jhala, V.S. Dabas, D.N. Suthar, P.V. Chaudhary and P.V.V. Subbarao

*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H.,
Navsari Agricultural University, Navsari, Gujarat*

In the present study, 24 cases of keratopathies comprising of pigmentary keratitis and ulcerative keratitis (n=07 each), superficial keratitis (n=06), endothelial dystrophy (n=03) and corneal degeneration (n=01) were observed in dogs of different age, breed and sex. Routine ophthalmological examination comprised of examination of various neuro-ophthalmic reflexes, Schirmer's tear test, fluorescein staining test, TFBUT and antibiotic and sensitivity testing. The cases of different keratopathies were managed either medically or surgically depending upon condition of eye. The results of which will be discussed.

OPH-15

MINOR LABIAL SALIVARY GLAND TRANSPLANTATION FOR MANAGEMENT OF DRY EYE IN BRACHYCEPHALIC BREEDS OF DOGS

Karthika T., C.B. Devanand, Sudheesh S. Nair, Dileep Kumar K.M., Anoop S., Soumya Ramanakutty and Sumena K.B.

*Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences,
Kerala Veterinary and Animal Sciences University, Mannuthy, Thrissur, Kerala*

Six dogs of brachycephalic breed presented to University Veterinary Hospital Mannuthy and Kokkalai, KVASU were selected irrespective of age and sex for treatment of dry eye by auto-transplantation of minor labial salivary gland to the upper conjunctival fornix under general anaesthesia. The animals were thoroughly investigated by detailed clinical, physiological, preliminary general ophthalmic examination, haematological, biochemical and wet film examination before surgical procedure and continued the follow up observations every two weeks during the post-operative period up to 60th day. Basal tear production (STT), visual function test, intraocular pressure and Tear film breakup time (TBUT) were also assessed pre-operatively and continued every two weeks of post-operative period up to 60th day. Labial salivary gland auto-transplantation was performed in all six dogs. Initially the mean STT value was 10mm/min and TBUT was less than 4 sec but after minor labial salivary gland transplantation the STT value increased

significantly up to 15mm/min and TBUT increased significantly up to 6 sec. on 60th post-operative day. The study concluded that auto-transplantation of minor labial salivary gland as a surgical treatment for the management of dry eye in brachycephalic breeds of dogs without any complications considering its value as a simple method and its merit in enhancing tear production and tear film breakup time.

OPH-16

MANAGEMENT OF CORNEAL OPACITY IN THEILERIOSIS AFFECTED CALVES: A CASE STUDY OF 5 CALVES

Kuldeep, Shivangi Pandey, Rajnish Kumar, Kundan Meena and S.K. Jhirwal

*Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences,
Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan*

Present study was conducted on five cattle calves of different sex, breed and age below three months. These calves were presented to Veterinary Clinical Complex, College of Veterinary and Animal Science, Bikaner with the common history of anorexia, lacrimation, impaired vision, diarrhoea (sometimes dysentery) and bulging of eyes. The careful clinical examination of all cases revealed high body temperature, enlarged lymph nodes, heavy tick infestation, cloudiness in eyes and exophthalmos. Theileriosis was confirmed by hematology, blood smear examination and also by lymph node biopsy. Out of these five calves, in only one calf Koch blue body was seen on lymph node biopsy. Another four calves were diagnosed with the help of microscopic examination of blood smear and found positive for *Theileria annulata*. These calves were treated with inj. Buparvaquone @ 2.5 mg/ kg B.W. Corneal opacity were managed by combination of inj. Gentamicin and Dexamethasone subconjunctival along with topical antibiotics and non-steroidal anti-inflammatory eye drops which helped in fast recovery.

OPH-17

MANAGEMENT OF MULTIPLE POST-OPERATIVE COMPLICATIONS IN A DIABETIC DOG – A CASE REPORT

Bhadsavle, K. and Kelkar P.

The Eyevet Multispeciality Clinic, Mumbai, Maharashtra

An 8-year old diabetic dog was operated in the right eye for cataract by phacoemulsification and intra-ocular lens implantation. The patient developed dry eye and post-operative ocular hypertension for subsequent two days which was managed by aqueocentesis and anti-glaucoma eyedrops. On the third day, a superficial corneal ulcer was detected which was treated with Alger-brush debridement two times without success. After the third Alger-brush debridement patient was started on Amnion drops which helped to heal the ulcer. Patient then developed moderate corneal oedema which reduced his vision significantly. This was treated with topical and systemic anti-inflammatory medication. After 4 weeks of multiple complications, this patient still has a good quality vision in the operated eye.

OPH-18

MANAGEMENT OF GLAUCOMA USING INTRA-VITREAL GENTAMICIN INJECTION IN DOGS

Kelkar P. and Bhadsavle, K.

The Eyevet Multispeciality Clinic, Mumbai, Maharashtra

Uncontrolled glaucoma is a painful condition which results in permanent loss of vision. The pain associated with glaucoma is debilitating and can cause depression, loss of appetite and behavioral changes. Intravitreal gentamicin injection can be successfully used as the least invasive method to treat these uncontrolled glaucoma cases. Exclusion criteria used for these cases was intra-ocular and extra-ocular neoplasia, anterior lens luxation, endophthalmitis.

OPH-19

MEDIAL CANTHAL BLEPHAROPLASTY FOR MANAGEMENT OF MEDIAL CANTHAL ENTROPION AND CARUNCULAR TRICHIASIS ASSOCIATED WITH BRACHYCEPHALIC OCULAR SYNDROME IN A PUG

Sooryadas S., **Nagashree V.**, Reji Varghese, Jinesh Kumar N.S., Gisha G. Nair, Rahul Rao and Dinesh P.T.

Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences, Kerala Veterinary and Animal Science University, Pookode, Wayanad, Kerala

A two-year-old female Pug was presented with corneal melanosis and epiphora at medial canthus. Visual function tests (OU) were normal. Macrophthalmos, incomplete blinks, reduced corneal sensitivity, lower eyelid medial canthal entropion, hair on medial caruncle rubbing on eye, corneal pigmentation from nasal limbus were noticed (OU). Pigmentation extended from nasal limbus to the centre of the cornea (OU). Schirmer Tear Test values were normal and FDT stained negative (OU). Under general anesthesia, medial canthoplasty (OU) was resorted to, for the correction of medial canthal entropion and caruncular trichiasis. Follow up examination revealed dispersal and dilution of corneal pigmentation, and resolution of epiphora and wetness at medial canthus. From this case it could be concluded that medial canthal blepharoplasty was successful in correcting the abnormalities of wide palpebral opening, medial canthal entropion and medial caruncular trichiasis, and addressing the corneal pigmentation associated with brachycephalic ocular syndrome in this Pug.

OPH-20

SURGICAL MANAGEMENT OF DEEP CORNEAL ULCERS IN DOGS

Gauri Khante, Reena Nathani, S.V. Upadhye, S.B. Akhare, A.M. Kshirsagar and Ushma Patel

Department of Veterinary Surgery and Radiology, Nagpur Veterinary College, Maharashtra Animal and Fishery Sciences University, Nagpur, Maharashtra

Total six dogs of different breeds with corneal ulcers for varying duration were presented to the TVCC of Nagpur Veterinary College, Nagpur. The cases failed to respond to the medicinal management.

There cases were surgically treated with conjunctival pedicle grafts followed by blepharoplasty. Antibiotic and analgesic ophthalmic preparations were instilled. All the cases showed corneal ulcer healing, reversion of corneal edema and opacity by 60th day.

OPH-21

PROCESSED HUMAN AMNIOTIC MEMBRANE GRAFTING FOR TREATMENT OF CORNEAL ULCERS IN DOGS

Nagashree V., Sooryadas S., Vasudevan V.N., Dinesh P.T., Jinesh kumar N.S.,
Umesh C.G. and John Martin K.D.

*Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences,
Kerala Veterinary and Animal Science University, Pookode, Wayanad, Kerala*

Corneal ulcers are common in veterinary practice. Simple corneal ulcers may heal without any much veterinary attention. Some become chronic, refractive to medical therapy and presented to referrals. The study was conducted in six dogs with corneal ulcers, of varying type and extent, presented to the Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences, Pookode. Detailed clinical and ophthalmic examination was carried out to assess type and extent of lesion in all six dogs. All the dogs were subjected to topical antibiotic (moxifloxacin) one drop q.i.d, NSAID (flurbiprofen) one drop t.i.d and cycloplegic (atropine) one drop o.d on the affected eye. An interval of ten minutes was given between the medications. Following surgical debridement of the ulcers, onlay grafting was done with the processed human amniotic membrane. An Elizabethan collar was provided in all the cases until complete healing. Nature of the ocular discharge, conjunctival changes, results of visual function tests, blink reflex, number of blinks per minute, direct and indirect ophthalmoscopic examination findings, results of Schirmer tear test and findings of fluorescein dye test were recorded on 0th day and on 3rd, 7th, 14th and 30th post operative days. Transplantation of processed human amniotic membrane was effective in corneal healing and all the dogs regained their vision without any complications.

OPH-22

SUBCONJUNCTIVAL ABSCESS IN CALVES-A REPORT OF EIGHT CASES

Dharmaceelan, S., Ninu, A.R., Kokila, S., Vishnugurubaran, D., Bharathidasan, M.,
Sweetline Anne, N, Ram Prabhu R and Johnson Rajeswar, J.

*Department of Veterinary Surgery and Radiology, Veterinary College and Research Institute,
Tamil Nadu Veterinary and Animal Sciences University, Tirunelveli, Tamil Nadu*

Sub conjunctival abscess is rarely reported in calves and the present case report discusses the condition in eight calves. All the calves were aged between one and a half to 8 months. One was male calf and rest were females. They were HF crossbred and Jersey crossbred animals. The cases were presented after a period of 6 days to one month. The cause was unknown in all cases except one, where there was a report of eye injury by the grass blades. The condition mimicked chemosis in one case but was differentiated later by the pointing of the abscess once it matured. Clinical signs in these cases included blepharitis, epiphora, drooping of the eyelids and a protruding conjunctiva through the palpebral fissure. The conjunctiva

of the lower eyelid, upper eyelid or the nictitating membrane was involved. Confirmatory diagnosis was made by fine needle aspiration of the swelling. Pus was whitish to yellowish or yellowish green in appearance and was watery to thick in consistency. The pus was sent for culture and isolation of the causative organism. *Bacillus* species and *Staphylococcus aureus* were isolated from these cases. After ABST (Antibiotic Sensitivity Testing) these microbes were found to be sensitive to Enrofloxacin, Gentamycin, Amikacin, Ofloxacin, Cefotaxime/tazobactam and Amoxicillin clavulanate. In all the cases, once the abscess was mature, it was lanced and pus was drained under auriculopalpebral and retrobulbar nerve block. Antibiotic and NSAID eye drops were prescribed post-operatively. Systemic antibiotics were also administered if needed. Prognosis was good in all cases.

OPH-23

PHARMOCOLOGICAL CYCLODESTRUCTION AND SURGICAL MANAGEMENT OF GLAUCOMA IN DOGS

Shriram Ganesan, Vikash Chauhan, Correia Salisha, Vaibhav Bishnoi and Samar Mahendran
CGS Hospital, Gurugram, Haryana

The aim of this study is to maintain normal intraocular pressure (IOP) in acute and chronic glaucomatous eyes of dogs. From Sep 2018- Sep 2019, twelve dogs were brought to CGS Hospital, Gurugram with complaints of hazy cornea, buphthalmus, congested conjunctival mucous membrane and loss visual acuity. Upon clinical examination, those pets had elevated IOP (> 50 mmHg), moderate to severe corneal edema, absence of menace response, absence of pupillary light reflex and dazzle reflex and diagnosed as Glaucoma (14 eyes). Anterior chamber paracentesis was done followed by pharmacologic cyclodestruction of ciliary body by injecting gentamicin, intracamerally. For five pets in which refractory increase in IOP, Trabeculectomy surgery was performed. Post-operatively and Post-pharmacologic ablation, the IOP was maintained between 10-25 mmHg except one eye in which the IOP was high due to vitreal haemorrhage and enucleation was performed. Over the follow-up period, four eyes had undergone phthisis. Pharmacological cyclodestruction in adjunct with trabeculectomy can be employed to treat glaucomatous eyes of dogs.

OPH-24

HOTZ-CELCUS TECHNIQUE FOR SURGICAL CORRECTION OF ENTROPION IN FOUR DOGS

K.P. Patel, J.K. Mahla, Ashwath Kumar S.N., R.R. Anjana, P.V. Parikh and P.B. Dabhi
Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H., Anand Agricultural University, Anand, Gujarat

Four dogs were presented with different ocular entities along with compromised ocular field of vision. On detailed ophthalmic examination two dogs (n=3 eyes) had corneal ulcer, one dog had bilateral corneal melanosis and one dog had epiphora (n=2) which was due to in-rolling of lower eyelids. Hence, all the dogs were diagnosed for entropion. Corneal ulcer and corneal melanosis were managed medically. Surgical correction of entropion was done by Hotz-celsus technique under general anesthesia. Post

operatively all the dogs received topical antibiotics and anti-inflammatory along with supportive post-operative care along with Elizabeth collar application. All the dogs recovered uneventfully after 14 post-operative days and near normal visual field.

OPH-25

PHACOEMULSIFICATION FOR MANAGEMENT OF CANINE CATARACT

Amit Kumar, S.P. Tyagi, Adarsh Kumar, Nikita Mastkar and Rohit Kumar

Department of Veterinary Surgery and Radiology, Dr. G.C. Negi College of Veterinary and Animals Sciences, CSK Himachal Pradesh Agriculture University, Palampur, HP

Dogs suffering from cataract made the subject of the present study. Complete clinical examination included physical, hemato-biochemical and ophthalmic examinations. All cases were subjected to a standard preoperative treatment protocol starting 3-5 days prior to surgery. All the surgeries were done under operative microscope. After achieving general anaesthesia, the central eyeball position was accomplished by using neuromuscular blocking agents. Phacoemulsification procedure for extraction of cataracts was employed in eighteen dogs out of total 22 surgeries undertaken for cataract removal. The phacoemulsification was done using two port corneal incisions. Eyeballs was positioned in front of operating microscope and stabilized with 2-4 stay sutures. The major and minor surgical ports were made as clear corneal incisions at about 10-11 and 2-3 O'clock position respectively. Trypan blue dye was used to stain anterior capsule of lens satisfactorily and 1 ml of diluted adrenaline (1:10000) was used intra-camerally to augment the mydriasis. Different Ophthalmic viscosurgical devices were used to maintain the shape of anterior chamber. A clean circular capsulotomy of a desirable diameter (5-6 mm) could be performed in twelve cases using continuous tear curvilinear capsulorhexis and the intraocular lens could be placed in 5 dogs following phacoemulsification and extraction of lens. The paper describes the preoperative protocol, various intraoperative steps along with complications and post-operative protocols and post-operative complications with short and long-term success rate of cataract surgery using phacoemulsification.

OPH-26

TREATMENT OF SUPERFICIAL CORNEAL ULCERS IN THREE DOGS USING PLATELET RICH PLASMA (PRP) EYE DROPS

Sooryadas S., Gisha G. Nair, **Anjana Satheesh**, Dinesh P.T.,

Jinesh Kumar N.S. and Johnson Chiang S.M.

Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences, Kerala Veterinary and Animal Science University, Pookode, Wayanad, Kerala

Platelet rich plasma are rich in proteins and growth factors, which make it possible for cells to proliferate, and migrate, thus stimulating healing and regeneration of tissues. Three dogs presented with superficial corneal ulcers were treated with platelet rich plasma (PRP) eye drops. A single drop of the platelet rich plasma was administered five times daily astopical application, for a week. Corneal oedema reduced from third day onwards. There was complete resolution of the corneal ulcers and return of corneal

transparency within 10 days, in all three dogs. The observations suggest that superficial corneal ulcers heal well with topical application of platelet rich plasma eye drops.

OPH-27

DIAGNOSING BLINDNESS IN DOGS: A CLINICAL STUDY

S.K. Jhirwal, Kuldeep, Gaurav Sharma, P. Bishnoi and T.K. Gahlot

*Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences,
Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan*

Dogs can go blind for a number of reasons, from disease to old age. This study was conducted on 20 cases of dogs presented at the department of Veterinary Surgery and Radiology, VCC, CVAS, Bikaner with the history of vision deficit. A thorough ophthalmological and haemato-biochemical diagnostic protocol was followed to reach on a conclusive diagnosis. Majority of the cases underwent ocular B-mode ultrasound and Electroretinography (ERG) for the differential diagnosis between the sudden acquired retinal degeneration (SARD) and optic neuritis. On the basis of history and detailed ophthalmological examinations the causes of blindness were found to be Cataract (n=6), corneal pigmentation (n=5), corneal edema (n=2), SARD (n=5), Glaucoma (n= 2). It was concluded that a complete clinical ophthalmological examination and neurologic assessment through ERG should be done in each case of vision deficit for efficient management of blindness.

OPH-28

AN APPROACH TO DIAGNOSE AND TREAT OCULAR INJURIES IN DOGS

S.K. Jhirwal, Vidhya, Kundan Meena, P. Bishnoi and T.K. Gahlot

*Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences,
Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan*

12 dogs of different breeds and of either sex with variable age presented at department of Veterinary Surgery and Radiology, CVAS, Bikaner with diverse ocular injuries were examined and diagnosed systematically. A simultaneous recording of nature & cause of injury, duration between injury & presentation were also recorded. A systematic ophthalmic examination was done in order to assess the part of the eye involved following ocular injury. The diagnostic tests used to assess the gravity and extent of ocular injury was Schirmer tear test, visual activity test, fluorescein dye test, tonometry etc. Vicious dogs enabled their ocular examinations under deep sedation or general anaesthesia whereas, topical and auriculopalpebral nerve blocks using local anaesthetic were used in docile dogs. Majority of dogs with ocular injury were presented within 6-8 hrs of injury. Diverse ocular injuries diagnosed were proptosis of the globe, eyelid lacerations, corneal lacerations, corneal ulcers and corneal foreign bodies, lacerations and foreign bodies of sclera and blunt trauma to the eye. The injuries within or around the eye were extremely painful hence need an appropriate pain management. The surgical procedures were done under general anaesthesia. These were keratoplasty, tarsorrhaphy, corneal suturing etc. the postoperative treatment and follow up of these cases will be discussed.

OPH-29

SURGICAL MANAGEMENT OF DESCEMETOCELE AND PERFORATED CORNEAL ULCERS USING CORNEO-CONJUNCTIVAL TRANSPOSITION GRAFT

Bhadsavle, K. and Kelkar P.

The Eyevet Multispeciality Clinic, Mumbai, Maharashtra

Descemetocoele and perforated corneal ulcers are a surgical emergency. There are many grafting methods to treat these conditions. Presently, most common techniques used in India are conjunctival graft and third eyelid flap which have many limitations. We treat these conditions using corneo-conjunctival transposition graft with a very high success rate in terms of healing-time, clarity of the cornea post-healing, preservation of vision after surgery, preservation of the globe after surgery. In conclusion, the author prefers corneo-conjunctival transposition graft technique over above-mentioned techniques to treat descemetocoele and perforated corneal ulcers.

OPH-30

SURGICAL MANAGEMENT OF OPHTHALMIC COMPLICATIONS ASSOCIATED WITH BLOOD PARASITES IN DOGS

Bhadsavle, K. and Kelkar P.

The Eyevet Multispeciality Clinic, Mumbai, Maharashtra

In dogs, tick-borne parasites namely Babesia, Ehrlichia, Hepatozoon canis, Anaplasma spp., Mycoplasma spp. have a wide-spread occurrence in a tropical country like India. These diseases can manifest as sudden chronically mildly inflamed eyes, chronic corneal oedema, painful red eyes or loss of vision. Some of these cases need surgical management for conditions like acute glaucoma which is non-responsive to medical management; acute focal corneal oedema and deep corneal ulcers. In this paper we discuss multiple surgical modalities for management of these painful ophthalmic complications keeping in mind the multi-organ involvement and anaesthetic safety.

OPH-31

COMPARATIVE EVALUATION OF DECELLULARISED BOVINE OMENTUM ALONE AND IN COMBINATION WITH MITOMYCIN-C IN THE MANAGEMENT OF CORNEAL INJURIES IN DOGS: A REPORT OF 12 CASES

Thajunnisa A.S., Anoop S., Devanand C.B., Dileepkumar K.M., Vasudevan V.N. and Laiju M. Philip

Department of Veterinary Surgery and Radiology,

Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences,

Kerala Veterinary and Animal Sciences University, Mannuthy, Thrissur, Kerala

The study was undertaken to evaluate the efficacy of decellularised bovine omentum alone and in combination with Mitomycin- C in the management of corneal injuries in dogs. All the cases with corneal

injuries which subsequently lead to corneal ulceration presented to University Veterinary Hospitals of Mannuthy and Kokkalai, KVASU were screened and 12 corneas were selected from 11 animals irrespective of breed, age and sex. Detailed ophthalmic examination was carried out in all the cases. Twelve corneas selected were randomly divided into 2 groups, Group I and II, consisting of six corneas each for surgical treatment. Under general anaesthesia corneal grafting was carried out in Group I, whereas Group II corneas underwent single time intra-operative application of topical Mitomycin-C for 2 minutes before corneal grafting with decellularised and gamma irradiated bovine omentum. All the corneas were protected by temporary tarsorrhaphy which was retained up to day 7 and observations viz. corneal oedema, neovascularization, extent of pigmentation, scarring and corneal clarity were serially recorded on day 7, 14, 21 and 60 post-operatively. From the present study it was concluded that re-epithelialization of cornea was enhanced by corneal grafting with decellularised bovine omentum and application of Mitomycin-C was effective in controlling corneal fibrosis.

OPH-32

DIAMOND BURR DEBRIDEMENT - AN ALTERNATIVE THERAPY FOR TREATING SCCED (SUPERFICIAL CHRONIC CORNEAL EPITHELIAL DEFECTS) IN DOGS

Viraj Rathod, Sumana Gharami and Sarbani Hazra

*Department of Veterinary Surgery and Radiology, Faculty of Veterinary Science and A.H.,
West Bengal University of Animal and Fishery Sciences, Kolkatta, West Bengal*

Superficial chronic corneal epithelial defects are common in middle aged dogs; the major pathology underlying the condition is improper adherence of the proliferating epithelial cells to the basement membrane. Grid keratotomy has been conventionally used to treat the condition; however, a risk of perforating the cornea remains and sedation or general anaesthesia is advocated for the procedure. Diamond burr debridement has shown superior success rate and comes without the risk of corneal perforation and is usually performed without sedation. We hereby present some cases of SCCED successfully treated with diamond burr debridement. Five Dogs with SCCED were identified following detailed history and examination with fluorescein staining under slit lamp bio microscope. Routine blood examinations were conducted to plan sedation in case it was required. The ocular surface was aseptically prepared using 1:50 povidone iodine. Topical anaesthesia was instituted with proparacain HCL (Paracain)®. The eyelids were retracted with speculum. Patients were manually restrained under the operating microscope. The loose epithelium surrounding the defect were completely removed with a cotton tipped applicator, which exposed the bigger defect underlying as delineated by fluorescein dye. The sterile diamond burr, AlgerBrush II, hand held unit (Alger company Inc) was passed over the entire defect in repeated circular movements gently and with uniform pressure including the edges of the defect. The patients were put on topical, tropicamide (3 days), moxifloxacin, flubiprofen and tear substitute drops for 2 weeks, routine weekly examination under slit lamp biomicroscope was performed to evaluate the healing till negative fluorescein retention was observed. The patients were put on E-collar till complete healing was confirmed. The patients could be physically restrained for the procedure. A weekly follow-up was performed and average time for healing in the present study was 14 days, in one case a repeat debridement was performed after a week. All ulcers healed without complication. Diamond burr debridement is a safe and effective therapy for SCCED in dogs.



Orthopaedic Session

MEET THE SPEAKER



Dr. Thotta Narasimhalu Ganesh

Professor

Faculty of Veterinary Medicine

University Malaysia Kelantan

thotta.ng@umk.edu.my

Dr. Thotta Narasimhalu Ganesh graduated from Madras Veterinary College (MVC), India in the year 1978 and obtained B.V.Sc degree from Tamil Nadu Agricultural University (TNAU). After serving in a research project on cytogenetics at the Madras Medical College, he joined his alma mater in 1980 as an academic member of staff. As a result of his passion for surgery, he pursued masters and completed M.V.Sc degree in Veterinary Surgery from TNAU in 1983. In the years to follow, he completed the doctorate programme in 1992 and earned his PhD degree in Veterinary Surgery from Tamil Nadu Veterinary and Animal Sciences University (TANUVAS). His enthusiasm towards orthopaedics led him to select research topics in Small Animal Orthopaedics (such as) femoral head prosthesis for dogs and bone grafting techniques in dogs for his masters and PhD programmes respectively. Furthermore, he persisted his career in Small Animal Orthopaedics by undergoing an AO (Association of Osteosynthesis) fellowship training under Dr. John E.F. Houlton, the Chief small animal orthopaedic surgeon at Cambridge Veterinary School, UK in the year 1996. Dr. Ganesh was also responsible for many postgraduate research works on orthopaedics and introduced new techniques in orthopaedics at the MVC Teaching Hospital during his time there. Dr. Ganesh mastered his orthopaedic surgical skills further by enduring an advanced training in Small Animal Orthopaedics under the mentorship of Dr. Charles DeCamp, the Specialist small animal orthopaedic surgeon at the College of Veterinary Medicine, Michigan State University, USA during the year 2007.

Dr. Ganesh served Madras Veterinary College, TANUVAS in different roles since 1980 and was the Unit officer for Small Animal Orthopaedic Unit for many years. He then retired as the Professor and Head for the Department of Veterinary Surgery and Radiology, Madras Veterinary College and the Director of Clinics incharge, Tamil Nadu Veterinary and Animal Sciences University, Chennai during December 2015. He has a plethora of global exposure in the field of teaching and surgery. Dr. Ganesh has worked at 'The University of the West Indies - School of Veterinary Medicine' in Trinidad and Tobago for five years during the period 2008-2013 as the Senior Lecturer in Veterinary Surgery and also as the Specialist Small Animal Orthopaedic Surgeon, at the Veterinary Teaching Hospital. In the recent past, he served Addis Ababa University-College of Veterinary Medicine and Agriculture as Professor of Veterinary Surgery between November 2016 and April 2017.

Dr. Ganesh has published 91 papers in peer-reviewed journals and mentored 17 masters and 1 PhD student in Veterinary Surgery as an advisor. He has travelled around the globe to attend conferences for paper presentations and also as a guest speaker.

Dr. Ganesh continues to be active in the profession and academics due to his zeal for Veterinary surgery and teaching. Presently he is serving the University Malaysia Kelantan-Faculty of Veterinary Medicine as Professor.

CHANGING CONCEPTS IN FRACTURE TREATMENT – TOOLS AND TECHNIQUES TO ACHIEVE RELATIVE STABILITY

Thotta N. Ganesh

*Department of Clinical Studies, Faculty of Veterinary Medicine
University Malaysia Kelantan, Malaysia*

Introduction

For many years the goal for fracture stabilization of long bones was an exact reduction of all fracture fragments in combination with a rigid osteosynthesis and also interfragmentary compression using dynamic compression plate or lag screw. Periosteum and muscle tissue had to be dissected/ removed to obtain an anatomical reduction of all fragments which resulted not only in lack of callus formation but also in decreased bone perfusion. Also, it was difficult to monitor fracture healing by radiographs. Complete bone healing was delayed in many cases and hardware failures were often the result.

The goal in modern fracture stabilization, using either a plate or nail osteosynthesis, is to maintain the fracture hematoma and the perfusion of the bone, a so-called biological osteosynthesis. The AO (Arbeitsgemeinschaft für Osteosynthesefragen/ Association of Osteosynthesis) proposed the need for biological fracture management. An intact perfusion of bone and soft tissue is more important for fracture healing than mechanical stability. In a biological osteosynthesis the periosteum is preserved where possible, an indirect reduction is performed, and small fracture fragments are left in place. The goal is to restore the length, axis, and rotation of the bone without altering bone perfusion. It was recognized that **callus formation is not a sign of instability but a natural and important process in fracture healing**. Micromotion at the fracture gap is necessary in order to obtain callus formation.

The biology of fracture healing:

In addition to the biological factors, many mechanical conditions have to be met for a fracture to heal. The size of the fracture gap and the amount of fracture motion are important criteria that can improve or delay fracture healing. Bone healing principles could be understood by distinguishing between osteonal and non-osteonal bone healing. In **non-osteonal fracture healing**, abundant callus formation. This type of fracture healing is observed after cast immobilization, for example, where the fracture gap and the motion between the fragments are large. Abundant callus is needed to reduce motion at the fracture site, which finally allows remodelling and bone healing.

In a mechanically stable situation, as is the case in a rigid osteosynthesis, **primary osteonal fracture healing** will take place. Regenerating osteones will migrate directly from one fragment through the fracture gap to the opposite fragment. No remodeling will take place and no callus will be seen which is possible only when the fragments are in direct contact. It does occur after rigid plate osteosynthesis with anatomical reduction and interfragmentary compression. However, less rigid osteosynthesis results in micromotion at the fracture site. In this case, fracture healing is initiated by periosteal and endosteal callus formation, followed by osteonal fracture healing. This is called “**secondary osteonal fracture healing**”. Remodeling processes are fast as long as the bone fragments are in direct contact or with only a small fracture gap. Presently, fracture healing is attempted to be achieved by secondary osteonal fracture healing. Hence,

surgeon should know in what way he or she can influence the amount of micromotion with relative stability at the fracture site and consequently the speed of fracture healing.

The choice of the implant:

Several surgical options such as plate osteosynthesis, intramedullary nailing, or external fixation are available for the treatment of fractures of long bones. The choice can be difficult. In an animal model, fracture healing after four different types of osteosynthesis was compared. Comminuted tibial shaft fractures were treated by (i) rigid plate osteosynthesis using lag screws, (ii) bridging osteosynthesis, (iii) external fixation, and (iv) intramedullary nailing. Of all procedures, the rigid, anatomically reduced plate osteosynthesis showed the highest mechanical stability initially, but the worst course of fracture healing. The best results were obtained with the bridging osteosynthesis and external fixation with an intact endosteal and periosteal perfusion.

Semi-rigid carbon-fibre-reinforced plastic plate: Semi-rigid plates are manufactured to overcome the issues posed by the rigid plates. Epoxy resin is the CFRP plastic of choice for the production of semi-rigid plates. The plate is fixed to the bone using stainless steel screws. These plates were quite successful in providing desirable movement and external bridging callus appeared producing strong union.

Less Rigid Plate: Fracture healing is fairly slower in rigid plates in contrast to less rigid plates. The dilemma can be overcome by designing a plate that permits micromotion restricted to axial direction and must provide shear, bending and rotational rigidity.

Axially Flexible Plates: Foux illustrated a plate that allowed augmented micromotion in axial direction merely, in 1997. This resulted in provision of compression at the fracture site. These plates were found to be successful in achieving spontaneous healing as well as the fragments were bridged before time.

Axially Compressible Plate: After the AFP, it was devised to use a bioresorbable material for manufacturing the cushions, Polylactic acid (PLA) was used for the purpose. The hypothesis was that as the PLA insert went up on to degradation the load would start transmitting from plate to the bone imparting healing of the bone. These plates caused excessive micromotion and delayed union so a successful insert would be the one that would allow union analogous to the biologic union with compact stress shielding.

Application of relative stability principles:

Relative stability principles which allows controlled motion at the fracture site are followed in certain modes of fracture fixation techniques viz: Dynamic plate osteosynthesis, Elastic Plate Osteosynthesis, Titanium Elastic Nailing, Dynamization with staged disassembly of the External Skeletal Fixators and casting.

Dynamic plate osteosynthesis: "Dynamic Plate Osteosynthesis" refers to plate fixation that allows micromotion which is different from "Dynamic Compression Plating". The surgeon performing a plate osteosynthesis has different possibilities to influence fracture healing. He/she can control micromotion at the fracture gap and fixation strength of the plate. It has been demonstrated that lag screws reduce motion at the fracture gap dramatically. Axial stiffness and torsional rigidity are influenced mainly by the bridging length; for example, the distance of the first screw from the fracture site. Micromotion increases exponentially with increasing bridging length. Omitting two or three plate holes at the fracture gap and avoiding lag screws, especially through the plate, allows sufficient micromotion and therefore fast bone healing.

The most important factor to improve pull-out strength of the screws in long bones is the length of

the plate and oblique screws at the plate ends. Another factor is the choice of the plate material. A titanium plate is twice as elastic as a steel plate and therefore allows more micromotion with the same plate configuration. The surgeon can influence fracture healing by the number of screws used. Drilling many screw holes may provoke local heat necrosis and the local endosteal blood flow may be disturbed without improving fixation strength. Hence, only few screws to be used for fracture fixation.

Recommended principles for successful dynamic plating:

- Use long plates.
- Use few screws only.
- Omit two or three plate holes at the fracture site.
- Avoid drilling near the fracture site.
- Avoid lag screws if possible. When a lag screw is indicated for technical reasons, for example in the case of a spiral fracture, never place it through a plate hole.
- Place oblique screws at the plate ends.
- Treat the periosteum with care. Never strip it from the bone. Keep bone fragments covered with muscle and soft tissue.
- Consider the fact that a SS plate is twice as rigid as a titanium plate. Titanium plates allows more micromotion and may be preferred over SS plates. However, for comminuted fractures where the bridging length is large owing to missing bone fragments a SS plate might be the better choice.

Elastic Plate osteosynthesis (EPO): Due to the shortcomings of intramedullary nailing and external fixation techniques, plate osteosynthesis remains the treatment of choice for diaphyseal fractures of long bones in juvenile dogs. However, strict adherence to the classic AO principles of anatomical reduction and rigid internal fixation during the early growth phase routinely results in catastrophic implant failure via screw pullout. The critical evaluation of these failures has led to the development of the biological, elastic plate osteosynthesis technique better suited to the treatment of diaphyseal fractures of long bones in puppies. The technique relies on the increased overall compliance of the bone/plate construct to reduce the risk of focal failure of the screw/bone interface. EPO in conjunction with minimally invasive surgical strategies (MIS) such as restoration of alignment rather than anatomical reconstruction and percutaneous sliding plate techniques to further decrease post-operative morbidity will optimize and hasten functional recovery. With this technique, the preservation of the strong periosteal sleeve, in conjunction with the use of an undersized implant 'Veterinary Cuttable Plate' (VCP) allows controlled motion at the fracture site, which in turn promotes rapid bone healing via callus formation (secondary osteonal fracture healing).

Titanium Elastic Nailing (TEN): The perceived advantage of Titanium elastic nailing due to elasticity of the fixation causes repeated micromotion at the fracture site and thereby promotes faster external bridging callus formation. TEN which is variously known as Elastic Stable Intramedullary Nailing (ESIN) has been highly successful in children. The adaptation of this technique in quadrupeds, along with the development of a large series of appropriately sized implants, may prove challenging in dogs due to the great variability of patient size and body weight. However, studies are being done to replace SS pins with titanium pins for routine IM pinning.

Staged disassembly of ESF: Staged disassembly or dynamization is the process of modifying a ES

fixation frame at approximately 6 weeks after surgery to increase the loading on the healing fracture. Increased loading on the fracture further stimulates bone healing and remodelling particularly in young patients.

Dynamization is also possible and practiced in interlocking nail fixation.

Combination of absolute and relative stability principles:

This type of fixation involves a combination of rigid fixation (ex: lag screw) and less rigid fixation (ex: bridge/biological plating) for an articular/peri articular fracture and extensive metadiaphyseal comminution respectively for a long bone of the same patient.

Summary

- While deciding on fracture treatment, the fracture personality and patient factors determine the fixation construct
- In general, simple fracture patterns and articular fractures are treated with direct/anatomic reduction and absolute stability
- Complex and comminuted fracture patterns are treated with indirect reduction and relative stability
- The goal in relative stability (bridge plating, IMN) is the restoration of length, alignment, and rotation
- Regardless of approach, reduction, and fixation, the soft tissues have to be respected always
- Always remember to choose conservative approach with external coaptation/ casting wherever applicable

References

- Bottlang, Michael; Tsai, Stanley; Bliven, Emily K.; von Rechenberg, Brigitte; Kindt, Philipp; Augat, Peter; Henschel, Julia; Fitzpatrick, Daniel C.; Madey, Steven M. (2017) Dynamic Stabilization of Simple Fractures with Active Plates Delivers Stronger Healing Than Conventional Compression Plating., *Journal of Orthopaedic Trauma*: 31 (2): 71-77. doi: 10.1097/BOT.0000000000000732
- Cabassu J (2001) Elastic plate osteosynthesis of femoral shaft fractures in young dogs. *Veterinary and Comparative Orthopaedics and Traumatology*; 14:40–45.
- Dejardin L M and Cabassu J P (2008) ‘Femoral fractures in young dogs’ *AO Vet Expert Zone AODialogue* 3/08: 39-43
- Juerg Sonderegger *et al.* (2010), Dynamic plate osteosynthesis for fracture stabilization: how to do it., *OrthopedicReviews*; volume 2: e4, doi:10.4081/or. 2010.e4
- Seemab Mehmood, Umar Ansari*, Murtaza Najabat Ali, Nosheen Fatima Rana (2014) Internal fixation: An evolutionary appraisal of methods used for long bone fractures., *International Journal of Biomedical and Advance Research* 05(03): 142-149
- Uhthoff H.K et al (2006) Internal plate fixation of fractures: short history and recent developments., *J Orthop Sci* 11(2): 118-126, doi:10.1007/s00776-005-0984-7
- Norris, Brent L.; Lang, Gerald; Russell, Thomas A. (Toney); Rothberg, David L.; Ricci, William M.; Borrelli, Joseph Jr (2018) ‘Absolute Versus Relative Fracture Fixation - Impact on Fracture Healing’ *Journal of Orthopaedic Trauma*: 32: pS12-S16 doi: 10.1097/BOT.0000000000001124

MEET THE SPEAKER

**Dr. Hari Prasad Aithal**

M.V.Sc., Ph.D., FNAVS, FISVS

*Principal Scientist*Training and Education Centre, ICAR-Indian Veterinary Research Institute
College of Agriculture Campus, Shivajinagar, Pune- 411 005 (Maharashtra)

Dr. Hari Prasad Aithal obtained B.V.Sc. degree in 1989 from Veterinary College, UAS, Bangalore, and completed M.V.Sc. and Ph.D degrees from Indian Veterinary Research Institute, Izatnagar in 1991 and 1997, respectively. Received National Merit Scholarship during the Under Graduation, and Junior and Senior Research Fellowships during the M.V.Sc. and Ph.D degree programmes. Consequent to selection in Agricultural Research Services, started professional career as *Scientist* in the Division of Surgery at IVRI, Izatnagar, in 1993. Subsequently promoted to the post of *Senior Scientist* in 2002 and *Principal Scientist* in 2009 in the same Institute. During >25 years of illustrious career, actively involved in research, post-graduate teaching, training and extension activities. Has been the Principal Investigator or Co-investigator in >20 research projects funded by different agencies. Significant contribution in the field of orthopaedic surgery, especially in the development of novel fracture fixation techniques, regional and general anaesthesia in ruminants, and tissue regeneration and reconstruction. Published more than 270 research papers in scientific journals of repute, including > 70 papers in renowned International Journals. Several research papers have been extensively cited by the researchers worldwide, including the latest editions of standard foreign Text Books of Veterinary Surgery, Veterinary Anaesthesia and Veterinary Pharmacology. As a veterinary surgeon, treated more than 10,000 surgical cases, especially of fractures in different species of animals. Developed novel techniques of regional and general anaesthesia, and several fracture fixation devices/techniques for small and large animals. Submitted two patents, and six designs have been registered in patent office on novel fracture fixation techniques; and two technologies, circular and linear external fixation systems for large animals, have been commercialized. Organised several training programmes for veterinary officers and farmers; several animal health camps in remote villages and actively involved in livelihood improvement programme for tribal farmers. Being *Associate Editor/Editor* of Indian Journal of Veterinary Surgery since 2002, actively involved in timely publication and distribution of the Journal, and has been instrumental in improving the quality of the Journal. For the last several years, as an *external reviewer*, involved in reviewing the research manuscripts for >20 International Journals. Co-edited 'Text Book on Anaesthesia and Analgesia for Veterinary Graduates'; 'Handbook on Field Veterinary Surgery'; Training Manuals on Orthopaedic Surgery, Techniques of Fracture Fixation, Basics of Internal Fixation of Fractures, Fracture Management by External Skeletal Fixation Techniques, Management of Fractures under Field Conditions, Fracture Management in Large Animals, Diagnostic Imaging, Radiology and

Ultrasonography, etc.; Monograph on 'Urolithiasis'; several Book Chapters, Souvenirs and Compendia, and Annual Reports. Guided 5 PhD and 7 MVSc students for their thesis research, and acted as external examiner for UG/PG courses/thesis evaluation/viva-voce examination of PG students of several universities. Has been a member of PME and RFD cells of IVRI and Member Secretary, Institute Animal Ethics Committee. Won many awards and honours, which included *Fellow National Academy of Veterinary Sciences*; *Fellow Indian Society for Veterinary Surgery*; *Best Teacher Award* of IVRI Deemed University; *Dr O Ramakrishna Oration Award* for outstanding contribution in Veterinary Surgery and Radiology (from Indian Society for Veterinary Surgery); *S.J. Anjelo Memorial Gold Medal* for best paper published in Indian Veterinary Journal; *Dr AK Bhargava Memorial Gold Medal* for the best papers published in Indian Journal of Veterinary Surgery (thrice); *Best Paper Award* for the paper published in Asian Journal of Animal and Veterinary Advances; *Certificate of Honour* for the Best Paper Published in INTAS POLIVET; *Elsevier Reviewer Recognition Certificate* for Reviewing of manuscripts for international journals; ICAR award for *Best Annual Report (2013-14)* (as Member Secretary, Editorial Board, IVRI); *Outstanding Achievement Honour 2019* from Senior Veterinarians' Foundation, Maharashtra; besides several Best Paper Presentation Awards at National Conferences.

MATERIAL ADVANCEMENTS IN BONE FIXATION IMPLANTS

Dr. Hari Prasad Aithal

*Training and Education Centre, ICAR-Indian Veterinary Research Institute,
College of Agriculture Campus, Shivajinagar, Pune- 411 005 (Maharashtra)*

Bone fixation has seen various technological advances during the last few decades in terms of implant designs and material advances. Due to the mechanical advantage, metals such as stainless steel and titanium alloys have been extensively used and are still being used in load-bearing applications. However, they have the main limitations of a high stiffness leading to stress shielding, and requiring a second surgery for their removal. Hence, of late, attention is being given towards developing low-stiffness biodegradable fixation devices, which retain their strength long enough to support healing of bone, and then gradually and harmlessly disintegrate in the patient's body. Various novel biodegradable materials (metallic and non-metallic) have been investigated and used as bone fixation devices. In recent years, biocomposites have emerged as the potential materials for manufacturing bone fixation devices, as they can be easily customized as per the patient and clinical requirements. In days to come, metallic implants may begin to be replaced by these 'biointegrative' materials.

Non-biodegradable Metallic Implants

Today, stainless steel and titanium alloys are the two most commonly used metals in manufacturing bone fixation devices because of their excellent mechanical strength and resistance to fracture. Stainless steel AISI 316L (ASTM F138 & F139) is extensively used for manufacturing implants such as bone pins/nails, plates, screws, and other implanted medical devices, besides surgical implements. These materials have high corrosion resistance as they spontaneously form oxides on the surface in various environments. On the other hand, titanium (Ti) and Ti alloys [commercially pure Ti (ASTM F67) and Ti-6Al-4V ELI alloy (ASTM F136)] have been preferred for implantation in the biomedical field due to their good mechanical properties, excellent corrosion behaviour, good biocompatibility, a relatively low Young's modulus, light weight and non-magnetic behaviour. Cobalt-chromium (Co-Cr) alloys have been recommended for surgical implant applications as they are highly resistant to fatigue and cracking caused by corrosion, but they are prone to failure due to fatigue fracture. Further, cobalt alloys have lower biocompatibility and higher mechanical resistance compared with titanium alloys. In general, poor fabricability and high costs have made Co-based alloys currently unsuitable for routine use in bone fixation implants.

Table 1: Characteristics of metals and alloys used for bone fixation

Metal/Alloy	Mechanical properties		Material properties
	Elastic modulus (GPa)	Yield strength (MPa)	
Stainless Steel (316L)	190	200-250	Biocompatible, resistant to corrosion, cost effective
Titanium alloys	55-100	530-900	Low density, excellent corrosion resistance, osteointegration
Co-Cr alloys	220-230	275-1585	Superior mechanical properties, corrosion and wear resistance

Many newer materials have been proposed with the choice of implant material depending on the priority given to mechanical advantages and biological tolerance. Ti-15Mo is a relatively new alloy with superior notch sensitivity and reverse bending properties, which offers improved implant design opportunities. Metal alloys with 'shape memory effect' are an attractive proposition; however, the currently available materials with shape memory have not been in general use because of their hardness, difficulty to machine and their high cost. Nitinol is a shape memory Ti alloy that has potential for fracture treatment in osteoporotic bone, providing a complex shape, low modulus of elasticity, and low stiffness porous foam allowing bone in-growth. Nitinol foam produced with nickel-cpTi powder has interconnected pores with 40-80% porosity and a modulus of elasticity similar to subchondral bone; hence there is possibility of using these foams as solid sponges for holding screws in osteoporotic bones. Shape memory alloys such as Nitinol exhibit super elasticity (ability to exert a recoil effect over a large range of deformation), and this effect seems to promise specific applications such as correction of spine deformities.

Although the metallic implants have desirable mechanical properties for use in orthopedic applications, there is a potential for the release of metallic ions and/or particles through corrosion and/or wear that trigger inflammatory responses that can reduce biocompatibility and lead to tissue loss. The elastic moduli and tensile strength of metals and bone are significantly different, which often cause stress shielding and result in weakening of surrounding bone. Hence, recent innovations are focused on the use of polymeric materials, which are less rigid and more elastic, in achieving better outcomes.

Non-biodegradable polymeric implants

Polyaryletherketone polymers such as polyetheretherketone (PEEK) and polyetherketoneketone (PEKK) thermoplastics are biocompatible and they can be sterilized by most methods including steam (autoclaving). They are radiolucent and non-magnetic, therefore not heated by MRI, and do not cause magnetic artifacts that distort images of the soft tissue (i.e., MR compatible). They do not corrode like metals, but there are concerns about possible leakage of their original components (softeners, accelerators, non-polymerized base components, and solvents). The tensile strength of PEEK is about 90-100 MPa, which can be improved by carbon reinforcement. However, this may cause problems due to possible release of microfibers after implant breakage, or fretting, or wear, as the bond strength of the fibers to the polymer decreases over time. These materials have high chemical resistance but are hydrophobic and, without coating or surface modification, will not allow bony integration. The high costs of these materials limit their applications in routine orthopaedic applications. The main use for this polymer is currently in spinal surgery for inter-body lumbar fusion.

Bone plates and screws have been fabricated from Carbon Fiber (CF) reinforced PEEK polymers. CF reinforced PEEK polymers can increase the fatigue life of the implanted device compared to metal/stainless steel-based plates. Carbon-reinforced implants made of composite materials, consisting of carbon fibre sheets inlaid within a PEEK resin, have several mechanical advantages compared to traditional metal implants. Carbon-reinforced implants have a modulus of elasticity (3.5 GPa) closer to the modulus of elasticity of cortical bone (12 to 20 GPa) and cancellous bone (1 GPa) than stainless steel (230 GPa) or

titanium (106 to 155 GPa). This modulus may provide an optimal loading environment to promote bone healing and it decreases stress-shielding and the risk of periprosthetic fracture that is associated with more rigid implants. Bone healing is improved by using the CF PEEK polymer rather than metal/stainless steel due to its stiffness being more similar to bone than metals. Further, it is easier to remove the CF PEEK plate than a metal plate due to less bone on-growth onto the implanted device. PEEK is increasingly becoming the material of choice in trauma fixation devices, sports medicine and oncology. Advancements in PEEK implants featuring antimicrobial properties may reduce the likelihood of infection around the implantation site. Currently though several such implants are available for use, the main disadvantage is their inability to be contoured at the time of surgery. Further, like metallic implants, they cannot degrade and are retained in the body permanently, unless a second surgery is done to remove such implants after bone healing. Therefore, researchers are investigating implants that can progressively degrade in the body and completely dissolve after bone repair without leaving any residue.

Ideally, the implant's mechanical properties such as strength, elastic modulus, and hardness should be comparable with or slightly higher than the natural bone to allow weight bearing and functional use of the limb without weakening or displacement of bone fragments. Further, it should not cause toxicity or inflammation in the human/animal body, but it should promote bone regeneration by osteoinduction and osteogenesis. Various materials have been researched for development of such 'ideal' bone fixation devices and have been tested for their clinical usage. These materials are of different types such as metals or metal alloys, ceramics, polymers or composites. While ceramics have limited application as a fixation device (used extensively for filling of bone defects), metals and metal alloys, polymers and composites are being tested as bone fixation implants.

Biodegradable metallic implants

Due to their biosafety and biodegradability, Mg and Mg alloys, Fe and Fe alloys, and Zn and Zn alloys, are drawing increased attention as bone implant materials. Mg and Mg alloys have similar densities and elastic moduli as compared to natural bone, but they degrade too quickly in physiological environments, resulting in excessive release of hydrogen and premature loss of strength. Fe and Fe alloys have outstanding mechanical properties, while their degradation rates are too slow to meet the requirements of bone repair. In comparison, Zn and Zn alloys have suitable degradation rates when compared with the growth rates of natural bone; however, their poor strength and ductility are the main constraints for their applications in bone repair. Efforts are being made to improve the deficiencies of these biodegradable metals, by alloying and heat treatment.

Mg alloys are 'revolutionary' biodegradable metal materials, which can be used in orthopaedic applications, as they are biocompatible, biodegradable, and have acceptable mechanical properties. Mg, primarily stored in bone tissue, is an essential element required for many metabolic processes. Mg alloys are degraded *in vivo* (in the presence of Cl in the physiological environment), thereby eliminating the need for second surgery to remove the implant. Mg, a corrosion product of Mg alloy implants, does not cause complications as excessive Mg cations are readily eliminated in the urine. Mg alloys have mechanical

properties similar to those of bone. They are lightweight too with densities (1.7-1.9 g/cm) very similar to cortical bone (1.75 g/cm), unlike titanium alloys (Ti-6Al-4V 4.47 g/cm) and stainless steel (about 7.8 g/cm). The elastic modulus of Mg alloys (45 GPa) is relatively close to that of natural bone (3-20 GPa), compared to the elastic moduli of titanium alloys (110 GPa) and stainless steel (200 GPa). Therefore, the stress shielding due to mechanical mismatch between natural bone and metal implants (normally seen with stainless steel) should be eliminated with the use of Mg alloys. Hence, Mg alloys are expected to become ideal load-bearing orthopedic implants.

Although research on Mg alloys as bone implants has led to significant progress over the past 20-25 years, there have been challenges for their use in bone repair. Significant efforts have been made to improve the mechanical properties, corrosion resistance, and biocompatibility of Mg alloys through alloying design and surface modification. However, more extensive studies are needed in their biomechanical aspect. Long-term studies are under way to investigate *in vivo* degradation and biocompatibility of Mg alloys. Work is under progress on the development of controllable degradation of Mg alloys through novel or traditional strategies, such as processing control and bionic coating (i.e., development of bio functional alloy systems using essential nutrients in alloying). Works focusing on angiogenesis of Mg-based implants, long term effects of Mg alloy implants on tissues and organs are also under way. Future works need to focus on the development of more improved properties in Mg-based alloys using various strategies, including alloying, impurity control, processing and coating; and also development of functional Mg-based alloys by alloying with elements that are functional in the body (such as Ca, Zr, Sn and Sr). Efforts are needed to develop novel porous magnesium scaffolds, magnesium matrix composites and bulk metallic glasses, hybrid materials (like Mg-based alloys coated with polymers or functional ceramics) to meet diverse implant requirements, to perform as a drug delivery system, or to have cell- and tissue- specific properties. Development of the next generation Mg-based alloys with superior performance may lead to more important role for Mg alloys as bone fixation implant in the future.

Bioresorbable polymers

Bioresorbable and biodegradable polymeric implants have been considered as an effective bone fixation system with several advantages over metallic fixation. There is no need to remove the implants after osseous healing, they are radiolucent, and without the problems of corrosion and accumulation of metal in tissues. Stress-shielding is reduced as the implants bear less load initially and gradually transfer the load as they degrade. Bioresorbable polymers commonly used in orthopaedic applications are PGA, PLA, poly lactide-co-glycolide (PLGA) co-polymers in various ratios, polydioxanone (PDS), propylene (PP), polysulphone (PS), and polycarbonate (PC). Among them, PGA, PLA and their co-polymers have received the most attention, in part because they can be self-reinforced to achieve better strength properties. The mechanical properties of these materials changes over time in a physiologic environment as determined by the molecular weight and degree of crystallinity. Hence, the molecular weight and crystallinity can be altered to optimize mechanical strength of an implant (e.g., polymers with a higher degree of crystallinity are stronger and degrade slower than amorphous polymers with the same chemical composition).

Table 2: Mechanical properties of different polymers used for biomedical applications

Polymer	Tensile strength (MPa)		Flexural strength (MPa)		Tensile moduli (GPa)	
	UR	R	UR	R	UR	R
PLA	11.4-72	200	45-145	89.6-412	0.6-4	6-29.9
PDLLA	45.5	-	-	70-174	3.2	-
PLLA	60.3	-	109	193	3.7	-
PGA	57.0	250	-	370	6.5	-
PLGA	40.0	290	150	190	1.4 – 2.8	-
PCL	19.3	22.5	-	-	0.34	-
PELA	3.8-16.1	-	-	-	0.11	-
Bone	50-150	-	130-180	-	12-18	-

R=Reinforced, UR=Un-reinforced

Polyglycolide : PGA was the first bioresorbable polymer used for reinforcing pins, screws and plates for bone surgery. PGA is a hard and crystalline polymer with an average molecular weight of 20000-145000, a melting point of 224-230°C. It is degraded by hydrolysis, and is broken down by nonspecific esterases and carboxy peptidases. Its mechanical strength is lost in 6 weeks, and it is totally reabsorbed in a few months depending on the molecular weight, purity, crystallinity, and the size and shape of the implant. However, adverse tissue responses to PGA implants have been reported, with 2.0-46.7% incidence. The risk of adverse tissue reactions has deterred the use of PGA implants in favour of PLA, which have lower rate of degradation. PGA has been used mostly in sutures, rods and screws in fracture fixation of cancellous bone due to the rapid loss of mechanical strength of the implants.

Poly lactide : PLA is a semicrystalline polymer with molecular weights of 180000-530000, a melting point of about 174°C. Depending on the L and D configuration, it can exist in several distinct forms, such as PLLA and poly-D-lactide (PDLA), and it is also degraded via hydrolysis. P(L/D)LA:PLLA is hydrophobic and crystalline and thus resistant to hydrolysis and degradation. By adding D-isomers into an L-isomer based polymerization system, polymer chains widen and cannot be packed as tightly as PLLA polymer chains, resulting in a less crystalline and more rapidly degraded material.

PLLA interference screws and plates have been used successfully for repair of skeletal fractures. In the area of high-strength fracture fixation, PLLA is favoured because of its slow rate of resorption in the body, although it does not have sufficiently high strength characteristics for use in the fixation of fractures in load bearing bones. Much of the PLLA research has focused on veterinary applications using rabbits. PDLLA (poly-DL-lactide) also shows characteristics that could be employed in high-strength situations, but PLLA is the preferred material for use in fracture fixation implants due to its higher strength. PDLLA and PLLA are well-tolerated and the tissue response is similar to that of stainless steel, with complete degradation occurring within 36 months. Some problems related to foreign-body reactions, however, have been reported with the use of PLLA implants, with a large number of patients demonstrating an aseptic soft

tissue reaction caused by delayed clearance of the degrading PLA particles. In comparison, the total resorption time of PLA is considerably longer (up to 5 years) than PGA (up to 6 months). Therefore, many resorbable orthopaedic implants are currently manufactured from PLLA.

Co-polymers : PGA and PLA can be combined to form a full range of PLGA polymers. Both L- and DL-lactides have been used for co-polymerization. Properties can be controlled by varying the ratio of glycolide to lactide for different compositions. The rates of hydration and hydrolysis can be increased when the crystalline PGA is co-polymerized with PLA. The degradation time of the co-polymer depends on the ratio of monomers used in synthesis; in general, the higher content of glycolide, the faster is the rate of degradation.

As on today, bioresorbable polymeric implants are mainly used to stabilize fractures of facial bones, foot and ankle, knee, wrist and hand injuries, spinal reconstructive surgery, and in paediatric orthopaedics.

Composite Biomaterials

To overcome the problems and failures of metals, polymers or ceramic materials, efforts were made to develop composite materials with higher strength and stiffness and having more similarity to natural bone. Polymeric (thermoset or thermoplastic) composite material is stable in the body and *in vivo* condition without any change in strength and stiffness. Polymeric composites are found to have fewer failures compared to other groups and the best choice would be reinforced polymeric material as composite material which has high strength and low modulus. Thermosetting polymers such as epoxy resins, they are different and vary in biocompatibility and durability, but have found to be attractive in fracture fixation. Their processing characterization is much better than thermoplastics.

The hybrids composite has emerged and have the potential reinforcement material for composites and thus gain attraction by many researchers. This is mainly due to their applicable benefits have they offer low density, low cost, renewable, biodegradability and environmentally harmless and also comparable mechanical properties with synthetic fibre composites. In the case of using composite materials as bone plates, a hybrid composite may need to be used to have a combination of properties with acceptable performance in different directions which may not be achieved by one type of fibre. Many investigations have been done regarding hybrid composites, but few studies involve hybrid composites reinforced with natural fibres and carbon fibres, and no studies have considered hybrid composites with a “sandwich structure” for bone fracture fixation applications.

Natural fibres present important advantages such as low density, appropriate stiffness and mechanical properties and high disposability and renewability. Moreover, they are recyclable and biodegradable. Natural fibre reinforced polymer composite materials which are less rigid than metals may be good alternatives because of properties closer to bone mechanical properties. It was found that they help to avoid stress shielding and increase bone remodeling. Natural fibre reinforced polymer (NFRP) composite plate material can be coated with bone graft substitutes such as calcium phosphate and hydroxyapatite and this plate material can be used for both internal and external fixation of fractures.

Conclusions

There has been a significant improvement in biomaterials used in manufacturing bone fixation implants, and the approach has been changed from bioinert stabilizers to bioactive and biodegradable healing promoters. Nevertheless, due to their mechanical strength and low cost, specific classes of bioinert metals such as stainless steel and titanium alloys are used in routine clinical practice. Bioresorbable implants can be effective fixation devices offering significant advantages over these traditional metal implants. Magnesium alloy, a biodegradable metal, which has almost similar density as that of bone, has been studied to function as an osteoconductive and biodegradable implant material in load bearing applications; however, there is need to control the high rate of degradation before it can see the light of load bearing applications. The bioresorbable polymers and composites are particularly attractive because of their manufacturing processes and properties comparable to host bone. Innovation in the composite material design and fabrication processes has raised the expectations of developing implants with improved performance. Despite decades of research, no suitable implant that fully meets all the requirements for bone fixation has been developed, and a large gap still exists between the present treatment modalities and ideal clinical situation. There is need to take a large leap towards development of high-performance tissue engineered devices to fulfil the criteria required for an ideal bone fixation. Promising biodegradable composite materials can be engineered to alter their material properties and degradation characteristics to maximize their biocompatibility, cellular interaction and biodegradability.

References

- Awati, S.S., Borgave, S.A. and Deshmukh, R.M. 2018. Limitations of current metallic bone plates: towards development of composite bone plates. *In: 1st National Conference on Recent Innovations in Mechanical Engineering (NCRIME-2018). IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE). e-ISSN: 2278-1684, p-ISSN: 2320-334X PP. 25-29.*
- Bob Baravarian, Tal Pnina Lindner and Ronit Merchav-Feurman. 2018. Advancements in bone fixation utilizing novel biointegrative fixation technology. *Clin. Podiatr. Med. Surg.* **35**: 53-62.
- Chen Liu, Zheng Ren, Yongdong Xu, Song Pang, Xinbing Zhao and Ying Zhao. 2018. Biodegradable magnesium alloys developed as bone repair materials: A review. <https://www.hindawi.com/journals/scanning/2018/9216314/>. Article ID 9216314.
- Chhaya, A., Suryavanshi, V., Borse, V., Pawar, V., Sindhu, K.R. and Srivastava, R. 2016. Material advancements in bone-soft tissue fixation devices. *Sci. Adv. Today* **2** (2016) 25236.
- Cijun Shuai, Sheng Li, Shuping Peng, Pei Feng, Yuxiao Lai and Chengde Gao. 2019. Biodegradable metallic bone implants. *Mater. Chem. Front.* **3**: 544-562.
- Deshmukh, R.M. and Kulkarni, S.S. 2015. A review on biomaterials in orthopedic bone plate application. *Int. J. Current Engin. Technol.* **5**, Aug 2015.
- James, J.P. 2016. Recent advancements in magnesium implants for orthopedic application and associated infections. *Clin. Trials Orthop. Disord.* **1**: 138-144.
- Mythili Prakasam, Janis Locs, Kristine Salma-Ancane, Dagnija Loca, Alain Largeteau and Liga Berzina-

- Cimdina. 2017. Biodegradable materials and metallic implants-A review. *J. Funct. Biomater.* **8**: 44. doi: 10.3390/jfb8040044.
- Narges Shayesteh Moghaddam, Mohsen Taheri Andani, Amirhesam Amerinatanzi, Christoph Haberland, Scott Huff, Michael Miller, Mohammad Elahinia and David Dean. 2016. Metals for bone implants: safety, design, and efficacy. <https://link.springer.com/article/10.1007/s40898-016-0001-2>.
- Nurettin Sezer, Zafer Evis, Said Murat Kayhan, Aydin Tahmasebifar and Muammer Koç. 2018. Review of magnesium-based biomaterials and their applications. *J. Magnesium and Alloys.* **6**: 23-43.
- Richard W. Gurich Jr. and Matthew J. Thompson. 2018. Carbon fiber implants aid fixation of extremity fractures in oncology cases. *Orthopedics Today*, October 2018.
- Sandra Pina and José M.F. Ferreira. 2012. Bioresorbable plates and screws for clinical applications: A review. *J. Healthcare Engineer.* **3**: 243-260.
- Takahiro Kanno, Shintaro Sukegawa, Yoshihiko Furuki, Yoshiki Nariai, and Joji Sekine. 2018. Overview of innovative advances in bioresorbable plate systems for oral and maxillofacial surgery. *Japan. Dent. Sci. Rev.* **54**: 127-138.

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ORT-1

CLINICAL MANAGEMENT OF VERTEBRAL COMPRESSION FRACTURE INDUCED NERVOUS DEFICITS USING ALLOGENIC BONE MARROW DERIVED MESENCHYMAL STEM CELLS (BM-MSC) IN CANINES

Sharun Khan, Rohit Kumar, Tushar Rawat, Abhishek Chandra Saxena, Prakash Kinjavdekar, A.M. Pawde and Amarpal

Division of Surgery, Indian Veterinary Research Institute, Izatnagar, Bareilly, Uttar Pradesh

Compression fractures of vertebral column is a common finding in canines that are met with automobile accidents. Damage to spinal cord can result in loss of locomotor and sensory function. Five clinical cases of non-deviating vertebral fractures in canine patients were included into the present study. All the selected cases were subjected to detailed clinical, neurological, radiographic, and haematological investigations and observations were recorded. Neurological examination was performed to grade neurological deficit in each case. Intra-spinal injection of allogenic bone marrow derived Mesenchymal Stem cell (BM-MSC) at the site or cranial to the site of spinal cord injury was performed at 15-day intervals. The treatment was followed by oral administration of methylcobalamin at the rate of 1000 mcg total dose twice daily along with gabapentin at the rate of 10 mg/Kg body weight twice daily throughout the duration of treatment. Improvement was evaluated on the basis of neurological examination and grading. Significant improvement in locomotor status and sensory functions were observed in all of the cases under the study. Based on the study it was concluded that intra-lesional administration allogenic bone marrow derived mesenchymal stem cell along with supportive therapy is effective in managing neural deficits associated with non-deviating vertebral compression fractures in canine patients.

ORT-2

STABILISATION OF CANINE FEMUR FRACTURE BY STATIC AND DYNAMIC INTRAMEDULLARY INTERLOCKING NAILING

Gurkirpal Singh Mago, Pallavi Verma, Tarunbir Singh, Vandana Sangwan, Rahul Udehiya and J. Mohindroo

Department of Veterinary Surgery and Radiology, College of Veterinary Sciences, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, Punjab

Present study was envisaged with the objective to evaluate static and dynamic intramedullary interlocking nailing (IMILN) for femur fracture repair in canine patients. The study was carried out on 26 dogs with fracture having no to minimal comminution to minimize the variation of results due to fracture type. Study was performed in two groups. Group I (n=12) included fractures stabilized by dynamic IMILN which was further divided into I-A (n=6) and I-B (n=6) depending upon the diameter of nail used in respect to narrowest bone marrow cavity. In Group I-A, interlocking nail (ILN) with diameter of 60-80% of the marrow cavity was used while in group I-B, ILN with diameter more than 80% of the marrow cavity was used. Static IMILN was done in Group II (n=14). Various pre, intra and post-operative parameters

including weight bearing score, limb usage score was recorded. Radiographic healing was graded from 1 to 5 based on amount of callus formation, visibility of fracture line and stage of union. Degree of fracture union at 15 days post-operative period in group I-B was significantly more than group I-A and even group II. While comparing the callus formation at 15 days post-operative among Group I-A and I-B, degree of callus formation was significantly more in group I-B. No significant difference was observed among groups in later stages of fracture union and callus formation. Days for first weight bearing in Group I-B was also significantly lower than Group I-A. So it was concluded that dynamic IMILN with nail diameter more than 80% of medullary cavity is suitable for repair of simple femur fractures with minimal complications and was having significantly faster rate of bone union as compared to groups with static fixation.

ORT-3

EVALUATION OF ANTIBACTERIAL POTENTIALS OF NANO COBALT OXIDE AND ITS COMPARISON WITH STANDARD ANTIMICROBIALS AT DIFFERENT CONCENTRATIONS

Gupta V., Sharma S., Sharma A.K., Kant V. and Sharma M.

Department of Chemistry, University of Jammu, Jammu, J&K

Development of suitable potent antimicrobial is the urgent need of modern era to cope up the problem of antimicrobial resistance. The applications of nanotechnology in metal oxides have shown favorable effects to some extent in this area. Thus, in present study cobalt oxide (Co_3O_4) nanoparticles were synthesized, characterized and antibacterial potentials against *S. aureus* and *E. coli* was determined at various concentrations. The maximum zone of inhibitions of Co_3O_4 nanoparticles against *S. aureus* and *E. coli* at 500 $\mu\text{g/ml}$ were 21.17 mm and 24.00 mm, respectively. The Co_3O_4 nanoparticles seemed more effective than gentamicin against *S. aureus* and *E. coli*. The activity index of nanoparticles with respect to tetracycline was higher than 1 at e^{-1} 125 $\mu\text{g/ml}$ for *E. coli* and e^{-1} 31.25 $\mu\text{g/ml}$ for *S. aureus*. It was also higher than 1 at all compared concentrations with respect to gentamicin against both bacteria. In conclusion, Co_3O_4 nanoparticles seemed to have potent antibacterial potential and these might be very helpful to replace the conventional antimicrobials to solve the problem of antibacterial resistance.

ORT-4

ANATOMICALLY CONTOURED INTRAMEDULLARY INTERLOCKING NAILS FOR FIXATION OF FEMORAL AND TIBIAL FRACTURES IN CANINE AND BOVINE

S.P. Tyagi, Tejender Kumar, Amit Kumar, Jasmeen Kaur, Sakshi Patiyal and Adarsh Kumar

Department of Veterinary Surgery and Radiology, Dr. G.C. Negi College of Veterinary and Animal Sciences, CSK Himachal Pradesh Agricultural University, Palampur, HP

The Intramedullary Interlocking nails (IILN) are in use for fixation of variety of fractures in animals since last many decades. However, many technical issues were routinely encountered during use of commercially available straight IILN and its accessories. Therefore, the present study was undertaken to

redesign the IILNs and its accessories with the objective of facilitating its introduction with in the bone more easily with less surgical trauma particularly in intramedullary reaming, fine-tuning the dimension and shape of IILN as well as the size and number of screw/bolt cannulations in them. The accessories were also suitably modified. Accordingly, a concept of Anatomically Contoured Intramedullary Interlocking nails (ACIILN) was worked upon to develop femoral ACIILNs for dogs and Tibial ACIILNs for bovine. For finalizing the designs, many prototypes were prepared and tested over cadaver bones; the best suited designs were later developed in to products and subjected to biomechanical and clinical testing. The current paper describes the technological inputs incorporated in the ACIILNs and the results of clinical and biomechanical studies to analyse their relative utility *vis-e-vis* straight IILNs.

ORT-5

APPLICATION OF ADMIT PIN FOR FIXATION OF HUMERUS AND FEMUR FRACTURES IN SMALL ANIMALS

Amit Kumar, Adarsh Kumar, S.P. Tyagi, **Mohit Sharma** and Sukhpreet Singh

Department of Veterinary Surgery and Radiology, Dr. G.C. Negi College of Veterinary and Animal Sciences, CSK Himachal Pradesh Agricultural University, Palampur, HP

The study was conducted on the fixation of long bones namely humerus and femur fractures by Admit pin (End threaded intramedullary positive profile self-tapering pin) in dogs and cat. A total of 22 long bone fractures were fixed/repared by the means of admit pin which includes 17 femoral fracture in dogs, 4 humerus fractures in dogs and 1 in cat. The animals aged from 2 months to 9 year and weighed 2 kg to 28 kg. Pre-operatively and post-operatively inflammation, pain was recorded on the scale of 0-3 and weight bearing recorded on scale of 0-5. Weight bearing on affected limb gradually improved after surgery. Pain and inflammation also gradually reduced in the course of time and are absent in most of cases at the day of pin removal/final reappraisal day. During fixation of the fracture by admit pin technical difficulty and soft tissue manipulation was mild to moderate depending upon the type of fracture. The status of fracture reduction and fracture fixation was good to excellent. So, in conclusion the admit pin is a user-friendly implant which can be efficiently used for fixation of humerus and femoral fractures in small animals.

ORT-6

EVALUATION OF DIFFERENT EXTERNAL FIXATORS FOR LONG BONE FRACTURE IN BOVINE

Richa Chaurasia, Shobha Jawre, Randhir Singh, Apra Shahi and Babita Das

Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H., Nanaji Deshmukh Veterinary Science University, Jabalpur, Madhya Pradesh

The breakage in continuity of a bone is called fracture. ESF provides early weight bearing and joint mobility with preservation of local and regional blood flow to fracture site and is very useful in treatment of compound fractures. The study was conducted on 12 bovines, weighing 100 kg and above, brought to

TVCC, Jabalpur for the treatment of long bone fractures. These animals were irrespectively divided into two groups, consisting 6 animals in each. In group I external fixation of fracture was done using acrylic while in the animals of group II polypropylene rods were used for the fracture fixation. Serum calcium and phosphorus levels showed significant variations in the animals of group II. Similarly, weight bearing score while walking, standing and running was better in the animals of group II as compared to animals of group I. Significant increase in radiographic score was observed in both the groups, however better radiographic union was observed in the animals of group II as compared to group I. Thus, on the basis of above findings it can be concluded that polypropylene connecting bars are more efficacious and economic as compared to acrylic connecting bars.

ORT-7

EVALUATION OF DIFFERENT BIOMATERIALS FOR FRACTURE HEALING IN DOGS

Astha Chaurasia, Shobha Jawre, Randhir Singh, Apra Shahi, Babita Das,
Rekha Pathak and Naveen Verma

*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H.,
Nanaji Deshmukh Veterinary Science University, Jabalpur, Madhya Pradesh*

Bone healing is a complex physiological process that involves numerous mechanisms at tissue and cellular level. Apart from providing stable fixation, adjunctive measures such as bone-grafting or use of bone-graft substitutes are of paramount importance to enhance the bone healing process in many cases of fractures. The present study was conducted on 12 dogs of either sex, aged between 1-8 years and belonging to different breeds that were subjected to repair of diaphyseal fractures of long bones. The dogs were randomly divided into three equal groups. The fractures were fixed with intramedullary titanium elastic pins in all the groups in a standard manner. In group I, the fracture was repaired by titanium pin alone, whereas, the bone gaps at fractures site were additionally filled by decellularised xenogeneic cancellous bone chip graft (DXBG) in group II and with granules of beta tricalcium phosphate (β -TCP) in group III. Radiographic, haemato-biochemical examinations and weight bearing score, were conducted at different time interval to evaluate the animal before internal fixation and to monitor fracture healing. On the basis of results, it was concluded that the decellularised xenogeneic cancellous bone graft had better osteoinductive properties than β -tricalcium phosphate to promote fracture healing in dogs.

ORT-8

EFFICACY OF FIBER-REINFORCED GELATIN NANOHYDROXYAPATITE (NHA) IN HEALING OF FRACTURES WITH SEGMENTAL DEFECTS IN DOGS

Archana G., Sooryadas S., John Martin K.D., Dinesh P.T., Anoopraj R. and Manitha B. Nair

Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences, Kerala Veterinary and Animal Science University, Pookode, Wayanad, Kerala

Correction of segmental bone defects involves the use of bone grafts to fill the defect. The limitations of autografts and allografts created scope for the development of newer synthetic bone substitutes. This formed the basis for the present study where a fibre reinforced ceramic biograft was evaluated for its efficacy to heal segmental bone defects in fractures of dogs. The study was conducted in six clinical cases of dogs. Post-operatively, the animals were evaluated for fracture healing at every two weeks interval from 2nd post-operative week to 8th post-operative week. Clinical, orthopaedic, radiographical and physical examination was carried out. The biograft was incorporated into the native bone and the fracture gap was successfully bridged in all cases except the one with implant failure, by the end of the study. The study concluded that fibre-reinforced gelatin nanohydroxyapatite composite successfully bridges segmental bone defects and has good osteoconductive and osteointegrative properties.

ORT-9

ELASTIC STABLE INTRAMEDULLARY NAILING (ESIN) FOR FIXATION OF DISTAL DIAPHYSEAL FRACTURE OF RADIUS IN TWO DOGS

Prabhu Kumar, M.D., **Dileep Kumar**, K.M., Devanand, C.B., Syam K. Vengopal, John Martin, K.D., Indu V. Raj, Laiju M. Philip, Sudheesh S. Nair and Anoop, S.

Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences, Kerala Veterinary and Animal Sciences University, Mannuthy, Thrissur, Kerala

Two dogs aged seven and twelve months respectively were presented to University Veterinary Hospital Mannuthy and Kokkalai, Kerala Veterinary and Animal Sciences University with the history of non-weight bearing on their left forelimb. Both the cases were investigated by physical and radiographic examinations and diagnosed as fracture of radius and ulna. Elastic stable intramedullary nailing technique (ESIN) was performed using stainless steel elastic nail for fixation of fracture under general anaesthesia plaster of Paris cast was applied to protect the limb for fifteen days in both the cases. Postoperatively antibiotics and analgesics were administered. Periodic clinical and radiographic evaluations were conducted at two weeks interval for a period of eight weeks. Both the dogs recovered uneventfully with early return to limb function.

ORT-10

MANAGEMENT OF LONG BONE COMPOUND FRACTURES IN CATTLE BY EXTERNAL SKELETAL FIXATION USING WOODEN PLANKS AS CONNECTING BARS AND STEINMAN PINS UNDER FIELD CONDITIONS

Pramodh J.K., Manjunath S.P. and Prashanth J.K

Department of Animal Husbandry and Veterinary Science, Hassan, Karnataka

Management of long bone compound fractures in cattle is very challenging under field conditions. In the present study management of long bone compound fractures using wooden planks as connecting bars and Steinman pins is presented. In the presented study 2 tibial, 2 metatarsal and 1 metacarpal bone compound fractures were treated with external skeletal fixation using Steinman pins no. 4 and 5 and wooden planks as connecting bars. Antibiotics and anti-inflammatory drugs are followed for 5 days. Assemblies were removed on day 60. Among them, 4 cattle were recovered completely. The present study concludes that external skeletal fixation using wooden planks as connecting bars and Steinman pins found as good method for long bone compound fractures under field conditions.

ORT-11

EXTERNAL SKELETAL FIXATOR FOR DISTAL HUMERUS FRACTURE IN DOG

Sandeep Saharan, **Robin,** Amit Kumar, Bijender and Deepak Kaushik

*Department of Veterinary Surgery and Radiology, College of Veterinary Sciences,
Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, Haryana*

A 4 months old German Shepherd dog was presented to Teaching Veterinary Clinical Complex, LUVAS, Hisar with a history of automobile accident with right forelimb lameness since 6 days. Based on history, clinical examination and radiography a compound and slight oblique distal humeral fracture was observed with maggot infestation. Under general anaesthesia Unilateral uniplanar external skeletal fixation along with full circlage wiring was done. Immediate post-operative radiographs revealed adequate reduction of fracture fragments. Broad spectrum antibiotics and analgesics were advised for 5 days. Animal started to bear weight on operated limb 15 days post-operatively.

ORT-12

FIXATION OF VERTEBRAL COLUMN LUXATION USING SEGMENTAL SPINAL FIXATION TECHNIQUE

Ram Niwas, Sandeep Kumar, R.N. Chaudhary and Vaibhav

*Department of Veterinary Surgery and Radiology, College of Veterinary Sciences,
Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, Haryana*

A nine-month old dog was presented with history of automobile trauma at Department of Veterinary Clinical Complex, LUVAS. Dog was in recumbent position with lower motor neuron dysfunctions. Dog was examined carefully and luxation was observed in between L13 and T1. All blood parameters were found within normal physiological range. Radio-graphically dislocation observed between T13 and L1 vertebrae column. Modified segmental spinal technique was done using 4mm pin and orthopaedic wire by keeping animal in sternal recumbency. Mid dorsal incision under aseptic conditions at dislocation site was given carefully and muscles were separated by blunt dissection from dorsal spinous processes of vertebrae along with one cranial and two caudal vertebrae to serve bridge for dislocated vertebrae. Then after proper alignment of vertebrae, drilling was done in dorsal spinous process of all 5 vertebrae. Then two pins on either side of spinous process were anchored by tightening the orthopaedic wires. Complete rest was advised for one month along with antibiotics, analgesic for five days and nervine tonics for 30 days with slight passive physiotherapy to avoid muscle degeneration due to disuse of limbs. After one-month dog was able to put weight on his hind limbs partially with normal defecation and urination. Partial locomotive movement with enhanced spinal reflexes and slight acquired kyphosis observed after three months might be due to movement of dog observed postoperatively.

ORT-13

EVALUATION OF DIFFERENT LOCKING BONE PLATES AS INTERNAL FIXATOR FOR TIBIAL DIAPHYSEAL FRACTURE REPAIR IN GOATS

Doddamani J., Shivaprakash B.V., Usturge, S.M., Dilipkumar, D. and Bhagvantappa, B.

*Department of Veterinary Surgery and Radiology, Veterinary College,
Karnataka Veterinary Animal and Fisheries Sciences University, Bidar, Karnataka*

The study was conducted in 18 clinical cases of goats presented with diaphyseal tibial fracture and randomly divided into 3 groups with 6 goats in each group. Three different techniques of open reduction and internal fixation using different 3.5mm locking plates applied as an “internal fixator” were evaluated. In group I, locking compression plate (LCP), in group II locking string of pearls (SOP) plate and in group III, locking reconstruction plate was applied. The plates were not pre-stressed or contoured to the bone. The plates were pre-dynamized by leaving one to three holes near the fracture site empty. The 3.5mm locking compression plates were wider than the reconstruction plate. The foot-print of the string of pearls plate was narrowest among the three groups. However, thickness of the SOP plate was more in comparison to

other two plates under study. Intra-operative visualization and assessment of the fracture site and post-operative evaluation of the fracture healing in medio-lateral view was feasible with the SOP plate followed by the reconstruction plate. LCP did not permit adequate exposure of the fracture site due to broader profile. Radiographic assessment of fracture healing in medio-lateral view was difficult with LCP, as the plate was wider and obstructed the fracture site. In all the groups, normal weight bearing was achieved by day 30 and functional weight bearing was observed by day 60. Group I (LCP) showed slightly better weight bearing throughout the period of study compared to group II and group III. Fracture healing in all the groups was through secondary callus formation. Initiation of periosteal callus was noticed by day 15 in all the groups. Apparent bridging of the fracture site was noticed in all the groups by day 30. Cortico-medullary union was established by day 60 and initiation of remodelling was observed by day 120. The complete union and initiation of remodeling of fracture was observed to be earlier in group III. The physiological and biochemical parameters fluctuated within normal limits and no significant alterations were noticed. The intra-operative and post-operative complications noticed were trivial and resulted in uneventful recovery in all the cases.

ORT-14

LONG BONE FRACTURE MANAGEMENT USING EPOXY-PIN AS EXTERNAL SKELETAL FIXATOR IN 12 DOGS

**P.V. Chaudhary, S.K. Jhala, V.S. Dabas, D.N. Suthar, S.K. Tyagi, R.H. Bhatt,
K.G. Bodat and P.V.V. Subbarao**

*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H.,
Navsari Agricultural University, Navsari, Gujarat*

The present study was conducted on 12 dogs of different age, breed and sex. Out of twelve cases four cases were of radius-ulna and eight cases were of tibia-fibula fracture. Orthogonal radiographs revealed complete transverse (n=07) fracture in seven cases followed by complete oblique in 03 cases and one case each of overriding and multiple fractures. All the cases were managed by using epoxy eternal skeletal fixator under general anaesthesia. There was significant increase in serum calcium level whereas; non-significant increase in serum Alkaline Phosphatase values observed during post-operative period as compared to pre-operative values in the present study. Immediate post-operative radiographs revealed proper alignment of fracture fragments and proper positioning of fixator in all cases except one. Post-operatively radiographic healing was evident on 30th and 45th post-operative days in eight and four cases respectively.

ORT-15**OCCURRENCE, CLASSIFICATION, METHODS OF FIXATION AND OUTCOME OF LONG BONE FRACTURES IN DOGS: A REVIEW OF 342 CASES**

Mohammed Arif Basha K., **Kiranjeet Singh**, Aswathy Gopinathan, Sarangom S.B., Sowbharenaya C., Swapna C.R., Sasikala R., Akshay K. and Naveen Kumar

Division of Surgery, Indian Veterinary Research Institute, Izatnagar, Bareilly, Uttar Pradesh

The study was conducted on 363 long bone fractures in 342 dogs to investigate the factors affecting occurrence, etiology of fracture, methods of fracture fixation, overall clinical outcome and complications. Intramedullary pinning (107) was the most common method of surgical fracture repair, followed by locking compression plating (56), external skeletal fixation (24) and interlocking nailing (15). External coaptation was used in 132 animals. Among 228 fractures treated surgically, 198 fractures showed good outcome after surgery, with 12 patients experiencing major complications. Puppies aged 4 months and above were considered for intramedullary pinning of humeral and femoral fractures. Locking compression plating was found stable internal fixator method for radial, femoral and tibial fractures which results in satisfactory load sharing and implants stability which leads to primary gap healing or healing under callus formation when proper principles of application are followed. For adult dogs with unstable diaphyseal femoral fractures interlocking nailing or plate-rod construct was preferred internal fixation method using a locking compression plate and intramedullary rod of 30-40% of medullary diameter. ESF with acrylic connecting bars was preferred fixation technique for open fractures of radius-ulna and tibia which resulted in secondary bone healing and restoration of limb function.

ORT-16**SURGICAL MANAGEMENT OF PATELLAR LUXATION IN DOGS – A REPORT OF THREE CLINICAL CASES**

L. Suresha, B.N. Nagaraja and K.M. Srinivasmurthy

*Department of Veterinary Surgery and Radiology, Veterinary College,
Karnataka Veterinary Animal and Fisheries Sciences University Bangalore, Karnataka*

The study was conducted in 3 clinical cases of dogs presented to the Department of Veterinary Surgery and Radiology, Veterinary College, Bangalore with the history of lateral patellar luxation by evaluating them with surgical repair. All stifles treated surgically had reduced patellofemoral joints, normal range of motion with improved limb usage. These findings suggest that early diagnosis and surgical intervention would promote early return of limb function and potentially reduce progression of osteoarthritis. The objective of this study was to report the complications and clinical outcome following surgical correction.

ORT-17**CONGENITAL DISPLACEMENT OF PATELLA IN A CALF AND ITS SURGICAL MANAGEMENT****Jayakrushna Das and Benudhar Mahanand***Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H.,
Odisha University of Agriculture and Technology, Bhubaneswar, Odisha*

A two months old male calf was presented for lameness due to congenital condition. On physical examination of patient, one depression at proximal dorsal aspect of stifle joint area with loosening of extensor muscle at the site. On radiographic examination, displacement of patella was diagnosed for which surgical treatment was advised. On palpation of the site, one depression at dorso-medial aspect of fetlock joint area was noticed at the site. With the consent of the owner it was decided to go for combination of both internal and external immobilization. A three cm long curvilinear incision was made at the dorsal aspect of stifle joint area extending from femoral condyles to condyles of tibia over tuberosity of tibia to the base of proximal extremity. The ligaments were sutured with braided silk suture using three rolls. Then the joint was covered by the subcutaneous muscles and sutured using vicryl suture no.-2. Skin incision was closed in routine fashion. The suture site was painted with povidone iodine and then chloramphenicol capsule powder was applied and the site was applied bandage using kulpa soft sterile bandage keeping the joint in extended position. Then the leg was immobilized by using modified Thomas splint using G.I. wire, leucoplast and gauge bandage. After one and half months the animal recovered well and the splint was removed.

ORT-18**BILATERAL MANDIBULAR FRACTURE IN BOVINES AND THEIR ORTHOPAEDIC MANAGEMENT****Jayakrushna Das, Benudhar Mahanand and Prabir Mohapatra***Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H.,
Odisha University of Agriculture and Technology, Bhubaneswar, Odisha*

Different types of fractures are met with bovine animals of different age groups and among them fractures of mandibles are uncommon, but these cases used to happen mostly due to automobile accidents. 3 nos of cases of bilateral mandibular fractures were taken up in different age groups. The fractures were mostly at interdental space and sometimes at symphysis along with the previous condition. The cases were diagnosed on physical exam and also by radiography in small age groups. The animals were injected with broad spectrum antibiotics and anti-inflammatory and analgesics prior to operation for better protection against micro-organisms and pain sensation. Under routine surgical preparations and nerve blocks and injecting local anesthesia at the site of fractured fragments the animals were surgically operated. Depending on the conditions intra-medullary pins of 2 to 4" diameters were selected. Then appropriate size pins were introduced inside the fractured fragments of horizontal ramus of mandibles. Then the oral mucosa was then

sutured using absorbable synthetic suture, vicryl suture no 1 and 1/0. The fractured sites were immobilized using netted mask always except at the time of drinking. Initially the animals were managed with i/v fluid therapies with nervine tonics, analgesics and antibiotics. Then the animals were managed with liquid diet and after every feeding clean water to drink. The owners were advised accordingly. After 45 days these showed with unmatching result of fracture healing.

ORT-19

SURGICAL MANAGEMENT OF DISTAL FEMORAL PHYSEAL FRACTURE IN YOUNG DOGS

Vaibhav Bishnoi, Vikash Chauhan, Samar Mahendran, Shriram Ganesan and Correia Salisha
CGS Hospital, Gurugram, Haryana

Three young (up to 1 year of age) dogs were presented to CGS Hospital, Gurgaon with history of automobile trauma. Physical examination revealed non-weight bearing lameness with swelling around the stifle joint. Radiograph revealed Salter Harris type-I (1), Salter Harris type-II (1) & Salter Harris type-IV (1) fracture of femur. Salter Harris type IV Femoral Fracture fixation was done with Cross pinning and cannulated screw. Salter Harris type-I (1) and Salter Harris type-II (1) femur fractures were stabilized using cross pinning technique. Post-operative management was done with antibiotics and anti-inflammatory medication. Restricted movement was followed in all cases. All patients recovered uneventfully. Implants were removed after complete fracture healing in all cases.

ORT-20

SUCCESSFUL SURGICAL MANAGEMENT OF TENDOACHILLE INJURY IN TWO DOGS

N. Nagaraju, D.R. Manjunath, Priyanka, N., Nagabhushana H.V. and Rakesh, T.
*Department of Veterinary Surgery and Radiology, Veterinary College,
Karnataka Veterinary Animal and Fisheries Sciences University, Bidar, Karnataka*

A 5 years old Pomeranian and 2 years old Doberman were presented to Department of Veterinary Clinical Complex, Veterinary College, Hassan with the history of automobile accident and accidental hit by sharp knife respectively and unable to bare weight on hind limb and hock was almost touching the ground. On clinical examination, the dog was not bearing weight on left hind limb in both the cases and swelling was noticed around hock joint with over flexion. Radiography of left hock joint revealed presence of air pockets with ruptured tendoachilles. Under general anaesthesia surgical site was incised. Ruptured tendoachilles was sutured with no-1 non absorbable suture [Bunnel Mayer Pattern]. The limb was immobilized using Thomas splint for 4 weeks with alternate day dressing. Dogs were recovered uneventfully.

ORT-21

SURGICAL CORRECTION OF A CASE OF BILATERAL GRADE IV CONGENITAL MEDIAL PATELLA LUXATION

Mekha Chandran, Aarsha Raj and Sunil Kumar

Multi-Speciality Veterinary Hospital, Kuduppanakunnu, Thiruvananthapuram

A six-month old German shepherd dog was presented with history of hind limb lameness and walking in crouched position since birth. Radiographic diagnosis revealed bilateral medial luxation of patella with deformity of both stifle. Surgical correction of this case of congenital deformity was done on right limb by the technique of Trochlear Wedge Resection Sulcoplasty (TWRS) and Transposition of Tibial tuberosity (TT) which showed normal weight bearing of good functional outcome.

ORT-22

COMPARISON OF EXCISION ARTHROPLASTY, DENERVATION AND TRANS-FEMOROARTICULAR WIRING FOR HIP DISPLASIA IN DOGS

N. Nagaraju, Makkena Sreenu, M.S. Vasantha, M. Srinivas and N.K.B. Raju

Department of Veterinary Surgery and Radiology, Veterinary College, Hassan, Karnataka

The present study was conducted on clinical cases of dogs with hip disorders viz, dysplastic hip, subluxated and luxated hips. Hip extended venterodorsal views of radiographs confirmed the dysplastic, osteoarthritic, subluxated and luxated hips. Dogs with hip disorders under the study were grouped into three groups. Excision arthroplasty was done in group I dogs where femoral head and neck was excised and joint capsule was sutured to prevent bone contact between femur and acetabulum. Denervation done in group II dogs wherein cranio dorsal gluteal nerves on acetabular rim were destroyed using bone curette. Trans-femoroarticular wiring was done in group III dogs for subluxated and luxated hips using nylon wiring. The dogs were followed up to 60 days. Based on clinical, radiological and hematobiochemical changes in dogs, excision arthroplasty was effective in relieving pain in osteoarthritis, simple technique to perform, cost effective, although range of motion reduced, owner's satisfaction was good with off leash activity. Denervation was effective in relieving pain, simple procedure, less time consuming and cost effective, for aged dogs. Trans-femoroarticular wiring in young dogs with subluxated and luxated dogs, using C-arm guide provided joint stability, less inflammation with nylon wire, comparatively more time consuming than group I and II however functional assessment by owners feedback shown better performance of dogs in group I and II than group III dogs.

ORT-23**UNILATERAL ULNAR HEMIMELIA IN A KITTEN AND ITS MANAGEMENT**

Nagabhushana, H.V., B.R. Balappanavar, L. Ranganath, Nagaraju N.,
Manjunatha, D.R. and Rakesh, T.

Department of Veterinary Surgery and Radiology, Veterinary College, Hassan, Karnataka

Twenty days old Kitten was presented to Department of Veterinary Surgery and Radiology, Veterinary College, Hassan, with history of flexed and atrophied left fore limb since birth and not bearing weight on that limb. On physical examination pet didn't expressed pain symptoms and we didn't felt the olecranon process of the ulna. On radiographic examination we observed absence of ulna and radius was fixed to the lateral condyle of the humerus. The flexed limb was extended and ice cream stick was used as splint to apply splint bandage until bone maturity and kitten started partially weight bearing after 3 months, and uneventful recovery observed after one year.

ORT-24**SURGICAL MANAGEMENT OF BILATERAL MANDIBULAR FRACTURE IN 3 DOGS WITH ORTHOPEDIC WIRING**

Nagabhushana, H.V., Nagaraju, N., L. Ranganath., B.R. Balappanavar,
Manjunatha, D.R. and Rakesh, T.

Department of Veterinary Surgery and Radiology, Veterinary College, Hassan, Karnataka

Five dogs of different breeds and age were presented to Department of Veterinary Surgery and Radiology, Veterinary College, Hassan, with history of automobile accident in two dogs and wild animal attack in one dog. Physical examination revealed crepitus on both mandibles in all dogs. Dogs evinced pain on palpation, unable to open the mouth. Radiological examination revealed complete bilateral transverse fracture of both the mandibles in all dogs. Dogs were anaesthetized using thiopental sodium 2.5% intravenously and fractured fragments were reduced and secured using one or two loop orthopedic wiring. Postoperative analgesics and antibiotics were administered and all dogs recovered uneventfully.

ORT-25**COMPARATIVE EVALUATION OF LOCKING COMPRESSION PLATES AND CUTTABLE PLATES FOR LONG BONE FRACTURE REPAIR IN DOGS**

S. Kamaljit, P.T. Jadhao, S.V. Upadhye, S.B. Akhare and B.K. Bhadane
*Department of Veterinary Surgery and Radiology, Nagpur Veterinary College,
Maharashtra Animal and Fishery Sciences University, Nagpur, Maharashtra*

The study on comparative evaluation of locking compression plates and cuttable plates for long bone fracture repair in dogs was conducted on 12 clinical cases with diaphyseal fracture of long bones

during the period December 2018 to July 2019 at TVCC of Nagpur veterinary college. The cases were divided into two equal groups of 6 dogs each with fracture stabilization by locking compression plates one group and cuttable plates in second by ORIF (Open Reduction and Internal Fixation). The cuttable plates were beneficial for fracture immobilization since they could be cut to desirable length, as against locking compression plate in small breeds and dogs below and up to 15 kg of weight.

ORT-26

LONG BONES FRACTURE FIXATION THROUGH DIFFERENT DESIGNS USING EPOXY PIN FIXATION IN CANINES

Naveen Kumar Verma, A.C. Saxena, Rohit Kumar, P. Kinjavdekar and Amarpal

Division of Surgery, Indian Veterinary Research Institute, Izatnagar, Bareilly, Uttar Pradesh

Six dogs of different breeds of either sex presented to RVP cum TVCC, I.V.R.I with the long bone compound fractures, non-union were selected for the study. The radiographs in two standard views were taken to diagnose the fracture and to select optimum pins size and site of pin insertion. Out of four animals, four animals had non-union fracture of radius and ulna, one animal had compound radius ulna fracture and remaining case had transverse fracture of phalangeal bone fracture along with hock joint dislocation. The surgery was planned under general anaesthesia. The general principles of external skeletal fixation were followed. All of the cases were managed with both open or closed approach as required. A variable number (6–12) of Kirschner wires, of various sizes (1.2 mm – 3.0 mm) were used depending on the patient size and clinical judgement. The connecting bars were constructed with epoxy putty in allusing different designs through pin bending in four varied fashion. Fracture healing was assessed through radiographs and weight bearing at different time intervals. In conclusion, epoxy putty external skeletal fixation can be a successful technique for the management of simple, compound, infected, multiple fractures of different bones and several joint dislocations which requires prolonged immobilisation.

ORT-27

OLECRANON HOOK PLATE FOR IMMOBILIZATION OF FRACTURED OLECRANON PROCESS IN A LABRADOR PUPPY

Mishra. R., Y.P. Singh, L. Bhat and M. Rajput

Department of Veterinary Surgery and Radiology, Apollo College of Veterinary Medicine, Jaipur, Rajasthan

A 9 months old male Labrador pup was referred with the history of lameness on the left forelimb since 6months and treated with local veterinarian. Clinical examination and radiography revealed fracture of olecranon process of left forelimb. Surgery was performed under general anesthesia and callus was noticed around the fracture site involving muscles. The fracture was reduced and immobilized with a customized 2.0 mm 5-hole Olecranon Hooked Plate and external Co-optation was applied. Advised cage arrest was for two weeks. The animal recovered uneventfully.

ORT-28

EVALUATION OF LOCKING COMPRESSION PLATE FOR THE MANAGEMENT OF TIBIA FRACTURES IN DOGS

Priyanka, Tarunbir Singh, Pallavi Verma, Rahul Udehiya, Jitender Mohindroo,
Arun Anand and Nameirakpam Umeshwori Devi

*Department of Veterinary Surgery and Radiology, College of Veterinary Sciences,
Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, Punjab*

The study was conducted on 20 clinical cases suffering from 20 tibia fractures in dogs. Fractures were repaired using plating (n=17) and plate-rod construct (n=3) techniques. LCP, T-plate, distal tibia plates were used in 15, 4 and 1 case respectively. Males of Labrador and Non-descript breed were most commonly affected with tibia fracture within age group of more than 12 months having medium body weight. Automobile accident was the main aetiological factor for tibia fracture. Mid shaft spiral and oblique fracture was most commonly reported. Early weight bearing was observed in all the animals. Complication with the technique of plating in tibia fracture was reported to be 20%. About 80% of animals showed excellent limb usage. No lameness was found in majority of the animals at the follow-up examination. Both LCP and plate-rod construct techniques provides rigid fixation and early weight bearing post-operatively. Plate-rod construct is comparatively simpler technique considering the ease of apposition.

ORT-29

STUDIES ON THE EFFECT OF *Cissusquandr angularis* ON LONG BONE FRACTURE HEALING IN WISTAR RATS

S.K. Yadav, Raju Sharda, Rukmani Dewangan, M.O. Kalim, M.V. Kamble and Devendra Yadav
*Department of Veterinary Surgery and Radiology, College of Veterinary Science & A.H.,
Anjora, Durg, Chattisgarh*

The study was carried out in twenty-four Wistar rats to evaluate the effect of *Cissusquandrangularis* on long bone fracture healing. The animals were randomly divided in to four equals groups that is Group I, II, III and IV which consisted of six animals in each group. In Group I-the rats were kept as healthy control, Group II the fractured rats were kept as operative control, Group III, the fractured rats were subjected to treatment by using *Cissus quandrangularis* (CQ) P.O 400mg/kg body weight daily for 30 days and in Group IV-the fractured rats were subjected to treatment by using topical application of *Cissus quandrangularis* (CQ) on site daily for 30 days. The parameters like physiological, haemato-biochemical and radiological were assessed. There were transient changes in physiological and haematological parameters which remained within normal physiological limits whereas, significant ($p < 0.05$) changes observed in biochemical parameters. The animals which were given oral administration of *Cissus quandrangularis* in (Group III) resulted in early healing of fractured bone as compared to other groups. Topical application of *Cissus quandrangularis* (group IV) was done as it took slightly longer time. However, both group III

and IV were better than the untreated group II (operative control) where no treatment was given. Therefore, it could be concluded that *Cissusquandrangularis* induces early long bone fracture healing.

ORT-30

SURGICAL MANAGEMENT OF MANDIBULAR FRACTURE IN A DOG WITH MAGNESIUM BASED BIODEGRADABLE PLATING

R.N. Chaudhary, **Robin**, Ram Niwas Sundariwal and Amit Kumar

*Department of Veterinary Surgery and Radiology, College of Veterinary Sciences,
Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, Haryana*

A 3 years old non-descript dog was presented to Teaching Veterinary Clinical Complex, LUVAS, Hisar with a history of automobile accident, anorexia and swelling over left caudal mandible since 2 days. Based on history, clinical examination and radiography a complete transverse fracture of horizontal ramii of left mandible at the level of first molar tooth was observed. Fracture was unstable so, surgical treatment was recommended. Fracture fixation was done with the 5 holed 2.7mm magnesium based biodegradable plate with two cortical steel screws and two magnesium-based screws were placed caudal and rostral to fracture respectively under general anaesthesia. Immediate post-operative radiographs revealed appropriate reduction of fragments. Animal started to eat and drink normally 10 days post-operatively. In summary, it is concluded that a biodegradable magnesium-based plate with screws can be used for stabilization of mandibular fracture in dogs as the plate has a property of promoting bone's osteoblastic activity unlike other plates where there is no such property and a need of plate removal.

ORT-31

SURGICAL MANAGEMENT OF BILATERAL LONG BONE FRACTURES IN SMALL ANIMALS

I. Nath, B. Jena, S.S. Behera, A.K. Sahoo, A. Dhanda, S. Sahoo, S.N. Varun and S.K. Pradhan

*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H.,
Odisha University of Agriculture and Technology, Bhubaneswar, Odisha*

Bilateral long bone fractures were recorded in seven dogs (5M & 2F) and a female cat. All animals were less than one-year-old. Cause was fall from multistoried building (5cases), fall from staircase (1 case) and automobile accident (1case). Bilateral radius and ulna (2cases) fractures were immobilized by external skeletal fixation using 2mm Steinmann pin and epoxy. Bilateral femur fractures (5cases) were immobilized either by intramedullary pinning using 3 to 5mm Steinmann pin or by cross pinning using 2mm Steinmann pin after open reduction. External splint support provided using either modified Robert John's bandage, modified Thomas splint or fibre glass cast. Post-operatively soft dry bedding and frequent rotation of recumbent animals was advised. Weight bearing with external splint support was noticed by 15th day and without external splint support by 30th day. External splints and orthopedic implants were removed on 30th and 60th post-operative days respectively.

ORT-32

CLINICAL, HAEMATO-BIOCHEMICAL AND RADIOGRAPHICAL COMPARISON OF LONG BONE FRACTURE HEALING STABILIZED WITH INTRA MEDULLARY PINNING WITH AND WITHOUT GRAFT IN DOGS

Rajnish Kumar, P. Bishnoi, Shivangi Diwedi, A.K. Bishnoi, Sakar Palecha and Raj Kumar

Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences, Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan

The present study was conducted to evaluate the efficacy of Calcium Hydroxyapatite composite graft in long bone fracture healing stabilized by intramedullary pinning (IMP) in dogs. Total 14 long bone fractures (femur, tibia and Humerus) were stabilized by IMP and composite graft was applied in 6 cases. A detailed regular clinical, radiographical and haematobiochemical examination was done to evaluate the fracture healing with and without graft. Lameness was graded from 0 to 4 on the basis of weight bearing on the affected limb and radiographic healing was graded from 1 to 5 based on the amount of callus formation and visibility of fracture line. There was noted continuous reduction in lameness and improvement in weight bearing score in both the groups from 3rd to 60th post-operative day. At the end of 60th day the mean of lameness score was found lesser in grafted group (0.67 ± 0.33) than the non-grafted group (0.75 ± 0.15). Similarly, there was non-significant difference in the radiographic healing score between the groups but it was found lesser in the grafted (1.5 ± 0.31) than the non-grafted group (1.75 ± 0.23). In both the groups, post-operatively, all the haematobiochemical values were found in the normal range. It was concluded that with adequate stability provided by IMP, the chosen graft may help in enhancing fracture healing in long bones.

ORT-33

POSTOPERATIVE MANAGEMENT OF AMPUTATED LIMBS BY “KRISHNA LIMB” PROSTHESIS: A REVIEW OF 95 CASES

Tapesh Mathur

Department of Animal Husbandry, Government of Rajasthan, Jaipur, Rajasthan

The exact number of Farm animals who have had amputations in India, is difficult to determine due to lack of proper records keeping. A study of 95 cases of limb amputation in farm animals and pet (mostly cows and dogs) in last 4 years, the lost joints and muscles functions were replaced by an artificial limb, “Krishna Limb”. The causes of amputation vary greatly from region to region. Disease, trauma and congenital deformities are three main causes of amputation. Trauma is most common cause, usually occurs as a result of road accidents and landmines in boarder areas whereas Disease limits the circulation of arterial blood causing ulcers and gangrene, lead to amputation. Tumor and Diabetes are another cause of limb amputation in pets. Congenital malformation accounts for a small portion of amputations. Trans metacarpal (36%) and trans metatarsal (47%) are most frequent level of amputation in animals. Trans tibial (10%) and Trans

radial (8%) are the other levels. The healing rate improves when the amputation is closer to the knee joint / hock joint, but the functional outcome decreases due to shorter the stump length is. Below knee and below hock joint amputations will be more likely to accept and functional use with a “Krishna Limb” prosthesis than with higher level limb amputations.

ORT-34

MINIMALLY INVASIVE TITANIUM ELASTIC NAILING TECHNIQUE FOR LONG BONE FRACTURE FIXATION IN YOUNG DOGS

Vaibhav Bishnoi, Vikash Chauhan, Samar Mahendran, Shriram Ganesan and Correia Salisha
CGS Hospital, Gurugram, Haryana

Four male young dogs were presented with the history of recent automobile trauma at CGS Hospital, Gurgaon. Physical examination revealed non-weight bearing lameness of left hind limb(1), right hind limb(2) and right forelimb(1), respectively. Survey limb radiographs revealed complete transverse (3) and oblique (1) diaphyseal fracture of Tibia(3) and Radius/Ulna(1). Fracture stabilization was done with hybrid combination of titanium elastic nailing and External skeletal fixator with minimum invasion under C-Arm fluoroscopy under general anesthesia. Post-operative management was done with antibiotics, anti-inflammatory medication and restricted movement and physiotherapy. External skeletal fixators were removed 3-4 weeks post operatively when fracture line was still translucent. Minimum invasion leads to early biological osteosynthesis, fast fracture healing and rapid recovery of patients. Early ambulation on affected limb was observed within 24 hours post operatively. No requirement for excessive external was observed. All patients recovered well without any complications.

ORT-35

SUCCESSFUL MANAGEMENT OF OSTEOARTHRITIS BY USING ALLOGENIC CANINE ADIPOSE DERIVED MESENCHYMAL STEM CELLS IN DOGS

Vinny Anna Varghese, **R.K. Udehiya**, M. Sharma, M.K. Lonare, T. Singh, P. Verma,
N.U. Devi and J. Mohindroo

*Department of Veterinary Surgery and Radiology, College of Veterinary Sciences,
Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, Punjab*

The present study was planned to compare and evaluate the management of osteoarthritis using canine adipose derived mesenchymal stem cells (cADMSCs) and traditional conservative medical management in dogs. Twenty-five dogs were distributed in two groups; control group A with normal medical management and group B treated with cADMSCs. All the dogs were assessed upto 60 days. Double intra-articular injection of allergenic canine ADMSCs under c-arm guidance was done at 15 days interval. Clinical, hemato-biochemical and radiographic observations were recorded in all the cases. However, synovial fluid examination was done only in cADMSCs treated group. It was resulted that significant improvement in lameness was recorded in group B whereas, no change was recorded hemato-biochemically and radiographically in both the groups. It was concluded that effective restoration of lameness was seen

in cADMSCs treatment as compared to conventional medical treatment. The functional improvement was detected after the second injection and persisted throughout the period.

ORT-36

SURGICAL MANAGEMENT OF LONG BONE FRACTURE WITH BILATERAL LINEAR FIXATOR IN TWO BUFFALO CALVES

Sandeep Saharan, Sandeep Goyal, Dinesh, **Dishant Saini**, Amit Kumar, Ankush, Ankit Dangi and Deepak Kaushik

Department of Veterinary Surgery and Radiology, College of Veterinary Sciences, Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, Haryana

Two buffalo calves were brought to Veterinary Clinical Complex Hisar, LUVAS with a history of compound fracture of left metatarsal. On radiography, it was suggestive for oblique overriding fracture of distal third of left metatarsus. Under general anaesthesia which was achieved by infusion of xylazine @ dose rate of 0.05mg/kg b.wt along with epidural nerve block. Fracture was stabilized with the help of bilateral linear fixator (BLF) made of two rods of 11mm in diameter and 12.5 inches in length connected with four Steinmann's pins (5mm × 12") with the help of eight connectors. After surgery animals were able to bear slight weight on the affected limb and resumed complete weight-bearing after one month. The result was quite encouraging and fracture healed in 12 weeks. Therefore, it is concluded that the fracture of lower limb bone can be successfully handled with BLF in buffalo calves.

ORT-37

BIOCOMPATIBILITY AND BIODEGRADABILITY STUDY OF MAGNESIUM BASED ORTHOPAEDIC BONE IMPLANTS IN AVIAN MODEL

Abhishek M.S., Satish Jaiswal, Debrupa Lahiri and Arup Kumar Das

Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences, G.B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand

The experimental study on biocompatibility and biodegradability of Mg based orthopaedic bone implants were conducted in 18 adult fowls for the period of 180 days. These birds were divided into three groups of six birds each (I-Plain-Mg implant, II-Mg-5%-apatite and III-Mg-15%-apatite) and subjected to surgical insertion of assigned implants into the intramedullary cavity of right humerus under ketamine anaesthesia with atropine sulphate premedication. Biodegradability of implants were assessed radiographically (medio-lateral) on scheduled intervals (immediate postoperative, 1st week, 2nd week, 3rd week, 4th week, 6th week, 8th week, 10th week, 12th week, 15th week, 18th week, 21st week and 24th week). Leading-edge positioning view was also used for final radiological assessment. Clinical parameters like cloacal temperature, flight test, and wing dropping test, and biochemical examinations like serum magnesium, calcium and phosphorous estimation were performed to evaluate biocompatibility of implant material. Similar postoperative treatment and care were given to every bird during surgical convalescence. Initiation

of biodegradation was discernible on radiographs in birds of Group-I on 1st-2nd week (11th day); in Group-II on 3rd week (17th day); and Group-III on 1st week (6th day). After the completion of 180 days these birds were euthanized using thiopentone sodium and test bone samples were collected for histological evaluation. From the results of this study following conclusions can be made that - (i) Mg based test metallic implants are biocompatible and biodegradable (ii) concentration of hydroxyapatite relates directly in the biodegradation of the Mg-apatite matrix implant.

ORT-38

IMMOBILIZATION OF OPEN/CLOSED TIBIA AND RADIUS-ULNA FRACTURE BY TYPE IIA LINEAR EXTERNAL SKELETAL FIXATION IN DOGS

Mohan Lal, A.K. Bishnoi, Ruchi Patwa, M. Tanwar, S.K. Jhirwal and P. Bishnoi

Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences, Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan

Total 8 fractures, four each of radius-ulna and tibia, of which 5 were open and 3 closed, were stabilized by Type Iia linear external skeletal fixation (ESF) method. In the bilateral linear ESF, all transcortical pins were inserted in full manner in 5 cases, in half-manner in one case and the combination of two in 2 cases. Of the treated animals, 4 were adult and 4 juvenile (< 6 months). At long follow-up (in 5 cases), in the final outcome, the limb function was found excellent and good in 2 cases each and fair in one case. Radiographically, at 8th post-operative week, in five follow-up cases, the fracture was found completely healed with obliteration of fracture line in 2 cases and with trace callus and distinct fracture line in rest of the 3 cases.

ORT-39

IMMOBILIZATION OF FEMORAL FRACTURES WITH THE COMBINATION OF LINEAR EXTERNAL SKELETAL FIXATION AND INTRAMEDULLARY PINNING IN JUVENIL DOGS

Mohan Lal, A.K. Bishnoi, Ruchi Patwa, M. Tanwar, S. Palecha and P. Bishnoi

Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences, Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan

Total 11 closed femur fractures in juvenile dogs (age < 6 months) were stabilized by the use of combination of Type Ia linear external skeletal fixation and intramedullary pinning method. The fracture reduction was achieved by closed method under C-arm fluoroscopic guidance in 4 cases while by open surgical method in the remaining cases. At long follow-up, in the final outcome the limb function was found excellent in 7 cases and good in 2 cases, while the 2 cases died in the early post-operative period. At 8th post-operative week, radiographically, complete fracture healing with the obliteration of fracture line could be achieved in 7 out of 8 cases (complete follow-up).

ORT-40**SURGICAL MANAGEMENT OF OSTEOSARCOMA IN THREE DOGS**

P.S. Dakhane, G.U. Yadav, D.U. Lokhande, A.T. Yamgar and Anoop Kumar

*Department of Veterinary Surgery and Radiology, Mumbai Veterinary College,
Parel, Mumbai, Maharashtra*

Three dogs of different age and breed were presented to Department of Surgery and Radiology and Department OPD, Mumbai Veterinary College, Parel, Mumbai. On thorough clinical examination, it was revealed that the growth was present near left elbow in two dogs and on left hock in one dog. On palpation, the growths were hard and firmly attached to bone. Radiological examination, revealed radio opaque mass, metastatic nodules and loss of bone at the area of tumor, on biopsy examination osteosarcoma was detected in all the three cases. Amputation of affected limb was performed in the dogs. All the dogs were recovered uneventfully and there was no recurrence of osteosarcoma up to six months.

ORT-41**SURGICAL REPAIR OF FEMORAL FRACTURES IN DOGS**

**Deepak Kaushik, Sandeep Saharan, Deepak Kr. Tiwari, Neeraj Arora, Gaurav Kumar, Dishant Saini,
Akshay Tikoo and Amit Kumar**

*Department of Veterinary Surgery and Radiology, College of Veterinary Sciences,
Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, Haryana*

The present clinical study was conducted on four dogs presented to the department with history of road accident and non-weight bearing lameness. Among four animals, three were males and one female having different age groups (ranging from 6 -12 months). Physical examination revealed severe pain and crepitus in all the animals. The haemato-biochemical parameters were within the normal limits. Plain radiography of the affected bone was performed in lateral and cranio-caudal views for confirmatory diagnosis, implant selection and surgical approach. Open reduction and internal fixation (ORIF) was performed in all the animals. The surgical site was aseptically prepared and cranio-lateral approach was used to expose the fractured fragments. All the animals were preanaesthetised using atropine sulphate while induction was achieved with a mixture of xylazine and ketamine and maintained under isoflurane anaesthesia. Retrograde technique followed for pin placement was quite satisfactory. Orthopaedic wire (hemi-cerclage or full cerclage) provide inter fragmentary compression between oblique, spiral and comminuted fracture fragments. All the dogs show uneventful recovery and all starts bearing partial weight after two weeks.

ORT-42

SURGICAL MANAGEMENT OF EQUINE LONG BONE FRACTURE

Ram Niwas, Sandeep Goel, **Dishant Saini**, Ankush, Akshay Tikoo and Deepak Kaushik

*Department of Veterinary Surgery and Radiology, College of Veterinary Sciences,
Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, Haryana*

Tibial and metatarsal fractures occur roughly with the same frequency as fractures of other proximal long bones. Two animals with average age of 5 months were presented to Veterinary Clinical Complex, LUVAS, Hisar with history of non weight bearing lameness. On the basis of radiographic findings, in one case comminuted fracture of tibial and in other compound transverse fracture of left metatarsal observed. Under general anaesthesia, fractures were stabilized with the help of external unilateral uniplanar fixation technique and in compound fracture case with dynamic compression plating. Also in compound fracture case full thickness skin grafting was also done. Additional stabilization was achieved by polyurethane cast. Both the cases showed uneventful recovery after one and half month without any complication.

ORT-43

**CLINICAL EVALUATION OF INTRA MEDULLARY PIN SIZE AND
PLATE WORKING LENGTH IN LCP-ROD CONSTRUCT FOR THE
REPAIR OF UNSTABLE DIAPHYSEAL FEMORAL FRACTURE IN
DOGS**

Mohammed Arif Basha K., **Kiranjeet Singh**, Aswathy Gopinathan, Sarangom S.B., Sowbharenia C.,

Swapna C.R., Sasikala R. Akshay K. and Naveen Kumar

Division of Surgery, Indian Veterinary Research Institute, Izatnagar, Bareilly, Uttar Pradesh

The study was undertaken to study the clinical effect of short and long plate working length using LCP rod fixation and effect of intramedullary pin size for unstable diaphyseal femoral fracture in dogs. Animals were randomly divided into four groups A, B, C and D having six dogs of each. Combinations of short plate working length (3 bicortical screws in proximal and distal fragments) for plate rod constructs using IMR of 30% and 40% size of medullary canal were used in groups A and B, respectively. Similarly combinations of long plate working length (2 bicortical screws in proximal and distal fragments) for plate-rod constructs using IMR of 30% and 40% size of medullary canal were used in groups C and D, respectively. Clinically, short plate working length with LCP rod fixation provided rigid fixation and fewer complications than long plate working length for the repair of unstable diaphyseal femoral fractures in dogs. Usage of intramedullary pin size diameter occupying 40% of medullary cavity in LCP rod fixation provided more stable fixation and gave better clinical outcome than IMRs occupying 30% of medullary cavity for the repair of unstable diaphyseal femoral fractures in dogs.



Radiology and Imaging Session

MEET THE SPEAKER



Dr. Adarsh Kumar

Professor and Head

College of Veterinary and Animal Sciences

CSK Himachal Pradesh Agricultural University

Palampur - 176 062 (HP) India

Dr. Adarsh Kumar is a Professor and Head, Department of Veterinary Surgery and Radiology in Himachal Pradesh Agricultural University, Palampur. He has over 24 years of experience in teaching, research and extension. He started his career as Surgical Specialist in the Department of Animal Husbandry, Govt. of HP and had was instrumental in establishing and operationalizing the first Veterinary Polyclinic of the state. He also served in Faculty of Veterinary Medicine in University of Tripoli, Libya as Visiting Professor. He topped All India Junior research fellowship examination in the subject of Veterinary Surgery and is also a recipient of Young Surgeon award by Indian Society for Veterinary Surgery (ISVS) in 2001. He also had the honor to receive the prestigious State “Himotkarsh award and University Gold medal” of HP State topper category in Ph.D. He has handled 14 research projects with approximate grant of over 3.6 crores from NATP, ICAR, Ministry of Agriculture, RKVY, DST, HP state and private linkages. He pioneered a work on standardization of anesthetics and anesthetic regimens in Yaks. Innovated an Orthopaedic implant, now commercially available as “ADMIT PIN” for management of long bone fractures in small animals. Standardized the abdominal sonography of hill horses for diagnosis of various abdominal affections as a part of his commitment for an applied research. As Organizing Secretary, he organized 2 International workshops on Ophthalmology and Cardiology, One National Seminar on Indian Agriculture and one CE Program on Emergency and Critical care. He has the credit to develop the first Vet consultancy webportal of the country for veterinarians and animal husbandry professionals “www.consultvetpalampur.org” as RKVY initiative. He had contributed a weekly column (Livestock helpline) pertaining to farmers queries in print media for six years and have written more than 400 columns. He is regularly invited as a resource person and lead speaker for various Veterinary CE programs, CAFT, wildlife wing workshops, conferences and Symposias etc. Dr. Adarsh has published 85 Research Articles in International and National Journals with 3 Books, 3 manuals and 6 book chapters. Guided 16 post graduate students. Bestowed with 22 awards/medals for scientific contributions. He is a member of many scientific and welfare societies and is a member of many national and international Editorial board of different journals.

EQUINE ABDOMINAL SONOGRAPHY: DIAGNOSTIC UPDATE FROM BASICS TO LOGICAL DECISION MAKING

Adarsh Kumar

*Department of Veterinary Surgery and Radiology,
COVAS, CSKHPKV, Palampur (H.P.) and Visiting Professor, Tripoli University, Libya*

This paper will describe a rapid, systematic examination protocol for ultrasound evaluation of the adult equine patient with abdominal pain. Once the clinician is comfortable with the normal ultrasonographic anatomy and alterations commonly seen in the wide spectrum of colic disorders, they should be able to quickly categorize the condition into gastric, small, or large intestinal disorders in order to add important information to the total colic examination procedure. The diagnostic abdominal ultrasonography is increasingly used in Veterinary practice and has an important role in decision making in equines with abdominal disorders. It has the potential for wide spread use in diagnosis of disorders like urogenital, gastro intestinal which mainly include gastric distension, small intestinal ileus, inflammation of large intestine, right dorsal colitis, intra-abdominal masses and neoplasms, intra-abdominal abscesses, intestinal obstructions, intussusceptions, impaction, entrapment of large colon in the nephrosplenic space, displacement of colon, and bowel rupture. In addition to this, intestinal diameter, gut motility, liver abscesses, splenic tumors, renal change in pyelonephritis, urolithiasis, etc. can be diagnosed easily with the help of sonography.

Ultrasonography has a number of advantages over other imaging techniques. It can distinguish between soft tissues of different echogenicity. It enables different regions of the gastro-intestinal tract to be identified and their location, size, anatomical features (such as sacculations), luminal contents and motility to be assessed. Fluid and soft tissue can be differentiated using ultrasonography. The small intestine wall can therefore be distinguished from its fluid contents, and parameters such as wall thickness and the nature of intestinal contents can be evaluated. The ultrasound image is constantly updated, producing a real-time moving image. Consequently, the position and movement of the structures relative to each other can be assessed. The frequency, amplitude and velocity of the peristaltic contractions can also be evaluated by B-mode, M-mode and Doppler ultrasonography. Furthermore, it is easy to perform and allow immediate interpretation that is essential in the colic patients. Other methods of imaging the gastro intestinal tract, such as radiography and endoscopy, are of limited value in the adult horses due to the large size of the abdomen.

One of the problems of gastro intestinal ultrasonography in horses is acoustic shadowing from gas and ingesta within the large intestine and gas within the lungs. In horses, large intestine is located along most of the lateral and ventral abdominal wall and the lungs overlie much of the cranial and dorsal abdomen. These structures reflect most of the entire ultrasound beam making imaging of any underlying structures difficult. In human ultrasonography, the reflection of ultrasound beam from the large intestinal contents is reduced by administering large volumes of oral fluids prior to imaging but this is not practical in equines and instead different techniques such as combining transrectal and transcutaneous imaging may have to be used to visualize most of the abdomen.

It is always not possible to evaluate the deeper cranial abdominal structures in horses. This is a particular problem in patients with large intestinal distension and when feasible, sequential ultrasonographic

examinations are of value. None the less, deeper structures may remain inaccessible and some lesions may not be identified.

Transducers and ultrasound machines

The sonographic examination of the gastrointestinal tract can be performed with a microconvex transducer, a high-frequency linear transducer for evaluation of bowel wall thickness close to the body wall, and a transrectal transducer for evaluating any abnormalities detected on rectal examination. A large lower-frequency convex transducer is useful for the flash examination, in which time is of the essence in making the diagnosis and the subtleties of the image are less important, or for evaluating gastrointestinal structures that are further away from the transducer. The standard linear transrectal transducer can be used and placed over any structure that is abnormal on rectal palpation to further define the abnormality but is limited by the depth of penetration of the transducer and the ability to place the transducer directly over the abnormality. A small microconvex transducer can also be used transrectally and has the advantage of a wide field of view and being able to direct the transducer towards the abnormality without having to place the transducer directly over the abnormality. Visibility with a rectal transducer is limited to structures close to the skin surface because of its maximal scanning depth of 10 to 12 cm. For transcutaneous evaluation, sector scanner transducers with frequencies of 2.5-5 MHz and 5-10 MHz microconvex linear array transducers are required. A low-frequency (2–5 MHz) curvilinear transducer is the transducer of choice for equine transcutaneous abdominal ultrasonography because of its ability to image up to 27 to 30 cm of depth.

Patient Preparation and Scanning Technique

The ultrasonographic evaluation of the abdomen is well tolerated and sedation is rarely needed. The hair must be clipped off the skin over the area under investigation with surgical clipper blade or shaved from the xiphoid process of the sternum to the pubis ventrally and bilaterally from the paralumbar fossa to the elbow, ventral to the lung fields. The skin cleaned and an ultrasonographic coupling gel applied. The skin should be thoroughly cleaned. Alcohol and warm ultrasound coupling gel applied to improve contact. Proper preparation for transrectal ultrasound include adequate restraint of the patient, administration of sedation as needed, and use of obstetrical lubricant. The entire ventral abdomen should be clipped. The horse should be scanned standing, if possible. The intraluminal bowel gas will rise to the more dorsal portions of the abdomen, enabling the clinician to examine a larger portion of the gastrointestinal tract. If the horse is recumbent, the scan should be performed from the most ventral portion of the abdomen.

It is estimated that the peripheral 2/3 of the abdomen of an average horse can be sonographically imaged with a percutaneous technique. Most abdominal sonography is performed percutaneously, but scanning per rectum can also augment the information gathered during rectal palpation, especially when the left kidney, urinary bladder, ureters, reproductive tract, or caudal abdominal vasculature are suspected as causes of abdominal pain. A good working knowledge of abdominal anatomy and image optimization is necessary to obtain diagnostic sonographic images in colic cases; that said, with practice and guidance, abdominal sonography is not difficult to learn. Newer protocols for scanning acute colic cases, such as the fast localized abdominal sonography of horses, provide guidance for performing rapid, consistent examinations that yield useful information in these cases. As with any diagnostic modality, there are limitations to the

application of sonographic evaluation to colic. Image quality can be affected by hydration, perfusion, and ambient temperature, as well as the horse's skin thickness and density, degree of adiposity, and hair coat.

Detailed technique

When the equine abdomen is scanned, it is important to use a systematic approach, scanning the left and right sides dorsally to ventrally and then rostrally to caudally. Careful attention should be paid to the spatial relationship of the viscera because this may be the key to distinguish normal from abnormal findings. The walls of some section of the GIT appear strikingly similar and may not be distinguishable if the clinician does not know where the transducer is placed on the abdomen. Transabdominal ultrasonography provides not only structural information but also functional information (motility). Heavy sedation can cause transient ileus and mild dilation of the small intestine. The full examination divides each side of the abdomen into 3 general regions:

- a. Paralumbar fossa/flank region from the level of the tuber coxae to the stifle
- b. ICS (5–17th) from the ventral lung margins to costochondral junctions
- c. Ventrum from sternum to inguinal region (cranial to caudal) and costochondral junctions to midline (left to right).

Each region is thoroughly evaluated in systematic fashion. In addition, each ICS is evaluated from the ventral lung margin to the costochondral junctions to ensure imaging of all abdominal structures and the ventral thorax to detect pleural/pulmonary abnormalities that can mask as colic. Although this examination can initially seem extensive, it can be performed quickly in colic patients.

Flash Technique

This FLASH (Fast Localized Abdominal Sonography of Horses) protocol is performed rapidly in emergency situations to provide useful additional information required in the decision-making process when faced with a horse displaying symptoms of colic. Apply liberal quantities of surgical spirit/alcohol to the areas to be scanned. The protocol splits the abdomen into 7 ultrasonographic 'windows': ventral abdomen, gastric window, spleno-renal window, left middle third of the abdomen, duodenal window, right middle third of the abdomen, and cranioventral thoracic (on the right side). These locations represent anatomical regions where pathology is mostly likely to be detected based on previous research. Using a low-frequency curvilinear (convex) transducer start at the ventral abdominal window on the ventral midline, moving through the 'windows' in sequence as listed above. At each site note the presence or absence of free abdominal fluid (visible as anechoic – black – regions, often triangular, between the abdominal viscera), the appearance of small intestinal loops, including their motility (or lack thereof), the contents of the large bowel, and the presence of the spleen in direct contact with the left kidney (the spleno-renal window). This technique is used to detect the

- a. Presence of free abdominal fluid, which is most frequently observed ventrally. In horses a small amount of free abdominal fluid is considered normal, and the decision as to whether or not the amount of free fluid visible is increased above what would be considered normal is a subjective one. Also be aware that the nature of free abdominal fluid cannot accurately be assessed.
- b. Small intestinal loops should be checked for degree of dilation, the presence or absence of turgidity,

and motility. Busoni *et al.* found the presence of dilated, turgid small intestinal loops to have a sensitivity of 80% and specificity of 96.15% for small intestinal obstruction.

- c. A suspicion of nephrosplenic entrapment can be investigated using this protocol (via the spleno-renal window). The presence of a gas-filled colon adjacent to the spleen, and an inability to visualize the left kidney support this diagnosis, though pairing this information with rectal palpation findings is wise.

Key considerations about normal ultrasonographic anatomy of an equine abdomen

Briefly, the cecum, cecal mesentery, right kidney, right liver lobe, duodenum, and right dorsal colon are evaluated from the right side of the abdomen, and the left kidney, spleen, stomach, and left liver lobe are evaluated from the left side of the horse. The left dorsal colon and ventral colon are seen predominantly in the left ventral abdomen, and the right ventral colon is visualized primarily from the right ventral abdomen. Differentiation between cecum and colon segments is primarily based on location rather than the presence and size of sacculations. Jejunum is most often seen in the ventral abdomen, but may be visible in multiple locations throughout the abdomen.

Left abdomen

The spleen is the predominant feature of the left abdomen, including the ICS and ventrum, and often extends to or slightly to the right of midline. The spleen is homogeneously echogenic and should appear hyperechoic to the liver and kidneys. The splenic vein is visible in nearly all horses near the gastrosplenic space. The left kidney is visible deep to the spleen in the left paralumbar fossa region and caudal (15–17th) ICS. The stomach is located dorsal to the spleen and ventral to the lung in the left 10th to 15th ICS. Evaluation is primarily limited to its greater curvature. Gastric contents are not typically visible, unless there are increased luminal fluid contents. The left liver lobe is imaged cranial to the stomach in the left 6th to 10th ICS. The left liver lobe may be situated lateral or medial to the spleen, but should always be hypoechoic to the spleen. Visibility of the left liver lobe is somewhat variable and may not be seen in some horses. Large colon should be visible deep to the spleen. Collapsed to mildly dilated SI loops are often detectable between the spleen and large colon and occasionally in the gastrosplenic space.

Right abdomen

The cecum is visualized from the upper right paralumbar fossa and flank region with its apex extending to the ventral abdomen. The cecal mesentery and lateral cecal artery and vein can be evaluated along this same path (30) but may not be of particular interest when evaluating the acute abdomen. The right kidney is seen in the caudal right ICS (14–17th) adjacent to the body wall. The right liver lobe is visible in the right ICS, usually the 10th to 15th ICS. Margins should be sharp and not extend to or beyond the costochondral junctions. The descending duodenum has a fixed location and is visible in most horses ventral to the right kidney and deep to the right liver lobe in the right 11th to 17th ICS.

Visibility in the more cranial ICS is highly variable, as the duodenum becomes deeper as it extends to the stomach. The ascending duodenum cannot be visualized with ultrasound. The right dorsal colon is located deep to the right liver lobe in the right ICS and shows a large, smooth radius of curvature. The mixture of luminal feed and gas precludes visualization of the lumen and the far wall of the colon and cecum.

Colonic or cecal wall thickness is often difficult to measure in normal horses. The hyperechoic gas/feed contents should not erroneously be included when acquiring wall thickness measurements. Normal colon and caecal wall thickness measurements are somewhat variable between reports, but measurements greater than 3 to 4 mm are generally considered thickened. Interpretation of measurements should consider the degree and distribution of thickening (focal vs diffuse) as well as the detail provided by the image to obtain accurate wall thickness measurements.

Ventral abdomen

The large colon is the dominant feature of the ventral abdomen. Although jejunum can be found in multiple sites throughout the abdomen, common locations for visualization of small intestinal loops include the inguinal regions, deep to the spleen and occasionally in the gastrosplenic space. SI visibility may be increased in fasted horses. The bladder may be seen caudally in the inguinal region in some horses. Urine may appear variably echoic due to the presence of mucus and crystals. Care should be taken not to confuse a bladder containing echogenic urine for an abdominal abscess. It should be emphasized that evaluation of the entire ventral abdomen is an important part of the ultrasound examination in the acute abdomen, as many abnormalities are frequently identified in the ventral abdomen.

Clinical scope of equine diagnostic sonography

1. **Gastric disorders:** Gastric distension usually implies a more distal obstructive process as opposed to primary gastric obstruction. Most often ultrasound cannot differentiate gastric distension from intestinal obstruction from that caused by ileus. The earlier the gastric distension is detected during the examination process; the sooner relief of pain can be provided by passage of a nasogastric tube. In fact, ultrasound can be useful in evaluating the success of gastric decompression. Irregular thickening of the gastric wall with prominent rugal folds may be detected in some horses with gastritis. An enlarged radius of curvature of stomach indicates increased gastric fluid contents due to gastric reflux.
2. **Small intestine disorders:** Small intestine distension has been defined as a luminal diameter great or than or equal to 5 cm. Increased small intestinal wall thickness is considered greater than or equal to 3 mm.
 - a. **Small intestinal strangulating obstructions:** Visualization of distended and nonmotile loops of SI is highly associated with small intestinal strangulating lesions. Careful evaluation of the ventral abdomen is important in all patients because strangulated loops tend to fall to the dependent portion of the abdomen. The presence of both distended and collapsed small intestinal loops can also be seen.
 - b. **Intussusception of small intestines:** Small intestinal intussusceptions are commonly diagnosed in foals. Cross sectional ultrasonography reveals a typical bull's eye or target appearance. Similar to most small intestinal lesions, small intestinal intussusceptions are typically edematous and fluid filled and fall to most dependent portion of the abdomen.
 - c. **Proximal enteritis / duodenitis:** Fluid distension of the intestinal tract with increased peristalsis indicates developing enteritis. The wall of the affected portion of the intestine may be thickened, edematous and more hypoechoic than normal, particularly with severe inflammatory bowel

disease. Shreds of intestinal mucosa may be imaged in the lumen of the intestinal tract. Fluid distention of the duodenum can also be imaged with anterior enteritis and other more distal obstructions. The lack of motility in these intestinal segments is consistent with an ileus and the thickness and echogenicity of the bowel wall are an indication of the degree of involvement of the bowel wall.

3. Large Intestinal disorders

- a. **Nephrosplenic entrapment of left dorsal displacement of colon:** Diagnosis of a nephrosplenic ligament entrapment is suspected ultrasonographically, based upon the inability to visualize the spleen or left kidney transabdominally and the visualization of ingesta and/or gas filled large bowel instead. The sonogram can be used to see if treatment with phenylephrine, followed by lunging, or rolling the horse has successfully corrected the nephrosplenic ligament entrapment.
- b. **Right Dorsal displacement of colon:** Ultrasonographic findings associated with right dorsal displacement include dilated mesenteric vessels on the right side of the abdomen, reported as near the costochondral junctions in 1 to 2 ICS. Rectal examination is still useful in further characterization of colon position within abdomen, and to further evaluate the colonic contents.
- c. **Colitis:** Right dorsal colitis associated with nonsteroidal anti-inflammatory drug toxicity can be diagnosed ultrasonographically by detecting a thickened right dorsal colon ventral to the liver in the right 10th - 14th intercostal spaces. The wall of the right dorsal colon is usually irregularly thickened with increased or variable echogenicity of the bowel wall detected sonographically.
- d. **Intussusception of Large Intestines:** Intussusceptions in adult horses usually involve the ileum and/ or large bowel. The majority of intussusceptions imaged in adult horses are imaged from the right side of the abdomen because the cecum or right ventral colon is involved. They are mostly caecocolic, caecocolic, colocolic, ileocaecal and ileocaecocolic intussusceptions. Target lesions is seen but because of their larger size, luminal fluid is appreciated within the concentric rings of the lesion. Fibrin is imaged between the two loops of affected intestine. In yearlings and young horses, ileal intussusceptions are more common and may be imaged rectally or transcutaneously.
- e. **Sand colic:** Sand accumulations within the large colon are typically diagnosed with abdominal radiographs as they cannot be imaged adequately with ultrasound. On the ventral aspect of abdomen small pinpoint hyperechoic structures on the mucosal surface casting small acoustic shadows in different directions suggests the presence of sand.
- f. **Impaction:** Small colon impactions have also been imaged from the flank in small horses. They may be imaged transrectally as echogenic intraluminal masses. Distension of the more proximal portion of intestine, proximal to an impaction, is usually present, making ultrasonographic visualization of the impaction easier. The impaction appears as a round to oval distended viscus, often measuring 20 to 30 cm or more, lacking any visible sacculations.

4. Peritoneal fluid: Sonography can be very useful in locating the site for abdominocentesis for

deriving the peritoneal fluid. It also assesses the quantity and character of fluid in horses with peritoneal effusions. Retroperitoneal fat should not be mistaken for peritoneal fluid or liver, which can occur in horses due to the hypoechoic and somewhat speckled appearance of fat. Close inspection will reveal that fat will indent on peristalsis of overlying bowel and swirling will be noted in horses with cellular effusion. The character of peritoneal fluid should also be evaluated, especially when faced with large effusions. Hemorrhagic fluid generally shows a fairly homogeneous and cellular appearance. Fluid that is heterogeneous, contains debris, or contains hyperechoic gas echoes is most consistent with bowel rupture. Severe anechoic effusion may be found due to uroabdomen.

5. **Abdominal abscessation:** Abdominal abscesses in the adult horse may be detected in the ventral abdomen, but are also frequently found dorsally associated with the root of the mesentery, cecum and large colon. Abdominal abscesses have also frequently been reported in the adult horse associated with the liver. The sonographic appearance of the abscess can be anechoic or hypoechoic filled with echoic material and may be loculated. Encapsulated mesenteric abscesses are associated with *Streptococcus equi*.
6. **Renal and urinary tract sonography:** The left kidney is visible transcutaneously and transrectally. Transcutaneously left kidney is located deep to spleen in the left PLF region. Enlarged sonolucent kidneys may be imaged in some horses with acute renal failure. Wedge shaped areas of increased echogenicity in the renal cortex are consistent with renal infarcts. Increased echogenicity of the renal parenchyma is usually associated with chronic renal disease, along with kidneys that are smaller than normal and irregular in contour, particularly if the renal disease is end stage. Renal calculi are not uncommonly reported in horses, usually associated with chronic end stage renal failure. Obstruction of the ureter or renal pelvis, resulting in hydronephrosis or hydroureter may be detected ultrasonographically, associated with nephrolithiasis. An enlarged renal pelvis filled with hypoechoic to echogenic debris may be imaged in horses with pyelonephritis.
7. **Liver:** The right liver lobe (RLL) is visible ventral to the lung margins in the right 8th to 15th ICS, although visibility can be quite variable within these ICS. The RLL should not extend to or beyond the costochondral (CC) junctions, in which case it is considered to be enlarged. The left liver lobe (LLL) is visible caudal to the heart in the left cranioventral abdomen in the 7th to 10th ICS. The LLL extends from the ventral lung margins to the CC junctions. Ultrasonographic abnormalities include hepatomegaly, rounded margins, changes in echogenicity (usually increased), decreased fine vascular markings, biliary/vascular fibrosis/inflammation, hepatoliths, biliary distention, and, less commonly, evidence of abscessation or neoplasia. Hepatomegaly and rounded margins may be seen with multiple disease processes, including hepatitis, cholangiohepatitis, obstructive cholelithiasis, and neoplasia.
8. **Spleen:** The spleen is the most echogenic organ in the abdomen and is normally visualized in the left side of the abdomen, ventral to the lung margins from the 7th or 8th intercostal space to the paralumbar fossa on the abdominal side of the diaphragm. The spleen is recognized by its more granular homogeneous texture with few vessels coursing throughout. The spleen may be as thick as 15 cm in its mid body. Splenic abnormalities are rare in the horse, with the exception of

lymphosarcoma, in which masses with a complex pattern of echogenicity are usually imaged involving the majority of the splenic parenchyma. Granulomatous masses, metastatic neoplasms of other types, and hematomas may also be imaged ultrasonographically but are unusual to find in the spleen of horses.

Closing remarks: Diagnosis and decision making in the colic patient might be challenging. The practitioner should gather all necessary information to get a full picture of the disease. In some cases, physical exam, rectal palpation and nasogastric intubation are sufficient. However, often, ultrasound provides key information for proper diagnosis, prognosis and decision making. For this reason, in many practices and equine clinics, echography is included in the standard examination of the equine colic patient. Sonography is extremely rewarding to assist in the diagnosis of multiple disorders of abdominal cavity and is going to transform the diagnosis and treatment of equines suffering from wide variety of affections.

References

- Beccati F, Pepe M, Gialletti R, *et al.* 2011. Is there a statistical correlation between ultrasonographic findings and definitive diagnosis in horses with acute abdominal pain? *Equine Vet J Suppl* 2011; **(39)**: 98–105.
- Bithell S, Habershon-Butcher JL, Bowen IM, *et al.* 2010. Repeatability and reproducibility of transabdominal ultrasonographic intestinal wall thickness measurements in thoroughbred horses. *Vet Radiol Ultrasound* 2010; **51(6)**: 647–51.
- Busoni V, De Busscher V, Lopez D, *et al.* 2011. Evaluation of a protocol for fast localised abdominal sonography of horses (FLASH) admitted for colic. *Vet J* 2011; **188(1)**: 77–82.
- Epstein K, Short D, Parente E, *et al.* 2008. Gastrointestinal ultrasonography in normal adult ponies. *Vet Radiol Ultrasound* 2008; **49(3)**: 282–6.
- Fairfield, T.B. 2011. Ultrasonographic imaging of the adult equine acute abdomen. In *proceedings of the AAEP focus meeting on colic, Indianapolis, USA*. Pp 31–37.
- Farooq, UB. 2014. Diagnostic ultrasonography of an equine abdomen. Thesis submitted to CSKHPKV, Palampur (H.P.)
- Freeman SL. Diagnostic ultrasonography of the mature equine abdomen. *Equine Vet Educ* 2003; **15**: 319–330.
- Grenager NS, Durham MG. Ultrasonographic evidence of colonic mesenteric vessels as an indicator of right dorsal displacement of the large colon in 13 horses. *Equine Vet J Suppl* 2011; **(39)**: 153–5.
- Hendrickson EH, Malone ED, Sage AM. Identification of normal parameters for ultrasonographic examination of the equine large colon and cecum. *Can Vet J* 2007; **48(3)**: 289–91.
- Jones SL, Davis J, Rowlingson K. Ultrasonographic findings in horses with right dorsal colitis: five cases (2000–2001). *J Am Vet Med Assoc* 2003; **222(9)**: 1248–51.
- Kirberger RM, van den Berg JS, Gottschalk RD, *et al.* Duodenal ultrasonography in the normal adult horse. *Vet Radiol Ultrasound* 1995; **36(1)**: 50–6.
- Klohn A, Vachon AM, Fischer AT Jr. Use of diagnostic ultrasonography in horses with signs of acute abdominal pain. *J Am Vet Med Assoc* 1996; **209(9)**: 1597–601.
- Korolainen R and Ruohoniemi M. 2002. Reliability of ultrasonography compared to radiography in revealing sand accumulation in horses. *Equine veterinary Journal* **34**: 499–540.

- Lores M, Ortenburger AI. Use of cecal bypass via side-to-side ileocolic anastomosis without ileal transection for treatment of cecocolic intussusception in three horses. *J Am Vet Med Assoc* 2008; **232** (4):574–7.
- Lores M, Stryhn H, McDuffee L, et al. Transcutaneous ultrasonographic evaluation of gastric distension with fluid in horses. *Am J Vet Res* 2007; 68(2): 153–7.
- Mitchell CF, Malone ED, Sage AM, et al. Evaluation of gastrointestinal activity patterns in healthy horses using B mode and Doppler ultrasonography. *Can Vet J* 2005;46(2):134–40.
- Ness SL, Bain FT, Zantingh AJ, et al. Ultrasonographic visualization of colonic mesenteric vasculature as an indicator of large colon right dorsal displacement or 180 degrees volvulus (or both) in horses. *Can Vet J* 2012; **53**(4): 378–82.
- Peek SF and Drivers TJ. 2000. Medical treatment of choleiohepatitis and cholelithiasis in mature horses. 9 cases. *Equine Vet J.* 2000; **32**: 301-306
- Porzuczek A, Kielbowicz Z, Haines G. The use of percutaneous abdominal ultrasound examination in diagnosing equine small intestinal disorders. *Pol J Vet Sci* 2012; **15**(4):759–66.
- Pusterla SM, Whitcomb MB and Wilson WD. 2007. Internal abdominal abscesses caused by streptococcus equi in 10 horses in California between 1989 and 2004. *VetRec* 2007; **160**: 589-592.
- Rantene NW. Diseases of abdomen. *Vet Clin North AmEquinePract.* 1986; 2: 67-88.
- Reef VB, Johnston JK, Drivers TJ. 1990. Ultrasonographic findings in horses with cholelithiasis. *J Am Vet Med Assoc.* **196**: 1836-1840.
- Reef VB. 1998. Adult abdominal ultrasonography. In: Reef VB, editor. *Equine diagnostic ultrasound*. Philadelphia: WM Saunders Co; 1998. p. 273–363.
- Reef VB. 2004. Sonographic evaluation of the adult abdomen. *Clin Tech Equine Pract* 2004;**3**:294–307.
- Reef VB. 1991. The use of diagnostic ultrasound in the horse. *Ultrasound Quart* 1991; **9**:1-34.
- Reimer JM. 1998. The abdomen, in: reamer JM editor. *Atlas of Equine Ultrasonography*. St Louis: Mosby1998: 224-242.
- Sarah, LJ, Whitcomb MB. 2014. Ultrasound of the equine acute abdomen. *Vet Clin Wquine* **30** (2014) 353-381.
- Scharner D, Rotting A, Gerlach K, et al. Ultrasonography of the abdomen in the horse with colic. *Clin Tech Equin Pract* 2002;**1**:118–24.
- Taintor J, Stewart AJ, Christmann U, et al. What is your diagnosis? Cecocolic intussusception. *J Am Vet Med Assoc* 2004;**225**(12):1829–30.
- Vaughan B, Whitcomb MB, Pusterla N. Ultrasonographic findings in 42 horses with cecal lymphadenopathy. *Am Assoc Equine Pract* 2013;**59**:238.
- Whitcomb MB. Advanced abdominal ultrasound for chronic colic. In: American College of Veterinary Surgeons: the surgical summit. San Diego (CA): 2005. p. 39–44.
- Whitcomb MB. Equine abdominal ultrasound, in *Proceedings. 24th Annual ACVIM Forum, Louisville KY*, May 31- June 6, 2006.

MEET THE SPEAKER**Dr. Ibrahim Abdulazeez Okene***Associate Professor*

Department of Clinical Studies, Faculty of Veterinary Medicine

University Malaysia Kelantan, Malaysia

Ph.: +60 1 4994 9578

Website: <https://www.linkedin.com/in/ibrahim-abdulazeez-okene-b8017044/>www.umk.edu.my; E-mail: ibrahim.az@umk.edu.my

My academic journey began with a Doctor of Veterinary Medicine degree from the University of Maiduguri, Nigeria, where I graduated per excellence and was awarded the best graduating student in 2005. Following National Service and a short stint in River State Ministry of Agriculture, I joined the University of Maiduguri, Nigeria, as an Assistant Lecturer in September 2006. Furthering my interest in the academics, I obtained a Doctorate from the prestigious Universiti Putra Malaysia in 2011 as the first Veterinary Forensic Pathology doctorate in the region. During the Ph.D. sojourn, I tutored undergraduates in Surgery and Pathology fields as well as consulted for clinical cases within and outside of Malaysia and Nigeria. In 2014, the University of Maiduguri, Nigeria, appointed me as the Liaison of the Intellect to Malaysia within which I am serving as an academic staff in the Faculty of Veterinary Medicine, Universiti Malaysia Kelantan - currently holding the position of Associate Professor and the immediate past Head of Clinical Studies Department. Currently, there are two doctorate and two master students under my supervision, among others (6), which I co-supervise. These are besides coordination of clinical practice in both Nigeria and Malaysia. Many publications in citation-indexed journals, books, conference proceedings and clinical case reports are some of my contributions to academia. Furthermore, engaging the academics in veterinary-related discussions and futuristic learning are areas of interest to me. I am married with three children.

FORENSIC RADIOLOGY – ESTIMATION OF EARLY POST-MORTEM INTERVAL IN DOGS

Ibrahim Abdulazeez Okene¹ and Noordin Mohamad Mustapha²

*¹Department of Clinical Studies, Faculty of Veterinary Medicine
University Malaysia Kelantan, Malaysia*

*²Department of Pathology and Microbiology, Faculty of Veterinary Medicine,
Universiti Putra Malaysia, 43400 UPM Serdang, Selangor DE, Malaysia*

Although there are notable advances made in post-mortem investigation in human forensics, the veterinary field is yet to appreciate over the years. Interestingly, there are more veterinarians – pathologists – been called upon to provide evidence related to animal abuse, unlawful killings and other related crimes in courts. There is a need to establish the timeline of events to build an active prosecution. Algor mortis, rigor mortis, livor mortis and biochemical alterations are commonly employed to estimate post-mortem interval. Despite been subjective and admissible in the Courts, the search continues for objective and pragmatic means to obtain post-mortem interval estimation. Post-mortem gas changes provide a window of opportunity that can be assessed with imaging modalities such as radiography. This study investigates post-mortem gas changes in the thorax and abdomen of dog models that can be observed by radiography and correlated to early post-mortem interval. Serial thoracic radiograph of ten adults euthanised dogs were taken at 6 hours intervals for 24 hours. Gas changes in the thorax and abdomen were interpreted and correlated with post-mortem interval. Gross changes in the carcasses were observed and recorded for further descriptive analysis. The onset of gas changes in the heart, liver and gastrointestinal system began at 6 hours post-mortem. These gas changes steadily progressed over the 24-hour study period time and required correlated with post-mortem interval. Laval instars of the domestic house fly were observed on the orifices of the carcasses from 6 hours post-mortem while rigor mortis and exophthalmos were seen at 12- and 20-hours post-mortem respectively. Post-mortem radiography of the thorax and can thus be valuable for early PMI estimation, thus reducing the need for cumbersome and time-consuming necropsy techniques aimed at PMI estimation.

Keywords: dogs; gas formation; post-mortem interval estimation; veterinary forensic radiology.

Background – Veterinary Forensics:

“CSI effect” denotes the expectation of judges presiding over homicides, murders and unlawful killings on prosecutors to provide a close-to-accurate re-enactment of events surrounding a crime just as is seen on the Crime Scene Investigation (CSI) TV series (Trainum, 2019). This expectation has put on more pressure on medical forensic experts to continuously devise means of improving the quality of evidence delivered in courts (Cooper, 2008). Post-mortem interval (PMI) or time of death estimation is core to medical forensic investigation (Henssge, 2007). Body temperature cooling patterns, tissue degradation patterns, and biochemical alterations are some of the methods used to estimate PMI in both medical and veterinary forensics (Swift, 2010). Quite recently, attention of researchers and field experts have drifted towards the use of non-invasive techniques such as imaging to assess subtle signs correlating with PMI and

to gather forensic related information from the carcasses/cadavers (Heng, 2009a, 2009b; Ibrahim, 2012).

Post-mortem radiography is based on the principle of post-mortem tissue degradation resulting in significant gas production that can be viewed as radiolucency on radiography (Abdulazeez, 2011; Heng, 2009a). Post-mortem tissue degradation via autolytic or putrefactive process begins as soon as nutrition and oxygen supply to the tissues is cut-off (Munro, 2013). Putrefaction involves tissue destruction by resident microflora leading to release of gas by-products such as methane and hydrogen sulphide. Gas accumulations in the abdomen and thorax have been observed via 2-D radiography in dogs from eight (8) to twenty-four (24)- hours post-mortem in different tissues and organs (Heng, 2009a, 2009b; Munro, 2013) in a tropical environment (Malaysia) at an average ambient temperature of 22 – 33°C. Identification of organs whose post-mortem gas accumulation is consistent with PMI are essential in the development of baseline data for the growing field of veterinary forensics. This study investigates post-mortem gas changes in the thorax and abdomen of dogs. Findings are presented descriptively for ease of reference and practicality.

Methods

Adult mongrel dogs (5 males and 5 females) weighing 10 to 18 kg were obtained from the Kuala Lumpur City Hall dog pound. All dogs used for the study were selected from apparently healthy dogs scheduled for rabies control protocol as observed by the City Hall. Physical examination and haematology revealed no clinical abnormalities. Housing, feeding and humane handling of the dogs met the faculty ACUC standards. Dogs were fasted for 12 hours before euthanasia – Dolethal® (France), containing 6% pentobarbitone sodium at a dose rate of 1ml/kg BW by intravascular route via the cephalic vein. Injections were administered aseptically following World Health Organization (WHO) guidelines for injections (World Health Organization, 2010) to prevent entry of extraneous bacteria through the drug. Animals were placed on lateral recumbencies in between radiography sessions.

Lateral (L – right and left) and ventrodorsal (VD) thoracic and abdominal radiographic views of the carcasses were taken at 0, 6, 12, 18- and 24-hours post-mortem. There was an average lapse of 15 minutes between euthanasia and the first radiograph (0 h) of each animal studied due to transfer from the post-mortem unit to the radiology unit. The Shimadzu® (Kyoto, Japan) radiography machine with a predetermined technique chart was used to obtain images. Obtained images were processed using the Kodak® (Malaysia) automatic processing machine. Parameters and guidelines for assessment of radiographic changes followed those described by previous authors (Heng, 2009a, 2009b; Heng, 2008). All unclear, poorly processed or low detailed/contrast radiographs were repeated. 0 h radiographs were the positive controls for comparison with the subsequent radiographs (6, 12, 18 and 24 h).

Results and Discussion

Post-mortem gas formation in tissues is therefore either because of putrefactive or autolytic process. In this study where there was no evidence of fever, we assumed that the gas formed in all tissues after death is as a result of putrefaction from normal flora in conformance to previous similar studies (Heng, 2009a, 2009b; Heng, 2008). At death, resident microflora begins to multiply exponentially releasing gases such as methane and hydrogen sulphide, and biochemical products such as polyamines. Progressive collapse of the lungs resulted from the distension of stomach from gas accumulation (Heng, 2009). The rapidity of gas

accumulation in the cardiac chambers observed in this study earlier than the 2-3 days reported by Saukko (2015) is due to the high ambient tropical temperature, which enables an increased proliferation rate of the resident flora and thereby rapid formation of gas that flows into the vasculature. The gas formed is reported to tend to flow towards the non-dependent parts of the body as well (Jackowski, 2007).

Our results revealed that post-mortem gas formation in thoracic and abdominal tissues gas is detectable as early as six hours after death in all the organs assessed. This is in disparity with the previous findings of such at eight hours post-mortem (Heng 2009a, 2009b). The reason for this observation is that the bacterial proliferation at post-mortem can occur at a faster rate than the earlier reported 8 hours hence further studies are needed to determine when these gases begin to form between death and 6 hours post-mortem. This study, therefore, provides a new understanding of the timing of gas formation in tissues and post-mortem interval estimation by radiography.

Immediately post-euthanasia, thoracic and abdominal radiographs revealed no significant deviation from the normal ranges in size, shape, contour, location, orientation and opacity of organs. One dog, however, had a mild broncho-interstitial pattern (Figure 1 and 2). The pleura of all the dogs were normal, with clear lung fields except for one that showed a slight bronchial pattern in Figure 1) on the right caudal lobe of the lung.

Thorax

Pleural cavity

Normal pleural cavity was observed for all animals all ten dogs immediately post-euthanasia. Gas opacities of varying degrees were evident in 9 carcasses at the 12th-hour postmortem. Progression of gas accumulation was not spectacular and appeared to be dependent on individual animals.

Mediastinum

Mild gas changes were observed in the mediastinum from 6 hours postmortem, and it increased in volume onwards until 18 hours postmortem without further increase. Mediastinal vessels could not be seen, as PMI progressed because of the compression of the lung from the distended stomach.

Pulmonary architecture

Post-euthanasia radiographs revealed typical lung fields in eight dogs, and one dog had mixed pattern (bronchial and interstitial). Lung collapse due to postmortem gastric dilatation was observed in all dogs beginning from 6 hours postmortem with increased severity as postmortem interval approached 24 hours.

Trachea

There were no significant changes in the trachea over the 24-hour study period except for displacement associated with gastric distension.

The heart and associated vessels

Heart sizes and position did not change significantly over 24 hours. Progressive accumulation in the cardiac chambers followed the following approximate sequence right atrium (6 hours PM), right ventricle (12 hours PM), left atrium (18 hours PM) and left ventricle (24 hours PM).

Pulmonary vessels

Gas changes in pulmonary arteries and veins were seen as pockets from 6 hours postmortem in 5 dogs. The volume of gas in the blood vessels increased as PMI increased. Three dogs did not show pulmonary vascular gas changes throughout the study.

Caudal vena cava

The caudal vena cava emerges from the left crus of the diaphragm and is directed cranioventrally towards the base of the heart. Gas accumulation in the caudal vena cava lumen increased in volume in all studied dogs as PMI increased. There were no significant postmortem gas changes in the aorta and coronary artery.

Abdomen

The abdominal organs showed remarkable gas changes because of the non-sterile nature of the gastrointestinal tract (Figure 2).

The stomach

Gas distension of the stomach began to ensue immediately post-euthanasia and progressed rapidly for 24 hours until the thoracic cavity was compressed as well as the abdominal organs. The severity of distension was, however dependent on individual animals hence there was no quantifiable pattern relating gastric distension with PMI.

Liver

The hepatic organ started forming gas in its parenchyma within the first six hours after death in mostly the bile duct. Two dogs maintained a mixture of vesicular and tubular pattern across the entire period while the rest had tubular patterns of parenchymatous gas formation. The hepatic portal vein also accumulated gas progressively in all dogs over twenty-four hours. Three dogs had gas in the portal vein immediately post-euthanasia and one dog's portal vein could not be read because of increased opacity of the liver. All animals had gas in the portal vein by the end of the study period.

Intestines

The small and large intestines also had similar gas accumulation pattern across PMI. Lumen distension with gas readily increased as PMI increased. Although this does not hold potentials for PMI interval marker, it provides clues on the broad PMI with significant standard deviation of the mean.

Other findings:

Subcutaneous emphysema

Observed from the 12th-hour post-mortem in the mild form, which and progressed to severe form with consequent linear pattern of aggregated muscular tissue seen at 24-hour post-mortem. A resultant effect of subcutaneous gas formation was the vacuum phenomenon seen in the scapula-humeral joints of carcasses. This, however, did not progress further after initial sighting. Abdulazeez (2012) observed similar phenomenon on routine postmortem radiography in dogs.

Potential radiographic markers

Based on the data presented in this study, the heart and associated blood vessels specifically the cranial and caudal vena cava provides a good representation of time interval since death for the thoracic

cavity. In the abdominal cavity, the hepatic tissue and portal vein, as well as the intestines, are good indicators of time-lapse post-mortem. These findings are supportive of those of Erlandsson (2007) and Heng, (2009).

Physical changes

Larval instars of common housefly (*Musca domestica*) were observed in the natural orifices and lateral ocular canthi as early as six hours post-mortem (n=6). Rigor mortis began from the fourth hour and was set within 6-12 hours after death. Post-mortem defecation and micturition started as early as three-hour post euthanasia up to the end of the study. Nasal bleeding and fuming were observed at about 12 hours post-mortem but reduced in volume towards the end of the study in all dogs. Livor mortis occurring as bluish-red hue of the skin and superficial veins began from the eighteenth hour after death. Ocular swelling and protrusion began at about 20 hours after death at which point flaccidity started to ensue in carcasses.

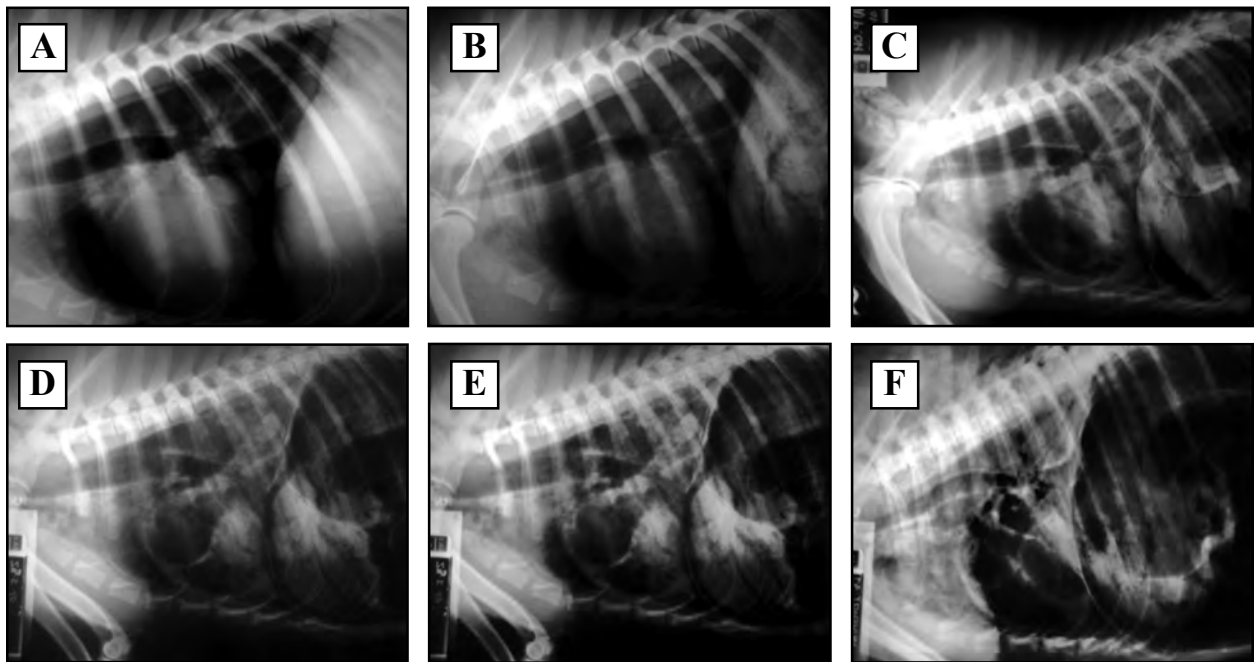


Figure 1: The serial radiographic changes in the thorax of a dog over 24 hours at the 6-hourly interval.

- Immediately post-euthanasia there was no observable abnormality
- Six hours post-euthanasia, there is a beginning of gas accumulation in the right atrium and small amount of gas in the cranial thoracic oesophagus. The hepatic portal vein is seen with accumulated gas.
- The right atrium with a communicating gas flow with the caudal vena cava is seen at 12 hours post-mortem as well as gas accumulation in the right ventricle. Note the increased gas intensity of the hepatic vein and tubular branching of the parenchyma.
- At 18 hours post-mortem, all chambers of the heart contained gas with as well as the adjoining cranial and caudal vena cava. Pneumo-mediastinum can be seen but on close assessment but the compressive effect of abdominal distension on the thoracic cage has increased the radiopacity at this hour. Subcutaneous emphysema advances at this stage.
- Severe subcutaneous emphysema imparts a generalised gas radiolucency on the thorax, but gas is seen present in the vena cava and heart chambers as well as the presence of vacuum phenomenon in the scapula-humeral joint.
- At 24 hours, the cardiac chambers are prominently visible with radiolucent gas accumulation with progression into the vena cava from the right atrium and into the pulmonary aorta from the left ventricle.

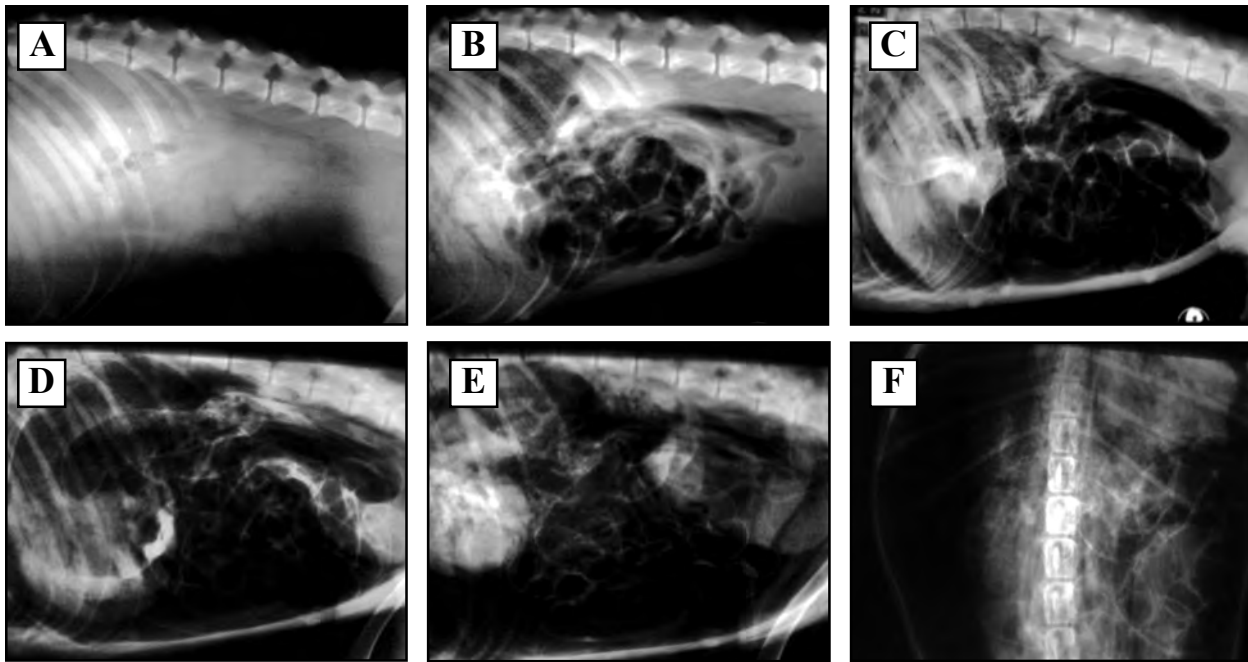


Figure 2: The serial radiographic changes in the abdomen of a dog over 24 hours at the 6-hourly interval.

- Immediately post euthanasia, there was no radiographic abnormality in the abdomen
- Increase in the gas intensities and volume in the intestinal lumen and hepatic portal vein with a tubular branching pattern of the hepatic tissue.
- At 12 hours post-euthanasia, the intestines irrespective of the region contained remarkable gas radiolucency as well as the peritoneal space and onset of abdominal distension.
- About the whole length of the intestines contained gas at 18 hours with general pneumo-peritoneum. The femoral arteries can be seen with gas radiolucency.
- Very severe abdominal distension is observed at 24 hours post-mortem with increased severity in intestinal radiolucency.
- Severe abdominal distension is observed at 24 hours post mortem.



Figure 3: The post-mortem nasal bleeding and fuming in dogs

Conclusion:

Post-mortem radiology in veterinary pathology is a handy tool in investigating forensic cases (Erlandsson and Munro 2008, Munro and Munro, 2008). A rapid radiographic scan of the whole body at necropsy would in addition to providing clues to cause and manner of death, provide insight into the timing of death. The utilisation of radiograph in the estimation of time of death from such rapid scans, would not incur further cost of installation or purchase of instruments since most veterinary establishments have radiography machines.

References:

- Abdulazeez, I. O. (2011). Use of Molecular Markers, Body Temperature and Radiography in Estimating Post Mortem Interval in Dogs in the Tropics. (Doctor of Philosophy), Universiti Putra Malaysia, Malaysia.
- Cooper, J. E., & Cooper, M. E. (2008). Forensic veterinary medicine: a rapidly evolving discipline. *Forensic Science, Medicine, and Pathology*, 4(2), 75-82. doi:10.1007/s12024-008-9036-x
- Erlandsson, M., & Munro, R. (2007). Estimation of the post-mortem interval in beagle dogs. *Sci Justice*, 47(4), 150-154. doi:10.1016/j.scijus.2007.09.005
- Heng, H. G., Selvarajah, G. T., Lim, H. T., Ong, J. S., Lim, J., & Ooi, J. T. (2009a). Serial postmortem abdominal radiographic findings in canine cadavers. *Forensic Sci Int*, 192(1-3), 43-47. doi:10.1016/j.forsciint.2009.07.016
- Heng, H. G., Selvarajah, G. T., Lim, H. T., Ong, J. S., Lim, J., & Ooi, J. T. (2009b). Serial postmortem thoracic radiographic findings in canine cadavers. *Forensic Sci Int*, 188(1-3), 119-124. doi:10.1016/j.forsciint.2009.03.031
- Heng, H. G., Teoh, W. T., & Sheikh-Omar, A. R. (2008). Postmortem abdominal radiographic findings in feline cadavers. *Vet Radiol Ultrasound*, 49(1), 26-29. doi:10.1111/j.1740-8261.2007.00312.x
- Henssge, C., & Madea, B. (2007). Estimation of time since death. *Forensic Sci Int*, 165, 182-184.
- Ibrahim, A. (2012). Subcutaneous tissue gas formation; an indicator of elapsed time since death.
- Ibrahim, A. O., Zuki, A. B. M. & Noordin, M. M. (2012). Applicability of virtopsy in veterinary practice: a short review. *Pertanika J Trop Agric Sci*, 35(1), 1-8.
- Jackowski, C., Sonnenschein, M., Thali, M. J., Aghayev, E., Yen, K., Dirnhofer, R., & Vock, P. (2007). Intrahepatic gas at postmortem computed tomography: forensic experience as a potential guide for in vivo trauma imaging. *Journal of Trauma and Acute Care Surgery*, 62(4), 979-988.
- Munro, R., & Munro, H. M. C. (2013). Some challenges in forensic veterinary pathology: A review. *J Comp Pathol*, 149, 57-73.
- Saukko, P., & Knight, B. (2015). *Knight's forensic pathology* fourth edition: CRC press.
- Swift, B. (2010). The timing of death. In G N. Ruttly (Ed.), *Essentials of autopsy practice; Current methods and modern trends* (pp. 189-214). London: Springer-Verlag.
- Trainum, J. L. (2019). The CSI effect on cold case investigations. *Forensic Science International*.
- World Health Organization. (2010). WHO best practices for injections and related procedures toolkit. Retrieved from Geneva, Switzerland.

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RIS-1**COMPARISON OF TWO METHODS OF MEASURING VERTEBRAL HEART SCORE (VHS) IN APPARENTLY HEALTHY GOATS (*Capra hircus*)**

Vimlesh Kumar, **S. Purohit**, R.K. Pathak and R.P. Pandey

*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H.,
DUVASU, Mathura, Uttar Pradesh*

Present study was conducted on twelve apparently healthy goats free from cordiothoracic diseases. The animals were divided into two groups each containing 6 animals to evaluate various the cardiothoracic parameters. Mean \pm S.E values of body weight and age were measured 11.83 ± 0.70 (range 10 - 15) kg, 3.75 ± 0.31 (range 3 - 5) month and 25.67 ± 1.73 (range 16-30) kg, 8.58 ± 0.95 (range 6.5 - 12) month in animals of the Group-I and II, respectively. The purpose of this study was to establish the standard values (range) for parameters of the heart and thorax. The vertebral heart score (VHS) were found to be significantly different between Group-I and Group-II animals, VHS- (Buchanan and Buchler (1995) and Ljubicaet *al* (2007) method). In clinical practice, VHS is easy to apply and objective in assessing cardiac sizes of patients.

RIS-2**ENDOSCOPIC ASSESSMENT OF OESOPHAGUS AND STOMACH AFFECTIONS IN DOGS- A CLINICAL STUDY IN 11 CASES**

Lotlikar, S.D., A.H. Ulemale, Salvekar. S.P., Suryawanshi R.V. and Kawhale. A.

*Department of Veterinary Surgery and Radiology
Krantsinh College of Veterinary Science, Shirwal, Satara, Maharashtra*

Endoscopic evaluation of the esophagus and the stomach was performed in 11 dogs belonging to different breeds and age groups which were presented to the TVCC, Shirwal with the history to vomition, regurgitation of gastric contents, partial to complete anorexia, weight loss, generalized weakness, and lethargy. Physiological and hemato-biochemical parameters were studied in all the dogs before during and after the endoscopy. Anesthesia was induced with propofol @ 4 mg/kg and diazepam @0.5mg/kg in dogs premedicated with trifluopromazine HCl @ 1mg/kg and maintenance of anesthesia was done with isoflurane @2-4% during the procedure. A gastroscope was used for the procedure. Various conditions that could be diagnosed on endoscopic examination were mega-esophagus (3), intra-luminal granuloma/nodule (1), oesophageal erosion (1), gastritis (5) and gastric ulcer (1) without any. The minimal invasiveness of endoscopy and the ability of visualization of esophageal and gastric the mucous membranes proved it to be a definitive option for diagnosis that aided in quick treatment.

RIS-3**RADIOGRAPHIC DIAGNOSIS OF ABNORMALITIES OCCURRING IN THE PHALANGES OF BOVINES****G.S. Ubhare**, P.B. Chaugale, R.V. Suryavanshi, S.P. Salvekar and A.H. Ulemale*Department of Surgery and Radiology,
KNP College of Veterinary Sciences, Shirwal, Maharashtra*

Bovine lameness is considered to be a painful condition affecting the draught ability of the bullock leading to economic losses to the farmers. Phalanges are superficially placed and are more prone to the trauma during the working. This study was done to evaluate occurrence of lameness due to abnormalities occurring in phalanges of affected animals. The lameness cases presented during last one year having alterations in osseous structures, soft tissues and cartilages were subjected to radiographic evaluation. The radiographic changes in the bone observed in these cases included periosteal bone proliferation, fractures, infections etc. Heavy work and trauma were the etiological in majority of cases. Incidence was more in Males as compared with females. Front limbs were more affected than hind limbs. Distal phalanx and surrounding area was more affected. In all the cases, general examination followed by radiography was performed and affections were diagnosed.

RIS-4**ULTRASONOGRAPHIC MORPHOMETRY OF GASTROINTESTINAL TRACT IN APPARENTLY HEALTHY DOGS AND ITS RELEVANCE IN DIAGNOSING INFLAMMATORY AND NEOPLASTIC AFFECTIONS****Kuldeep Bhuwal**, J. Mohindroo, S.K. Mahajan, Tarunbir Singh and Kuldeep Gupta*Department of Veterinary Surgery and Radiology, College of Veterinary Sciences,
Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, Punjab*

The objective of this study was to establish GIT morphometry in Indian bred dogs of different size, breed and weight and to study its relevance in ultrasonographic diagnosis of GIT ailments like inflammation and neoplasia. Inflammatory disorders of GIT were characterized by loss of layering of one or multiple segments of GIT (in 100% cases), corrugated appearance of small intestine, hyperechoic mucosa and/or abnormal thickening of wall layers. GIT neoplasia was characterized by significant increase in wall thickness of fundus, pylorus and duodenum as compared to values recorded in apparently healthy dogs (Part I). Ultrasonographic features of GIT lymphoma, rectal/colon TVT, adenocarcinoma and gastric leiomyoma confirmed by ultrasound guided fine needle aspiration cytology were described. The ultrasonographic morphometry of GIT in apparently healthy dogs bred in Indian conditions were established. It was concluded that alterations in ultrasonographic morphometry and features of various segments of GIT was reliable in diagnosing and differentiating inflammatory and neoplastic disorders of the GIT in dogs.

RIS-5

DOPPLER AND COLOR M-MODE EVALUATION OF DIASTOLIC FUNCTION IN DOGS

A.C. Saxena, Asif Majid, M. Hoque, Rohit Kumar, P. Kinjavdeka, A.M. Pawde and Amarpal
Division of Surgery, Indian Veterinary Research Institute, Izatnagar, Bareilly, UP

The diastolic function is mainly concerned with the filling of ventricles. Diastolic dysfunction in dogs is generally the result of increased resistance to ventricular filling and usually precedes the systolic dysfunction. The present study was conducted on 30 clients owned, healthy adult Labrador retriever dogs of either sex, and 4 cases of congestive heart failure in dogs due to degenerative mitral valve disease, to assess diastolic function through spectral Doppler and color M-mode echocardiography. Mitral peak E and A velocity, deceleration time (dtE) and isovolumic relaxation time (IVRT) was measured in spectral Doppler; and mitral early propagation velocity index (Vp) was measured in color M-mode echocardiograms. dtE and Peak A velocity were significantly lower ($p < 0.05$), whereas E/A was significantly higher ($p < 0.05$) in dogs affected with CHF. Vp showed a trend ($p = 0.09$) wherein, it was lower in dogs affected with CHF as compared to normal dogs.

RIS-6

STANDARDIZATION OF ULTRASONOGRAPHIC EXAMINATION PROTOCOL OF ADRENAL GLANDS IN HEALTHY DOGS

Akash, Mamta Mishra, Gulshan Kumar and R.P. Pandey
*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H.,
DUVASU, Mathura, Uttar Pradesh*

The present study was undertaken in 18 apparently healthy dogs to standardize ultrasonographic examination protocol of adrenal glands. The animals were divided into three groups of six animals each: group I (0 to 9 months), group II (> 9 months up to 6 yr) and group III (> 6 yr). Ultrasonographic examination was done in lateral recumbency in all the examined dogs. The left adrenal gland was scanned by placing the transducer in the subcostal area (immediately behind the last rib) in the dorsal plane (along the body length parallel to the dorsum of the dog) and locating the aorta and caudal vena cava in long axis. The transducer was then slid cranially along to the level of the left kidney keeping the aorta in view and the left renal artery and vein were located. The transducer was rotated 45 degrees clockwise and gently swept cranial to the renal artery and vein to locate the left adrenal gland in long axis. The aorta and kidney were not always visible in the same field of view when the adrenal gland was imaged but in some ultrasonograms many structures, namely, the adrenal gland along with aorta and kidney were visualized in the same field. For locating of the right adrenal gland, the dog was placed in left lateral recumbency. The transducer was placed behind the last rib in the sub-lumbar area, in all the animal and intercostal approach was not needed to locate the right adrenal gland. The aorta and caudal vena cava were again located in the long axis in the dorsal plane. The transducer was then slid cranially, keeping the caudal vena cava in view. The adrenal

gland was located along side and dorsal to the caudal vena cava. The sub-costal approach was found to be the best approach to scan left adrenal gland using a 7.5 MHz linear transducer.

RIS-7

ULTRASONOGRAPHIC CHARACTERISTICS OF BENIGN AND MALIGNANT CANINE MAMMARY TUMOURS

Goyal Shashank, Apra Shahi, Shobha Jawre, Randhir Singh, Babita Das and Apoorva Mishra
*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H.,
 Nanaji Deshmukh Veterinary Science University, Jabalpur*

In the present study eighteen mammary tumours were scanned by B mode grey scale ultrasonography. Out of these five were benign and rest of thirteen were malignant, confirmed by histopathological examination. D/W ratio in benign and malignant tumours measures as 0.41 ± 0.05 and 0.79 ± 0.04 respectively. It was markedly higher in malignant tumours which showed growth potential of malignant tumours. Mammary tumour margin was observed regular in 100% benign tumours and 61.5% malignant tumour showed irregular wavy, abraded poorly defined margins. Capsule was present as hyperechoic thick band around the tumour margin in 100% benign and 46.2% malignant tumours rest of the malignant tumour showed either absence of capsule or it was partially present. Echotexture of mammary tumour was found heterogeneous in 92.3% of malignant tumours. Internal echogenicity was found hypoechoic in 100% benign and malignant tumours. Invasiveness was not present in benign tumours and it was observed in 77% malignant tumours. Anechoic cavities were present in 40% benign and 84.6% malignant tumours. Acoustic shadowing was present in 20% benign cases and 46.2% malignant tumours and acoustic enhancement was recorded in 60% benign and 77% malignant tumours. It was concluded that ultrasonographic evaluation of D/W more than 0.7 is a strong indicator of malignant mammary tumours in 77% cases. Tumour echotexture, invasiveness and presence of anechoic cavities were also observed useful for differentiation between benign and malignant mammary tumors with minimum 77% accuracy.

RIS-8

COLOUR DOPPLER AND SPECTRAL DOPPLER CHARACTERISTICS OF BENIGN AND MALIGNANT CANINE MAMMARY TUMOURS

Goyal Shashank, Apra Shahi, Shobha Jawre, Randhir Singh, Babita Das and Apoorva Mishra
*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H.,
 Nanaji Deshmukh Veterinary Science University, Jabalpur*

Eighteen mammary tumours were scanned in the present study out of these, five were benign and rest of thirteen were malignant, confirmed by histopathological examination. Vascular flow was observed in colour Doppler examination in all the benign and malignant tumours. In malignant tumours numerous blood vessels of various sizes were visualized in every field and in few tumours a strong central pulsation was seen. In benign tumours vascular flow was not present in every field. It appeared as weak blood supply either centrally or peripherally with average blood flow on colour Doppler scale measured as 16.8 cm/s. In

benign tumours vascular pattern was found central in 20%, peripheral in 80% and mixed pattern was not seen in any case. In malignant tumours vascular pattern was found central in 30.7% and mixed in 69.3% cases. Peripheral vascular pattern was not observed in any case. In the present study ring sign was not observed in benign tumours and 53.8% malignant tumours showed ring sign. In benign tumours Spectral Doppler was not possible and RI_{mean}, PI_{mean} and V_{max} were not detectable. In malignant tumours RI_{mean} 0.70 ± 0.02 , PI_{mean} 1.39 ± 0.06 and V_{max} was 30.96 ± 7.16 cm/s. Therefore, it can be concluded that in Colour Doppler malignant mammary tumours showed both central and peripheral vascular pattern in 69.3% cases with numerous blood vessels per field. Spectral Doppler showed average maximum velocity (V_{max}) more than 23.8 cm/s or above is the strong indicator of malignancy in approximately 77% cases which can later be confirmed by FNAC and histopathology.

RIS-9

CLINICAL PRESENTATIONS AND RADIOGRAPHIC FEATURES OF HOOF DISORDERS IN GOATS

Laiju Philip, M., Dileepkumar, K.M., John Martin, K.D., Narayanan, M.K.,
Syam K. Venugopal and Devanand, C.B.

*Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences,
Kerala Veterinary and Animal Sciences University, Mannuthy, Thrissur, Kerala*

Lameness due to hoof disorders is an important health and welfare concern in goat farming. The study was conducted in 841 goats from Thrissur district of Kerala state for the assessment of claw health indicators and prevalence of hoof disorders. Hoof health was assessed with hoof score, hoof angle, leg score, body condition score and locomotion score. Lameness with varying severity was evident in 28.2% of the animals. Those animals showing high scores on hoof health indicators were subjected for examination of hoof disorders, radiography and corrective hoof trimming. Prevalence of the overgrown hoof, foot rot and white line lesion were high in affected animals and other findings were chronic laminitis, cork screw claw, heel erosion, maggot wound and foreign body penetration of the sole. Radiographic changes like alterations in the bone density, soft tissue calcification, rotation of third phalange and pedal osteolysis were evident in lesions graded high. The study recommended early detection and treatment of hoof disorders in goats for improving productivity and ensuring welfare.

RIS-10

COMPUTED TOMOGRAPHY DIAGNOSIS OF AXIAL SKELETAL TUMOURS IN CANINES

Vikash Chauhan, Vaibhav Bishnoi, Shriram Ganesan, Correia Salisha and Samar Mahendran
CGS Hospital, Gurugram, Haryana

Five dogs were presented to CGS hospital, Gurgaon with the history of chronic limping on hind limbs (3) and hind limb paraplegia (2). Few cases were under treatment without any improvement. Neurological examination, haematology and routine survey radiography were done on presentation.

Computed Tomography (CT) was done under gaseous anesthesia to enable further diagnosis. CT scan revealed vertebral body neoplasia (2), left femoral head neoplasia (1) which were not clearly revealed in survey radiographs and iliac neoplasia (2). CT scan is a better diagnostic modality with reference to axial skeletal disorders as compared to survey radiographs. CT scan serves as a prognostic indicator in axial skeletal tumours of canines.

RIS-11**CONTRAST SPINAL COMPUTED TOMOGRAPHY IN CANINES**

Vikash Chauhan, Vaibhav Bishnoi, Shriram Ganesan, Correia Salisha and Samar Mahendran
CGS Hospital, Gurugram, Haryana

Six dogs were presented to CGS hospital, Gurgaon with the history of forelimb paraparesis (1), hind limb paraparesis (1) and progressive tetraparesis (3). Survey computed tomography (CT) was done under inhalant general anesthesia. C-arm guided injection of Iohexol @ 0.2ml/kg into epidural space was performed aseptically after removal of cerebro-spinal fluid. Contrast CT of spinal column was performed. Intervertebral disc herniation was observed at cervical vertebrae in four cases and lumbar vertebrae in two cases. Contrast CT of spinal column is exceptionally useful in diagnosis of Intervertebral Disc herniation in canines.

RIS-12**USE OF COMPUTED TOMOGRAPHY IN SURGICAL PLANNING OF ABDOMINAL MASS EXCISION IN CANINES**

Vikash Chauhan, Vaibhav Bishnoi, Shriram Ganesan, Correia Salisha and Samar Mahendran
CGS Hospital, Gurugram, Haryana

Five dogs were diagnosed with abdominal masses via abdominal Ultrasonography at CGS Hospital, Gurgaon. All dogs were subjected to a pre-operative Computed tomography for a metastasis evaluation and planning for surgical approach of right medial iliac lymph node mass (1), mesenteric root mass (1), left renal and adrenal neoplasia (1), right cranial abdominal mass (1), right adrenal tumour (1). Metastasis was observed in three cases. Computed tomography is a useful diagnostic modality for surgical planning and metastatic check in canines with abdominal masses.

RIS-13

DOPPLER ECHOCARDIOGRAPHIC REFERENCE VALUES IN APPARENTLY HEALTHY GERMAN SHEPHERD DOGS

Mamta Mishra, Akash, S. Purohit and R.P. Pandey

*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H.,
DUVASU, Mathura, Uttar Pradesh*

The present study was conducted on eight apparently healthy German shepherd dogs free from cardiothoracic diseases and three dogs with cardiac affections. The animals were divided into two groups (Group-I contains healthy animals while group-II animals with cardiac problems) to evaluate the various cardiothoracic parameters. Mean \pm S.E values of body weight and age were measured 26.80 ± 1.26 (range 22 – 33.2) kg and 55.00 ± 3.62 (range 36 - 72) months and 36 ± 1.53 (range 34 – 39) kg and 68 ± 4.00 (60-72) months in animals of the Group-I and II, respectively. Positive correlation with age and body weight was observed in Doppler echocardiographic measurements of Peak tricuspid velocity (A peak) while age was positively correlated with Peak mitral velocity (ME/A). Negative correlation with age and body weight was observed in Doppler echocardiographic measurements of Peak mitral velocity (A peak, P peak), Peak tricuspid velocity (E peak, TE/A), pulmonary velocity and aortic velocity while body weight was negatively correlated with Peak mitral velocity (ME/A). The purpose of this study was to establish the standard values (range) for doppler echocardiography in apparently healthy German shepherd dogs.

RIS-14

STUDIES ON THE EFFICACY OF RADIOGRAPHY AND ULTRASONOGRAPHY ON DIAGNOSIS OF FOREIGN BODY SYNDROME (FBS) IN BOVINES

Upasana Sharma, Ashok Kumar, H.R. Bhardwaj, M.M.S. Zama, D.K. Dwivedi,

R.K Bhardwaj and Ankur Sharma

*Division of Veterinary Surgery and Radiology, Faculty of Veterinary Science and A.H.,
R.S. Pura, SKUAST-J, Jammu, J&K*

The present study was conducted in bovines (n=9) suffering from foreign body syndrome (FBS) from which 78% were cattle and 22% were buffaloes. Majority of animals were pregnant (56%) or recently parturited (44%) with a mean age of 4.77 ± 0.52 years. Mean rectal temperature and heart rate were within normal range while mean respiration rate and rumen motility were elevated on day of presentation of cases. Haematological and biochemical parameters revealed leucocytosis, neutrophilia, lymphocytopenia, hyperproteinaemia, hypoalbuminemia and hyperglobulinemia. FBS is difficult to diagnose solely on the basis of clinical symptoms and physical examination. However, laboratory diagnosis along with radiography and ultrasonography can be of high diagnostic value in detecting the FBS in bovines. Radiographic examination revealed presence of metallic foreign bodies in reticulum of the bovines.

Ultrasonographic picture showed morphological changes of reticular wall, reticular adhesions, reticular abscess and fibrin deposits. Radiographic examination showed foreign bodies in three cases, however, ultrasonography failed to visualize foreign body.

RIS-15

CLINICAL STUDIES ON SHEAR WAVE ELASTOGRAPHY (SWE) OF LIVER IN APPARENTLY HEALTHY DOGS

Deepti Sharma, J. Mohindroo, Neeraj Kashyap, SK Mahajan and Tarunbir Singh
*Department of Veterinary Surgery and Radiology, College of Veterinary Sciences,
 Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, Punjab*

The present study was conducted on 40 apparently healthy dogs to standardize ideal anatomical windows and generation of reference range values for non-invasive shear wave elastography of liver in dogs. The most suitable acoustic windows for recording shear wave ultrasonography in dogs were established and documented. The mean value of the SWE measurements of healthy liver in 40 dogs was 2.09 ± 0.73 Kpa for left lateral liver lobe and 2.23 ± 0.84 Kpa for right medial lobe. The mean liver stiffness values obtained by SWE was not influenced by the sex, breed type, breed size, but the mean value liver stiffness in dogs below 1-year age group ($p < 0.001$) was significantly lower than the dogs above 1 year of age. Based on 95% confidence interval, it was concluded that the stiffness values of liver in healthy dogs may range from 1.86-2.50 kPa and should be considered as normal.

RIS-16

ENDOSCOPY ASSISTED DIAGNOSIS AND SURGICAL REMOVAL OF LINEAR FOREIGN BODY IN CAT

Akash, Mamta Mishra, Amolak Sharma, Chetan Sharma and R.P. Pandey
*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H.,
 DUVASU, Mathura, Uttar Pradesh*

A cat of 2 years of age was presented to TVCC, Kothari Veterinary Hospital with history of anorexia, hypersalivation and a thread was hanging out from its anal orifice. On further examination it was found that the thread was also strangulating its tongue. Exploratory endoscopy was done to investigate the extent and tract of the thread (foreign body). At some places it had also entangled intestine, marking extensive haemorrhage. Finally, on the basis of signs and symptoms, history provided & diagnostic imaging it was concluded to be cases of linear foreign body. The case was then scheduled for laparotomy. Later laparotomy was done under general anaesthesia using atropine (premedication) 0.02 mg/kg wti/m, xylazine (sedation) @ 1.5 mg/kg i/m, ketamine (induction) 7 mg/kg i/m and isoflurane 1-2.5% to remove that foreign body.

RIS-17

ENDOSCOPIC RETRIEVAL OF GASTRIC FOREIGN BODIES IN THIRTEEN DOGS- A CLINICAL STUDY

S.D. Lotlikar, A.H. Ulemale, R.V. Suryawanshi and S.V. Salvekar

*Department of Surgery and Radiology, KNP College of Veterinary Science,
Shirwal, Satara, Maharashtra*

Total thirteen clinical cases of dogs aged between 2.5- 7 years presented to teaching veterinary clinical complex with complaint of sudden onset of vomiting, anorexia or dysphagia and abdominal discomfort. Location, orientation and type of gastric foreign bodies were confirmed by plain radiography. Out of 13, 9 dogs showed radiolucent foreign bodies (socks, PVC pipe, mango kernel, plastic spoon etc.) whereas, remaining four dogs showed obvious radio-opaque foreign bodies (magnet, belt buckle and stones) with non-significant changes in haemato-biochemical parameters. All dogs were positioned on left lateral recumbency under general anaesthesia after proper fasting and subjected to gastroscopy. Gastroscopic examination revealed that, dogs with radiolucent foreign bodies showed, hyperemic, severely congested gastric mucosa along with erosive changes, severely inflamed gastric mucosa, thickened rugal folds, severely inflamed gastric mucosa, thickened rugal folds with some areas showing blanched appearance was observed. Foreign bodies like plastic spoon, monkey toy with an entrapped magnet metal belt buckle from the stomach were retrieved with foreign body grasping forcep whereas plastic pipe, mango kernel, stone, *etc.* was successfully removed with endoscopic snares. To concludes, non-potential foreign bodies can be easily retrieved through endoscopic procedure after radiographic examination to avoid invasive surgery in canine practice.

RIS-18

CLINICAL EVALUATION OF LAPAROSCOPIC-ASSISTED TECHNIQUE FOR SURGICAL MANAGEMENT OF GASTROINTESTINAL AFFECTIONS IN DOGS

Thomas E.G., Tripathi S.D., Khandekar G.S. and Lokhande D.U.

*Department of Veterinary Surgery and Radiology, Mumbai Veterinary College, Parel, Mumbai
Maharashtra Animal and Fishery Sciences University, Nagpur*

Five dogs with gastric dilation (01), intestinal tumour (01) and Intussusception (03) respectively, were diagnosed/treated using laparoscopic-assisted (LA) technique under atropine sulphate (0.02 mg/kg s. c.) as pre-medication, butorphanol tartrate (0.2 mg/kg i. v.) and acepromazine maleate (0.02 mg/kg i.v.) as sedation, propofol (4 mg/kg i.v.) as induction and isoflurane (2.5%) as maintenance. LA technique was used in these cases to perform LA gastropexy, LA intestinal biopsy, LA intestinal resection and anastomoses/enterotomy with minimal handling of the tissues using key hole incisions. LA technique enabled confirmatory diagnosis (especially in cases when diagnosis was doubtful using other modes of diagnostic imaging) by allowing clear in-vivo vision of any abnormality in the abdominal cavity prior to a laparotomy being done

(intussusceptions and intestinal tumours/obstructions). No significant difference was noted in the haemato-biochemical parameters and electrolyte levels before and after surgery in these cases. No intraoperative and postoperative complications were seen in any cases during this study.

RIS-19

GLYMPHATIC WASTE CLEARANCE PATHWAY –DEMONSTRATED BY CONTRAST ENHANCED MRI IN LIVE RAT BRAIN

Thajunnisa A.S., Thennavan A., Unni A.K.K., Sreekumar K.P. Gowd G.S. and Anoop S.

Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences, Kerala Veterinary and Animal Sciences University, Mannuthy, Kerala

The lymphatic vasculature represents a second circulation parallel to the blood vasculature that accounts for the clearance of interstitial fluid (ISF) in most of the vascularised tissues. Yet, brain does not have a histologically identifiable lymphatic vasculature and thus lacks a discrete pathway for interstitial solute and fluid clearance. Glymphatic system is a recently identified brain-wide pathway for the efficient clearance of solutes and waste from the brain through CSF-ISF exchange. In the present study, we used contrast enhanced MRI to visualize brain-wide subarachnoid CSF-ISF exchange in Sprague Dawley rats. The animals were anaesthetised with a combination of xylazine and ketamine to inject the contrast agent (Gd-DTPA) in to the subarachnoid space of the cistern magna with the help of a stereotaxis frame. The imaging performed on small animal 7T MRI (Biospec 70/30 USR), Bruker instrument was useful to demonstrate circulation of a large portion of CSF through the brain parenchyma along the para-vascular spaces to exchange with the interstitial fluid in addition to the ventricles. This contrast enhanced MRI quantification approach may provide the basis for a new strategy for evaluating Alzheimer's disease susceptibility and disease progression.

RIS-20

STUDY ON INTRAVENOUS PYELOGRAPHY IN DOGS SUFFERING WITH URINARY OBSTRUCTION

Zaid Bashir Tragwal, **R.B. Kushwaha,** D.K. Dwivedi, Pankaj Gupta, Sharad Kumar and R.A. Rafiqee

Division of Veterinary Surgery and Radiology, Faculty of Veterinary Science and A.H., R.S. Pura, SKUAST-J, Jammu, J&K

Intravenous pyelography was conducted on 11 dogs, having the history of urinary obstruction, with the objective to outline the urinary tract for the diagnoses of kidneys, ureteral and bladder diseases. Anamnesis, clinical signs, BUN and creatinine values were recorded in each case. Plain radiograph was taken in two orthogonal views. Intravenous pyelography was carried out by injecting 350 mg I/ml iohexol @ 1.5 ml/kg body weight intravenously in each dog and series of radiographs were taken immediately after injection of contrast media and at 5, 10, 15, 25 and 40 min. intervals. Radiographs were divided into three groups based on quality of pyelograms as good (I; n=3), fair (II; n=4) and poor (III; n=4) and BUN

and creatinine value of each group was compared. Non-descript and pug breeds and geriatric dogs were more affected. All dogs were male. Plain radiographs revealed vesicular and urethral calculi in 10 cases. Intravenous pyelography revealed ectopic ureter, abnormal positioning of ureter and unilateral ballooning of left proximal ureter and loss of kidney function, each in one case and hydro ureter and renal pelvis dilatation in 3 cases. Pyelograms of poor quality group had poor contrast and significantly ($P<0.05$) higher level of BUN and Creatinine than fair and good groups.

RIS-21

DIAGNOSIS OF RETICULAR ABSCESS BY ULTRASONOGRAPHY AND RADIOGRAPHY, AND ITS ULTRASOUND GUIDED EXTERNAL DRAINAGE IN A COW

R.B. Kushwaha, Pankaj Gupta, R.K. Bhardwaj, Ankur Sharma and J.S. Soodan

*Division of Teaching Veterinary Clinical Complex, Faculty of Veterinary Science and A.H.,
R.S. Pura, SKUAST-J, Jammu, J&K*

An adult cow brought to the clinics with a history of calving 15 days ago, and anorexia, decreased water intake, scanty faeces, and recurrent mild tympany for about 25 days. The case was treated by local field veterinarian without any improvement. Cow was dull, depressed, dehydrated, hidebound condition, no milk yield and had low grade of fever. Standing lateral radiograph of ventral thoraco-abdominal area revealed intact diaphragmatic line and presence of radiopaque area in the region of reticulum along with fluid gas line horizontally. USG of right 6th intercostal space revealed anechoic to echoic area suggestive of fluid. Upon needle aspiration, it was diagnosed as reticular abscess which was drained externally by using trocar and cannula at the right 6th intercostal space under 2% lignocaine local analgesia. About 2.5 to 3.0 liters of foul-smelling cream coloured pus was drained. The abscess cavity was lavaged with a mixture of betadine and normal saline solution. Post-drainage radiograph of the same area revealed honeycomb reticulum with non-potential foreign bodies.

RIS-22

ULTRASONOGRAPHY IN THE DIAGNOSIS OF THORACO-ABDOMINAL DISORDERS IN SHEEP AND GOATS

Manjunatha, D.R., Nagaraju, N., Basavarju B. Balappanavar, Shivakumar, V. and Ranganath, L.

Department of Veterinary Surgery and Radiology, Veterinary College, Hassan, Karnataka

Ultrasonography is a non-invasive, safe, economical and reliable tool in the diagnosis of fore stomach and intestinal disorders in sheep and goats. However, it is most helpful in evaluating the motility of abdominal and thoracic organs like reticulum, omasum, intestine and heart. The present study was conducted on 58 sheep and 34 goats, out of which 61 were female and 31 were male, the age of randomly selected animals were in the range of 4 months to 6 years. These animals had the history of fever, decreased milk yield, dullness, exercise intolerance, coughing, anorexia, recurrent bloat and constipation. On clinical

examination, dyspnea; hurried respiration; enlarged abdomen were noticed. All the animals were subjected to ultrasound examination with 6-8 MHz curvilinear ultrasonic transducer. The diagnosis of thoraco abdominal disorder likes cystoliths, uroperitonium, ruptured uterus, cysts and hernia weremade. Ultrasonography was helpful in identifying extent and content of hernia. In this present study more number of urolithiasis case were diagnosed and it will help in planning type of treatment based on urinary bladder enlargement or rupture and also helpful in assessing proper location of catheter postoperatively.

RIS-23

DIAGNOSIS OF SOME INTERESTING CASES IN DOGS WITH SPINAL AND ABDOPELVIC AFFECTIONS USING CT AND MRI

Gauri Khante, S.V. Upadhye, S.B. Akhare, M.R. Kate, A.M. Kshirsagar and Ushma Patel

*Department of Veterinary Surgery and Radiology, Nagpur Veterinary College,
Maharashtra Animal and Fishery Sciences University, Nagpur, Maharashtra*

The use of radiography and ultrasound has become a routine in veterinary practice. Addition of CT and MRI has provided additional tools to veterinary surgeons in diagnosing various affections precisely. The paper presents various affections of spinal cord and abdo pelvic organs using these modalities.

RIS-24

UTILITY OF ULTRASONOGRAPHY IN POSTSURGICAL EVALUATION OF HERNIOPALSTY IN BOVINES

P.B. Patel, P.T. Sutaria, J.B. Patel, A.M. Patel, R.K. Gosai, N.S. Chaudhari, Abhishek M. Patel, H.M. Barot, K.R. Chaudahri and A.N. Patel

*Department of Veterinary Surgery and Radiology, Dr. V.M. Jhala Clinical Complex,
College of Veterinary Science and A.H., S.D.A.U., Sardarkrushinagar, Gujarat*

The study was conducted on nineteen bovine calves with hernias undergoing surgical correction with hernioplasty. Ultrasonographic examinations were performed on 0 day (pre-operative), 15th and 30th post operative day. The pre-operative examinations revealed break in continuity in abdominal. The hernial content was identified on ultrasound. The polypropylene mesh was visualized as a distinct hyperchoic line with anechoic fluid accumulation beneath the surgical site that might be indicative of surgical oedema. Visceral organs adhesion with mesh was not found in any cases on 30th post-operative day when examined ultrasonographically.

RIS-25

CONTRAST RADIOGRAPHIC EVALUATION OF MEGAOESOPHAGUS IN DOGS- A REVIEW OF 12 CASES

Sudheesh S. Nair, Laiju, Philip M., **M.K. Praveen**, Lavanya B., Manasa, M.R., Salumol, S., Sharat Joshi, Lekshmi, S., Anvitha H., Soumya Ramanakutty, John Martin K.D., Dileep Kumar, K.M and Devanand, C.B

Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences, Kerala Veterinary and Animal Sciences University, Mannuthy, Thrissur, Kerala

Twelve cases of megaesophagus in dogs were presented to University Veterinary hospitals of Mannuthy and Kokkalai, KVASU. All the animals were presented with a history of anorexia and regurgitation. The age group of the animals ranged from six months to two years. All animals were subjected to plain and contrast radiography of neck region with barium sulphate suspension at the rate of 6-10 ml/kg body weight. The dilation pattern of oesophagus was assessed and the normal to dilated oesophageal diameter ratio was assessed. All the animals were medically managed along with elevated feeding management. This presentation focuses on various aspects of radiological features of megaesophagus in dogs.

RIS-26

ULTRASONOGRAPHIC OBSERVATIONS OF DIGESTIVE AND UROGENITAL SYSTEM IN NEW BORN CALVES

Priti Patel, Vaibhav Bhardwaj, Alok Kumar, Priyanka Pandey and Prem Singh

*International Institute of Veterinary Education and Research,
Bahu Akbarpur, Rohtak, Haryana*

Five newborn calves having age of two to four days were brought to the clinic with the complaint of abnormality of external genitalia, anuria and absence of the anal opening. Out of five calves, three were buffalo calves and two were cow calves. There was no visible external genitalia and anal opening but there was mark of fused vulvar lips and anal opening below the tail. A cord like structure was hanging from the ischeal region. On ventral side of abdomen, there was marks of scrotum and the preputial sheath therefore it was difficult to decide about the sex of the calves. There was slight deviation of the rudimentary tail from its base but in some cases even the tail was absent. Ultrasonographic study of the fibrous cord showed presence of lumen in the centre surrounded by muscular structure. The lumen was observed to be obstructed near the tip of the fibrous cord. All these ultrasonographic findings were suggestive that the cord is a rudimentary penis which could not developed properly. Ultrasonogram of the rudimentary scrotum further revealed presence of oval hypoechoic structures resembling testicles. The buffalo calves were sedated with xylazine (0.02 mg/kg intravenously) and controlled in right lateral recumbency. Caudal block was achieved by infiltrating 2% lignocaine hydrochloride. The perineal area was prepared for aseptic surgery and the fibrous cord was incised to open. There was presence of urethral linings in the centre of fibrous cords. When sterilized polyethylene catheter was passed in the centre of the cord, urine started flowing in

three calves. The catheter was transfixed *in situ*. The area below the tail was opened for atresia ani and after surgery three calves passed faeces without much problem. The post-operative management included fluid therapy, antibiotics, analgesic, Vitamin B-complex and daily anti-septic dressing with povidone iodine followed by maggoticidal spray till healing. Three calves survived, while two calves could not be corrected for artificial opening for passage of urine and faeces. Follow up the operated cases revealed that the calves survived only up to one to three months.

RIS-27

RADIOGRAPHIC CARDIAC INDICES AND CARDIOTHORACIC RATIO IN APPARENTLY HEALTHY GERMAN SHEPHERD DOGS

Mamta Mishra, S. Purohit, Akash, Amolak Sharma and R.P. Pandey

*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H.,
DUVASU, Mathura, Uttar Pradesh*

The present study was conducted on eight apparently healthy German shepherd dogs free from cardiathoracic diseases and three dogs with cardiac affections. The animals were divided into two groups (Group-I contains healthy animals while group-II animals with cardiac problems) to evaluate the various cardiathoracic parameters. Mean \pm S.E values of body weight and age were measured 26.80 ± 1.26 (range 22 – 33.2) kg and 55.00 ± 3.62 (range 36 - 72) months and 36 ± 1.53 (range 34 – 39) kg and 68 ± 4.00 (60-72) months in animals of the Group-I and II, respectively. Thoracic radiographic examination, is routinely used in cases which are indicated for cardiac evaluation, quantitative assessment of the heart plays a useful role in combination with subjective analysis. The purpose of this study was to establish the standard values (range) for parameters of the heart and thorax. Most of the parameters were found to be non – significantly different between group-I and group-II animals like Cardiophrenic contact (cm), Cardiosternal contact (No. of sternebrae), Cardiac inclination angle (degree), Tracheal angle (degree), Cardiac width/thoracic height, Cardiac width / T3-T5, Cardiac height / R3-R5, Cardiac width / R3-R5, Cardiophrenic contact /cardiac height, Cardiac height + cardiac width/R3-R5, cardiac height + cardiac width /thoracic height and, except Tracheal diameter/T4 and Tracheal diameter (cm).

RIS-28

RADIOGRAPHIC EVALUATION OF CAUDAL VENA CAVA AND AORTA SIZE IN APPARENTLY HEALTHY GERMAN SHEPHERD DOGS

Mamta Mishra, S. Purohit, Akash, Amolak Sharma and R.P. Pandey

*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H.,
DUVASU, Mathura, Uttar Pradesh*

The present study was conducted on eight apparently healthy German shepherd dogs free from cardiathoracic diseases and three dogs with cardiac affections. The animals were divided into two groups (Group-I contains healthy animals while group-II animals with cardiac problems) to evaluate the various cardiathoracic parameters. Mean \pm S.E values of body weight and age were measured 26.80 ± 1.26 (range 22 – 33.2) kg and 55.00 ± 3.62 (range 36 - 72) months and 36 ± 1.53 (range 34 – 39) kg and 68

± 4.00 (60-72) months in animals of the Group-I and II, respectively. Thoracic radiographic examination, is routinely used in cases which are indicated for cardiac evaluation, quantitative assessment of the heart plays a useful role in combination with subjective analysis. The purpose of this study was to establish the standard values (range) for parameters of the heart and thorax. Non-significant ($p < 0.05$) positive correlation of aorta (AO) diameter, caudal vena cava (CVC) diameter with age and non-significant ($p < 0.05$) negative correlation with body weight was found. Positive correlation with age and body weight were observed in CVC/ T, CVC/ R, AO/ T and AO/ R while Negative correlation with age and body weight were observed in CVC/AO.

RIS-29

COMPUTED TOMOGRAPHIC (CT) CHARACTERS OF SKULL AND VERTEBRAL COLUMN FRACTURES IN DOGS

Satyaveer Singh, Sakar Palecha, P. Bishnoi and T.K. Gahlot

Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences, Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan

The present study was based on computed tomographic (CT) diagnosis of various fractures involving skull and vertebral column in 29 dogs of different breeds, age, sex and body weight, presented with bleeding from nostrils, recumbency and different neurological signs following automobile accident, hitting by hard object and fallen from height. Survey radiographs were taken. Computed tomography in the dogs was performed under general anaesthesia on a 16 slice CT scan machine (Supria, Hitachi, Ltd.). Both the imaging modalities were assessed independently. CT scan images were evaluated on bony window using 2-D MPR (transverse, sagittal & dorsal plane) and 3-D reconstructive images. Fractures of cranial, nasal and facial bones and different vertebrae were diagnosed based on the CT findings. In conclusion, fracture of skull bone and incomplete fracture of vertebrae were best appreciated on computed tomographic images compared to radiographs.

RIS-30

COMPARATIVE STUDY OF ULTRASONOGRAPHY TECHNIQUES IN PREDICTING HISTOPATHOLOGICAL LESION OF CANINE TUMOURS

Sagar Sahoo, Indramani Nath, Biswadeep Jena, Jayakrushna Das, Sidhartha Sankar Behera, Prasana Kumar Rath and Shuvranshu Shekhar Biswal

Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H., Odisha University of Agriculture and Technology, Bhubaneswar, Odisha

The aim of the study was to evaluate and standardize the different ultrasonography techniques for different canine tumours. The present study was conducted on 28 canine patients (20 females and 8 males) with visible tumour masses with age ranging from 5 to 13 years of age and body weight from 11 to 37 Kg presented to the Department of Veterinary Surgery and Radiology and Teaching Veterinary Clinical Complex,

C.V.Sc. & A.H., Bhubaneswar for a period of 8 months. The ultrasonographic variables for different techniques (B-Mode, Colour Doppler and ARFI Elastography) were measured and recorded. The tumour masses after excision were submitted to the Department of veterinary Pathology for Histopathology. Statistical analysis was performed using analysis of variance, and paired “t” test using IBM SPSS statistical packages. Our study recorded highest level of sensitivity, specificity and accuracy for the ARFI Elastography. The B-Mode and Colour Doppler ultrasonography had a moderate to low sensitivity, specificity and accuracy in predicting the malignancy in canine tumours. The ARFI Elastography is a reliable and non-invasive technique to predict the malignancy in case of canine tumours. The sensitivity, specificity and accuracy can be increased when the ARFI Elastography is combined with the B-Mode and Colour Doppler ultrasonography.

RIS-31

RADIOGRAPHIC DIAGNOSIS OF ABNORMALITIES OCCURRING IN THE PHALANGES OF BOVINES

G.S. Ubhare, P.B. Chaugale, R.V. Suryavanshi, S.P. Salvekar and A.H. Ulemale

Department of Veterinary Surgery and Radiology, KNP College of Veterinary Sciences, Shirwal, Satara, Maharashtra

The occurrence of lameness in the bovine bull is main economic problem in livestock population. This study was done to evaluate occurrence of lameness due to abnormalities occurring in phalanges of affected animals. The lameness cases presented during last one year having alterations in osseous structures, soft tissues and cartilages were subjected to radiographic evaluation. Common changes seen in radiography were periosteal bone proliferation, fractures, infections etc. Majority of cases were reported due to heavy work load and due to trauma. Males were affected more as compared with females. Hind limb was more affected than front limb. Distal phalanx and surrounding area was more affected. In all the cases, general examination followed by radiography was performed and affections were diagnosed.

RIS-32

URETHRO-CYSTOSCOPIC FINDINGS IN DOGS WITH DIFFERENT AFFECTIONS OF LOWER URINARYTRACT

J.J. Parmar, P.V. Parikh, P.B. Dabhi and D.N. Kelawala

Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H., Anand Agricultural University, Anand, Gujarat

Seven dogs (two females and five males) were subjected to urethro-cystoscopic examination under general anesthesia. Urethro-cystoscopy revealed mass in bladder in three dogs (2 males and 1 female), cystolith in one male and female each, cystitis and hemorrhagic cystitis in one each male. The dogs with cystitis evinced the mucosa to be oedematous, hyperemic and prominent vessels while in haemorrhagic cystitis the wall was thickened with haemorrhagic patches and ulceration while dogs with urolithiasis revealed yellowish brown irregular masses attached to each other in urinary bladder. Urinary bladder stone appeared to be thickened and in the other dog, two small sized white coloured calculi were seen. In dogs with mass

in bladder, large sized round shaped hanging mass was found on dorsal wall and borders of mass appeared free at ventral floor of bladder while in other female the mass appeared as a whitish irregular surface attached to bladder wall. Based on the observations in the present study it can be concluded that use of 1.2 mm diameter direction of view: 0° angle and working length: 100 cm flexible fiberoptic-endoscope could be used very effectively for diagnosis of lower urinary tract affections.

RIS-33**ENDOSCOPIC STUDY OF PHARYNGEAL AREA IN EQUINE**

Prem Singh, Sandeep Saharan, Vishal, Tarun Kumar and **Vaibhav Bhardwaj**
*Department of Veterinary Surgery and Radiology, College of Veterinary Sciences,
 Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, Haryana*

Five horses were brought to the veterinary clinic with the history of inappetance, foul smelling nasal discharge and coughing. The nasal discharge was blood tinged in two horses and purulent in three horses. The horses were dull, depressed and emaciated. Water intake was also reduced. Clinical examination showed increased body temperature (102-103°F), respiration (24-26/min) and the heart rate (60-70/min). The blood was collected and sent for hematological examination (hemoglobin, TLC and DLC). The nasal swab was collected and sent for cultural examination and sensitivity test. The horses were sent for radiological examination of lung area. The pharyngeal area was subjected to endoscopic examination to know the possible source of hemorrhage and infection. Endoscopy was done in standing position and horses were restrained under xylazine sedation (@ 0.5 mg/kg intravenously) with application of ear twitch. The endoscopic examination of pharyngeal area revealed inflamed mucosa and hemorrhage in two horses and thick mucoid material in three horses. The radiographic report of lung area in these three horses showed multiple radiodense granules however the radiographic image was normal in two horses. The hematological report revealed low hemoglobin (7-9 g/dl) and increased TLC count (22-35 thousands/mm³) with neutrophilia (92-96%). The cultural examination of nasal swab showed bacterial infection of streptococcus in two horses, mixed infection of staphylococcus and streptococcus in one horse and Streptococcus and Klebsiella in other two horses. These were found sensitive to chloramphenicol, kanamycin and azithromycin. The line of treatment included pheneramine maleate, chloramphenicol/kanamycin, vitamin C, bronchodilator and turpentine oil inhalation for 10-15 days. Out of five horses, three horses couldn't be saved. Only two horses responded to the treatment.

RIS-34

**ROLE OF COMPUTED TOMOGRAPHY (CT) IN DIAGNOSIS OF
 DEGENERATIVE DISORDERS OF THE CANINE ELBOW AND HIP
 JOINTS**

Satyaveer Singh, Sakar Palecha, P. Bishnoi and T.K. Gahlot
*Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences,
 Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan*

The present study investigates the use of Computed tomography (CT) in the diagnosis of degenerative

disorders and associated changes in the elbow and coxo-femoral joints in 10 dogs. Computed tomography was performed under general anaesthesia and the CT scan images were acquired in a bony window. The images were evaluated on bony window using MPR (transverse, sagittal and dorsal planes) reconstruction and 3D volume rendering images were also reconstructed to evaluate and characterize the degenerative changes and its extent involving these joints. Based on the different pathological changes, the CT findings have been reported in hip joints viz Osteoarthritis, and associated hip dysplasia, sclerotic changes attenuating density of air, deformed anatomy of coxo-femoral joints, obliteration of joint space with shallow acetabulum. In the elbow joints, the CT findings demonstrated the changes viz. exuberant new bone formation, incongruity of elbow joint with osteophytosis and irregular articular surface of humero-radioulnar joint. The 3D volume rendering images showed the extent of such degenerative changes associated with the joints. In conclusion, CT enabled the improved understanding of the complex anatomical structure and enhanced the successful diagnosis of degenerative changes of the elbow and hip joints in dogs.

RIS-35

CLINICAL AND ULTRASONOGRAPHIC ASSESSMENT OF TEAT AFFECTIONS IN BUFFALOES

Sukhdev Singh, R.S. Bisla, Deepak Kr. Tiwari, Gaurav Kumar, Neeraj Arora, Dishant Saini,
Akshay Tikoo and Preeti Chaudhary

*Department of Veterinary Surgery and Radiology, College of Veterinary Sciences,
Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, Haryana*

The present study was conducted in three clinical cases of buffaloes referred to the department with the history conjoined teats, partial or complete obstruction, soft or hard painless or painful hot swelling that are either progressive or stagnant. The cases were thoroughly examined clinically on the basis of appearance, palpation, and siphoning of teat canal. The teats of all the animals were ultrasonographically scanned by water bath technique using curvilinear probe with frequency of 5MHz. The cases diagnosed were teat spider, conjoined teat and nodular teat growth. The conclusion is that ultrasonography with water bath method is a very useful tool to assess the type of lesion and obstruction whether membranous, focal, diffuse and partial obstruction to follow the line of treatment.

RIS-36

ROLE OF COMPUTED TOMOGRAPHY (CT) IN DIAGNOSIS OF DEGENERATIVE DISORDERS OF THE CANINE ELBOW AND HIP JOINTS

Satyaveer Singh, Sakar Palecha, P. Bishnoi and T.K. Gahlot

*Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences,
Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan*

The present study investigates the use of Computed tomography (CT) in the diagnosis of degenerative disorders and associated changes in the elbow and coxo-femoral joints in 10 dogs. Computed tomography

was performed under general anaesthesia and the CT scan images were acquired in a bony window. The images were evaluated on bony window using MPR (transverse, sagittal and dorsal planes) reconstruction and 3D volume rendering images were also reconstructed to evaluate and characterize the degenerative changes and its extent involving these joints. Based on the different pathological changes, the CT findings have been reported in hip joints viz. Osteoarthritis, and associated hip dysplasia, sclerotic changes attenuating density of air, deformed anatomy of coxo-femoral joints, obliteration of joint space with shallow acetabulum. In the elbow joints, the CT findings demonstrated the changes viz. exuberant new bone formation, incongruity of elbow joint with osteophytosis and irregular articular surface of humero-radioulnar joint. The 3D volume rendering images showed the extent of such degenerative changes associated with the joints. In conclusion, CT enabled the improved understanding of the complex anatomical structure and enhanced the successful diagnosis of degenerative changes of the elbow and hip joints in dogs.

RIS-37

IMAGING OF ABDOMINAL DISORDERS USING ULTRASONOGRAPHY AND COMPUTED TOMOGRAPHY IN CANINES

P. Bishnoi, S. Diwedi, S. Palecha and S. Singh

Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences, Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan

The present study was performed in 56 dogs of different breed, age groups and body weight affected with various abdominal disorders. The organ wise distribution of the abdominal disorders was performed for cases pertaining to liver and gall bladder; spleen; stomach and intestine; kidney, urinary bladder and urethra; uterus; prostate; abdominal cavity and cases involving multi-system. Two modalities were used to diagnose the disease. Most of the cases were diagnosed using ultrasonography alone, while few cases were diagnosed using CT scan and USG both and rest with CT scan alone. Cases diagnosed using ultrasonography alone were pyometra, cystic calculi, ascites, biliary sludge, biliary sludge with cholecystitis, urolithiasis, hepatic neoplasia, metastatic/Neoplastic lesion attach to liver, space occupying lesion in liver parenchyma with biliary sludge, space occupying lesion attached to liver with mineralized gall bladder wall, cholecystitis with leptospirosis and hydronephrosis, gastric foreign body, inflammatory bowel disease, enteropathy, nephro-calcinosis, hematoma of kidney, cystitis, bladder sediment, prostate enlargement with space occupying lesion, gall bladder mucocele and space occupying lesion in spleen with splenomegaly, cholelithiasis with gastritis and gastric and renal neoplasia. Cases diagnosed with ultrasonography and computed tomography both were renal neoplasia, hydronephrosis and cystic stone, hydronephrosis with extra-luminal growth attach to neck of bladder, prostate enlargement, neoplastic growth attach to liver with cholelithiasis and ascites, abdominal mass attached to the liver with hydrothorax and ascites, space occupying lesion attach to caudal lobe of liver and hepatomegaly with splenomegaly and ascites. Cases diagnosed with computed tomography alone were space occupying mass related with spleen, liver, cholelithiasis and hepatomegaly.

RIS-38**RADIOGRAPHY IN CONJUNCTION WITH CARDIAC BIOMARKERS FOR DIAGNOSIS OF CARDIAC AFFECTIONS IN DOGS**

Gaurav Kumar, Deepak Kumar Tiwari, Ashok Kumar, Neeraj Arora, Sandeep Saharan,
Divya Agnihotri and Sandeep Gupta

*Department of Veterinary Surgery and Radiology, College of Veterinary Sciences,
Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, Haryana*

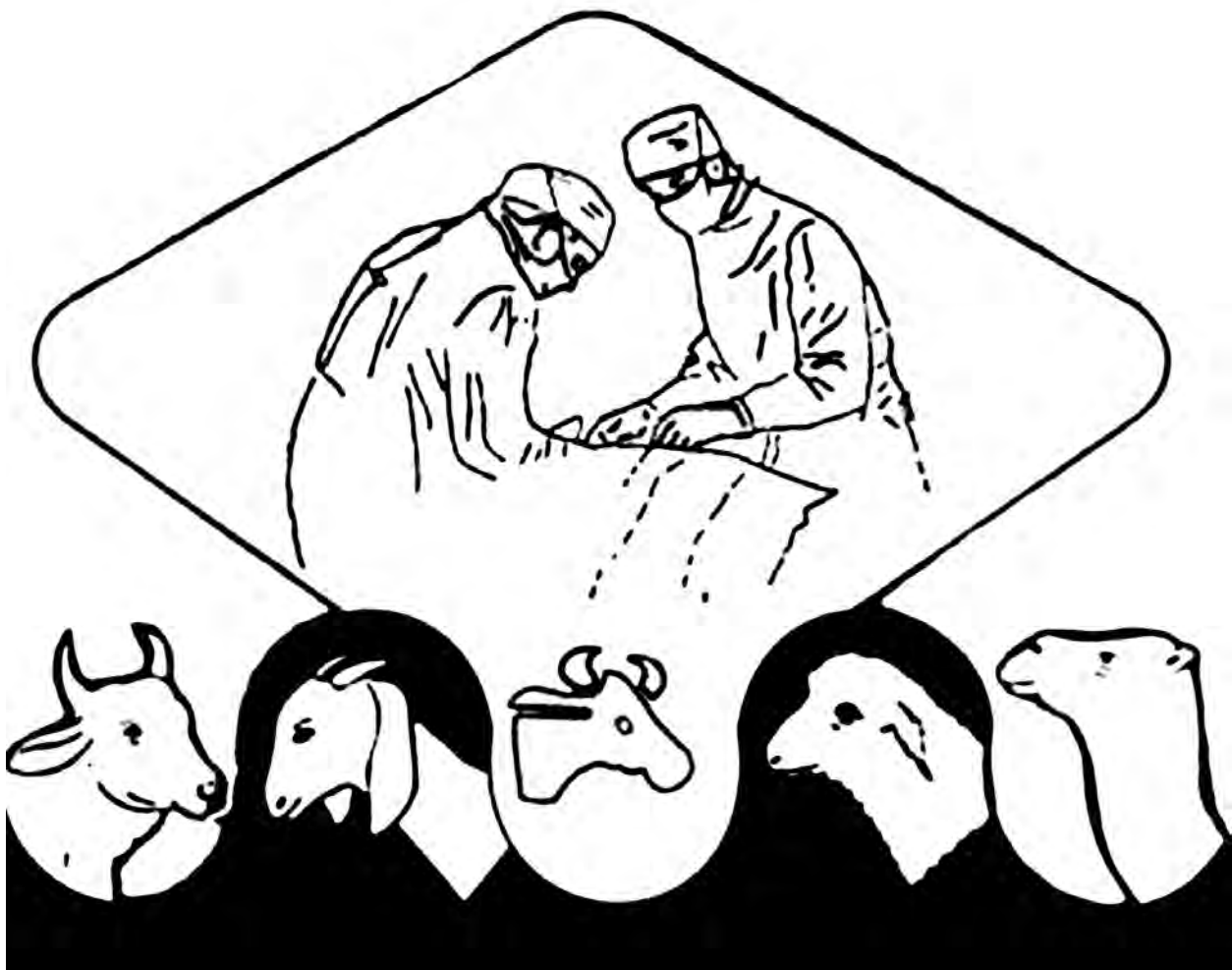
Cardiac affections are the second most common disorder in dogs after cancer. The present study was conducted on twenty dogs irrespective of age, breed and sex presented to the department with a history of coughing, ascites, lethargy and exercise intolerance etc. Thoracic radiography was performed in lateral and ventro-dorsal view in all the animals for assessment of vertebral heart score (VHS) and Cardiothoracic ratio (CTR). Blood was collected aseptically for evaluation of cardiac biomarkers viz., CK-MB, NT-proBNP, Cardiac Troponin-I and CRP. Thoracic radiography revealed cardiomegaly, pulmonary oedema, elevated trachea and enlargement of left atrium. The estimation of cardiac biomarkers was used to ascertain the functional changes in heart musculature which showed higher values than already established values. Thus, it has been concluded that thoracic radiographic imaging and cardiac biomarkers estimation are helpful for evaluating the cardiac affections.

RIS-39**ECHOCARDIOGRAPHY: A DIAGNOSTIC TOOL FOR CARDIAC AFFECTION IN DOGS**

Gaurav Kumar, Deepak Kumar Tiwari, Ashok Kumar, Sandeep Saharan, Neeraj Arora,
Divya Agnihotri and Satbir Sharma

*Department of Veterinary Surgery and Radiology, College of Veterinary Sciences,
Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, Haryana*

Echocardiography is considered to be gold standard diagnostic tool as it is possible to detect the structural and functional abnormality in cardiac musculature with high sensitivity and specificity. The present study was conducted on twenty clinical cases of dogs irrespective of age, breed and sex presented to the department with history of chronic coughing, oedema over dependent parts, lethargy and exercise intolerance. On the basis of echocardiography animals were divided into four groups viz. Group-I (n= 9, Mitral valve disease); Group-II (n= 6, Dilated cardiomyopathy); Group-III (n= 3, Aortic regurgitation); Group-IV (n= 2, Congestive heart failure). B-mode, M-mode and Doppler ultrasonography was conducted using phase array probe with frequency range from 4-9 MHz. Various M-mode reference values were evaluated which provide us the values for ejection fraction, fractional shortening, end systolic volume index, end point septal separation, left atrium to aortic ratio and E/A ratio that revealed the animal is either in systolic or diastolic dysfunction. In color doppler mode mosaic pattern of regurgitation jet was observed at mitral and aortic valves. Thus, it was concluded that echocardiography was a reliable non-invasive tool for accurate diagnosis of cardiac alterations in dogs.



Ruminant Surgery Session

MEET THE SPEAKER



T.K. Gahlot

Professor

Department of Veterinary Surgery and Radiology

College of Veterinary and Animal Science

Rajasthan University of Veterinary and Animal Science, Bikaner 334001

Professor Tarun Kumar Gahlot is a fellow of ISVS. He is a graduate and post-graduate from College of Veterinary and Animal Sciences, Bikaner and has completed his PhD from CCS Haryana Agricultural University, Hisar, India. He is serving as a re-employed Professor in the Department of Veterinary Surgery and Radiology at Rajasthan University of Veterinary and Animal Sciences, Bikaner, earlier he superannuated as Director of Clinic from RAJUVAS. He has published more than 212 papers in the reputed journals and has been serving as an Editor in Chief of Journal of Camel Practice and Research. He has organized international camel conference at College of Veterinary and Animal Sciences, Bikaner in 2007 and hosted special sessions on Camel Science in World Veterinary Congresses at Paris and Berlin. He has edited many books on camels, i.e. Selected Topics on Camelids, Selected Research on Camelid Physiology and Nutrition, Selected Research on Camelid Parasitology, Selected Research on Camelid Immunology, Selected Research on Gross Anatomy and Histology of Camels etc. He is in receipt of many awards which include gold medals for two consecutive years for ophthalmic surgery by ISVS, SJ Angelo and Swaminatha Iyer awards by Indian Veterinary Association and best paper awards for the papers in Indian Journal of Veterinary Surgery and Intas Polivet. He also received distinguished camel scientist award and Camel Saviour Award 2010 by LPPS, Germany. He served as an expert for selection of Professor in King Faisal University, Al Hasa, Saudi Arabia and member of the Research Advisory Council, IVRI, Izatnagar and NRC on Yak, Derang, Arunachal Pradesh. He has authored a chapter “Nutraceuticals in Camelids” published by Springers in the book- Nutraceuticals in Veterinary Medicine. He has developed superspecialities in the Department of Veterinary Surgery and Radiology, CVAS, Bikaner like laparoscopic surgery, laser surgery, orthopedic surgery, cataract surgery with phacoemulsification and intraocular lens transplantation, first Computed Tomography facility of Veterinary Colleges of India etc. Dr Gahlot was invited in more than 27 countries in the Interantional Conferences to deliver lead papers on camel and equine surgery. He has guided more than 30 MVSc and 10 PhD students.

CURRENT AND FUTURISTIC TRENDS IN CAMEL SURGERY

T.K. Gahlot

*Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences,
Rajasthan University of Veterinary and Animal Science, Bikaner, Rajasthan*

Camels are primarily used as a draft animal followed by its use as a pack and breeding animal. A frequent trauma to its musculoskeletal system and injuries to other body parts leads to lots of production losses and surgery plays a pivotal role here to restore the production, hence camel surgeons are important in this region. Surgical disorders of camels are reported by Gahlot (1992), Ramadan (1994) and Gahlot (2000). Present paper would stress on important surgical disorders of dromedary camels. These disorders are categorized as soft tissue surgery and orthopaedic surgery. Restraint, anaesthesia and surgeries of camelids are described in few books (Miller and Fowler, 2014; Ramadan, 1994; Gahlot, 2000).

Soft tissue surgery

Ocular disorders : Camels frequently suffer from eyelid lacerations, corneal injuries, third eyelid prolapsed, panophthalmia, corneal opacities, ulcers, keratoconjunctivitis etc. Treatment is done similar to those done for the bovines.

Lacerated nostril : Nostrils often get lacerated to a variable length and in different directions due to violent pulling of nose-strings by the attendants/ owners in a bid to control vicious animals. These injuries may be fresh or old. Sometimes these are partially healed and are presented for cosmetic repair. It is repaired under infraorbital nerve block and applied vertical mattress suture pattern.

Salivary fistula : It occurs due to lodgement of feed straw through the opening of salivary duct into the oral cavity. An increased interdental space between two upper cheek tooth at this region facilitates entry of feed straw, during mastication, into the opening of parotid salivary duct. Hard fibres of feed straw repeatedly traumatize the inner lining of the duct and penetrate out through the wall of the duct and skin. Initially a small swelling appears on the skin just below the lower eyelid with a central opening. Saliva escapes out through this opening leading to wetting of hairs down below. Ligation of salivary duct can easily be carried out under local anaesthesia.

Soft palate injuries : These injuries are seen only in adult male camels, particularly during breeding season when camel often balloons it. It gets injured either with its own teeth, or by biting of offender camel or external trauma. Dulla is resected from the base under mild sedation with xylazine.

Wound at chest pad, Rope gall, Saddle Gall : These may be punctured, ulcerative or purulent wounds and sometimes enlarged chest pad is also found which is resected.

Scrotal Bite Wounds : As the testes are located high in the perineal region between the thighs and also become enlarged and protrude caudally in the rutting season, they become more accessible to the other male camels and hence, are prone to bite injuries.

Hydrocele : Sometimes unilateral or bilateral accumulation of the serous fluid is noticed between the visceral and parietal layers of the tunica vaginalis resulting in scrotal enlargement. The condition is generally

believed to be the result of mild trauma to the tunic. It manifests as a soft, fluctuating, painless swelling with a normal size and contour of the testicle which helps the clinician to differentiate this condition from orchitis and scrotal hematoma.

Orchitis : Orchitis is not common in the camel. However, the condition may occur following trauma or scrotal skin injuries during fighting between the male animals in the rutting season. Although rare in the camel, the condition can also arise from a primary infection or by hematogenous spread of bacteria into the testes superinfecting the pre-existing traumatic, viral or parasitic damage. Orchitis is more commonly unilateral and may also involve epididymis.

Scirrhus cord : Chronic inflammation of the spermatic cord is always a sequel to either pyocele or ascending infection following open castration.

Rupture of urethra and subcutaneous infiltration of urine : Is mostly due to complete obstruction of urethra with calculi and at times complete occlusion of the urethra caused by mechanical compression with a tight strap taken around the sheath and abdomen while carting a camel. Urethrostomy is done as a treatment of this disorder.

Phimosis : It may be congenital or acquired due to localized trauma, hemorrhage and/or abscessation in and around the prepuce.

Paraphimosis : It may be due to congenital or acquired strictures of the prepuce, paralysis of the penis, balanoposthitis or injury to the penis during copulation or sand masturbation.

Foot affections : Some common foot affections are dermatitis, exuberant granulation, oedema of foot, burn, wounds, abscess, digital cushion hernia, cracked sole, punctured foot, elongated nail etc.

Orthopedic Surgery

Mandibular fracture : Fracture of the mandible is one of the most common fractures in the camel, particularly in the rutting or breeding season and external trauma is also an etiology. The fracture usually occurs across the tushes (first premolar); however, it may also occur cranial or caudal to this site. Most of the fractures are transverse, but oblique and multiple fractures may also be encountered. We use the technique of interdental wiring for transverse fractures. It is simple, convenient and economical and can be easily performed in the field conditions (Gahlot et al, 1984).

Fracture of cervical vertebrae : The presence of long neck predisposes camel to fracture of vertebra causing torticollis. The fracture of transverse process are managed by external support with coaptation splint over the neck and stall rest for 8-10 weeks is sufficient for a clinical union.

Fracture of the long bones has poor prognosis in camels because of lack of proper implants and devices which can be used for massive bones of this animal. However, cannon bone fractures are manageable with transfixation technique.

Upward Fixation of Patella : It is commonest in occurrence among the dislocations in camels. The medial patellar ligament in camels is ill developed. During walk jerks are observed in hind limb and sometimes it remains straight with extension of stifle and hock and flexion of digital joints. After taking a few steps with a click sound the normal gait is resumed. The treatment includes injection of irritant drugs at the site of ligament (Gahlot et al, 1991).

Future vision : It involves use of laser surgery, endoscopic surgery, minimum invasive surgery, cryo surgery, robotic surgery together with stem cell therapy to treat many surgical affections including neoplastic conditions, arthritis and tenosynovitis.

References

- Gahlot TK and Chouhan DS (1992). *Camel Surgery*. Gyan Prakashan Mandir, Bikaner
- Gahlot TK, Chouhan DS and Choudhary RJ (1991). Treatment of upward fixation of patella in camels. *Indian Veterinary Journal* **68**:1178-1179.
- Gahlot TK, Khatri SK, Chouhan DS, Choudhary RJ and Purohit RK (1984). Repair of transverse mandibular fracture by silver wiring in camel (*Camelus dromedarius*). *Indian Journal of Veterinary Surgery* **5**:74-76.
- Gahlot TK (2000). In: *Selected Topics on Camelids*, The Camelid Publishers, Gahlot TK (Editor). pp 286-430.
- Ramadan RO (1994). *Surgery and Radiology of the Dromedary Camel*. 1st Edn., King Faisal University, Saudi Arabia.
- Miller R Eric and Fowler Murray E (2014). *Fowler's Zoo and Wild Animal Medicine*, Volume 8 - E-Book, Elsevier Health Sciences.

MEET THE SPEAKER



V.P. Chandrapuria

Former Professor and Head

Department of Veterinary Surgery and Radiology

Nanaji Deshmukh Veterinary Science University, Jabalpur, M.P.

Dr. Vishnu Pratap Chandrapuria, Retired Professor and Head, Department of Veterinary Surgery and Radiology, College of Veterinary Sciences and Animal Husbandry, NDVSU, Jabalpur was born on 19th October 1953 in Panna District of Madhya Pradesh. He had his school and college education in Shahdol district and later got his BVSc and AH degree from COVS Mhow in 1977 and MVSc (Surgery and Radiology) from COVS JNKVV Jabalpur in 1981. He completed his PhD degree from IVRI Izatnagar (UP) in 1988 on ICAR Senior Research Fellowship. He started his service career by joining as Senior Research Assistant in the Department of Surgery and Radiology on 27th July 1977 and went on to occupy the highest post of Professor in 1999 and Head of the same Department in 2012. He also served as Dean Students Welfare and Director TVCC during this period. He gave his services to many prestigious organizations like ICAR, VCI and many universities in various capacities in his illustrious career. He had special aptitude for research and worked on various innovative techniques related to cataract surgery, ophthalmology, canine anal surgery, vascular surgery, Doppler imaging, skin grafting, bio tissue adhesive, orthopaedics and wildlife surgery. He guided 26 MVSc and 4 PhD students. He took help of medical professionals in these areas of research and also organized a Veterinary Medical Meet in 2017. In 2015 he brought laurels to the institution by securing a mega research project “Super Speciality Centre on Orthopedic Surgery in Large Animals” worth Rs 5.16 crores. He is author more than 200 publications which include research articles, abstracts and extension papers published in journals of international and national repute along with many manuals and conference proceedings. He participated in 36 scientific conferences and symposia and was honoured with Life time Achievement Award by Indian Society of Vety Surgery. He is recipient of 30 national and state level awards for his meritorious services to the profession. He superannuated on 31st December 2017 after a distinguished career spanning about 40 years.

A NEW APPROACH TO CASTRATION IN BULLS- PIN HOLE TECHNIQUE

V.P. Chandrapuria

Former Professor and Head

*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H.,
Nanaji Deshmukh Veterinary Science University, Jabalpur, Madhya Pradesh*

Castration is a common surgical procedure in male animals performed for various reasons and in practice throughout the country since decades. Various non-invasive, minimally invasive and invasive physical (traditional testicular crushing, application of rubber ring, emasculator and clamps), chemical (2% calcium chloride, 88% lactic acid, formaldehyde etc.), hormonal (immuno-castration, immuno-contraceptives, GnRH, estradiol) and open surgical methods are in practice to castrate the animals. Burdizzo's method is the most common procedure used for castration of bulls. However it is thought to be inhumane, painful, cruel and complicatory.

A new approach to castration- the PinHole technique had been evaluated and established which is humane, non-invasive, comparatively painless, easy, ethical and non-complicatory.

The technique was established in a PG curricular research "BURDIZZO VERSUS PINHOLE CASTRATION IN BUCKS AND CATTLE CALVES" at NDVSU, Jabalpur in 2016. It is evaluated by clinical, ultrasonographical and histological examinations and found very effective.

Xylazine and Meloxicam injections are optional as per surgeons description. After restraining and securing the animal in lateral recumbency, scrotum is pulled downward and one testicle is stretched so as the spermatic cord could be palpated at the neck. Asepsis is achieved by applying Providone Iodine at this site and 1-2 ml of 2% lignocaine hydrochloride is infiltrated lateral to the cord. After securing the spermatic cord in between the thumb and forefinger laterally, the straight traumatic suturing needle loaded with number 1 or 2 black braided silk is passed through and through the skin, medial side of the spermatic cord in caudal to cranial direction, leaving the thread in place. Now, the spermatic cord is released pushing it medially and the same needle is now redirected in reverse direction from cranial to caudal previously created same holes. The threads are pulled and a square knot is applied under tension. A simple knot is applied over the first knot. Threads are cut small, few drops of Povidone Iodine is applied at the knot and then skin is lifted upward to embed the knot inside. This procedure is repeated on the other spermatic cord.

By using straight traumatic needle loaded with thread, each spermatic cord is encircled insitu and tied by just piercing at the neck of the scrotum. This procedure causes encircling of spermatic cord, resulting to ischemia, development of collagen fibres inside the testicular tissue and ultimately leading to testicular atrophy in 30-40 days.

Department of Animal Husbandry, Govt. of Madhya Pradesh has adopted it in May 2019 and 56 field veterinarians, one from each district of the state were trained as master trainers by hands on training in Gaushalas at Bhopal in July 2019. In almost every district of M.P. this procedure is being demonstrated to field Vets at present. Very shortly Pin hole technique will replace Burdizzo in the state.

MEET THE SPEAKER**Dr. Naresh Kumar Singh**

B.V.Sc, M.V.Sc, Ph.D, PDF (South Korea)

Professor and Head

Department of Veterinary Surgery and Radiology

Faculty of Veterinary & Animal Sciences-RGSC

Institute of Agricultural Sciences, Banaras Hindu University,

Varanasi-221005, Uttar Pradesh, India

E-mail: naresh2101@gmail.com, Mobile: 9554786939

Dr. Singh, received his Bachelor of Veterinary Sciences in the year 1998 from Veterinary College, Bangalore, India. He accomplished his postgraduation on pain signaling pathways in animals in the year 2000 and doctoral degree on Chondroblast culture with/or without bone marrow progenitors and various growth factor and their impact on cartilage repair in the year 2005 from Indian veterinary research institute, India. He has also worked as postdoctoral fellow at National Livestock Research institute, Suwon, Korea (2005-2007) and his research focus during Post-Doc was on stem cells transdifferentiation and proteomics. Dr. Singh started his career as a professor in the year 2001 and has worked as Assistant Professor at the faculty of veterinary sciences, SK University of agricultural sciences and technology, Jammu, India till April, 2010. During his career he has published 5 books, contributed three chapters and has published more than 70 research papers in the international and national peer reviewed journals. Dr. Singh also worked in the capacity of faculty in the Dept of Biotechnology, College of Animal Life sciences, KNU, Chuncheon, South Korea for around five years. Dr. Singh has earned name in the field of stem cell research and was awarded several awards and one such award was conferred recently in the year 2014 at Indonesia by AJAS society for outstanding research contribution. At Present Dr. Singh has been working as Professor & Head of Dept. of Veterinary Surgery & Radiology, in the of faculty of Veterinary and animal Sciences-RGSC, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi-221005.

DEVELOPMENT OF BLASTEMA RESEARCH TO OVERCOME AMPUTATIONAL INJURIES IN RUMINANTS

Naresh Kumar Singh

Department of Veterinary Surgery and Radiology,

Faculty of Veterinary and Animal Sciences-RGSC,

Institute of Agricultural Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh

Introduction

Prosthetic limbs are the state-of-the-art of recent developments in active lower limb prosthetics particularly in humans. First such development was noticed around 1970's and since then it has been receiving increasing attention. Prosthesis is a mechatronic system that is designed to functionally replace a missing extremity. The development of active prostheses is a challenging task and thus should remain subject to future research especially through clinical evaluations. In veterinary institutions, we learn much about how to repair bone fractures, ligament injuries, and neuropathies. The idea, from human prosthesis has given way i.e. to return some level of function to a damaged appendage and decrease pain. When a limb cannot be salvaged for medical or financial reasons we know that animals do "great" on three legs. As a profession we have come to expect – even accept – that limited mobility, limb breakdown, and chronic neck or back pain are unavoidable consequences. Often there is no precedent for these new therapies in animals, and the onus rests with the veterinary community to educate itself in order to provide best care for patients and clients. The newest emerging therapeutic modality is Veterinary Orthotics and Prosthetics (V-OP). Like the previously mentioned modalities, the origin lies in human health care and subsequently leaps to veterinary health care (Fig.1). The current bovine prosthesis market is catering towards ruminants with amputation. Due to variation in limb deformities, there is yet to be a customizable solution. Instead, the production of prostheses for deformities occurs on a case to case basis and the products are tailored to a specific user with definitely low cost device fabrication.

No doubt the prosthesis has definitely given a greater salvage to injured limb over limb amputation only as the last attempt to save the life of the animal. The procedure of prosthesis applications is simple with rapid resolution of pain and quick return to production. However, average life and mobility of the animal gets affected.

Lately, few research observations have given insight to look for possibilities to tackle the situation of limb formation to its original size and shape after deformation. To understand the phenomenon lets discuss first what is regeneration?

Regeneration

Regeneration is the most common phenomenon in animals seen after injury but has been poorly understood so far (Brockes and Kumar, 2008). Regeneration process commonly requires new cell formation along with the little information to specify the identity of tissues to be generated. For example, salamanders and some insects can regenerate missing limbs, which requires proper restoration of a complete proximal–distal axis starting from an injured limb that lacks distal regions (Brockes and Kumar, 2008). Freshwater

Hydra can regenerate its whole body (Brockes and Kumar, 2008) and similar properties can also be seen in the context of embryonic regulative development. For example, removal of half of the field of cells that become part of the vertebrate limb results in regulative compensation such that a normal limb develops rather than half of a limb (Harrison, 1918). The identification of secreted proteins with morphogenic activity in a variety of regenerating systems have supported the notion in the past that cell–cell communication influences tissue patterning during regeneration (Kumar et al., 2007).

The ability of vertebrates to regenerate limbs varies greatly. Urodele amphibians (newts and salamanders) possess remarkable ability to regenerate amputated limbs anytime during their life (Roy and Levesque, 2006). Anuran amphibians (frogs) can also regenerate their amputated limbs during larval stages, but progressively lose this capability during further development. Amputated or severed limbs in adult mammals and chickens do not regenerate at all; however, digit tips of mature mammalian limbs do possess regenerative capabilities (Borgens, 1982). Great deal of knowledge has been gathered in studying limb regeneration in each organism, from both the standpoint of what is required for a regenerative limb to regenerate as well as how to induce a non-regenerative limb to do so. Out-here, our effort is to gather what has been so far learnt for regeneration from different organism and would highlight the missing link that is essential for the development of blastema in mammals/ ruminants.

What is regeneration and wound healing?

The term regeneration refers to all those processes that allows organism to regain the function of an organ or structure damaged by injury or disease. Regeneration in vertebrates has basically been distinguished into three types: (1) “Epimorphic”: regeneration via formation of a blastema, a population of progenitor cells that arises through epithelial mesenchymal interactions and contains intrinsic morphogenetic information that is required to repattern the regenerating structure (e.g., limb, tail, and fin regeneration). (2) “Compensatory growth”: here it is not the damaged part of an organ that is restored, but uninjured parts of the organ compensate for the loss by growth (e.g., after removal of two lobes of the liver, the third lobe grows until the original mass of the liver is restored). (3) “Tissue regeneration”: repair of local, limited damage to an organ predominantly via restoration of only one cell type (e.g., skeletal muscle).

All animals have means of dealing with damage due to injury or diseases. Healing of epidermis wounds is an efficient process of repair in most organisms, but the ability to recover from damage to other organs or structures varies widely in different organisms. Studies on various regeneration models describe a highly dynamic process in which the wound-healing response that results in the formation of a regeneration blastema interfaces with a redevelopment process (Bryant et al., 2002). In contrast, the wound healing response following limb amputation in adult mammals has not been studied and known in great detail, but key events of non-amputation wound healing include the formation of a fibrin clot, a relatively slow re-epithelialization, an inflammatory response that helps to populate the wound site, the formation of granulation tissue, the differentiation of fibroblasts to become myofibroblasts that contract the wound. Following an inflammatory response, a large wound in mammals takes days to close and results in the accumulation of collagen bundles that form scar tissue (Han et al., 2005).

On the contrary, after amputation of the urodele or larval anuran limb, the surface of the wound is

covered rapidly (within a matter of hours) with epidermal cells that migrate from the edge of the amputation surface, forming the “wound epidermis” (WE) (Call and Tsonis, 2005) (Fig. 1). It is not known what immediate signals induce cells to migrate to cover the wound, but it is known now that the formation of the WE is required for regeneration to occur (Thornton, 1957). Matrix metalloproteinases (MMPs) have been found to be up-regulated very early after amputation, required for regeneration, matrix degradation and formation of WE (Vinarsky et al., 2005). The WE becomes a specialized structure (that some call the apical epithelial cap [AEC]), which is distinct morphologically and in gene expression from the normal epithelium (Han et al., 2005). This structure is thought to be similar to the apical ectodermal ridge (AER) that is present in the developing limb bud, which directs and patterns the limb outgrowth in amniotes (Saunders, 1998), but there is some debate about how similar these structures actually are. This is due, in part, to the fact that after amputation of a regenerating limb with a WE (or AEC), the AEC (and limb) regenerates, but after amputation of a developing limb with an AER (like the chick limb bud), the AER does not regenerate, and neither does the developing limb (Hayamizu et al., 1994). Recent evidence shows that Wnt/ β -catenin signaling is required for structural maturation of the WE in axolotls and frogs, but not for the earlier phase of epidermal migration after wounding (Kawakami et al., 2006).

Dedifferentiation during wound healing

Amputation of the mature limb cut through a number of different tissues such as epidermis, dermis, muscle, nerve, blood vessels, and bone, as well as the loose connective tissue that surrounds these tissues and thus exposing all of these tissues at the wound surface. In urodeles, the initial response to the injury is the formation of a fibrin clot that covers the wound surface and provides a substrate on which peripheral epidermal cells migrate to close the wound (Donaldson et al., 1985). This process is initiated by cells at the wound edge extending lamellipodia and actively moving across the wound, and more proximal cells similarly extending lamellipodia behind these lead cells (Dungan et al., 2002). Urodele wound closure occurs incredibly fast; in young axolotls, an amputation wound is closed within 4 hr (Carlson et al., 1998) and in the adult newt, wound closure is completed in less than 12 hr (Repesh and Oberpriller, 1978). By comparison to a similar-size mammalian wound, for example, an amputated mouse digit that takes multiple days to close, the speed of urodele wound closure is extraordinary. Some of the outcomes of rapid wound closure include minimizing tissue damage, minimizing infection and an inflammation response, and rapid stabilization of the wound microenvironment. After wound closure, the wound epithelium begins to thicken and eventually forms an AEC that is required for a regenerative response. Covering the amputation wound surface with mature skin completely inhibits the regeneration response and that has demonstrated clearly that the wound-healing response and AEC formation are essentially required for regeneration. The AEC is a transient epidermal structure that functions much like the AER which directs the limb outgrowth during development in amniotes (Christensen and Tassava, 2000). The AEC induces ectopic regenerative outgrowths as AER does. It has been noted that removal of the AER from a limb bud results in the inhibition of limb outgrowth, which is same in case of AEC removal (Saunders, 1998). The major difference between the AER and the AEC is that the AEC readily regenerates, whereas the AER is nonregenerative. The nonregenerative character of the AER has been accounted due to its regenerative failure in the developing limbs of higher vertebrates (Hayamizu et al., 1994). On the other hand, AER function has been largely associated with the

production of FGFs, in particular FGF4 and FGF8 (Sun et al., 2002). The urodele AEC expresses *Fgf8* in order to accumulate FGF1 and FGF2 peptides (Giampaoli et al., 2003). Nevertheless, there are few functional studies that test the role of FGFs in regeneration. From the expression pattern of Fgf family members, it has been observed that there are key differences between the AER of amniot limb buds and the AEC of urodele regenerating limbs. For example, in the AER, *Fgf8* and *Fgf4* are specifically expressed by AER cells, whereas *Fgf8*, but not *Fgf4*, is expressed in the AEC (Christensen et al., 2002). In addition, *Fgf8* is also expressed in mesenchymal cells of the distal blastema in contrast to the AER-specific expression of *Fgf8* in the limb bud (Han et al., 2001). During the limb development, in addition to FGF2, GF2 is also immunolocalized to the AEC and the AER (Giampaoli et al., 2003). When nerve is cut and undergoes regeneration, it is generally thought that *Fgf1* and *Fgf2* are one among the few factors which transcribed in nerve cell bodies and transported to nerve terminals present in the AEC, where they are secreted (Dungan et al., 2002). Thus, while both the AER and the AEC are sources of FGFs and appear to function in a similar manner, there appears to be clear differences in which FGFs are produced and how they accumulate in the distal epithelium which needs to be elucidated. Epidermis is not generally considered to participate in dedifferentiation and redifferentiation during limb regeneration as it does undergo transdifferentiation (Hay and Fischman, 1961). Relevant epidermal cell is the basal stem cell that is mitotically active, stationary, and committed to form epidermal cells by asymmetric division and in the event of injury, these basal cells cease proliferating (Gardiner and Bryant, 2005) and initiate a migration response to cover the wound surface rapidly. This response is curiously reminiscent of the behavior of ectodermal cells during gastrulation. This type of wound closure occurs regardless of the type of injury, i.e., amputation versus skin wound. After wound closure, however, the wound epithelium of an amputation injury dedifferentiates to become AEC and functions to direct limb outgrowth during the regeneration process. It is interesting that the re-expression of embryonic genes such as *Fgf8* and *Dlx3* in the AEC does not occur until blastema is developed, thus suggesting that the final stages of epidermal dedifferentiation may be dependent on interactions with the dedifferentiating mesenchyme. After outgrowth of the blastema, these cells presumably undergo redifferentiation to form the basal stem cells that populate the regenerated epidermis.

What is blastema and how it can be obtained in non-regenerating tissues?

The blastema is the structure that develops at the cut end of an amputated limb in some vertebrates, from which the limb regenerates. In order to determine the lineage of blastema a chimeric experiment was performed in salamanders where donor cells were kept different from the host. Later, donor cells were followed over the course of regeneration (Kragi et al., 2009). Cells from transgenic animals expressing green fluorescent protein (GFP) were transplanted into non-GFP-expressing host embryos. The chimeras were allowed to develop, their limbs were amputated, and the journeys of GFP-expressing cells through the blastema and out into the new limb were documented. The analysis revealed very little transdifferentiation between cell types, although not all cell types could be analyzed in this manner for technical reasons by the investigating team. Kragi et al. (2009) suggested that the blastema is not a homogeneous population of molecularly identical cells but is instead heterogeneous from its inception, a conclusion that challenges the notion that complete dedifferentiation is a major force behind blastema creation. Instead, a new model has emerged in which some amount of dedifferentiation occurs – but perhaps only enough to send cells

'backwards in time' yet not enough to make them completely naïve. At minimum, there seem to be two distinct cell populations in the blastema giving rise, respectively, to muscle and non-muscle tissue (cartilage, fibroblasts, and connective tissue), a situation at least analogous to that found in the early developing limb bud (Kragi et al., 2009).

Regeneration physiology and other biological processes

Recently, a protocol for creating pluripotent stem cells (induced pluripotent stem cells, iPSCs) from differentiated cells, through the expression of just a handful of genes, has been developed (Takahashi and Yamanaka, 2006). Blastema shares number of stem cells as single blastema cells cannot give rise to the entire amputated limb. Therefore, a blastema cell might be predicted to be molecularly similar to a cell somewhere to a stage of more undifferentiated state even if it never really becomes completely pluripotent (and thus would more properly be referred to as a multipotent progenitor cell than a stem cell).

Maki *et al.* (2009) revealed that a few of these genes are even necessary for regeneration to occur. However, most of the stem cells genes show higher levels of expression in the tissues that are embryonic in nature. Pluripotent embryonic reference cells' (from the same species), and iPSCs (created *in vitro*) were shown to have more commonness than blastema. Perhaps this is not unexpected because we know the pluripotent embryonic reference cells and the iPSCs have more developmental potential than the blastema cells. This clearly explains that blastema cell do not naturally replace the entire organism, while a whole mouse can be cloned from an iPSC. It has also been pointed out that when there is cut of the tissue, at zero point of time, we may get some stem cells from the tissue specific. However, blastema is formed few hours late the cut has taken place. It clearly shows that blastema may be formed from other local factors as well and therefore, cannot be compared with the stem cells.

pou and *sox2* are two stem cell genes that have shown loss of regeneration in their absence in tail fins though they are present in abundance in the intact tissue of zebrafish. Perhaps organisms capable of epimorphic regeneration maintain expression of pluripotency factors in otherwise differentiated tissue as a way to ready themselves to regenerate should the need arise (Christen et al., 2010).

Another similarity between embryonic stem cells and cells undergoing regeneration relates to the epigenetic status of their chromatin. A recent study of zebrafish tail fins (Stewart et al., 2009) identified targets of histone methylases, and among these targets were the promoters of many key patterning genes expressed during regeneration. Like embryonic stem cells, cells capable of undergoing epimorphic regeneration might use these histone modifications to keep cells in a poised state whereby they can easily turn 'on' or 'off' the expression of key genes. For example, repressive chromatin modifications seem to be removed from the promoters of genes required during fin regeneration, allowing their expression. Given that many of the required genes are targets of the same methylases and demethylases, modulating the expression or activity of the methylases or demethylases themselves could be an efficient means of controlling a whole suite of regeneration genes. Indeed, loss of one of the demethylases results in inhibition of tail regeneration, perhaps because the promoter for one of its targets (*dlx4a*, a homeobox gene whose family members are involved in appendage development across many taxa) cannot be activated (Stewart et al., 2009).

Nerve-derived signals

Limb regeneration requires nerve innervations and its axonal extensions secrete neurotrophic factors which finally up-regulate genes important for the regenerative process. FGF2 may be one such factor (Mullen et al., 1996). Protein level in the WE and innerves are normally found in them but its expression decreases dramatically after denervation. FGF2-soaked beads have been demonstrated to rescue regeneration in denervated regenerates (Mullen et al. 1996). It has been recently shown that innervation is required for maintenance of expression of genes in the early blastema of the froglet, including *tbx5* and *prx1*, and for initiation of expression of *msx1*, *fgf8*, and *fgf10* in the late blastema (Suzuki et al., 2005). The *fgf8* and *fgf10* expression levels reduces in the denervated blastema of the axolotl (Christensen et al., 2001), suggesting that the requirement of neuronal input for FGF expression is a conserved and peculiar feature among species.

Signals regulating morphogenesis

For cells to become organized in a pattern in a developing or regenerating organ is crucial for regeneration. Classical experiments show that retinoic acid (RA) instructs positional identity in regenerating anuran tadpole or urodele limbs (Maden, 1982). Normally, amphibia regenerate only the missing part of a limb after amputation. In contrast, in an excess of RA, limbs amputated at the wrist level will not only regenerate a hand or foot, but an additional entire limb, resulting in a limb that is duplicated along the proximodistal axis. This has been shown to be dose-dependent in that decreasing amounts of RA results in distalization of the duplicated regenerate. In addition to the role RA plays in patterning of the proximodistal axis, it has also been shown to affect dorsoventral patterning of the regenerating axolotl limb as well (Ludolph et al., 1990). Endogenously, it is thought that the role of RA is to specify proximal identities by acting through the GPI anchored cell surface molecule *prod1* and through *meis1* and *meis2*, two homeobox genes that are RA targets during limb development (Mercader et al., 2000) as well as in limb regeneration (Mercader et al., 2005). Shh is also expressed after limb amputation in urodeles (Torok et al., 1999) and in regenerating limb buds of anurans (Endo et al., 1997), and functional evidence suggests that Shh is important for imparting anterior–posterior axis information to the regenerating limb (Roy and Gardiner, 2002), much like it does during limb development in other species (Roy and Gardiner, 2002) (Table 1).

Wnt expression and regeneration polarity

Whether intrinsic properties of morphogen gradients are sufficient to account for pattern restoration or whether tissue patterning requires wound-induced input is essential to understand the patterning program. Self-regulation during size scaling, regeneration, or regulative development is a widespread but poorly understood phenomenon. During regulative development, missing tissues can be replaced by neighboring tissues. For example, sea urchin blastomeres isolated at the four-cell stage can give rise to an intact sea urchin larva, and transplantations of fragments of the vertebrate embryonic limb field can induce the formation of complete limbs rather than partial limbs (Harrison, 1918). In another dramatic example, dorsal, but not ventral, halves of amphibian embryos can undergo regulative development to form a normal embryo (Speman, 1903). In *Xenopus*, this attribute involves rescaling of a signaling network with ventrally expressed BMP2/4/7 and dorsally expressed ADMP ligands (Reversade et al., 2005). Theoretical models of regulative

development in *Xenopus* embryos (Ben-Zvi et al., 2008) and other systems (Meinhardt, 2004) suggests that intrinsic properties of the diffusion, degradation, shuttling, and interaction of protein gradients could be sufficient to account for self-regulation to restore missing pattern elements or tissue. On the other hand, recently the molecular mechanisms controlling the property of self-regulation in regeneration blastema polarity has been demonstrated in planarians (Fig. 3). A wound signal induces *wntP-1* expression. *wntP-1* acts in the posterior, through β -catenin-1, to induce *wntP-2* expression in a stem-cell-independent manner. *wntP-1* is expressed at both the faces i.e. anterior- and posterior facing of wounds however, only *wntP-2* expression is seen at the posterior facing wounds, which finally suggests that additional factors must be involved in making posterior- rather than anterior-facing wounds a permissive environment for WNTP-1 activity. Since neoblasts are required to make tails but are not required for *wntP-1* or *wntP-2* expression at wound sites, the neoblasts have been claimed to act after the Wnt mediated polarity specification process to resume tail formation. Furthermore, *wntP-1* expression also been observed to be induced by any wound type because this expression would be unanticipated if resetting of gradients that control body positions was explained solely by properties of the gradients themselves. Several lines of evidence suggest that it is the wound-induced phase of *wntP-1* as opposed to only the later phase of *wntP-1* expression that acts in regeneration polarity. First, polarity requires expression of *wntP-1* during regeneration. Second, *wntP-2* expression in the posterior is activated in a *wntP-1*-dependent manner only when *wntP-1* is expressed dispersedly near posterior wounds and before *wntP-1* expression coalesces to the posterior pole. *wntP-1* expression is also β -catenin-1-independent at this stage. Third, inhibition of *wntP-1* caused anteriorization during lateral regeneration, and *wntP-1* expression was also detected at lateral wounds only at early times during the wound-specific phase of *wntP-1* expression. Finally, above observations suggests that β -catenin-1 is an independent wound signal that induces *wntP-1* expression near any wound and it subsequently controls regeneration polarity (Fig. 2). It was therefore, demonstrated that the pattern formation in planarian regeneration depends on wound-induced cues rather than entirely on intrinsic self-organizing properties of morphogen gradients.

Conclusion

Limb regeneration understanding led to the identification of a proximally-distally graded cell-surface protein, Prod1, and its ligand, the newt Anterior gradient protein, in yester years. Recently in the year 2008, Prod1 crystal structure was solved (Garza-Garcias et al., 2009) and it was observed and found that the protein is not homologous to any known mammalian proteins, and is suspected to be a salamander-specific. The conclusion is notable because it might support a paradigm shift in the regeneration field. Previously, many researchers favored a theory that epimorphic regeneration of body parts was an ancestral trait common to all animals that had been extinguished in some lineages. Thus, re-activating a regenerative process that might lie latent seemed a reasonable way to improve regenerative prospects in humans once the key molecular events were elucidated in animals that retain regenerative capabilities. If, however, Prod1 is indeed key, and necessary, in limb regeneration, but mammals do not possess it, the outlook to regeneration concept needs to be revised to further unravel the secrets of regeneration.

Table. 1. Regenerative signals in Vertebrates

Organ	Trigger	Activating cellular source (blastema formation in epimorphic regeneration)	Controlling proliferation	Controlling cell fate	Controlling morphogenesis	Inhibiting
limb	Thrombin	Wnt/ β -cat, FGF, BMP	Thrombin, Rb, BMP	---	RA, Shh (A/P axis)	---
tail	?	BMP notch	BMP Shh	BMP Shh	Shh (D/V axis)	---
fin	?	BMP notch	Wnt/ β -cat, FGF, BMP	Shh (bone), Notch	Controlling morphogenesis	inhibiting
heart	---	Wnt/ β -cat	---	FGF	---	---
Liver-hepate-ctomy	Innate immune system	IL-6	HGF	---	---	inhibiting

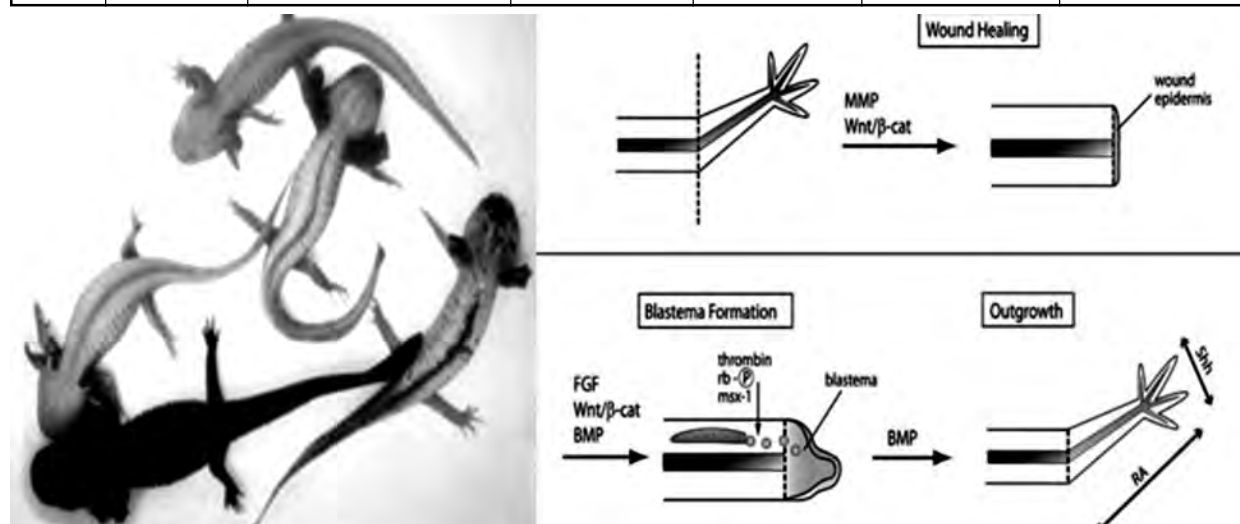


Fig.1. Signaling pathway for vertebrate limb regeneration. (1) Wound healing and formation of specialized WE require Wnt/ β -catenin signaling and the action of MMP's. (2) Wnt/ β -catenin signaling, together with FGF and BMP signals are also required for blastema formation.

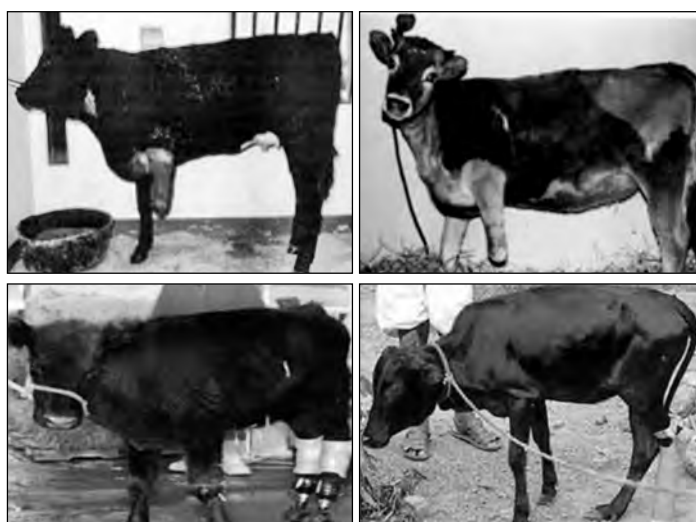


Fig. 1a) Amputational Injuries in ruminants and their salvation device- Prosthesis

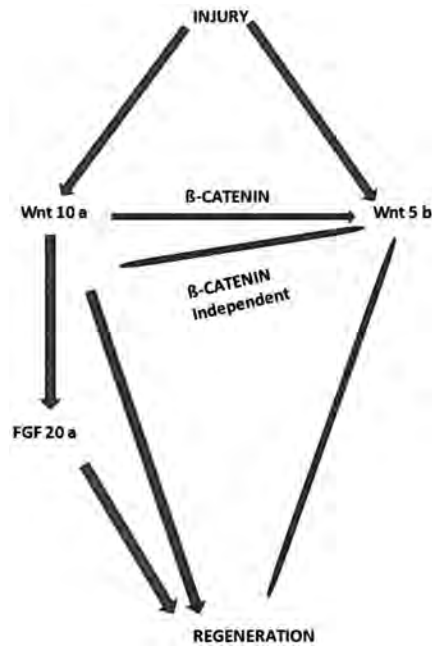


Fig. 2. Schematic presentation of signaling events regulating zebrafish.

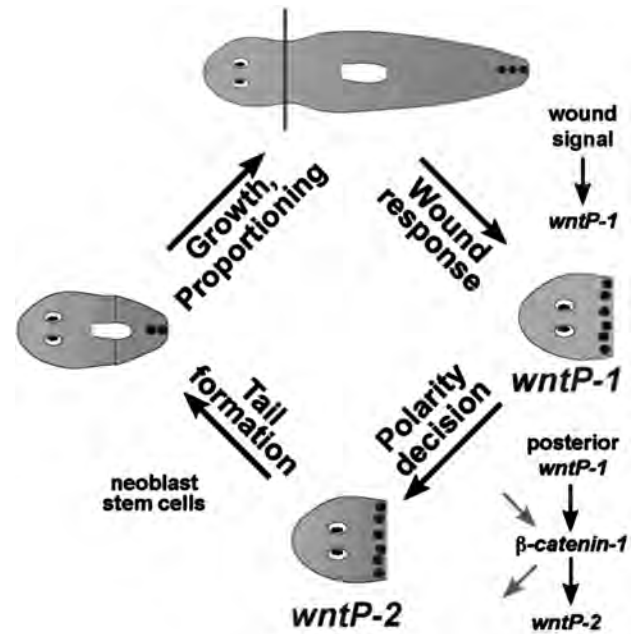


Fig.3. Schematic presentation of regeneration polarity in head fragment.

References

- Ben-Zvi, D., Shilo, B.Z., Fainsod, A. and Barkai, N. 2008. Scaling of the BMP activation gradient in *Xenopus* embryos. *Nature* 453:1205–1211.
- Borgens, R.B. 1982. Mice regrow the tips of their foretoes. *Science* 217: 747–750.
- Brookes, J. P. and Kumar, A. 2008. Comparative aspects of animal regeneration. *Annu Rev Cell Dev Biol* 24:525–549.
- Call, M.K. and Tsonis, P.A. 2005. Vertebrate limb regeneration. *Adv. Biochem. Eng. Biotechnol.* 93: 67–81.
- Christen, B., Robles, V., Raya, M., Paramonov, I., Izpisua Belmonte, J.C. 2010. Regeneration and reprogramming compared. *BMC Biol* 8:5.
- Christensen, R.N., Weinstein, M. and Tassava, R.A. 2002. Expression of fibroblast growth factors 4, 8, and 10 in limbs, flanks, and blastemas of *Ambystoma*. *Dev Dyn* 223: 193–203.
- Donaldson, D.J., Mahan, J.T., Hasty, D.L., Mc-Carthy, J.B. and Furcht, L.T. 1985. Location of a fibronectin domain involved in newt epidermal cell migration. *J Cell Biol* 101: 73–78.
- Dungan, K.M., Wei, T.Y., Nace, J.D., Poulin, M.L., Chiu, I.M., Lang, J.C. and Tassava, R.A. 2002. Expression and biological effect of urodele fibroblast growth factor 1: relationship to limb regeneration. *J Exp Zool* 292:540–554.
- Gardiner, D.M. and Bryant, S.V. 2005. Limb regeneration. In: Hall B, editor. *Fins into limbs*. Chicago: University of Chicago Press (in press).
- Garza-Garcias, A., Harris, R., Esposito, D., Gates, P.B. and Driscoll, P.C. 2009. Solution structure and phylogenetics of Prod1, a member of the three-finger protein superfamily implicated in salamander limb regeneration. *PLoS One* 4: e7123.
- Giampaoli, S., Bucci, S., Ragghianti, M., Mancino, G., Zhang, F. and Ferretti, P. 2003. Expression of FGF2 in the limb blastema of two Salamandridae correlates with their regenerative capability. *Proc Biol Sci* 270:2197–2205.

- Han, M., Yang, X., Taylor, G., Burdsal, C.A., Anderson, R.A. and Muneoka, K. 2005. Limb regeneration in higher vertebrates: Developing a roadmap. *Anat. Rec. B New Anat.* **287**: 14–24.
- Harrison, R.G. 1918. Experiments on the development of the fore-limb of *Amblystoma*.
- Hay, E.D., and Fischman, D.A. 1961. Origin of the blastema in regenerating limbs of the newt *Triturus viridescens*: an autoradiographic study using tritiated thymidine to follow cell proliferation and migration. *Dev Biol* **3**:26–59.
- Hayamizu, T.F., Wanek, N., Taylor, G., Trevino, C., Shi, C., Anderson, R., Gardiner, D.M., Muneoka, K. and Bryant, S.V. 1994. Regeneration of HoxD expression domains during pattern regulation in chick wing buds. *Dev. Biol.* **161**: 504–512.
- Kawakami, Y., Rodriguez Esteban, C., Raya, M., Kawakami, H., Marti, M., Dubova, I. and Izpisua Belmonte, J.C. 2006. Wnt/-catenin signaling regulates vertebrate limb regeneration. *Genes & Dev.* **20**: 3232–3237.
- Kragi, M., Knapp, D., Nacu, E., Khattak, S., Maden, M., Epperlein, H.H. and Tanaka, E.M. Cells keep a memory of their tissue origin during axolotl limb regeneration. *Nature* 2009, 460:60-65.
- Kumar, A., Godwin, J.W., Gates, P. B., Garza-Garcia, A. A. and Brookes, J.P. 2007. Molecular basis for the nerve dependence of limb regeneration in an adult vertebrate. *Science* **318**:772–777.
- Maden, M. 1982. Vitamin A and pattern formation in the regenerating limb. *Nature* **295**: 672–675.
- Maki, N., Suetsugu-Maki, R., Tarui, H., Agata, K., Del Rio-Tsonis, K. and Tsonis, P.A. 2009. Expression of stem cell pluripotency factors during regeneration in newts. *Dev Dyn* **238**:1613-1616.
- Mercader, N., Leonardo, E., Piedra, M.E., Martinez, A.C., Ros, M.A. and Torres, M. 2000. Opposing RA and FGF signals control proximodistal vertebrate limb development through regulation of Meis genes. *Development* **127**: 3961–3970.
- Reddien, P. W., Bermange, A. L., Kicza, A.M. and Sa´ nchez Alvarado, A. 2007. BMP signaling regulates the dorsal planarian midline and is needed for asymmetric regeneration.
- Reversade, B. and De Robertis, E.M. 2005. Regulation of ADMP and BMP2/4/7 at opposite embryonic poles generates a self-regulating morphogenetic field. *Cell* **123**:1147– 1160.
- Roy, S. and Gardiner, D.M. 2002. Cyclopamine induces digit loss in regenerating axolotl limbs. *J. Exp. Zool.* **293**: 186–190.
- Roy, S. and Levesque, M. 2006. Limb regeneration in axolotl: Is it superhealing? *Sci. World J.* **6**: 12–25.
- Saunders Jr., J.W. 1998. The proximo–distal sequence of origin of the parts of the chick wing and the role of the ectoderm. 1948. *J. Exp. Zool.* **282**:628–668.
- Stewart, S., Tsun, Z.Y. and Izpisua Belmonte, J.C. 2009. A histone demethylase is necessary for regeneration in zebrafish. *Proc Natl Acad Sci USA* **106**:19889-19894.
- Suzuki, M., Satoh, A., Ide, H. and Tamura, K. 2005. Nervedependent and -independent events in blastema formation during *Xenopus* froglet limb regeneration. *Dev. Biol.* **286**: 361–375.
- Takahashi, K. and Yamanaka, S. 2006. Induction of pluripotent stem cells from mouse embryonic and adult fibroblast cultures by defined factors. *Cell* **126**:663-676.
- Thornton, C.S. 1957. The effect of apical cap removal on limb regeneration in *Amblystoma* larvae. *J. Exp. Zool.* **134**: 357– 381.
- Torok, M.A., Gardiner, D.M., Izpisua-Belmonte, J.C. and Bryant, S.V. 1999. Sonic hedgehog (shh) expression in developing and regenerating axolotl limbs. *J. Exp. Zool.* **284**: 197– 206.
- Vinarsky, V., Atkinson, D.L., Stevenson, T.J., Keating, M.T. and Odelberg, S.J. 2005. Normal newt limb regeneration requires matrix metalloproteinase function. *Dev. Biol.* **279**: 86–98.

RUMINANT SURGERY SESSION

Sr. No.	Title with Authors	
RUS-1	AUGMENTED STEM CELL DELIVERY: PREPARATION OF BIOMIMETIC CAPRINE FORESTOMACH MATRIX (CFM) THROUGH CELL ADHESION PEPTIDE FABRICATION FOR STEM CELL CULTURE <i>P.D.S. Raghuvanshi, Naveen Kumar, Sameer Shrivastava, S.K. Maiti, Sonal Saxena, K.P. Singh and V. Upmanyu</i>	271
RUS-2	REGENERATION OF CUTANEOUS WOUNDS THROUGH CELL ADHESION PEPTIDE (CAP) FABRICATED AND STEM CELL SEEDED CAPRINE FORESTOMACH MATRIX CFM <i>P.D.S. Raghuvanshi, Naveen Kumar, Sameer Shrivastava, S.K. Maiti, Sonal Saxena and K.P. Singh</i>	271
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RUS-1

AUGMENTED STEM CELL DELIVERY: PREPARATION OF BIOMIMETIC CAPRINE FORESTOMACH MATRIX (CFM) THROUGH CELL ADHESION PEPTIDE FABRICATION FOR STEM CELL CULTURE

P.D.S. Raghuvanshi, Naveen Kumar, Sameer Shrivastava, S.K. Maiti, Sonal Saxena,
K.P. Singh and V. Upmanyu

Division of Surgery, Indian Veterinary Research Institute, Izatnagar, Bareilly, Uttar Pradesh

Cell adhesion peptides (CAPs) have recently gained widespread attention as a potential to deliver requisite number of bone marrow-derived mesenchymal stem cells (BMSCs) with a proliferative capacity and a similar ability to undergo multilineage differentiation. In this study, we evaluated the effectiveness of freshly prepared CAPs through solid phase peptide synthesis (SPPS) and BMSCs on glass surfaces and decellularized caprine forestomach matrices (*in-vitro*). Caprine fore stomach matrices (CFMs) were prepared from the sub-mucosae of different forestomach components *viz.* rumen, reticulum and abomasums and compare on the basis of physical, histological and calorimetric parameters. Cell adhesion peptides were synthesized by SPPS which cyteinyllated and non- cyteinyllated and were fabricated on the glass surfaces and evaluated for better compatibility against BMSCs isolated from rat bone-marrow and cultured up-to third passage. On the basis real-time microscopy, and electron microscopy the better protocol tested with the CFM. After three way (real-time microscopy, histological examination and electron microscopy) evaluation, we prepared CAP fabricated and BMSCs seeded CFM for augmented cell delivery.

RUS-2

REGENERATION OF CUTANEOUS WOUNDS THROUGH CELL ADHESION PEPTIDE (CAP) FABRICATED AND STEM CELL SEEDED CAPRINE FORESTOMACH MATRIX CFM

P.D.S. Raghuvanshi, Naveen Kumar, Sameer Shrivastava, S.K. Maiti,
Sonal Saxena and K.P. Singh

Division of Surgery, Indian Veterinary Research Institute, Izatnagar, Bareilly, Uttar Pradesh

Collagenous scaffolds based regenerative (stem) cell delivery is emerging as a promising and augmented delivery technique for reconstruction surgery. Caprine collagen scaffolds can offer a valuable alternative to address these challenges because skin wounds, burns and scars represent a major burden upon world health care costs. Here, we aim at combining the positive structural features of the extracellular matrix (ECM) to generate a hybrid construct that can provide a mix of structural and biological stimuli needed for fibroblast regeneration. A cell adhesion peptide (CAP)-mimetic caprine forestomach matrix (CFM) scaffold, designed for cutaneous tissue engineering, was decorated with CAPs deposited by rat bone marrow-derived mesenchymal stem cells (rMSCs). The fibroblast inductive potential of the CAP

fabricated CFM construct was validated in vitro, by culture with rMSCs and through 3-way microscopy, and in vivo, by reconstruction of critical full-thickness skin defects against autograft and augmented autograft. Our findings demonstrate that the bioengineered CAP-CFM provides proper mechanical support and fibroblast inductive stimuli, with potential applicability as off-the-shelf material for cutaneous tissue reconstruction.

RUS-3

SURGICAL MANAGEMENT OF HERNIA IN RUMINANTS

S. Purohit, Vimlesh Kumar, Raveendra R.T., Prabha Sharma Chetan Sharma,
Atul Yadav and R.P. Pandey

*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H.,
DUVASU, Mathura, Uttar Pradesh*

Present clinical study was conducted to evaluate the compatibility and efficacy of the nylon mesh hernioplasty in clinical cases of hernia in ruminants. Total 34 ruminants suffering from various types of the hernias are included in this study. Animals included in this study were 15 cattle, 13 buffaloes, 4 goats and 2 sheep. Clinical and ultrasonographic examination revealed these as hernia and hernial contents were identifies. We recorded umbilical hernia, ventro-lateral hernia, latero-ventral hernia, perineal hernia, inguinal hernia, scrotal hernia in these animals. In case of small size hernia – herniorrhaphy was done using silk in overlapping mattress suture pattern. The large hernias were managed by hernioplasty using nylon mesh. The nylon mesh proved good in clinical study to manage the large hernias in ruminants. The post-operative evaluation and communication with owner revealed eventless recovery in these cases.

RUS-4

COMPARATIVE EVALUATION OF NOVEL MINIMAL INVASIVE PINHOLE CASTRATION TECHNIQUES AND BURDIZZO CASTRATION IN BUCKS

C.A. Avhad, R.V. Raulkar, V.D. Aher and S.A. Jadhav

*Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences,
Parbhani, Maharashtra*

Eighteen clinical cases of bucks were randomly divided into three groups to evaluate the efficacy of novel minimal invasive pinhole castration technique by in situ spermatic cord ligation using non absorbable (silk) and absorbable (vicryl) suture material and compare it with traditional burdizzo castration. The pinhole castration using silk and using vicryl was successfully accomplished, confirmed by atrophy of testes grossly and by testicular histopathology microscopically. Silk suture material for pinhole ligation of spermatic cord was found to be more effective and causing lesser physiological, hematological and scrotal inflammatory changes than vicryl. The present study concluded that, the novel minimal invasive pinhole castration technique is a new and improved method of castration, less painful and ethical, non-hemorrhagic, simple, effective

and practical castration method, causes minimal surgical trauma and has minimal postoperative complications and can be used an alternative castration technique to other traditional castration techniques in field condition.

RUS-5

COMPARATIVE EVALUATION OF NEW MODIFIED PINHOLE METHOD WITH STAB METHOD FOR MEDIAL PATELLAR DESMOTOMY IN CATTLE

S.A. Jadhav, V.D. Aher, R.V. Raulkar, G.P. Dhage and C.A. Avhad

Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences, Parbhani, Maharashtra

For comparative evaluation of stab method of patellar desmotomy with new pinhole method of patellar desmotomy, 24 cattle with upward fixation of patella were randomly divided into two groups and medial patellar desmotomy by severing of medial patellar ligament using double stranded braided silk no. 1-0 and by using B.P. blade (closed method) was performed. On the basis of observations and results obtained it was concluded that severing of medial patellar ligament with the help of braided silk was more advantageous and safer over severing of medial patellar ligament with the help of B.P. blade. The major advantages of this new medial patellar desmotomy technique were absence of skin incision, minimal tissue injury, minimal hemorrhage and damage, minimum swelling and infection and joint capsule was not invaded. New medial patellar desmotomy using silk was found to be simple, less invasive, workable, reliable and practical method with minimum post-operative complications.

RUS-6

SURGICAL MANAGEMENT OF EVISCERATED RUMEN AND RUPTURED DIAPHRAGM IN CATTLE

Sandeep Saharan, Amit Kumar, Robin, Deepak Kaushik and Shiwansh

Department of Veterinary Surgery and Radiology, College of Veterinary Sciences, Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, Haryana

An emergency case of 10 years old cattle bull was brought to Veterinary Clinical Complex with a history of automobile accident 3 days ago. Externally, rumen was protruded outside through ruptured left lateral abdominal wall. Clinical examination revealed respiratory distress and dyspnea. On the basis of history and clinical examination, an emergency surgery was performed. After sedation and restraining in right lateral recumbency, rumenotomy was performed. Lumps of polythene bags, cement bags and foreign bodies including nails, coins, bullets, glass etc were evacuated from reticulum and rumen. Then routine rumen suturing was performed. Ruptured diaphragm was sutured with silk No.3. Routine muscles and skin suturing was done. Postoperatively animal was treated with antibiotics, analgesics, antihistaminics and fluid therapy. Sutures were removed on 14th post-operative day and animal had an uneventful recovery.

RUS-7**PREVALENCE AND MANAGEMENT OF CASES OF OBSTRUCTIVE UROLITHIASIS IN CALVES OF SOUTHERN HARYANA****Amit Sangwan** and Rajender Yadav*Haryana Pashu Vigyan Kendra, Mahendergarh**Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar*

A total of seventy four cases of urolithiasis in buffalo (71/95.95 %) and cattle (03/4.05 %) calves have been reported during a period of one year. The average age of the affected calves was 3.0 months. Minimum age of the affected calf was one month whereas maximum age was six months. The average number of days the cases reported to the clinic was 3.2 days. Latest case brought to the clinic was only one day whereas cases of seven days old have also been brought to the clinic. On basis of intraoperative findings the cases were divided into three categories i.e. urinary bladder ruptured (39 cases/52.70%), urinary bladder intact (33.78%) and urethra ruptured (10/13.51%). In most of the cases urinary bladder was found ruptured. Tube cystotomy was performed in all cases except for cases where urethra was ruptured. Stab incisions were given to relieve the urine deposited in muscular plane and urethra rupture was allowed to heal. The success rate for the cases was 84.6 (33/39) %, 88% (22/25) and 60% (6/10) in animals with Urinary bladder ruptured, urinary bladder intact and urethra ruptured respectively.

RUS-8**SUCCESS OF SURGICAL MANAGEMENT OF *COENUROSIS* (GID) IN GOAT****Anjali Pradhan**, Parsha Jyoti Nath and Fulmoni Kalita*Department of Surgery and Radiology, College of Veterinary Sciences,**Assam Agricultural University, Khanapara, Guwahati, Assam*

Coenurosis (GID) is a neurological disorder of sheep and goats caused by *coenurus cerebralis*, an intermediate stage of *Taenia multiceps*. Pathological manifestation is there when the parasite migrates to central nervous tissue via blood stream after hatching eggs in small intestine. Symptoms include dullness, circling, torticollis, frequent bleating, visual impairment, muscle tremor and death etc. All total thirty-two cases of neurological disorder with circling movement of in goat were presented to Department of Surgery & Radiology, College of Veterinary Science, AAU, Khanapara, Guwahati-22 for surgical management for a period of three years. After thorough clinical examination, based on signs and symptoms and palpation in the skull craniotomy in the soft area was carried out in twenty-four numbers of goat, while remaining eight was given symptomatic treatment due of lack of softening of skull area. Following successful removal of cyst the surgical wound was closed with standard protocol. Post-operative study for one month revealed complete recovery with normal physiological changes in twelve numbers, recover with neurological disorder in seven numbers and five goats died within week of surgical correction.

RUS-9

SURGICAL MANAGEMENT AND REMOVAL OF OESOPHAGEAL TRICHOBEZOAR IN A CATTLE

Anjan Kour and Amantaj Singh

Roshan Animal Health Care Clinic, Jammu

A cattle was presented with a history of anorexia, greenish nasal discharge, loss of rumination and straining to defecate since 2 days. Physical examination revealed subnormal temperature (99° F) and increased respiratory rate. Medicinal treatment with Inj Intalylte I/V, Injection Amoxyclav@20 mg/kg, Injection Tribivet was given. A soft fluctuating swelling was felt on the left side of oesophagus. Oesophagotomy was performed under local infiltration with 2% lignocaine. Animal was restrained in right lateral recumbency and surgical site prepared by proper shaving and scrubbing the site. A 10 cm longitudinal incision was given over the swelling. The esophagus was retrieved with stay sutures and incised to remove trichobezoar ball. Oesophagus was sutured in 2 layers using Polyglactin 910. The overlying muscles and skin were sutured in routine manner. Post operatively animal was kept on Inj NSS, antibiotic amoxyclav, Injection Melonex@15ml I/M. Follow up of animal revealed uneventful recovery without any complication.

RUS-10

PREPARATION, CHARACTERIZATION AND XENOGENIC APPLICATION OF EXTRACELLULAR SCAFFOLD FROM CAPRINE SKIN FOR ABDOMINAL WALL REPAIR IN BUFFALOES

Foram A. Asodiya, **Vineet Kumar**, Shruti D. Vora, Vivek K. Singh and Dhaval T. Fefar
*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H.,
Junagadh Agricultural University, Junagadh, Gujarat*

Effective removal of cellular components while retaining extracellular matrix (ECM) proteins is the ultimate goal of decellularization. The aim of this study is to prepare a decellularized ECM with highly preserved ECM proteins and to evaluate biocompatibility of decellularized caprine skin into abdominal wall repair in buffaloes. The caprine skin was de-epithelialized using NaCl (2-4M) and Trypsin (0.25-0.5%) followed by treatment of sodium dodecyl sulfate (SDS) (1-4%) solution over time. Acellularity of the prepared matrix was confirmed histologically and characterized by appropriate staining, scanning electron microscopy (SEM), DNA quantification and Fourier transform infrared (FTIR) spectroscopy. Biocompatibility was evaluated into congenital abdominal hernia repair in ten buffaloes using clinical, hematological, biochemical and antioxidant parameters. Histologically, skin treated with 0.25% trypsin in 4M NaCl for 8h resulted in complete de-epithelialization. Further treatment with 2% SDS for 48h demonstrated complete acellularity and orderly arranged collagen fibers. SEM confirmed preserved collagen arrangement within decellularized skin. DNA content was significantly ($P < 0.05$) decreased in decellularized skin as compared to fresh skin indicating effective acellularity. FTIR spectra showed characteristic collagen

peaks of amide A, amide B, amide I, amide II and amide III in decellularized caprine skin. Ten animals recovered uneventfully and remained sound. Hemato-biochemical and antioxidants findings were unremarkable. Results indicated acceptance and biocompatibility of the decellularized caprine skin for abdominal hernia repair in buffaloes.

RUS-11

EFFICACY OF CALENDULA OFFICINALIS FOR LARGE OPEN WOUND IN ANIMALS

Sandeep Kumar, Ashok Kumar, R.N. Chaudhary, Ram Niwas, Amit Kumar and Dishant Saini
*Department of Veterinary Surgery and Radiology, College of Veterinary Sciences,
 Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, Haryana*

The present study was conducted on ten animals irrespective of species, breed, age and sex reported to Department of Veterinary Surgery and Radiology, LUVAS, Hisar with history of large open wounds. All the animals were treated by topical application of 10% Calendula officinalis in glycerine base twice a day. Post operative follow up was recorded as gross observations and photographic evaluation for wound area, margins exudation epithelisation and appearance. Most of the wounds were infected, large in size and many of them having no tendency to heal with routine clinical treatment. Antibiotics were prescribed for three to five days. Initially infected wounds were dressed with acriflavin for one to two days. Wound healing property of Calendula officinalis was found more satisfactory than other clinical routine treatment in animals and can be used as alternative medicinal treatment for large open wound in animals.

RUS-12

COMPARATIVE EVALUATION OF MEDIAL PATELLAR DESMOTOMY BY CLOSE METHOD IN STANDING AND LATERAL POSITION OF BUFFALOES

Raj Kumar, M.C. Parashar, A.K. Bishnoi, Pradeep Kumar, Rajnish Kumar, Shivangi Diwedi,
 Anita Kumara and **P. Bishnoi**
*Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences,
 Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan*

The present study was conducted on 51 buffaloes affected with upward fixation of patella (UFP). Diagnosis was made on basis of clinical examination and history. The efficacy of medial patellar ligament section technique as a surgical treatment for UFP in standing and lateral position of buffaloes was evaluated. In total 51 buffaloes, incidence according to age-group, breed, parity of animal, pregnancy, affected limb, locking of patella and management practices were recorded. Animals were divided in two groups. In group-I, 36 animals restrained in standing position in an iron travis and under local anesthesia (2 % lignocaine HCl) were treated with medial patellar desmotomy (MPD) by closed method using B.P.blade No. 11. In group-II, 15 animals casted on soft bed or sand bed in lateral recumbency were treated with MPD by

closed method without local anesthesia using B.P. blade No. 21. All treated animals in both the groups had uneventful recovery.

RUS-13

SURGICAL MANAGEMENT OF FORESTOMACH DISORDER IN CATTLE– A REVIEW OF THREE CASES

**S. Dharmaceelan, D. Vishnugurubaran, S. Kokila, A.R. Ninu,
M. Bharathidasan and R. Ramprabu**

*Department of Veterinary Surgery and Radiology, Veterinary College and Research Institute,
Tamil Nadu Veterinary and Animal Sciences University, Tirunelveli, Tamil Nadu*

A 9 year old Kangeyam bullock (Case No 1) was brought with the history of scanty faeces for past 6 days and presented in sternal recumbency and distended abdomen. Rectal examination showed empty intestinal loops, collapsed rumen and absence of dung in the rectum. Emergency right flank explorative laparotomy was performed under Xylazine - Ketamine- double drip and Lignocaine continuous rate infusion and revealed intestinal ileus along with omasal impaction with more than 10 liters of peritoneal fluid. The condition was diagnosed as confirmed as peritonitis with omasal impaction and functional ileus. A 5 year old pregnant crossbred Jersey cow (Case No 2) was presented with the history of bilateral distended abdomen and scanty faeces. On clinical examination, ruminal hyper motility with 7 % off dehydration was noticed. Serum biochemistry is suggestive of hypocalcemia and hypophosphatemia. Explorative rumenotomy was performed under paravertebral nerve block and about 2kgs of ropes; gunny bags along with phytobezoar were removed. A 5 year old non-pregnant crossbred Jersey cattle (Case No 3) was presented with the history of gore injury by a bull. On physical examination of the animal, there was a fistulous opening on the right cranial aspect of lateral abdomen between 9th and 10th intercostal space with escape of feed material from the fistula. The pH of the content was around 3.0 and was diagnosed as abomasal fistula. Under ketamine – guaiphenesin double drip induction and isoflurane maintenance the wound was extended dorsally and ventrally the fistulated abomasum was retrieved out and the abomasum and abdomen was closed as per the standard protocol.

RUS-14

COMPARISON OF ECHOCARDIOGRAPHIC INDICES OF NORMAL BUFFALOES AND BUFFALOES HAVING DIAPHRAGMATIC HERNIA

Neelam Tandia, Navdeep Singh and Vandana Sangwan

*Department of Veterinary Surgery and Radiology, College of Veterinary Sciences,
Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, Punjab*

Study was conducted in 15 healthy buffaloes and 15 buffaloes having diaphragmatic hernia. The echocardiography was done in M-mode with phased array transducer upto frequency 2.8 to 3.5 MHz. The measurements were taken from left parasternal short axis in standing non-sedated condition. The site

of probe placement was fourth intercostal space after slight lifting of the forelimb. The different measurements were taken like RVIDd, LVIDd, LVIDs, IVSd, IVSs, LVPWd, LVPWs, CO, SV and FS. The parameter was subjected to statistical analysis with SAS software using t-test and the significant changes were noted at 5% significance level.

RUS-15

EVALUATION OF BUBALINE DECELLULARISED TENDON DERIVED COLLAGEN POWDER FOR TREATMENT OF EXTENSIVE WOUNDS IN DOGS – A REVIEW OF THREE CASES

Prakash G.V., Rekha Pathak, Wahengbam Pipelu, Rajesh Kumar,
Mohammed Arif Basha and Azam Khan

Division of Surgery, Indian Veterinary Research Institute, Izatnagar, Bareilly, Uttar Pradesh

Three dogs of different age and breeds were presented to Referral Veterinary Polyclinic of Indian veterinary research institute Izatnagar having history of automobile accident and bites leading to non-healing extensive wounds. The clinical examinations revealed contaminated wounds with mild to moderate exudation and peripheral tissue swelling and mild to severe pain on palpation. Aseptic wound bed preparation was done and pre-evaluated bubaline decellularised tendon derived collagen powder was applied on wounds on alternative days averaging to about 5 applications. The gradual healing of the wounds was noticed with reduced pain, exudation and peripheral tissue swelling on consecutive days. The granulation tissue formation was noticed in an average of 3rd day and gradual reduction in wound area measurements and wound contracture was noticed in an average of 6th day of collagen powder application. Complete healing of wounds was noticed in an average of 25 days with no cicatrix formation. Therefore deep and extensive wounds can be attempted with tissue engineering techniques using xenogenic collagen powder prepared from bubaline tendons decellularization.

RUS-16

A RARE CASE OF HEMATOMETRA AND ASCITES IN SHE CAMEL

Gyan Singh, Rishipal, Pooja Yadav, Neeraj Arora, Gitesh Saini, Pradeep,
Harender Singh and R.K. Chandolia

*Department of Veterinary Gynaecology and Obstetrics, College of Veterinary Sciences,
Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, Haryana*

A she camel with a history of anorexia since six days and increased abdominal size bilaterally was referred in Veterinary Clinical Complex, Hisar. A reddish brown vaginal discharge was also there since 15 days. On per rectal examination, a soft and fluid filled left uterine horn was palpated. On ultrasonography with rectal probe, fluid filled left uterine horn was found without pregnancy. Trans-abdominal ultrasonography revealed that fluid was filled in abdomen and on needle aspiration, it was confirmed that increase in abdominal size was due to ascitic fluid. She camel died during examination. On post mortem examination, approximate

500-1000 liters of ascitic fluid was drained out. Liver and kidneys were enlarged. Both the lungs were severely congested. Left uterine horn was filled with fluid. Ultrasonography of left uterine horn was done and no fetal parts were seen after that fluid was drained out giving a stab incision in the left uterine horn. Fluid was diagnosed as blood mixed mucus. This case was diagnosed as hematometra with ascitis. Hence, ultrasonography is a boon in diagnosis.

RUS-17

SURVIVABILITY IN BUFFALOES AFTER DYSTOCIA DUE TO UTERINE TORSION

Gyan Singh, Sandeep Panihar, Gitesh Saini, Pradeep Dangi, Rishipal Yadav, Ravi Dutt,
A.K Pandey, Harender Singh, V.K. Jain and R.K. Chandolia

*Department of Veterinary Gynaecology and Obstetrics, College of Veterinary Sciences,
Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, Haryana*

Caesarean section and mutation after detorsion by modified Shaffer's method are routinely performed to relieve dystocia due to uterine torsion. Present study deals with 50 dystocia cases due to uterine torsion which were analyzed to observe the consequences of caesarean section and uterine torsion on viability of dam including caesarean sections being performed on 10 animals and 40 animals underwent mutations after detorsion by modified Shaffer's method. The survival rate of dams those experienced caesarean section and mutation after detorsion was 60% and 65%, respectively. The animals experiencing caesarean section resulted in a 5% lower survival rate as compared to animals underwent mutation after detorsion. The incidence of male fetus and female fetus was 51.5% and 48.5%, respectively. The data indicated that survival rate after caesarean section and mutation was almost similar and caesarean sections can be opted as a method of choice in cases of unresolved dystocia due to uterine torsion.

RUS-18

DELIVERY OF A MUMMIFIED FETUS THROUGH CAESAREAN SECTION IN A CROSS BRED COW

Gyan Singh, Sonu Kumari, Rishipal, Harender Singh, Gitesh Saini, Pardeep Singh,
R.K. Chandolia and V.K. Jain

*Department of Veterinary Gynaecology and Obstetrics, College of Veterinary Sciences,
Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, Haryana*

A cross bred cow was referred to Veterinary Clinical Complex with the history of mummified fetus at gestation period of eleven months. On per rectal examination, a fully developed fetus was palpated inside the uterus and uterus was contracted around the fetus. No fetal fluid was present in the uterus. There were no fetal movements and fetus was dead. On per vaginal examination, the external os was two fingers open where as internal os was closed. The treatment was given for induction of parturition but in vain. Then caesarean section was decided through lateral to milk vein. A dead mummified fetus was delivered with

sunken eye balls. Uterus was sutured with catgut no. 3 with cushing suture pattern and muscle with lockstitch suture pattern. Skin was suture with silk no. 3 by using horizontal suture pattern. Supportive treatment including antibiotics, anti-inflammatory drugs, B – complex, Metronidazole was advised for seven days and owner was advised to get removed skin suture after two weeks.

RUS-19

CLINICAL STUDY ON DIAGNOSIS AND SURGICO-THERAPEUTIC MANAGEMENT OF DIVERSE SURGICAL AFFECTIONS OF HEAD REGION IN BOVINES

Rakesh Tailor, **Satyaveer Singh**, Sakar Palecha, P. Bishnoi and T.K. Gahlot

Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences, Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan

The present study was conducted on 81 clinical cases of bovines affected with various surgical disorders of head region. The signalment, history and clinical findings were recorded for various surgical conditions. Radiographic and histopathological examinations were also conducted wherever required. The incidences were categorized according to anatomical site. Different surgical conditions of horn, eye and adnexa, salivary glands, nasal region, ear, mandible, dental, cutaneous were diagnosed and categorized based on the clinical features. Surgico-therapeutic management of the surgical disorders were done on the general principles and standard surgical procedures described. In conclusion, horn affections were recorded the highest incidence, followed by eye and oral cavity affections. Most of the surgical disorders of head region were diagnosed early and successfully managed by surgico-therapeutic treatment.

RUS-20

HISTOMORPHOLOGICAL EVALUATION OF MEDIAL PATELLAR LIGAMENT IN UPWARDS LUXATION OF PATELLA IN CATTLE

Chougale P.B., Suryawanshi R.V and Ulemale A.H.

Department of Veterinary Surgery and Radiology, KNP College of Veterinary Science, Shirwal, Satara, Maharashtra

The present clinical study was conducted on twenty clinical cases of cattle presented with chief complaints of upward luxation of patella and subjected to open method of medial patellar desmotomy. Harvested samples of ligament were preserved in 2.5% glutaraldehyde solution for histomorphological evaluation. Histopathological examination of affected ligament showed degenerative changes characterized by unevenly distributed and broken collagen fibers, atrophy and hypertrophied collagen fibre with loss of nuclei indicative cellular alterations. Scanning electron microscopic study of affected ligament showed derangement in collagen fibre bundles arranged in irregular, wavy, loosely and remarkable gap between two collagen fibre bundles whereas transmission electron microscopy showed degenerative changes of the fibres characterized by thin and disorganized collagen fiber bundles with heterogeneity of size and diameter

in collagen fiber bundles. To concludes, upward luxation of patella is a common musculoskeletal malady in cattle and medial patellar ligament undergoes several degenerative changes of collagen fibrils i.e. loss of normal fibril architecture, broken fibrils and heterogeneity of collagen fibril bundles due to multifactorial reasons causes weakening and laxity of ligament.

RUS-21

MANAGEMENT OF AFFECTIONS OF HOOF IN CATTLE

Manjunath S.P

Veterinary Dispensary, Anathi, Hassan, Karnataka

Identification and management of hoof affections is very important for increasing the productivity of the cows. In the present study, management of different hoof affections under multimodal approach under field conditions is presented. A total of 12 cattle affected with different hoof affections were presented to Veterinary dispensary, Anathi, Karnataka. Among them 8 cattle affected with toe, sole and heel ulcers, 2 with inter digital fibromas, 1 with chronic coronitis and 1 with ascending infection from inter digital space leading to development of abscess on posterior aspect of fetlock region. Cattle with ulcer in hoof were treated with application of wood blocks to healthy claw and application of copper sulphate. Cattle with inter digital fibromas were treated with excision of cauterization. Cattle with chronic coronitis were treated with application of sugardine. Cattle affected with ascending infection were treated by lancing of abscess. All the cattle were recovered uneventfully. The study concludes that use of multimodal and proper approaches for different hoof affections is very important under field conditions for increasing the productivity of the farmers.

RUS-22

DIAGNOSIS AND SURGICAL MANAGEMENT OF INTESTINAL OBSTRUCTION IN CATTLE; REPORT OF 2-CASES

Anita Kumari, Shivangi Diwedi, Rajnish Kumar, A.K. Bishnoi, Narendra Singh, P. Bishnoi, A.K. Bishnoi and Mahendra Tanwar

Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences, Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan

Two cows were presented with a similar history of absence of voiding faeces from past 10 and 8 days respectively. Both the animals were dull, dehydrated, anorectic and unresponsive to previous medicinal treatment. On rectal palpation rectum was found empty with mucinous discharge in both the animals. The first case was 5 year old Rathi in which distension of right flank was present so a Right flank exploratory laparotomy was performed under local infiltration with lignocaine 2%. A spherical hard mass was located in small intestine. Enterotomy was performed to remove the mass which was a trichobezoar. The second case was a 8 year old HF cattle in which distention of the abdomen was on either side, so a left flank exploratory laparotomy was performed under local infiltration with 2%lignocaine HCl. Impacted feed

material was felt in large intestine. Kneading was performed through left side incision. Surgical wound closed as per routine manner. Post-operative care and feed restriction was carried and maintained on fluid therapy for three days. Post-operatively both the animal was administered Ceftriaxone with Tozabectom and meloxicam for 5 days and 3 days respectively. The skin sutures were removed on the 10th post-operative day. Both the cattle started passing faeces on next day.

RUS-23

MULTIPLE MAXILLO-MANDIBULAR FRACTURE AND ITS SURGICAL MANAGEMENT IN A BULLOCK

Jayakrushna Das, Prabir Mohapatra, Benudhar Mahananda, Ansul Shukla and Millon Rout
*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H.,
 Odisha University of Agriculture and Technology, Bhubaneswar, Odisha*

One bullock while grazing in the field consumed some materials and then it was fired inside the mouth. It ran in the field and thereafter it was developed with heavy swelling of the head with complete anorexic condition. It was presented after 2 days of occurrence with the complaint of anorexia and heavy swelling of head. On palpation of the maxillary region crepitating sound was heard with pits on pressure. Trial was made to open the buccal cavity and it was revealed that clotted blood and bony materials were packed inside. Under physical restraint and analgesia the mouth was opened to some extent and it was felt that multiple pieces of bones were packed inside the oral cavity. On close examination it was found that, numbers of bony pieces were there due to fracture of mandible and maxilla and pharyngeal region. Very carefully the pieces were removed and cleaned with normal saline and finally glycerine was applied. The animal was maintained with dextrose 20%, NSS, electrolytes with antibiotics, analgesics and multivitamins. The animal was survived for 9 days. Using different types of fireworks and explosives for catching the birds and some other purposes some people act as boomerang for the living creatures which are highly needed for society.

RUS-24

MANAGEMENT OF LAXITY OF FLEXOR TENDONS OF BOTH HIND LIMBS AND UNILATERAL CONGENITAL MALFORMATION AT STIFLE JOINT IN A CALF

Manjunath S.P. and Chaitra Y.
Veterinary Dispensary, Anathi, Hassan, Karnataka

A new born calf was presented with the history of over extension of both hind limbs after fetlock joint touching the ground. There was angular deformity at left stifle joint leading to abduction of left hind limb at stifle joint. It was diagnosed as laxity of flexor tendons of both hind limbs and congenital malformation of left stifle joint. At first, application of wood blocks to hooves of both hind limbs was done with the intension of lengthening of limb which increases the tonicity of flexor tendons. But the calf felt difficulty to

walk with the wood blocks. Hence as next sort of treatment PVC pipe splintage was done from above the fetlock up to the hooves. Laxed tendons became normal completely by day 5. Abduction of hind limb at stifle joint disappeared from day 10. Animal recovered uneventfully.

RUS-25

SURGICAL MANAGEMENT OF SUPPURATIVE PERICARDITIS THROUGH ULTRASOUND GUIDED PERICARDIOSTOMY TECHNIQUE IN CATTLE

Manjunatha, D.R., Suresh Kumar, R.V., Nagaraja, B.N., Veena, P., Nagaraju, N., Basavaraj, B.B., Ranganath, L., Jagapathiramayya and Ch. Srilatha

Department of Veterinary Clinical Complex, Veterinary College, Hassan, Karnataka

The study was conducted in twelve bovines cases presented to the Veterinary College Hospitals Hassan, KVAFSU, over a period of two years, with the history of fever, decreased milk yield, depressed, exercise intolerance, coughing, recurrent bloat, dyspnea, jugular pulsation, brisket and submandibular edema. All the animals were subjected to clinical, haematological and ultrasonographic evaluation. Based on the clinical signs, haemato-biochemical and ultrasonographic findings diagnosed as Pericarditis. The suppurative form of pericarditis cases were subjected for ultrasound guided pericardiostomy technique using Foleys catheter and artificial inseminating gun stilet. The pericardial fluid was drained with the help of suction pump and pericardial cavity flushed with warm 2 liters normal saline followed by 200 ml of Metris daily once for five days. Post operatively parental antibiotic, supportive therapy was given for 5-7 days. Out of twelve animals three animals were died on 10th postoperative day, another three animals survived for 2 months and given birth to calf. Four animals survived nearly for a year and calved. Two animals survived till today out of which one animal calved two times and giving more than 15liters of milk till dateafter surgery. The minimally invasive ultrasound guided pericardiostomy technique will help in early recovery with minimal complications.

RUS-26

SUCCESSFUL SURGICAL MANAGEMENT OF DIFFERENT HERNIAS IN CATTLE

Manjunatha, D.R., Nagaraju, N., Basavarju B Balappanavar and Ranganath, L.

Department of Veterinary Surgery and Radiology, Veterinary College, Hassan, Karnataka

The animals with different body swellings with progressive increasing in size were presented to the Department of Veterinary Surgery and Radiology, Veterinary College, Hassan over a period of three years were selected for the study. These animals were subjected for clinical and ultrasonographic evaluation to confirm the type of swelling. Hernia revealed discontinuity of muscle layer and direct visualization of internal organ below the skin. 32 hernia cases were diagnosed and were repaired depending on hernial ring size and location herniorrhaphy and hernioplasty were performed. Post operatively antibiotics and analgesics were administered, all the animals were made uneventful recovery.

RUS-27

**MODIFIED LOCKSTITCH PATTERN FOR DIAPHRAGMATIC
HERNIAL RING CLOSURE IN MEHSANA BUFFALOES**

P.B. Patel, P.T. Sutaria, J.B. Patel, A.M. Patel, R.K. Gosai, Abhishek M. Patel,
H.M. Barot K.R., Chaudahri and A.N. Patel

*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H.,
S.D. Agricultural University, Sadar Krushinagar, Gujarat*

The study was conducted on 135 buffaloes diagnosed with DH on basis of clinical, auscultation and ultrasonographic examination. All the buffaloes were operated for D.H under trans- abdominal approach of diaphragmatic herniorrhaphy. The lockstitch suture pattern using silk was modified by taking a knot over each lock in all the operated cases. This modification resulted in quick and safe closure of ring. The laparotomy wound was closed in routine manner.

RUS-28

**RADIOGRAPHIC AND HISTOPATHOLOGICAL DIAGNOSIS OF ORAL
TUMOUR IN BOVINE AND THEIR MANAGEMENT**

Sandeep Kumar, Ranbir Singh Bisla, Prem Singh, R.N. Chaudhary and K.K. Jakhar
*Department of Veterinary Surgery and Radiology, College of Veterinary Sciences,
Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, Haryana*

The study was conducted on thirteen bovines (cattle and buffaloes) having tumorous growth in oral cavity. Radiographic examination was done to observe the invasiveness of tumour, osteolytic changes, teeth displacement, calcification or any other changes to undertake surgery accordingly. Histopathological examination revealed that all oral tumours were benign in nature. Tumorous growths were excised by surgery followed by chemotherapeutic treatment. Vincristine sulphate at the dose rate of 0.75mg/m² body surface area intravenously at weekly interval for 4 to 6 times and anthiomaline at the rate of 15-20 ml total dose by deep intramuscular injection six times on alternate days were administered. Nine animals recovered, three animals died while one animal had reoccurrence during follow up. Main aetiology behind death of the animals was anorexia after vincristine sulphate treatment and surgical stress. The results showed that excision of tumorous growth by surgery followed by chemotherapy is effective to some extent in treatment of benign oral tumours in bovine.

RUS-29

IMMUNOHISTOCHEMICAL EXPRESSION OF CYTOKERATIN 14 AND P53 IN BOVINE ORAL TUMOURS

Sandeep Kumar, Ranbir Singh Bisla, Prem Singh and Babu Lal Jangir

*Department of Veterinary Surgery and Radiology, College of Veterinary Sciences,
Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, Haryana*

The present study was conducted on the tumourous growths collected from 29 clinical cases of cattle and buffaloes bearing oral growths. Present study was carried out with an aim to evaluate the immunohistochemical expression of cytokeratin (CK) 14 and p53 in bovine oral tumours. Histologically, these were classified as epithelial tumours such as ameloblastoma (9), papilloma (1), adenoma (1); mesenchymal tumours such as fibroma (7), myxoma (3) and mixed type tumours (8). All epithelial tumours revealed intracytoplasmic expression of CK14; however, no immunoreactivity was noticed in mesenchymal tumours. None of the tumours showed immunohistochemical expression of p53. From the present findings, it is concluded that CK expression in epithelial tumours differentiated these from mesenchymal tumours. No expression of p53 indicated that the p53 mutants may not play an important role in bovine oral tumours.

RUS-30

BURDIZZO VERSUS PINHOLE CASTRATION IN BUCKS AND CATTLE CALVES

Pallove Sawhney, V.P. Chandrapuria, Apra Shahi and Randhir Singh

*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H.,
Nanaji Deshmukh Veterinary Science University, Jabalpur, Madhya Pradesh*

Castration is the most common surgical procedure in animals performed by different techniques with its limitations, in which Burdizzo's method is most popular. Therefore, the study was designed to evaluate the minimally invasive Pinhole technique and to compare it with the conventional Burdizzo's method in bucks and cattle calves. The study included, 12 apparently healthy bucks aged 3-6 months and 12 cattle calves aged 6 months to 1 year divided equally in two groups, subjected to Burdizzo's and Pinhole castration. Clinical observation, evaluation and haematological examination were conducted at precastration period and found clinically normal. Burdizzo's castration was performed as per standard guidelines. Pinhole castration was performed under suitable local anaesthesia. After pulling the spermatic cord towards the lateral side of scrotal skin, threaded suture needle (black braided silk no. 1 or 2) was passed in a caudal to cranial direction adjacent to medial aspect of spermatic cord, leaving the suture in place. The needle was reintroduced (in reverse direction) through the previously made skin holes adjacent to the lateral margin of the released spermatic cord. The knot was tied after completing loop around the cord at the caudal aspect. Both suture strands were transacted 3.0mm from the skin. Thereafter, the needle holes were only visible immediately after submerging the knot inside the scrotal skin (insitu spermatic cord ligation). Haematological study showed only transient changes. Testicular atrophy was significant ($p > 0.05$) and grossly incomparable in

both the procedures at 30th post-castration day. Ultrasonographically, precastration echotexture of testicle was homogenous, granular, with a thin hyperechoic capsule and linear hyperechoic mediastinum testis. On 30th day after castration, testicular atrophy, less echogenic parenchyma with microliths were depicted in both the species, but pronounced in Pinhole castrated animals. On 30th day, histological study revealed atrophy of seminiferous tubules with desquamation and obliteration of the lumen by cell debris. There was no evidence of any viable cell. However, in Pinhole castrated testicle, vacuolations at the basal part of the seminiferous tubules with more intertubular collagen bundles were observed in both the species. Complications recorded were unilateral failure of castration in one buck castrated by Burdizzo's method, while in other buck castrated by Pinhole technique, the ultrasonogram showed unilateral hydrocele with degenerative changes in testicular parenchyma. Thus, it can be concluded that, Pinhole technique was found satisfactory, effective, easy and humane procedure. It can be tried for castration and vasoligation in other domestic species.

RUS-31

EVALUATION OF AUTOLOGUS PLASMA COATED POLYPROPYLENE MESH FOR UMBILICAL HERNIOPLASTY IN BOVINE CALVES.

N.S. Chaudhari, P.B. Patel, J.B. Patel, P.T. Sutaria, A.M. Patel, R.K. Gosai, Abhishek M. Patel, K.R. Chaudhari, H.M. Barot and U.H. Prajapati

Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H., S.D. Agricultural University, Sadar Krushinagar, Gujarat

In this study, Twelve bovine calves with umbilical hernias were randomly divided into two groups, viz. Group I (Polypropylene mesh hernioplasty, N=6) and Group II (Plasma coated polypropylene mesh hernioplasty, N=6). In group II hernioplasty with plasma coated polypropylene mesh was performed while uncoated mesh was used in group I. Ultrasonography, physiological, haematological and biochemical parameters were recorded on 0 day (pre operative), 12th and 30th post operative day in both the groups. On post operative evaluation, in Group I four cases were recovered uneventfully, while complications, viz. pus formation along with partial rejection of mesh and seroma formation were seen in two cases. In Group II, all the operated cases recovered uneventfully without any complication. Umbilical hernioplasty using polypropylene mesh alone provoked more inflammation and infection at surgical site, while plasma coated polypropylene mesh hernioplasty found satisfactory result without any post operative complication.

RUS-32**SURGICAL MANAGEMENT OF CERVICAL TUMORS IN THREE COWS**

J.B. Patel, P.B. Patel, A.M. Patel, R.K. Gosai, P.T. Sutaria, Abhishek M. Patel, K.R. Chaudhari, H.M. Barot, and A.N. Patel

Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H., S.D. Agricultural University, Sadar Krushinagar, Gujarat

Surgical resection of space occupying pendulous growth in vulva was performed in three Holstein Friesian crosscattle. In all animals the mass was pendunculated with origin palpable at cervix. The surgery was performed under epidural anesthesia, a tight ligature was applied blindly in the caudal most portions near cervix and growth was transected distally. The histopathology confirmation of tumor was performed in routine manner. All the animals made un-eventful recovery with no recurrence.

RUS-33

CLINICAL EVALUATION OF ACELLULAR TENDON OF BUBALINE ORIGIN EMPLOYED AS TENDON GRAFT IN TENDON GAP DEFECTS IN RUMINANTS

Wahengbam Pipelu, Rekha Pathak, Amarpal, Prakash Kinjavdekar, Mohammed Arif Basha, Ishfaq Ahmad Hajam, Prakash G.V., A.M Pawde, M. Hoque and A.C. Saxena

Division of Surgery, Indian Veterinary Research Institute, Izatnagar, Bareilly, Uttar Pradesh

To evaluate the acellular bubaline derived tendon grafts for the repair of tendon gap defects in ruminants. The present study was conducted on young cattle and buffalo with tendon injuries/ flexural deformity, extensor injury etc. resulting in gap defects presented to Referral Veterinary Polyclinic I.V.R.I. Decellularized bubaline tendon grafts tested in preclinical studies in rabbits and guinea pigs were used to repair the tendon gap defects in 5 clinical cases. With appropriate restraints, anaesthetic protocol and aseptic measures implantation of the grafts were performed to reconstruct the defect and sutured by Bunnell-Mayer/ single locking loop/ double locking loop suturing technique to join the graft end with host tissue end. Postoperatively, the affected limbs were immobilized and the animals were given antibiotics, analgesics and anti inflammatory drugs. The animals were evaluated on the basis of pain, wound condition, weight bearing, ultrasonography and digital photography at different time interval to monitor tendon healing. It was observed that the pain, swelling and exudation lasted from mild to moderate from 0 day to 15th day. The normal weight bearing was observed by 30th day. The ultrasonographic image showed the vascularisation of the site and attainment of paratenon regularity. On the basis of results, xenogenic decellularized tendon grafts can be successfully employed to repair the tendon gap defects, thus provide a potential solution for tendon tissue engineering.

RUS-34**IN- VITRO EVALUATION OF ACELLULAR TENDON OF BUBALINE ORIGIN TO BE EMPLOYED AS TENDON GRAFT**

Wahengbam Pipelu, Rekha Pathak, Amarpal, Prakash Kinjavdekar, Mohammed Arif Basha, Ishfaq Ahmad Hajam, Prakash G.V., A.M Pawde, M. Hoque and A.C. Saxena

Division of Surgery, Indian Veterinary Research Institute, Izatnagar, Bareilly, Uttar Pradesh

To evaluate acellular tendon of bubaline origin to be employed as tendon graft by in- vitro studies. In the present study, Achilles tendon of bubaline origin collected from the slaughter house was used. The tendon implants were subjected to decellularization by combination methods employing treatment with 5% SDS for 48 hrs, 5 cycles of freeze and thaw by snap freezing using liquid nitrogen at -196o C for 2 min. then thawing at 56oC for 5min to disrupting cell membranes. Further treatment with hydrogen peroxide (3%) and 75% ethanol- 25% acetone (vol%) bring about decellularization and decontamination. Final sterilization was done by UV irradiation. Finally, in vitro evaluation for decellularization of the tendon implants were performed by haematoxylin and eosin staining, Masson's trichrome staining, DNA quantification, Scanning Electron Microscopy (SEM), biomechanical analysis and biochemical analysis. The in vitro evaluation revealed effective removal of cells and nuclear materials from the tendon implants along with preserved ultrastructure and optimum biomechanical strength and significant magnitude of biochemical properties. The developed decellularized tendon grafts are proficient to support the bridging of tendon gap defects as evaluated in the in vivo implantation studies in clinical cases.

RUS-35**POLYPROPYLENE MESH IMPREGNATED PMMA AS A GRAFT AND FIBER GLASS AS EXTERNAL CAST FOR REPAIR OF PUNCTURED AND FRACTURED WOUND OF HORN IN BOVINES**

Bhagavantappa, B., Dilip Kumar, D., Jahangirbasha Doddamani, B.V. Shivaprakash, **C.N. Vijay Kumar**, Kartik Bidari, Neelkanth, Pallavi, Karan Hosmani, Kumarswamy, Swaroop L., Tokappa, Birappa and Venkatgiri

Department of Veterinary Surgery and Radiology, Veterinary College, Karnataka Veterinary Animal and Fisheries Sciences University, Bidar, Karnataka

Two cases of horn affections in bovines of age 5-6 years with one case infected punctured wound at the middle of horn and in another case simple fracture at the base of the horn were presented for treatment. The cases were diagnosed based on history, clinical examination and radiography. In punctured horn wound, case was repaired by orthopedic wire, polypropylene mesh impregnated PMMA as a graft and stabilized with fiber glass cast as external support for healing of wound. In simple horn fracture case, was stabilized by aluminium wire at the tip of horns and externally supported by fibre glass cast at the base

of the both horns. Post-operatively antibiotic and anti-inflammatory drugs were administered for 10 days and 4 days respectively. Both the cases were thoroughly followed for upto three months for evaluation of the healing of the respective horn injuries and no complications were observed.

RUS-36

SURGICAL MANAGEMENT OF GID (COENUROSIS) IN GOATS (*Capra hircus*)- REPORT OF 4 CASES

Raju Sharda, M.O. Kalim, R. Dewangan, Sanjay Yadav and Devendra Yadav

*Department of Veterinary Surgery and Radiology, College of Veterinary Science & A.H.,
Anjora, Durg, Chattisgarh*

Gid is an important metacestodal disease commonly affecting CNS of goats and sheep caused by the larval stage of *Taenia multiceps*. Four goats (2 female and 2 male) aged 2 to 3 years were presented in department of Veterinary Surgery & Radiology with the history of anorexia, head pressing against wall, bleating along with circling movement. Diagnosis of the gid was done by history, clinical signs and palpation of occipital region. Goats were secured in lateral recumbency and aseptic preparation of the area between two horns was done. Anaesthesia was obtained by local infiltration of 2% lignocaine hydrochloride solution around the soft point caudal to base of horn in occipital region. Surgical removal of the Coenurous cyst was done in all the goats. Ceftriaxone and meloxicam were administered postoperatively for 5 days. All animals recovered uneventfully.

RUS-37

MANAGEMENT OF PNEUMOTHORAX IN CATTLE

Priyanka, **Robin**, Deepak Kaushik, Akshay and Amit Kumar

*Department of Veterinary Surgery and Radiology, College of Veterinary Sciences,
Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, Haryana*

A Cow of 3 years age was presented to Teaching Veterinary Clinical Complex, LUVAS, Hisar with a history of gored wound at the level of left 5th intercostals space caused by a cow bull horn during fighting. On clinical examination the intercostals muscles were torn, left cranial lung lobe was visible and tachypnea was present. Animal was prepared for aseptic surgery under local anaesthesia with 2% lignocaine hydrochloride and sutures were placed in two layers while the last suture was closed immediately after inspiration. A foley's catheter was inserted into the thoracic cavity and is attached to the one-way valve device to remove excess air to maintain negative pressure in the thoracic cavity. Skin suturing was done in routine manner. After surgery the animal was returned to her normal respiration rate and was breathing normally. Antibiotic ceftiofur and NSAID meloxicam were given for three days. The animal had an uneventful recovery.

RUS-38

SUCCESSFUL REPAIR OF RUPTURED ACHILLESTENDON UNDER GENERAL ANAESTHESIA IN A 250 KG DEONI BULL

Bhagavantappa B, Dilip Kumar. D, Jahangirbasha Dodamani, B.V. Shivaprakash, **C.N. Vijay Kumar**, Kartik Bidari, Neelkanth, Pallavi, Karan Hosmani, Kumarswamy, Swaroop L., Tokappa, Birappa G., Venkatgiri and S.M. Usturge

Department of Veterinary Surgery and Radiology, Veterinary College, Karnataka Veterinary Animal and Fisheries Sciences University, Bidar, Karnataka

A 3 year old deoni bull weighing 250 kg was presented with the history of traumatic injury, unable to bear weight on hindlimbs and was in state of recumbency. Clinical examination revealed ruptured achilles tendon. Surgical repair of ruptured tendon was carried out under general anaesthesia using Inj Xylazine hydrochloride @ 0.08 mg/kg i/v + guaifenesin @ 50mg/kgi/v + Inj Ketamine hydrochloride @ 3mg/kg i/v for induction and maintained using isoflurane. Surgical site was prepared aseptically and ruptured tendon was sutured using locking loop pattern along with Bunnel Mayer suture pattern with nylon suture no 2. Skin was sutured with nylon. The limb was immobilized for a period of 60 days using fibre glass cast. Post-operatively Inj ceftriaxone and Inj meloxicam were administered for 10 days and 5 days respectively. Skin sutures were removed after healing and case recovered uneventfully.

RUS-39

MODIFIED PROXIMAL PERINEAL URETHROSTOMY-A NOVEL TECHNIQUE FOR THE SURGICAL MANAGEMENT OF OBSTRUCTIVE UROLITHIASIS IN MALE GOATS: A REVIEW OF TWELVE CASES

Sudheesh S. Nair, Soumya Ramankutty, Anvitha Hansoge, Narayanan M.K. and C.B. Devanand

Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences, Kerala Veterinary and Animal Sciences University, Mannuthy, Thrissur, Kerala

Twelve cases of chronic obstructive urolithiasis in male goats were presented to the University Veterinary Hospital, Mannuthy, KVASU Thrissur over a period of six months from March to August, 2019 with a history of stranguria, anuria and anorexia. Diagnosis involved a detailed physical examination followed by ultrasonography which revealed typical hyperechoic sludge in the bladder which was confirmatory in all cases of intact bladder. A novel and simple technique of modified proximal perineal ureterostomy was developed for managing chronic obstructive urolithiasis. Under epidural anesthesia, 1 centimeter long incision was made at the midpoint of two pin bones after gentle separation of subcutaneous tissue and retractor penis muscle. A longitudinal nick incision was placed over the pulsating urethra to relieve urine and stent was carefully removed and catheter was fixed to the skin in situ for two post operative week. The surgery was followed by a concurrent therapy with antibiotics and urinary acidifiers. All animals started

voiding urine through the normal opening by the third post operative week during which the catheter was completely withdrawn from the bladder. Modified Proximal Perineal Urethrostomy is a new approach which was found to be highly effective giving remarkable results in management of obstructive urolithiasis. This is the first documentation of this technique in male goats.

RUS-40

SURGICAL MANAGEMENT OF 360° SPIRAL COLON TORSION IN A HF CROSS COW

P.T. Sutaria, J.B. Patel, P.B. Patel, A.M. Patel, R.K. Gosai, K.R. Chaudahri, H.M. Barot,
Abhishek M. Patel and A.N. Patel

*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H.,
S.D. Agricultural University, Sadar Krushinagar, Gujarat*

A 400 kg Holstein Friesian cross bred cow was presented with history of anorexia and no defecation since five days. Detailed clinical examination revealed pale mucous membrane, decreased ruminal motility, progressive abdominal distension and empty rectum with only blood tinged mucous. Physiological parameters like heart rate, respiration rate and rectal temperature were within normal limit. Hematological and ultrasonographic examination was performed. Under right paravertebral nerve block right flank laparotomy in standing position was performed and colonic torsion was diagnosed. The devitalized spiral colon was resected and enteroanastomosis performed. The cows start defecating 12hrs after, with un-eventful recovery.

RUS-41

COMPARATIVE EFFICACY OF GREEN SYNTHESIZED SILVER NANOPARTICLE OINTMENTS OF AZADIRACHTA INDICA AND CATHARANTHUS ROSEUS ON WOUND HEALING IN GOATS

S.R. Vaidya, S.D. Chepte, M.G. Thorat, F.A. Fani, R.K. Fulsunge, N.P. Bhawe,
G.D. Khatal and K.S. Pawar

*Department of Veterinary Surgery and Radiology,
Post graduate Institute of Veterinary and Animal Sciences, Akola, Maharashtra*

The present study was conducted on 12 clinical cases of goats presented with fresh contaminated wounds at TVCC, PGIVAS, Akola. These cases were randomly divided into two equal groups irrespective of sex, breed and body weight. Group A was treated with green synthesized silver nanoparticle ointments of Azadirachta indica and group B with silver nanoparticle ointment of Catharanthus roseus. Clinico-physiological, hemato-biochemical and histochemical parameters of the groups were studied. Better wound contraction with thick and well-organized collagen fibers was observed in group A than group B. Wound healing was evaluated on the basis of swelling, colour, exudation, pain and irritation of both the groups. Better wound healing was observed in group A as compared to group B. On the basis of observations it can be concluded that, green synthesized silver nanoparticle ointment of Azadirachta indica has better

wound healing ability for fresh contaminated wounds than *Catharanthus roseus* in goats.

RUS-42

MANAGEMENT OF TIBIAL NERVE INJURY IN A COW

Manjunath S.P. and Chaitra Y.

Veterinary Dispensary, Dasarigatta, Tumkur, Karnataka

A cow was presented with the history of severe lameness of right hind limb after the parturition. There was flexion of right hind limb during standing and also during movement with the hoof touching the ground indicating tibial nerve injury. Bamboo splintage, PVC pipe application, POP application were done according to the situation. But all the supports failed to retain the limb straight at fetlock region. There was severe lameness even 20 days after the parturition. Infrared therapy was started from day 20. Infrared bulb was kept at 20-30cm away from the affected limb. Infrared therapy was done on both medial and lateral aspect groove formed by of gastrocnemius muscle tendons of affected limb for 5 minutes in the morning and evening for 10 days. Animal recovered uneventfully from day 30 onwards. This study concludes that sustained efforts with multimodal approach with infrared therapy and rest played important role in recovery of the cow from tibial nerve injury.

RUS-43

THORACOTOMY IN CATTLE UNDER ISOFLURANE

Borakhede S.S., Pitlawar S.S., Chaudhary K.S., Agivale S.M.,

Kherkar T.T. and Abdul Khyum N.M.

Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences, Udgir, Latur, Maharashtra

The study was conducted on six cattle of either sex which were admitted to Teaching Veterinary Clinical Complex, College of Veterinary and Animal Sciences, Udgir, with the history of symptoms like chronic coughing, arched-back, long standing posture and anorexia since several days to months. Clinical examinations were carried out and on the auscultation they were suspected for pneumonia. Radiological examinations in lateral recumbency revealed penetrating metal foreign bodies in the thoracic cavity. Thoracic hemisphere and location of foreign body was confirmed on multiple serial x-rays in dorso-ventral and lateral position. The penetrating metal foreign bodies (metal wires and needles) were located at different positions in the lung. Out of six, four animals showed PFB in right diaphragmatic lobe and two in left diaphragmatic lobe. Thoracotomy was carried under isoflurane (2%) by rib resection technique in all animals, before surgery water and food was withheld for 24 hours. Post operatively broad spectrum antibiotic, analgesics, antihistamines and multivitamins were administered for 5 days. All animal showed eventful recovery.

RUS-44

ULTRASONOGRAPHY AS AN AID IN DIAGNOSIS AND MANAGEMENT OF VARIOUS THORACIC DISORDERS IN BOVINE

Prince, Adarsh Kumar, Amit Kumar, Arvind Negi, S.P. Tyagi and Amit Kirmani

Department of Veterinary Surgery and Radiology, Dr. G.C. Negi College of Veterinary and Animal Sciences, CSK Himachal Pradesh Agricultural University, Palampur, HP

The study was conducted on 10 clinical cases of bovine presented at TVCC, Palampur with clinical symptoms like anorexia, respiratory distress, coughing, open mouth breathing etc. After complete physical, laboratory and radiographic examination, the animals were subjected for thoracic ultrasonography. Four animals having abnormal lung sounds showed free anechoic plural effusion marked by hyperechoic foci between visceral and parietal pleura in the thoracic cavity. Three animals were found to have meshwork of hyperechoic fibrin strands with pockets of anechoic fluid effusion on pericardium confirmed to be suffering from traumatic reticulopericarditis. One animal had a distinct pericardial abscess, which appeared as a large circumscribed mass of mixed echogenicity and was seen moving in tandem with heart beat with heart pushed markedly with decreased area of auscultation. The pleural effusion and pericardial abscess drainage of fluid/pus was performed successfully under ultrasound guidance. This paper includes the detailed thoracic ultrasonographic features that would help in the diagnosis and treatment of various thoracic ailments that affect large animals.

RUS-45

DIAPHRAGMATIC HERNIORRAPHY IN TWO JAFFARABADI HEIFERS WITHOUT IPPV: A CLINICAL STUDY

V.D. Dodia, V.L. Parmar, G.R. Patel, A.A. Vasava and A.R. Bhadaniya

Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H., Junagadh Agricultural University, Junagadh, Gujarat

A total of two Jaffarabadi buffalo heifers presented with diaphragmatic hernia at VCC, COVSAH Junagadh. One presented with papple shaped abdomen like vagus indigestion and another presented with chronic recurrent tympany. Radiography near reticulum in right lateral recumbency, both animals revealed a break in the continuity of diaphragmatic line and a sac-like structure in thorax with non-potential foreign body in one animal and another one had no foreign body. B-mode Ultrasonography with 3.5 MHz convex transducer at right 5th intercostals space revealed gliding reticular motility. Hematology, blood gas and electrolyte analysis revealed leukocytosis with neutrophilia, lower blood Ph and pCO₂ along with higher pO₂ and HCO₃ and lower Ca⁺⁺, P, Na⁺, K⁺ and Cl⁻ concentration. Rumen was evacuated by laparo-rumenotomy day before diaphragmatic herniorrhaphy. Diaphragmatic herniorrhaphy performed under xylazine sedation and lignocaine hydrochloride 2% local analgesia without IPPV in dorsal recumbency. Post operative fluid therapy, antibiotics and analgesics were administered. Animal recovered uneventfully.

RUS-46**SURGICAL MANAGEMENT CECAL AFFECTIONS IN BOVINES –A REVIEW OF 6 CASES****S. Vigneshwaran**, S. Kathirvel, P. Sankar, P. Vidyasagar, A. Kumaresan and S. Senthil Kumar*Department of Veterinary Surgery and Radiology, Veterinary College and Research Institute, Tamil Nadu Veterinary and Animal Sciences University, Namakkal, Tamil Nadu*

Caecal affections are mostly seen during first few months of lactation and if recovery does not become evident within 24 hours after initiation of medical treatment, surgical intervention is recommended. Six bovines (five cattle and one buffalo) aged between eight days to eight years presented to VCC, Veterinary College and Research Institute, Namakkal with the history of not passing dung for past four days and no signs of colic were observed. On Clinical examination physiological parameters were within the normal limits. Examination of digestive system revealed loss of rumination, doughy rumen and reduced rumen motility. Auscultation of right flank ping sound was audible. Rectal examination revealed empty rectum, distended intestinal loops with blind end was palpable in 5 cases and unable to palpate the blind end in one case. Ultrasonographic examination confirmed the presence of distended intestinal loops. Haematobiochemical parameters were within the normal limits except mild hypocalcemia. The cases were tentatively diagnosed as caecal dilatation and surgical attempt was made because of failure in medical therapy. Right flank laparotomy was advised and surgical site was prepared aseptically under right proximal paravertebral anaesthesia. On exploration of abdominal cavity distended cecum was noticed in five cases and distended cecum with displacement of blind end in one case. Typhlotomy was performed as per standard surgical procedure and the contents were evacuated and after closure the cecum was repositioned into the abdominal cavity. Right flank laparotomy incision was closed as per standard surgical procedure. Postoperatively fluid therapy, antibiotics and analgesics were administered for five days with appropriate wound care. All the animals made an uneventful recovery.

RUS-47**SURGICAL MANAGEMENT OF TYPE II VAGAL INDIGESTION IN CROSS BRED CATTLE – A REVIEW OF TWO CASES****S. Kathirvel**, S. Vigneshwaran, **K. Monikakrish**, A. Kumaresan, P. Sankar, K. Jayakumar,

C. Saranya and R. Vinilkumar

Department of Veterinary Surgery and Radiology, Veterinary College and Research Institute, Tamil Nadu Veterinary and Animal Sciences University, Namakkal, Tamil Nadu

Two HF cross bred cattle with the age of four and six years were brought to the veterinary clinical complex (VCC), VCRI, Namakkal with the history of anorexia, not passing dung for past 3 days. The physiological parameters were within the normal range except elevated body temperature. Clinical examination revealed papple shaped abdomen and scanty faeces in the rectum and rumination was absent. Radiological examination revealed clear diaphragmatic border and absence of potential radio opaque

foreign materials. The cases were tentatively diagnosed as vagal indigestion and exploratory laparorumenotomy was advocated. The exploratory rumenotomy was performed under left paravertebral nerve block and exploration of the rumen revealed huge quantity of frothy ruminal contents. Further exploration of rumen revealed radio lucent foreign material occluding the reticulo-omasal orifice. The foreign materials were removed and the rumen was packed with rumen filling agents and closed with double layer of inversion suture pattern Cushing followed by Lembert pattern. The laparotomy incision was closed as per standard surgical procedure. Based on the ruminal content and occlusion of the reticulo-omasal orifice the condition was diagnosed as type II vagal indigestion. Post operatively fluid therapy, antibiotics and analgesics were administered for five days with appropriate wound care. Both the animals made an uneventful recovery.

RUS-48

SURGICAL MANAGEMENT OF SUPERFICIAL AND DEEP DIGITAL FLEXOR TENDON RUPTURE IN CATTLE - A REVIEW OF TWO CASES

M. Vijayakumar, A. Arunprasad, P. Tamilmahan and Senthil Kumar S.

Department of Veterinary Surgery and Radiology, Veterinary College and Research Institute, Orathanadu, Thanjavur, Tamil Nadu

Two cattle were referred to large animal surgical unit of Veterinary Clinical Complex, VCRI, Orathanadu. A seven years old kangayam bull was presented with history of accidental injury during jallikattu. Clinical examination revealed open superficial and deep digital flexor tendon rupture over the mid metatarsus along with metatarso-phalangeal joint dislocation of right hindlimb. Under xylazine-butorphanol sedation at dose rate of 0.1mg per kg body weight and 0.01mg per kg b.wt. intramuscular and 2% lignocaine 20ml as total intravenous regional anaesthesia in the recurrent tarsal vein. Superficial and deep digital flexor tendon was sutured using No-2 polyamide with bunnell mayor and two loop suture pattern. Then metatarso-phalangeal dislocation was stabilised using cross pinning 4.5mm Steinmann pin. A 2 years old non-descript female heifer with a history of man-made malicious injury below the right hock joint. On physical examination of the right hind limb, non weight bearing lameness, open wound below the hock joint with severed superficial and deep digital flexor tendon with tarso-metatarsal dislocation was noticed. The similar anaesthetic protocol and surgical techniques was adopted to repair the tendon. A 3.5mm Steinman pin was passed from Tuber calcis to Metatarsal and cross pinning with 2mm K-Wires passed from Tarsal to the Metatarsal to induce arthrodesis. Post-operatively, the both cases bandaging was done and the limb was immobilized with PVC splint. Periodical dressing and post operative antibiotic therapy was provided and partial weight bearing of limb was noticed without any untoward complication. The animals recovered uneventfully.

RUS-49**INCIDENCE OF SURGICAL DISORDERS IN DOMESTIC ANIMALS**

Sandeep Potliya, R.S. Bisla, Ankit Kumar, Harpreet Singh and Swati Ruhil

Haryana Pashu Vigyan Kendra (LUVAS), Karnal, Haryana

The present study was undertaken for incidence of surgical conditions presented at HPVK (LUVAS), Karnal, Haryana during the period from 1st July 2016 to 30th June 2019. A total of 8008 surgical conditions (14.58 %), out of total OPD of 54943; were managed to alleviate various ailments in domestic animals. Maximum incidence of surgical disorders was perceived in buffaloes (4651 cases, 58.08%) followed by cattle (2449 cases, 30.58%), canines (147 cases, 8.78%), equine (132 cases, 1.65%), goat (74 cases, 0.92%) and sheep (34 cases, 0.42%). Surgical conditions presented with highest incidence was observed for teat canal fibrosis/ teat obstructions in 2496 animals (31.17%); followed by urinary obstruction cases in 1100 animals (13.74%), medial patellar fixation in 685 animals (8.55), bone fractures in 634 animals (7.92%), accidental injury/ wound in 497 animals (6.21%), teat laceration injury/ fistula in 342 animals (4.27%), tumor conditions in 296 animals (3.7%), rumenotomy in 252 animals (3.15%). Other surgical conditions included; abscess in 236 animals (2.95%), abdominal/ umbilical hernia in 155 animals (1.94%), atresia ani in 147 animals (1.84%), hygroma of joints and arthritis in 115 animals (1.44%), diaphragmatic herniorrhaphy in 92 animals, eye injury in 92 animals (1.15%), horn injury in 90 animals (1.12%), uneven molars in 79 animals (0.99%), tail amputation in 71 animals (0.89%), dermoid cysts in 29 animals (0.36%) and knuckling in 22 animals (0.27%). Based on the study; buffalo was found more liable for surgical disorders than other domestic animals and maximum incidence of surgical disorder was observed for teat canal fibrosis/ teat obstructions condition followed by urinary obstruction.



Small Animal Surgery Session

MEET THE SPEAKER

**Dr. Swapan Kumar Maiti***Principal Scientist*

Surgery Division

ICAR-Indian Veterinary Research Institute, Izatnagar-243122 (UP)

E-Mail: swapanivri@gmail.com. Mobile: +91-9412049169

Dr. Swapan Kumar Maiti is born in West Bengal, India and presently working as Principal Scientist at ICAR-Indian Veterinary Research Institute. He has associated with more than 25 research projects and published more than 250 research papers, four Text-books and five manuals. He has been awarded prestigious fellowship from German Research Foundation (DFG, Bonn, Germany), four times on Stem Cells Biology under International Cooperation of Govt. of India. He has been deputed as “Visiting Professor” at the University of Leipzig (Germany) on 2006; University of Köln (Germany) on 2010; Technical University of Munich (Germany) 2014; Uniklinik, University of Köln (Germany) on 2018 and also acted as Technical expert for Teacher’s Assessment of University of Khartoum, Republic of Sudan (2000, 2007). He has presented papers as “International Speaker” in the 32nd, 33rd, 35th, 36th and 38th World Small Animal Veterinary Association (WSAVA) World Congress, held in Sydney (Australia); Dublin (Ireland); Geneva (Switzerland); Jeju (South Korea), Auckland (New Zealand) on 2007, 2008, 2010, 2011 and 2013 respectively and FASAVA Congress held at Bangkok (Thailand) on 2009. He has guided eight M.V.Sc, one M. Pharm and nine Ph. D students and honored with different National Awards viz. Prof A.K. Bhargava Gold Medal, Prof S.J. Angelo Memorial Award, Shri Ramlal Agrawal National Award (Gold medal & Cash prize), Indian Science Congress Centenary Congress best paper award (Certificate & Cash prize). He also received Best paper/Appreciation award from ISVS five times and ISVM three times. He has been selected five times in Indian National Science Academy (INSA, New Delhi) under Bilateral Scientist’s Exchange Programme of Govt of India. He also honoured with “Fellow” award- from National Academy of Veterinary Sciences (NAVS), Indian Society for Veterinary Surgery (ISVS) and Indian Society for Advancement of Canine Practice (ISACP). He has been recently awarded as “International Life Member” by German Society for Stem Cell Research (GSZ).

Presently, he is actively engaged in research on Animal cancer, Laparoscopic surgery and therapeutic application of Stem cells in animals.

CANINE MAMMARY NEOPLASMS - DIFFERENT DIAGNOSTIC AND THERAPEUTIC APPROACHES

Swapan Kumar Maiti

Division of Surgery, Indian Veterinary Research Institute, Izatnagar, Uttar Pradesh

Now-a-days cancer has gained considerable relevance in animals owing to the increased awareness among people towards animal sufferings and pain. The diagnosis and management of neoplasm, therefore, represent the major challenge faced by a veterinary oncologist. Mammary tumours are the most frequent neoplasia in female dogs; therefore, these tumours represent a serious problem in veterinary medicine. Of all species, dog develops neoplasms twice as frequently as humans, with incidence of skin and mammary tumours being the highest. Tumours of mammary gland are the most common tumours of female dog representing approximately 30-50% of all tumours in bitch and it is the second most common tumor in dog after skin neoplasms and most common malignant tumor in dog.

Dogs have 5 mammary glands on each side (total of 10 breasts)-cranial thoracic, caudal thoracic, cranial abdominal, caudal abdominal and inguinal. The normal gland should be soft and pliant, especially towards the rear legs. There should be no firm lumps. Posterior mammary glands (4th and 5th.) are often involved (about 65%) compared to their anterior counter parts. The reason for this is that the posterior glands are having greater volume of breast tissue. It was reported that, both benign and malignant tumours increased in frequency from anterior to posterior glands with higher incidence of 32.7% and 35.6% in caudal abdominal and inguinal mammary gland respectively.

High-risk breeds: Poodle, English Spaniel, English setter, Terriers and German Shepard. Low-risk breeds: Boxer, Chihuahua, Greyhounds and Beagles.

Mammary tumours occur almost exclusively in female dogs. However, there are several reports of mammary tumours in male dogs and these are usually very aggressive and have a poor prognosis.

The incidence increased with age of animals up to 14-16 years of life. The median age at diagnosis is between 10 and 12 years. Occasionally, it may be found as young as 2 years. These tumours are rare in dogs that were spayed less than 2 years of age.

The etiology of spontaneous mammary neoplasia in dog is unknown. But several studies have been conducted to unveil this enigma. The risk reducing effect of early ovariohysterectomy, in development of mammary tumour in dog is well notified in literatures. Development of mammary neoplasm is hormone dependent, with risk for development of mammary tumour in bitches spayed before first estrous, after one estrous and after 2 or more cycles being 0.5%, 8% and 26%, respectively. A higher risk for mammary cancer has been reported for multifarious bitches and in animals that have had few litters compared to bitches, which have whelped large number of litters. Incriminating factors put forth for etiological significance of mammary tumour in dogs are sex hormonal derangement, higher growth hormone level, use of progestin's for estrous control and b-type retroviral particles, BRCA-1/2 gene mutations.

Mammary tumours present as a solid mass or as multiple swelling. When tumours first appear they will like small piece of pea gravel just under the skin. They are very hard and are difficult to move around

under the skin. They can grow rapidly in a short period of time, doubling their size every month or so. When tumours do arise in the mammary tissue, they are usually easy to detect by gently palpating the mammary glands. It usually occurs most frequently in the 4th and 5th mammary gland. In half of the cases, more than one growth is observed. Multiple glands in one or both mammary chains may be affected. Cystic ducts associated with the tumour may cause fluid secretion through the nipple. Lymphatic involvement may cause local swelling (lymph edema) and discomfort, especially of the hind legs. Respiratory or other organ metastases may result in systemic problems (e.g., Dyspnea, anorexia, vomiting, and diarrhoea). Benign growths are often smooth, small and slow growing. Signs of malignant tumours include rapid growth, irregular shape, and firm attachment to the skin or underlying tissue, bleeding and ulceration. Occasionally tumours that have been small for a long period of time may suddenly grow quickly and aggressively, but this exception not the rule.

It is very difficult to determine the type of tumour based on physical inspection. A biopsy or tumour removal and analysis are always needed to determine if the tumour is benign or malignant, and to identify what type it is. Tumours, which are more aggressive may metastasize and spread to the surrounding lymph nodes or to the lungs. A chest x-ray and physical examination of the lymph nodes will often help in confirming malignancy.

Mammary neoplasm in the bitch originates from epithelial cells lining ducts or alveoli, from myoepithelial cells or from interstitial connective tissues. Approximately 50-60% of mammary neoplasms are benign and approximately 25% are malignant. Among them, 90% are epithelial origin; 70% adenocarcinoma (solid, tubular, papillary) and 20% ductal (inter or intralobular).

Approximately 50% of malignant mammary tumours in the dog have receptors for either estrogen or progesterone. This means that spaying is important even if a tumour has already developed.

Diagnosis:

- A. History: rate of growth, reproductive history, medication history and other systemic disorders.
- B. Documentation and measurement of all mammary gland lesions.
- C. Pre-surgical hematological and biochemical profile, as for the geriatric patient.
- D. Thoracic radiography, including two lateral and one dorso-ventral view for metastasis. The presence of metastatic disease generally contraindicates surgery. Mastectomy offered as a palliative treatment if metastatic lesions are small or if the primary tumour is causing the animal discomfort or other clinical problems.
- E. Cytology: Abnormal treat secretions-rarely diagnostic for neoplasia may be septic mastitis. Fine needle aspiration (FNAC) from lesions-positive for carcinoma-consider more radical initial surgery; negative-does not rule out malignancy.
- F. Biopsy: Eliminates all gross evidence of disease. It provides an adequate tissue specimen for histopathology.
- G. Histopathology of tumors: Benign; malignant and mixed

- H.** Estimation of MMPs enzymes
- I.** Immunohistochemistry (IHC and PCNA test)
- J.** Genotype frequency of CMT affected dogs

Clinical staging of canine mammary carcinoma (WHO)

- T** T1-Less than 3 cm diameter
T2-3-5 cm diameter
T3-Greater than 5 cm in diameter

Subgroups:

- A) Not fixed to other tissues, b) Fixed to skin, c) Fixed to underlying muscle
- T4- Any size, but inflammatory carcinoma (dermal infiltration)
- N** N0-No nodal involvement
N1a- Ipsilateral node, nonfixed
N1b- Ipsilateral node-fixed
N2a- Bilateral nodes, nonfixed
N2b-Bilateral node-fixed
- M** M0- No distant metastasis
M1- Metastatic

Stage-I-T0, T1 a, b, or c, N0, M0

Stage-II -T0, T1 or T2, a b. or c, N0 or N1a, M0

Stage-III-Any T3 tumour, with any N, and M0

Status or any T with Nb and M0

Stage-IV-Any T, Any N and M1 status

T= Tumour; N= Node; M= Metastasis

Treatment

Diagnostic tests prior to surgery

- Complete blood cell count
- Biochemical profile and urinalysis to evaluate function of the internal organs.
- Chest x-ray to rule out evidence of spread to the chest
- Tissue biopsy for histo-pathological confirmation.

(A) Surgery

Surgery stands as first choice for the treatment of canine mammary tumours. The simplest surgical procedure in the mammary gland should be performed in the absence of metastatic disease and inflammatory carcinoma. Six categories of surgical excision of mammary tumours had been reported.

1. Removal of tumour alone (Lumpectomy)
2. Removal of gland bearing tumour (simple mastectomy).
3. Removal of tumour, gland intervening lymphatic and regional lymph node (en-bloc dissection).
4. Removal of gland and adjacent gland 1 of 2 or 4 of 5 (half chain removal).
5. Removal of entire chain of 5 mammary gland + regional lymph node (unilateral mastectomy).
6. Removal of all 10 mammary glands, the skin covering them and the four lymph nodes at the same time (radical mastectomy)

The goal of surgery in canine mammary cancer is to remove all tumours by simplest procedure. More surgery is not better surgery for the dog. Upon finding any mass within the breast of a dog, surgical removal is recommended unless the patient is very old.

- If a single gland is affected, then only that gland is removed.
- If multiple glands on one side are affected, then the entire 5 glands on that side are removed.
- If multiple glands have tumours on both sides then both mammary chains are removed (all 10 glands are removed).
- If the lymph nodes (axillary/ inguinal) are within the resection zone, then they also are removed and especially if they are enlarged.
- If a growth is detected in the number 2 gland on the left side, glands 1,2, and 3 and the axillary lymph node on that side should be removed.
- If it is found in the number 4 gland on the right side, then glands 3,4,5, and the inguinal lymph node on that side should be completely removed.
- If the groin region is difficult to suture closed, a flap of skin from the flank may be needed to reconstruct the area.

(B) Chemotherapy/adjuvant chemotherapy:

Chemotherapy is a kind of treatment that uses drugs to attack cancer cells. The importance of chemotherapy has been emphasized by different workers and it was reported that survival could be prolonged after chemotherapy in cancer patients. However, no chemotherapy can guarantee a complete eradication of tumour cells from the body and a prolonged lifespan. All these therapies also have side effects and limitations. The taxanes includes paclitaxel and docetaxel, are among the most successful anticancer agents recently reported. Their primary mechanism of action is inhibition of the mitotic progression through binding and stabilization of the microtubules, which leads to inhibition of mitotic spindle function.

The recommended dosage of different chemotherapeutic agents in dogs is as follows:

1. Cyclophosphamide -0.3 mg/kg, IV for 14 days and then rest for 14 days.
2. Chlorambucil- 0.2 to 0.3 mg orally daily for 2 months.
3. 5- Fluorouracil -5 mg/kg intravenously for 5 days then weekly.

4. Vincristine -0.1 to 0.5 mg/kg intravenously daily.
5. Doxorubicin -30 mg/sq. m IV 21 days apart up to 4-8 treatments.
6. Tamoxifen -20-40 mg/day orally in two divided doses for 1-3 weeks
7. Methotrexate -0.65mg/kg intravenously at weekly intervals for 2-4 weeks
8. Nanosomal Paclitaxel @150mg/ 32 kg b.wt on day 0/ 21/42 days
9. Nanosomal Docetaxel @30mg/ 32 kg b.wt on day 0/ 21/42 days

(C) Immunotherapy:

- Neuraminidase treated tumour cells.
- Intravenous injection of BCG vaccine
- Levamisole, Immuplus
- Mixed bacterial vaccine using *Streptococcus pyogenes* and *Serratianarcescens* as rewarding as good adjunct to surgical therapy.

(D) Anti-angiogenic therapy:

Angiogenesis is a good target for cancer therapy because solid tumours can not grow beyond 2-3 mm without sufficient oxygen and nutrition. Anti-angiogenic therapy is regarded as future therapy in canine mammary tumours which are highly angiogenic cancers. Two angiogenesis inhibitor drugs – Tamoxifen and Trastuzumab posse angiogenesis inhibitor activity and likely contribute to their efficacy in canines. In addition to its effect of estrogen receptors, Tamoxifen prevents blood vessel cells from dividing. The Angiogenesis Foundation is studying Tamoxifen as part of multi-targeting regimen for canine cancers. Trastuzumab is a monoclonal antibody directed against the HER-2 new gene associated with breast cancer. This gene helps tumours to produce the angiogenic growth factor VEGF. In animal studies, Trastuzumab can inhibit angiogenesis and tumour growth. Anti-angiogenic therapy may be useful in treating mammary cancer, and there are numerous scientific studies demonstrating that angiogenesis inhibitor drugs can slow or regress mammary tumour growth. The timing of intervention appears to be important, with treatment of early disease being more successful than treatment applied when the tumour burden is extensive. Cancers in dogs depend on angiogenesis (the creation of new blood vessels) to survive and proliferate. Tumours create new blood vessels that supply them with oxygen and nutrients, allowing them to grow in size and spread throughout the body. Anti-angiogenic therapy cuts off these new blood vessels, effectively starving tumours and preventing their growth. Cancers may be controlled with effective doses of anti-angiogenic drugs. Angiogenesis inhibitors are designed to attack tumours by depriving cancer cells of their blood. Some anti-angiogenic drugs may also be combined in order to hit multiple targets and improve their effectiveness. Anti-angiogenic therapy offers a number of advantages over traditional therapies for cancer:

- Tumour cells often mutate and become resistant to chemotherapy. Because anti-angiogenic drugs only target normal endothelial cells, these cells are less likely develop acquired drug resistance.
- All tumours rely upon host vessels. Anti-angiogenic agents are therefore effective against a broad

range of cancers.

- Conventional chemotherapy and radiotherapy indiscriminately attacks all dividing cells in the body, leading to side effects such as diarrhoea, mouth ulcers, hair loss, and weakened immunity. Anti-angiogenic drugs selectively target dividing blood vessels and cause fewer side effects.

- Anti-angiogenic drugs are relatively nontoxic and work at levels well below the maximum tolerated dose, so may be given in lower doses over longer periods of time.

- Anti-angiogenic treatment may take weeks or even months to exhibit its full beneficial effect, but this allows for continuous, chronic control of disease.

- Anti-angiogenic drugs also serve as a supplement to chemotherapy or radiotherapy.

- Unlike chemotherapy, anti-angiogenic treatments are well-tolerated, have few side effects, and may control disease over the course of the dog's lifetime.

(E) Cox-2 inhibitors drug therapy:

COX (Cyclooxygenase)-2 inhibitors are promising anti-cancer drugs because they inhibit tumour angiogenesis, induce tumour cell apoptosis and potentiate the effects of chemotherapy in canine mammary tumours. Chemotherapy with COX-2 inhibitor (Meloxicam/Etoricoxib) treatment reported very encouraging results in the treatment of canine mammary cancer.

(F) Gene therapy:

Although current chemo-radiotherapies are known to cause tumour regression by inducing apoptosis, failure to achieve preferential killing of tumour cells while leaving normal cells intact limits their wide-spread use. A number of viruses with an ability to kill cancer cells while sparing normal cells have been discovered. Such viruses are called as oncolytic viruses. These include adeno, herpes simplex, rabies, polio, measles, vesicular stomatitis, hepatitis A, bovine enterovirus, mumps etc. Newcastle disease virus (NDV) is one such virus with an inherent oncolytic property that can be harnessed for the treatment of various cancers. The chicken anemia viral protein (VP) 3, also termed apoptin kills tumour cells while sparing normal cells. Upon expression in normal cells, apoptin is accumulated in the cytoplasm whereas in cancer cells, it is specifically targeted to the nucleus where it elicits its lethal effects. Canine parvovirus-2 (CPV-2) is an extremely simple DNA virus that encodes one to two early products and limited number of late structural proteins. It lacks mechanisms for inducing S phase and replicates only in proliferating host cells. This feature confers additional selectivity for killing rapidly growing cancer cells. The apoptosis-inducing activity of parvovirus was mapped to the non-structural protein-1, -2 (ns1/ns2) of minute virus of mice (MVM) and ns1 of parvovirus B19. Unlike apoptin, ns1 does not rely solely on apoptosis for its oncolytic effect. Certain viral genes act as tumour destructive agent, and the viral capsid as a nano-sized nucleic acid delivery vehicle. The greatest advantage that the oncolytic virus offers over chemotherapeutic agent is its ability to be engineered by *in vitro* genetic manipulation in response to preclinical and clinical findings.

(G) Other therapy:

- Radiation therapy
- Anti- hormonal therapy, but success rate is not encouraging.
- Magnetofection/ magnetic therapy

Prognostic factors:

- ❖ If a dog is spayed before the first estrous cycle there is about a 0- 0.5% chance that this dog will develop mammary cancer.
- ❖ Spaying a dog after the 4th estrous cycle or after 2.5 years of age will not decrease the risk for developing mammary cancer.
- ❖ After a dog has mammary cancer, spaying the animal does not decrease the recurrence rate of the cancer, as these tumors are not under the influence of estrogen.
- ❖ The larger the mammary tumour the greater the risk that it has spread to the lymph nodes, lungs or other parts of the body.
- ❖ When a mammary tumour has been found, there is a 50% chance that it is malignant and a 50% chance that it is benign.
- ❖ Of the malignant mammary tumours found 50% have already spread at the time of diagnosis.
- ❖ If the tumour is less than 3 cm in size the recurrence rate is relatively low, versus greater than 3 cm has a fairly high recurrence rate.
- ❖ If the biopsy report indicates that the mammary tumour has spread to the lymph nodes, lymphatic channels or blood vessels the prognosis is poor.
- ❖ If the biopsy report indicates that the tumour is surrounded by cells lymphocytes, a better prognosis is expected.

Complications:

Anesthetic death; infection; spread of cancer to other regions of the body (lymph nodes, lungs, bones) and reoccurrence.

Conclusions:

Mammary cancer is a very common cancer and can often be successfully treated, if treated early. If all non-breeding dogs were spayed before their first heat this disease could be almost completely eliminated. If dog owner find a growth or lump in the mammary tissue, he should inform the veterinarian immediately and not take a “wait and see” attitude. In general, there is an urgent need to address the early diagnosis and effective low cost treatment schedule for the management of this dreaded animal disease- “cancer” for the betterment of animal pain and sufferings.

MEET THE SPEAKER



Dr. Gajendra Subhanrao Khandekar

Professor

Department of Veterinary Surgery and Radiology
Bombay Veterinary College, Maharashtra Animal Fishery Science University,
Mumbai, Maharashtra

ISVS-2019

Dr. G. S. Khandekar, was born on 21st July, 1969 in the city of Jat (Maharashtra). He completed his BVSc & AH in the year 1991 and M. V. Sc. in the year 1995 with first class distinction from Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli (Maharashtra). He was awarded PhD from MAFSU, Nagpur in 2011. He has also completed PG diploma in Sustainable Rural Development from NIRD, Hyderabad. He received the fellow of Indian Society of Veterinary Surgery (FISVS) in 2018 for the meritorious contribution in the field of Veterinary Surgery & Radiology. He has also participated in hands on workshop on Spinal Surgery in Small Animals at Canter for Veterinary Continuing Education, Faculty of Veterinary Science, Chulalongkorn, Thailand and Presented lead paper on Anaesthesia for laparoscopic surgeries in canines in VES conference at Italy. He started his career in 1993 as Veterinary Officer at BVC and reached to the position of Professor with additional charge of Project Officer of upcoming Veterinary College at Jalgaon, Maharashtra. He has been instrumental in establishing Centre of Excellence in Minimally Invasive Technique at Mumbai Veterinary College and organised Laparoscopic trainings for field veterinarians and academic staff of Maharashtra, Rajasthan, Uttarakhand, Military Veterinary Hospital Uttar Pradesh as well as Human Gynaecologist for various parts of India. He has received a total of 14 research recommendations on Laparoscopy, thoracoscopy and Theloscopy by Joint Research Council of MAFSU, Nagpur. He has also worked as Principal Investigator of various research projects sponsored by RKVY, IIT and is CO-PI in an ICAR project. He is also the Project-Coordinator of the Animal Birth control Programme conducted at MVC in collaboration with Municipal Corporation of Greater Mumbai. He has organised trainings in Surgery in Ophthalmology, anaesthesia, orthopaedics and dental surgery for veterinarians. He organized a first of its kind workshop at field level on Canine ophthalmology, ear and dental affections in collaboration with Society of Animal Protection, Kolhapur-Maharashtra where live demonstration of Cataract Surgery was given to field veterinarians. He has organised free animal health-check-up and gelding camps for horse and for dairy animals in various districts of Maharashtra. He has developed numerous anaesthetic combinations for equines and small animals. He has organized several entrepreneurship programmes for B. V. Sc. & A. H. students and has received appreciation certificate from Indian National Kennel Club (INKC), for organizing National Level Dog shows at Bombay Veterinary College in the year 2009, 2014, 2015 and 2016. Since last 10 years he is working as Internship Coordinator

for undergraduate students at Mumbai Veterinary College. As a Chairman Gymkhana, MVC, he has successfully organized various cultural and sport interuniversity competitions and selection trials. He has also been recipient of Appreciation award (2006, 2009), Best Poster award (2011) and Gold Medal for best paper presentation in ISVS conferences. He has also been bestowed with Gurudev Rabindranath Tagore Sanman, 2011 and 2018, Bharat Jyoti award 2012, Best volunteer award of NSS 1989-90 and Best Teacher in 2005 and 2006. He has co-authored one book chapter and prepared five manuals. He has guided 23 M. V. Sc. students and is guiding three Doctoral students. He has also been bestowed with Jury award of Veterinary Practitioner's Welfare Association Navi Mumbai. He is Co-ordinator, Broad Subject Matter area (BSMA) for clinical subjects. He was also the zonal secretary of ISVS (2002-2004). He has organized various orations like Bai Ratanbai Gharda oration, Rao Memorial Oration and C.R. Sane oration as a secretary of BVC Alumni association from 2017. He has been instrumental in development of various educational materials such as CDs on Small Animal Surgery, Large Animal Surgery in collaboration with COL-Canada, ISNAR-Netherland and MAFSU. He has been the Editor-in-Chief of the Journal of Bombay Veterinary College from 2011-17 and Member of editorial board of Indian Journal of Veterinary Surgery. He was part of the screening and assessment committee of CAS under ICAR (CIRCOT), ICMR (NIRRH). He has also worked as nodal officer in Vice-Chancellors recruitment committee for MAFSU. He has participated as an invited speaker on various forums and has delivered lectures in more than 25 conferences, workshops and trainings. He has authored more than 100 publications in various journals of national and international repute.

RECENT TRENDS IN MANAGEMENT OF GASTRIC DILATATION AND VOLVULUS (GDV) IN PET ANIMAL PRACTICE

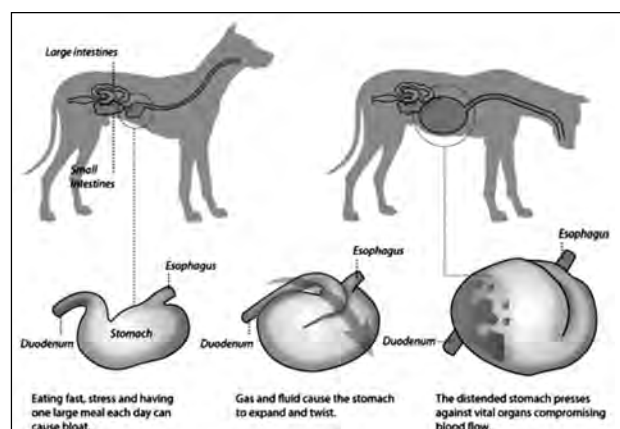
Khandekar G.S. and S.D. Tripathi

*Department of Surgery and Radiology, Mumbai Veterinary College, Mumbai
Maharashtra Animal and Fishery Sciences University, Nagpur*

Gastric dilatation and volvulus (GDV) is a rapidly progressing, life threatening, acute, emergency condition in deep chested dogs; characterised by a rapid accumulation of gas within the stomach. It may progress to rotation of the stomach resulting in failure of eructation and pyloric emptying, increased gastric pressure and development of shock eventually leading to death. This multi-systemic condition can be rapidly fatal due to its ability to affect multiple organs and systems within a span of 2-3 hours of the volvulus which makes it a dangerous condition. It is a medical and surgical emergency that requires immediate intervention to reverse the pathophysiological effects occurring due to the gastric distention and its malpositioning. GDV is associated with severe fluctuations of the cardiovascular, respiratory, renal, and gastrointestinal physiology and if not treated promptly, these changes lead to the development of shock and the death of the patient (Monnet, 2003). The syndrome involves various degrees of volvulus of the stomach, which causes intra-gastric accumulation of gas and increased intra-gastric pressure leading to decreased venous return, portal hypertension, gastrointestinal tract ischemia, hypovolemia, hypotension and often cardiogenic shock. Death is a certainty, if appropriate treatment is not given immediately. Acute gastric dilation with or without volvulus has been a frequent cause of high morbidity and mortality in pet animal practice since decades (Slatter, 2003).

There are a number of factors which have been recognised as the cause of this life-threatening condition such as age, breed, sex, body conformation, weight, nasal mite infestation, diet composition, feeding schedule, feeding behaviour etc. In a retrospective study of the incidence of GDV reported at the Department of Surgery and Radiology, Mumbai Veterinary College, it was noted that most of the cases of GDV were noted in large breed dogs such as Great Danes, Alsatians, Bull mastiffs etc. and more so during the Diwali period which coincided with the wedding season.

Pathophysiology:



A schematic representation of the pathophysiology of Gastric Dilatation with Torsion (Image: Courtesy, Cindi Bossart)

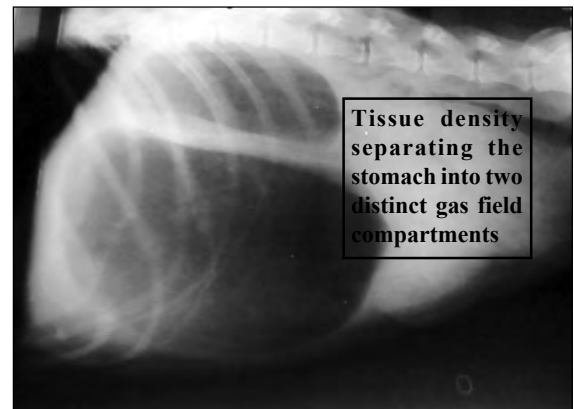
Signs and Symptoms:

In a large number of cases, owners report, frothing from the mouth with the pet making numerous unsuccessful attempts at vomiting, retching with a gradual increase in the size of the abdomen over a period of few minutes to 2 hours. These episodes are usually noted by vigilante pet owners after feeding; especially in cases, where the dog has been fed on a sumptuous meal of rice, chapati, and various items during a family function or after excessive intake of dry pet foods. The animal initially appears anxious, looking or biting at the abdomen, assuming the praying posture or stretching the abdomen. As the severity increases the animal is weak, recumbent and breathing heavily.

Diagnosis:

The diagnosis of GDV is made on history, signs and symptoms followed by physical examination accompanied with radiography if available. A typical double bubble appearance of the stomach on radiograph confirms the incidence of gastric dilation.

Right lateral Radiograph of the abdomen showing a typical Double-bubble appearance of the stomach.



Management of GDV:

GDV management can be divided into various phases.

Phase 1:

The owner reports about the signs such as slight discomfort and distention of abdomen. During this phase, the owner should be instructed to keep the dog calm and quiet and to give oral antacids (Gelusil, digene etc.) along with carnicide liquid. During this phase the dog may recover without developing GDV.

Phase 2:

There is continuous distention noted with increased levels of discomfort and retching. The dog should be taken to the nearest vet as the release of the distention may relieve the discomfort. The patient's condition is stabilized by administration of isotonic fluids preferably Ringer's Lactate (90 ml/kg/ hour), or hypertonic 7% saline (4 to 5 ml/kg over 5 to 15 minutes), or hetastarch (5 to 10 ml/kg over 10 to 15 minutes) or a mixture of 7.5% saline and hetastarch (dilute 23.4% saline with 6% hetastarch until you have a 7.5% solution; administer at 4 ml/kg over 5 minutes) is administered. Broad-spectrum antibiotics (e.g., cefazolin, ampicillin plus enrofloxacin) should be administered. If the animal is dyspnoeic, oxygen therapy may be given by nasal insufflation mask. Gastric decompression should be performed by stomach tube or insertion of a large bore needle while shock therapy is initiated.

Phase 3:

In this phase the patient is very restless (gastric volvulus), whining & panting, salivating copiously, tries to vomit every 2 - 3 mins, stands with legs apart and head hanging down, spleen becomes engorged gums dark red shock begins to develop, heart rate 80 - 100 beats/min, temperature raised (104°F).

In this phase stabilizing the patient's condition is the initial objective by administration of isotonic fluids (90 ml/kg/ hour), hypertonic 7% saline (4 to 5 ml/kg over 5 to 15 minutes), hetastarch (5 to 10 ml/kg over 10 to 15 minutes) or a mixture of 7.5% saline and hetastarch (dilute 23.4% saline with 6% hetastarch until you have a 7.5% solution; administer at 4 ml/kg over 5 minutes) is administered. Broad-

spectrum antibiotics (e.g., cefazolin, ampicillin plus enrofloxacin) should be administered. If the animal is dyspnoeic, oxygen therapy may be given by nasal insufflation or mask. Surgery should be performed as soon as the animal's condition has been stabilized, even if the stomach has been decompressed. Rotation of an undistended stomach interferes with gastric blood flow and may potentiate gastric necrosis. Upon entering the abdominal cavity of a dog with GDV, the first structure noted is the greater omentum, which usually covers the dilated stomach. Intraoperative manipulation of the cardia usually allows the tube to be passed into the stomach without difficulty. If adequate decompression is still not achieved or an assistant is not available, a small gastrotomy incision can be performed to remove the gastric contents, although this should be avoided if possible. Gastropexy techniques such as Muscular wrap (incisional) gastropexy or circumcostal gastropexy or tube gastropexy can be performed to prevent the recurrence of this life-threatening condition in pets.

Even with appropriate treatment, mortality rates for dogs undergoing surgery because of GDV, ranges from 15% to 33% (Beck, 2006). GDV has a high mortality rate and dogs that have sustained damage to the stomach, spleen or heart are at a high risk of mortality. The morbidity rates with GDV in dogs after surgery are high and post-operative complications are more likely to occur. Even after corrective surgery for GDV, reoccurrence rates are more and complications such as ischemia-reperfusion injury (IRI), hypotension, cardiac arrhythmias, acute kidney injury (AKI), gastric ulceration, electrolyte imbalances, and pain are possible (Bruchim *et al.*, 2014). In addition, early identification of the patients in need for re-exploration owing to gastric necrosis, abdominal sepsis, or splenic thrombosis is crucial. Despite appropriate medical and surgical treatment, the reported mortality rate in dogs with GDV has been reported to be 10%-28% (Bruchim *et al.*, 2014). Dogs with GDV, that are affected with gastric necrosis or develop AKI, have a higher mortality rate.

In the light of the above pathophysiological and surgical condition a preventive technique such as "gastropexy" is necessary to prevent reoccurrence of GDV. In a comparison between animals that received gastropexy and those that did not, the one-year mortality due to GDV and GDV related causes was 19% and 71% respectively (Eggertsdottir *et al.*, 1996). An effective gastropexy decreases the reoccurrence of GDV from as high as 80% to less than 5%. (Allen and Paul, 2014)

The goal of gastropexy is to create a permanent adhesion between the pyloric antrum and the right abdominal wall. This permanent adhesion prevents the rotation of the stomach even if the stomach distends with gas.

Prophylactic gastropexy is a low risk procedure because it is performed at a time when the metabolic derangements, associated with GDV are not present. Hence, gastropexy should be considered in high risk animals that have a known predisposition to it. This procedure can be performed at the same time as other routine abdominal surgeries such as ovariohysterectomy, cryptorchidectomy, etc.

Conclusion:

Gastric dilation with or without volvulus can be a fatal condition in pets. Quick recognition of the clinical signs and symptoms can help in managing this condition without much problem. However, in cases with progressive signs of deterioration, surgery should be performed at the earliest to save the pet. Prophylactic gastropexy either by open method or laparoscopically assisted technique can be done in large breed deep chested dogs to prevent such episodes in pets.

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SAS-1

DIAGNOSIS OF FEMALE GENITAL SYSTEM DISORDERS IN CANINE**B. Konwar**, Hitesh Bayan, Kalyan Sarma, Dibyajyoti Talukdar and Nirmali Sarma*Department of Veterinary Surgery and Radiology, College of Veterinary Sciences and A.H.,
Central Agricultural University, Selesih, Aizawl, Mizoram*

A study was conducted on 653 dogs brought to the TVCC and observed that 22 bitches aged between 2 to 6 years were affected with the female genital system disorders. The animals were physically examined by palpation and percussion of the abdomen after collecting detailed anamnesis and rectal temperature, pulse rate and respiratory rate were recorded. Blood samples were collected for the examination of CBC and serum were separated for the estimation of ALT, AST, ALP, BUN, GGT, SC, Total protein and Albumin. Abdominal radiographs (Lateral and ventro-dorsal radiographs) and transabdominal and real time colour Doppler ultrasonography was carried out in all the animals. Bitches with closed pyometra had lethargy, depression, inappetance/ anorexia, polyuria, polydipsia, vomition, pear shaped abdominal distension with congested mucous membrane and sanguineous to mucopurulent vaginal discharge and soiled perineal region in open pyometra. Mummified foetus had the history of being mated three months earlier and were presented as the whelping was overdue with distended abdomen but no vaginal discharge. Animals were dull, depressed with congested mucous membrane and abdominal palpation revealed distended uterus with no palpable hard masses inside the uterus. Pyometric bitches were recorded with significantly decreased Hb, PCV, TEC and lymphopenia with significantly increased TLC or leukocytosis and neutrophillia. There were significantly elevated AST, ALT, ALP, BUN, GGT and SC; total protein and albumin levels were significantly decreased in dogs with pyometra. Radiograph of closed pyometra appeared as homogenously increased fluid density of uterus with coiled uterine horns found in the ventral and caudal abdomen displacing normal abdominal contents cranially and dorsally. The lateral abdominal radiograph in open pyometra cases were appeared as slight enlargement of the uterus with homogenous fluid opacity. There was enlarged uterus with irregularly mineralized masses which were observed with evidence of some fetal skull bones and tubular bones visible inside the uterus in one case mummified foetus. Ultrasonographically bitches with closed pyometra were recorded as distended, sacculated uterus and the uterine lumen showed characteristic “snow storm” appearance.

SAS-2

SURGICAL MANAGEMENT OF OBSTRUCTIVE UROLITHIASIS IN CANINES**Mohar Singh, Sharun Khan**, Kalaiselvan E, Rajesh Kumar, Aakanksha, Akash,

Abhishek Chandra Saxena and Naveen Kumar

Division of Surgery, Indian Veterinary Research Institute, Izatnagar, Bareilly, Uttar Pradesh

Urinary obstruction secondary to urolithiasis should be considered as an emergency due to its case fatality rate among the canine patients. The study involved eight male dogs presented to the Teaching

Veterinary Clinical Complex, ICAR-Indian Veterinary Research Institute that exhibited signs of anuria, stanguria and haematuria. Based on the history and clinical examination the condition was tentatively diagnosed as urinary tract obstruction secondary to urolithiasis. Further confirmation was made using radiographic and ultrasonographic techniques. Retrograde urohydropropulsion was attempted in all cases to push the obstructing calculi back into the urinary bladder by advancing the urinary catheter of appropriate size through the urethral orifice. This was followed by caudal midline approach of cystotomy procedure under general anaesthesia to retrieve the cystoliths. Postoperatively all the animals were treated with antibiotics and analgesics along with other supportive therapies. All the dogs recovered uneventfully. Hence retro-urohydropropulsion cum caudal midline cystotomy is an effective therapeutic option for large obstructive or medically unresponsive refractory urolithiasis in canines.

SAS 3

SURGICAL MANAGEMENT OF CUTANEOUS HEMANGIOSARCOMA IN CANINES: A REVIEW OF THREE CASES

Sharun Khan, Mohammed Arif Basha, Mudasir Ahmad Shah, Shivaraju,
A.M. Pawde and Amarpal

Division of Surgery, Indian Veterinary Research Institute, Izatnagar, Bareilly, Uttar Pradesh

Hemangiosarcoma is a type of malignant vascular tumor that commonly affects the canines and has very poor prognosis. Three dogs affected with cutaneous hemangiosarcoma were presented to Referral Veterinary Polyclinic, Indian Veterinary Research Institute, Izatnagar. The possibility of pulmonary metastasis was ruled out by subjecting the patients to thoracic radiography. All of the patients were also screened for possible intra-abdominal metastasis especially in the spleen using trans-abdominal ultrasonography. The tumor mass was surgically excised in all the three animals. Microscopic examination of the stained sections revealed presence of numerous small to medium sized blood vessels filled with red blood cells. Endothelial cells lining the blood vessels showed hyperchromatic changes and variation in cytoplasm to nucleus ratio. The cells were darkly stained and mitotic figures were also seen inside the cells. The cases were diagnosed as hemangiosarcoma on the basis of histopathology and immune-histochemistry findings. The post-operative survival period was different for each case. Surgical excision was found to be effective in removing the tumorous mass but lacks good outcome in cases which had pulmonary metastasis. Though metastasis was not diagnosed during the initial presentation, the possibility of developing it in future will affect the outcome of the surgery.

SAS 4

QUERCETIN ACCELERATES CUTANEOUS WOUND HEALING IN DIABETIC RATS BY STIMULATING ANGIOGENESIS

Vinay Kant, Joshi V.G., Babu Lal Jangir and Vinod Kumar

*Department of Veterinary Pharmacology and Toxicology, College of Veterinary Sciences,
Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, Haryana*

Complicated wounds like diabetic wounds have significant impact on the economics of patient or owner of patient. Angiogenesis gets compromised in diabetic wounds and quercetin has stimulatory potential for angiogenesis. So, the present study was aimed to investigate the effects of quercetin on wound healing in diabetic rats. A cutaneous wound was created on the back of rats. The wounded rats were divided into healthy control, diabetic control and quercetin treated diabetic group. Ointment base once daily for 21 days was topically applied in healthy control and diabetic control groups. The 0.3% quercetin was applied similarly in quercetin treated diabetic group. Quercetin application caused fast wound closure with up-regulation of the mRNA expression and protein expressions of VEGF, as compared to healthy and diabetic control group. The quality of healing was better in quercetin treated diabetic group. In conclusion, topical application of 0.3% quercetin accelerated wound healing in diabetic rats.

SAS 5

RETRIEVAL OF MARBLE STONE FROM THE ESOPHAGUS OF A DOG WITH HELP OF FOLLY'S CATHETER GUIDED BY ENDOSCOPE --AN INNOVATIVE IDEA

Sandeep Saharan, Ram Niwas, Amit Kumar, **Ankit Dangi**, Ribu Vargese Mathew,
Anju Poonia and Preeti Chaudhary

*Department of Veterinary Clinical Complex, College of Veterinary Sciences,
Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, Haryana*

A German Shepherd male dog was brought to VCC, LUVAS, Hisar with the history of anorexia, nausea since 4 days. Radiographic examination revealed one radiopaque structure in the oesophagus. Endoscopic retrieval of this foreign body was attempted. Snares and basket were not usefully used as size of foreign body was too large. Finally marble stone was retrieved successfully by inflating folly's catheter No. 18 balloon behind this for assisted traction.

SAS-6

**SURGICAL TREATMENT OF GRADE III LATERAL PATELLAR LUXATION IN DOGS BY TROCHLEAR BLOCK RECESSION
METHOD: 2 CASES REPORT**

A.K. Bishnoi, M. Tanwar, Anita Kumari, Rajneesh Kumar, Mohan Lal and S. Jhirwal
*Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences,
Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan*

Two young female dogs, Great Dane (12 months age, 50 kg b.wt.) and German Sheperd (5 months age, 13 kg b.wt.) with a common history of showing lameness after slipping on floor with spreading of hind legs apart were diagnosed with grade III lateral patellar luxation in right and left hind limbs, respectively. Clinically, both the animals were showing crouching during walking in the affected limb and on palpation the patella were found luxated laterally. Radiographically, lateral patellar luxation was evident in both the cases and also in Great Dane there was medial bowing of femoral diaphysis. Surgical treatment for restraining of patella in normal position within the trochlear groove included trochlear block recession with deepening of trochlear groove. Along with this, to increase the patellar stability, the medial loose retinacular tissue was excised, fibrous capsule was imbricated and medial parapatellar fibrocartilage was sutured to medial fabella. In both the cases surgical wound healed normally without any complication. Complete normal stifle function was observed after 2nd week in German Sheperd but the recurrence of luxation occurred in Great Dane after the surgery.

SAS-7

ASSESSMENT OF REGENERATIVE POTENTIAL OF MUSCLE-DERIVED MESENCHYMAL STEM CELLS IN SKELETAL MUSCLE INJURIES IN MICE

Akanksha Godiyal, Manjul Kandpal, N.S. Jadon, Priyanka Pandey, **Jyotsana Bhatt**,
Deepti Bodh and R.S. Sandhu
*Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences,
G.B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand*

Twenty four Swiss albino mice were randomly divided into three groups and subjected to following treatment: group A (Phosphate Buffer Saline injected on day 1 and 5), group B (Muscle derived mesenchymal stem cells injected on day 1 and 5), group C (Muscle derived mesenchymal stem cells injected on day 5 and 10). Gene expression profiling depicted upregulation of muscle derived vegetative endothelial growth factor gene in mice of group B indicating angiogenesis. Biochemical parameters, wound condition scoring, free wire hanging test and histopathological evaluation confirmed early, better and complete muscle regeneration in group B. Thus, MDSCs may be used for early, better and complete muscle regeneration in clinical cases of muscle injuries.

SAS 8

APOPTIC EFFECTS OF VINCRISTINE SULPHATE AND CISPLATIN SCAFFOLDS ON HELA CELL LINE AND THEIR CLINICAL EFFICACY ON CANINE TRANSMISSIBLE VENEREAL TUMORS

Arun Kumar, N.S. Jadon, M.G.H. Zaidi, M. Kandpal, Rashmi Saini, R.S. Sandhu

*Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences,
G.B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand*

The present study was undertaken to evaluate the effects of vincristine sulphate, cisplatin and their scaffolds on canine transmissible venereal tumour in twenty four sexually mature adult dogs affected with naturally occurring canine transmissible venereal tumour (CTVT). The animals were randomly divided into four groups (n=6) and subjected to administration of different oncolytic drugs and drugs scaffolds. The animals of group A were administered vincristine sulphate @ 0.025 mg/kg intravenously once in a week for four consecutive weeks and animals of group B were administered cisplatin @ 2.14 mg/kg intravenously and repeated after 21 days. The animals of group C and D were subjected to the administration of scaffolds of vincristine sulphate @ 0.025 mg/kg intravenously once in a week for four consecutive weeks and scaffolds of cisplatin @ 2.14mg/kg intravenously and repeated after 21 days respectively. Preparation and characterization of hydrogel scaffolds were consisting of FT-IR measurements, ultrastructure studies and electrochemical analysis. The oncolytic potential of the different chemotherapeutic agents were evaluated on the basis of physical parameters, histopathological studies, haemato-biochemical parameters and apoptotic effect on HeLa cell line. On the basis of parameter observed in this study, it was concluded that the early and best regression of the CTVT was observed in the animals treated with vincristine scaffolds. These vincristine scaffolds may be used safely by field veterinarian for the treatment of TVT in canines.

SAS-9

COMPARATIVE STUDY ON CARDIAC ALTERATIONS INDUCED AFTER VINCRISTINE AND DOXORUBICIN ADMINISTRATION IN CANINE NEOPLASMS

Tushar Jain, Ashok Kumar, Deepak Kumar Tiwari, Sandeep Saharan,

Sandeep Kumar and Sandeep Kumar

*Department of Veterinary Surgery and Radiology, College of Veterinary Sciences,
Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, Haryana*

The study was undertaken to evaluate the cardiac alterations induced after vincristine sulphate and doxorubicin administration in canine neoplasms. For this, twelve animals suffering from soft tissue tumours were randomly divided in two groups of six animals each. In group I, tumour was excised and chemotherapy with vincristine sulphate at the dose rate of 0.025mg/kg body weight was given at weekly intervals. In group II, the tissue growth was excised and chemotherapy with doxorubicin hydrochloride at the dose rate of 1mg/kg body weight was done at weekly intervals. Echocardiography and blood sample collection were done prior to start of operation at 0 day and before chemotherapy on day 7, 14, 21 and 28. On 28th

day, the drug was not given but the blood samples were taken and echocardiography was also done. Cardiac troponin I showed no significant change in group I while in group II, it increased significantly and very high mean values were obtained. EF, FS and E/A ratio no significant change in group I while in group II, they decreased significantly upto 28th day. The present study concluded that doxorubicin hydrochloride was found to be more cardiotoxic than vincristine sulphate for treatment of tumours in dogs.

SAS 10

MANDIBULAR AND SUBLINGUAL SIALADENECTOMY TO TREAT CERVICAL SIALOCELE IN 7 DOGS

Ashwani Kumar, Vandana Sangwan, N. Umeshwori Devi and Siddharath Deshmukh
*Department of Veterinary Surgery and Radiology, College of Veterinary Sciences,
Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, Punjab*

A salivary mucocele or sialocele is a surgical condition in which salivary secretions leaking from a damaged salivary gland or duct, gets accumulated ventrally in the inter-mandibular region. Seven adult dogs aged between 3.5 and 8 year, were presented with a soft fluctuating swelling in the inter-mandibular region since 1 to 6 months. Five dogs had unilateral while two had ventral swellings. These swellings were refractory to multiple treatments with needle or incisional drainage. All dogs were active with normal appetite, however 3 dogs had mild skin disease with history of scratching in neck region. Haematological parameters were within normal physiological range. Fine needle aspiration yielded blood tinged sticky mucoid fluid. Cytological examination revealed low cell transudate and ruled out abscess. Based on the typical clinical features and cytology, the condition was diagnosed as cervical sialocele. Surgical excision of mandibular and sublingual salivary glands (unilateral in 5 dogs and bilateral in two dogs) along with the drainage of mucocele by stab incision was done under general anaesthesia. All dogs recovered uneventfully with no recurrence from 6 months to 2 years of follow up. Histopathology of the resected salivary glands revealed no significant abnormality. In conclusions, typical clinical features and cytology helps in diagnosing the cervical sialocele; unilateral or bilateral sialodectomy of the mandibular and sublingual salivary glands can be safely done to manage cervical sialocele in dogs.

SAS 11

EVALUATION OF HEALING PATTERN OF ABDOMINAL SKIN INCISIONS BY USING 2-OCTYL CYANOACRYLATE TISSUE ADHESIVE, SKIN STAPLER AND NYLON SUTURE MATERIAL IN DOGS

Jyoti Gupta, Ashok Kumar, D.K. Dwivedi, H.R. Bhardwaj, M.M.S Zama,
Ankur Sharma and H.K Sharma
*Division of Teaching Veterinary Clinical Complex, Faculty of Veterinary Science and A.H.,
R.S. Pura, SKUAST-J, Jammu, J&K*

The study was conducted on female dogs (n=18) undergoing mid-ventral abdominal surgeries for ovario-hysterectomy (n=17) and caesarean section (n=1). All cases were randomly divided into 3 groups

(A, B and C) of 6 dogs each. All operations were performed by adopting the standard anaesthetic and surgical techniques, however, skin incisional wounds were closed using 2-octyl cyanoacrylate tissue adhesive, skin stapler and nylon suture material in groups A, B and C, respectively. Skin biopsies were collected from the surgical skin wound from the dogs of each group under sedation on 7th and 14th postoperative day. Healing of skin was evaluated histomorphologically and histochemically. (hydroxyproline estimation). On 7th and 14th post-operative days healing of skin incisional wound in group A was better than groups B and C.

SAS 12

EMERGENCY SCROTAL URETHROSTOMY IN CANINES

Samar Mahendran, Vikash Chauhan, Correia Salisha, Shriram G. and Vaibhav Bishnoi
CGS Hospital, Gurugram, Haryana

16 male dogs were presented to CGS Hospital with the history of stranguria. Physical examination revealed altered mentation, distended abdomen, abdominal pain. Haematology and urine analysis was performed. Radiographs revealed urethroliths and/or Cystoliths indicative of obstructive urolithiasis. Abdominal Ultrasonography revealed cystitis and urinary tract infection. Urinary catheterization was attempted unsuccessfully. Scrotal castration with urethrostomy was performed in all cases under inhalant general anesthesia. Sutures were removed 3 weeks post surgery. Complications included suture dehiscence (1), urine scalding and stricture (2), 13 recovered uneventfully. Urethroliths were most commonly seen in pugs (10/16). Emergency scrotal urethrostomy can be an effective surgical option for stranguria.

SAS 13

SUCCESSFUL SURGICAL TREATMENT OF TWO CASES OF LINEAR INTESTINAL FOREIGN BODIES IN DOGS

Thomas E.G., Pai T.P., Ubale A. S., Vasudeo D.M. and Dalal L.R.
Pet Zone Veterinary Clinic, Mumbai, Churchgate, Maharashtra

An adult neutered male German Shepherd (case I) aged 7 years and an intact Golden Retriever puppy (case II) aged 4 months were brought to Pet Zone Veterinary Clinic, Mumbai, with a history of swallowing a foreign body (FB) along with clinical symptoms of dehydration, vomiting, scanty stools, lethargy, anorexia, pain and firm mass in intestine on abdominal palpation. Full blood panels, GI-contrast radiography, ultrasound was used as diagnostic tools. Exploratory laparotomy was performed under general anesthesia. For case I, linear plication of the FB (cleaning mop) was found extending from the stomach to jejunum. The plication was corrected, and FB was retrieved with a gastrotomy and two enterotomies. For case II, a complete obstruction (rope toy) in the jejunum and a partial obstruction (chew sticks) near the ileo-caecal junction were retrieved with two enterotomies. Recovery in both patients was uneventful.

SAS-14

**CLINICAL EVALUATION OF LAPAROSCOPIC-ASSISTED
TECHNIQUE FOR SURGICAL MANAGEMENT OF
GASTROINTESTINAL AFFECTIONS IN DOGS**

Thomas E.G., Tripathi S.D., Khandekar G.S. and Lokhande D.U.

*Department of Veterinary Surgery and Radiology, Mumbai Veterinary College,
Parel, Mumbai, Maharashtra*

Five dogs with gastric dilation (01), intestinal tumour (01) and intussusception (03) respectively, were diagnosed/treated using laparoscopic-assisted (LA) technique under atropine sulphate (0.02 mg/kg s. c.) as pre-medication, butorphanol tartrate (0.2 mg/kg i. v.) and acepromazine maleate (0.02 mg/kg i. v.) as sedation, propofol (4 mg/kg i. v.) as induction and isoflurane (2.5%) as maintenance. LA technique was used in these cases to perform LA gastropexy, LA intestinal biopsy, LA intestinal resection and anastomoses/enterotomy with minimal handling of the tissues using key hole incisions. LA technique enabled confirmatory diagnosis (especially in cases when diagnosis was doubtful using other modes of diagnostic imaging) by allowing clear in-vivo vision of any abnormality in the abdominal cavity prior to a laparotomy being done (intussusceptions and intestinal tumours/obstructions). No significant difference was noted in the haemato-biochemical parameters and electrolyte levels before and after surgery in these cases. No intraoperative and postoperative complications were seen in any cases during this study.

SAS 15

**SURGICAL TREATMENT OF UTERINE TUBULAR
ADENOCARCINOMA IN A GERIATRIC NEW-ZEALAND WHITE
RABBIT**

Thomas E.G., Shah N.K., Ubale A.S., Pai T.P. and Dalal L.R.

Pet Zone Veterinary Clinic, Mumbai, Churchgate, Maharashtra

Uterine adenocarcinoma is commonly diagnosed at necropsy in rabbits and rarely presents clinical symptoms (Alizadeh et al., 2012). A 7-year-old intact New Zealand White female rabbit weighing 1.9 kg was brought to PetZone Veterinary Clinic, Mumbai, with clinical symptoms of anorexia, dehydration, dullness, blood tinged purulent discharge from the genital opening. Abdominal Ultrasound indicated an irregular thin walled an-echoic fluid filled organ with some debris suspected to be the uterus. On exploratory laparotomy, the uterus looked enlarged, severely inflamed with perforations and adhesions to the urinary bladder. An ovario-hysterectomy was performed, and the affected organs were sent for histopathological examination. The conclusive diagnosis was Uterine tubular adenocarcinoma. The rabbit made an uneventful recovery.

SAS-16

EVALUATION OF BUBALINE DECELLULARISED TENDON DERIVED COLLAGEN POWDER FOR TREATMENT OF EXTENSIVE WOUNDS IN DOGS – A REVIEW OF THREE CASES

Prakash G.V., Rekha Pathak, Wahengbam Pipelu, Rajesh Kumar,
Mohammed Arif Basha and Azam Khan

Division of Surgery, Indian Veterinary Research Institute, Izatnagar, Bareilly, Uttar Pradesh

Three dogs of different age and breeds were presented to Referral Veterinary Polyclinic of Indian veterinary research institute izzatnagar having history of automobile accident and bites leading to non-healing extensive wounds. The clinical examinations revealed contaminated wounds with mild to moderate exudation and peripheral tissue swelling and mild to severe pain on palpation. Aseptic wound bed preparation was done and pre-evaluated bubaline decellularised tendon derived collagen powder was applied on wounds on alternative days averaging to about 5 applications. The gradual healing of the wounds was noticed with reduced pain, exudation and peripheral tissue swelling on consecutive days. The granulation tissue formation was noticed in an average of 3rdday and gradual reduction in wound area measurements and wound contracture was noticed in an average of 6thday of collagen powder application. Complete healing of wounds was noticed in an average of 25 days with no cicatrix formation. Therefore deep and extensive wounds can be attempted with tissue engineering techniques using xenogenic collagen powder prepared from bubaline tendons decellularization.

SAS-17

GASTROINTESTINAL FOREIGN BODIES IN DOGS AND ITS SURGICAL MANAGEMENT: REPORT OF 7 CASES

I. Nath, B. Jena, S.S. Behera, A. Shukla, P. Rath, S. Nayak and S. Mohammad

*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H.,
Odisha University of Agriculture and Technology, Bhubaneswar, Odisha*

Gastric foreign bodies recorded in seven cases of dogs were rubber ball, stapler pin, belt hook and decaying rat wrapped in polythene cover. Intestinal foreign bodies recorded were maize cob, nails and dog neck belt as linear foreign body. History of vomiting and weight loss not responding to routine treatment. On clinical examination hard mass palpable in intestinal foreign bodies. Radiodense foreign bodies were visible on plain radiography. Exploratory laparotomy were conducted under general anesthesia using atropine (0.04mg/kg), xylazine (1mg/kg) and ketamine (5mg/kg) mixture for induction and maintenance with ketamine. Foreign bodies were removed either by gastrotomy or enterotomy. A case of linear foreign required multiple enterotomy and enterectomy of severely necrosed part. Surgical site closed in routine manner. Post-operatively animals were kept off-fed for 3days and gradually shifted to liquid diet. Meantime fluid therapy and supportive medications were given for 7days post-operatively. All animals recovered uneventfully.

SAS 18

COMPARATIVE STUDY ON HAEMATO- BIOCHEMICAL ALTERATIONS INDUCED AFTER VINCRISTINE AND DOXORUBICIN ADMINISTRATION IN CANINE NEOPLASMS

Tushar Jain, Ashok Kumar, Deepak Kumar Tiwari, Shalini Sharma and Sandeep Kumar
*Department of Veterinary Surgery and Radiology, College of Veterinary Sciences,
Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, Haryana*

The study was undertaken to evaluate the haemato- biochemical alterations induced after vincristine sulphate and doxorubicin administration in canine neoplasms. For this, twelve animals suffering from soft tissue tumours were randomly divided in two groups of six animals each. In group I, tumour was excised and chemotherapy with vincristine sulphate at the dose rate of 0.025mg/kg body weight was given at weekly intervals. In group II, the tissue growth was excised and chemotherapy with doxorubicin hydrochloride at the dose rate of 1mg/kg body weight was done at weekly intervals. Blood samples were taken before chemotherapy at day 0, 7, 14, 21 and 28 and haemato-biochemical analysis was done. It was found that both vincristine and doxorubicin cause bone marrow suppression leading to leucocytopenia and neutropenia. Thrombocytosis was found in group I while thrombocytopenia was found in group II. Increase in serum ALT, AST, triglycerides, ALP, cholesterol, GGT, BUN, creatinine, LDH and CK was found in both groups. This shows that both drugs cause hepatotoxicity, nephrotoxicity and cytotoxicity.

SAS 19

PHOTOBIMODULATION FOR HEALING OF AN EXTENSIVE FULL THICKNESS WOUND AND THERAPEUTIC MANAGEMENT OF OSTEOMYELITIS IN A MONGREL DOG

Reji Varghese, **Anjana Satheesh**, Dinesh P.T., Sooryadas S.,
Jinesh Kumar N.S. and Souljai Jayakumar Sindhu
*Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences,
Pookode, Kerala*

A four-year-old, mongrel dog was presented to TVCC, Pookode with an extensive wound on cranial aspect of right forelimb and non-weight bearing lameness. Clinical examination revealed signs of systemic infection. Gross examination of the wound revealed infected full thickness defect of eighty-centimeter square area with exposed bones and maggot infestation. Osteomyelitis could be detected on radius and ulna radiographically. The wound was managed conventionally for myiasis. Broad spectrum antibiotic and anti-inflammatory drug was given for 7 days. As the infection subsided the wound was subjected to photobiomodulation with initial dose of 2J/cm² and gradually increased the dose to 4J/cm². A total of six courses of treatment were given at 24hr intervals for four consecutive days with seven days interval till the wound healed completely. Ciprofloxacin was given @ 2mg/kg bodyweight orally for 21 days for management

of osteomyelitis. After two months, there was complete healing of the wound and weight bearing, thus having an uneventful recovery.

SAS-20

EFFECT OF ORAL SUPPLEMENTATION OF TWO DIFFERENT ANTIBIOTICS IN DOGS SUFFERING FROM PERIODONTAL DISEASE

Vaibhav Bhardwaj, R.N. Chaudhary, Ashok Kumar and Deepak Kumar Tiwari
*Department of Veterinary Surgery and Radiology, College of Veterinary Sciences,
 Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, Haryana*

The present study was conducted on 10 dogs suffering from periodontal disease of different stages. Animals were randomly divided into 2 groups of five animals each. Supragingival scaling and polishing followed by tooth brushing and chlorhexidine mouthwash was recommended in all the animals. Additionally, enrofloxacin tablet (@5 mg/kg) and ofloxacin (@10 mg/Kg)-ornidazole (@25mg/kg) tablet was given in group I and II respectively twice a day for one week. After recording history and general clinical examination, all the dogs were anaesthetized for full mouth examination, dental radiography and dental scaling & polishing. Blood samples were collected before treatment, at 7th day, 14th day and 21st day after treatment for haemato-biochemical analysis. Group I showed more significant reduction in plasma ALT, AST, ALP, GGT, BUN, creatinine and cytokines (IL-1 β) level in comparison to group II. So, oral supplementation of enrofloxacin had significant therapeutic effect in the treatment of periodontal disease.

SAS-21

EXPRESSIN OF IL-1 IN DOGS SUFFERING FROM PERIODONTAL DISEASES

Vaibhav Bhardwaj, R.N. Chaudhary, Aman Kumar and Suman Chaudhary
*Department of Veterinary Surgery and Radiology, College of Veterinary Sciences,
 Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, Haryana*

The study was conducted on 15 systemic healthy dogs brought in the Veterinary Clinical Complex, Hisar. Dogs suffering from periodontal disease of different stages were randomly divided into 3 groups of five animals each to evaluate the expression of IL-1 β and effectiveness of different treatment protocols. Halitosis was observed in 13 dogs and 6 dogs had reduced food and water intake. On an average, canine and 3rd and 4th premolar were most affected tooth. Haemato-biochemical analysis as well as expression analysis of IL-1 β with real time PCR was done before treatment, at 7th day, 14th day and 21st day after treatment. Dogs were restrained under general anaesthesia. In the study, supragingival scaling with tooth brushing and chlorhexidine lavage was recommended in all the dogs. Plasma ALT, AST, GGT and alkaline phosphatase decreased more in group II. Dental scaling, tooth brushing, antibiotics and chlorhexidine lavage causes the significant reduction in inflammatory cells and cytokines (IL-1 β). The fold change in expression of IL-1 β gene was decreased more rapidly in group II than other groups.

SAS-22

RADIOGRAPHIC AND HEMATO-BIOCHEMICAL EVALUATION IN DOGS SUFFERING FROM PERIODONTAL DISEASES

Vaibhav Bhardwaj, R.N. Chaudhary, Deepak Kumar Tiwari,
Sandeep Kumar and Aman Kumar

*Department of Veterinary Surgery and Radiology, College of Veterinary Sciences,
Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, Haryana*

The present study was conducted on 15 dogs suffering from periodontal disease of different stages. After recording history and general clinical examination, all the dogs were anaesthetized for full mouth examination, dental radiography, dental scaling and polishing. Dental radiography were done at reporting day and 21 days after scaling. Blood samples were collected before treatment, at 7th day, 14th day and 21st day after treatment for haemato-biochemical analysis. Out of 15 dogs, root resorption in 2 dogs, root fracture in 3 dogs, alveolar bone loss in 10 dogs, combination of horizontal and vertical bone loss in 8 dogs were observed. Improvement in haemoglobin, TEC along with significantly improvement in PCV and MCV was observed after 21 days. Significantly reduction in TLC, neutrophils, ALT, AST, GGT and creatinine was observed.

SAS-23

FIBROMA OF COLON & ITS SURGICAL MANAGEMENT IN A PARIAH DOG-A CASE STUDY

Jayakrushna Das, Prabir Mohapatra, Benudhar Mahananda and Ansul Shukla

*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H.,
Odisha University of Agriculture and Technology, Bhubaneswar, Odisha*

One 15 years male dog of indigenous breed was presented with complaint of chronic constipation. Presently it was treated with laxatives for 6 months back with change of feeding habit, which yields only controlled condition. On physical examination through anus it was found that one large sausage shaped mass felt like annular rings of cartilage feeling which suppose to block the colon passage. Contrast radiography using Barium enema was taken which confirmed regarding the shape & size of the structure. It was diagnosed as a fibroma like mass developed on colon which needs surgical intervention. The animal was prepared for surgical excision of the mass. Under routine procedure laparotomy was done & affected colon site was excised out. The healthy & bisected colon then attached & sutured at anal region. Post operative management was taken along with proper & adequate management practice of fluid therapy & supportive drugs. After 15 days of operation the sutures were removed for anal site & the animal recovered uneventfully.

SAS-24

DIFFERENTIATION AND CHARACTERIZATION OF RABBIT MSCS INTO OSTEOBLASTS

Jyotsana Bhatt, N.S. Jadon, Priyanka Pandey, Manjul Kandpal,
Deepti Bodh and Kanika Tiwari

*Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences,
G.B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand*

Bone marrow was collected from the ileac crest of the anesthetized rabbit in a heparinized 16G Jamshidi needle. For the isolation and propagation of mesenchymal stem cells, marrow sample was processed in laboratory under standard protocol. The cell pellets obtained was re-suspended, counted and plated in a 25 cm² culture flask. The cells was cultured in DMEM medium containing 10% fetal bovine serum and antibiotics in a CO₂ incubator with an atmospheric concentration of 5% CO₂, 21% O₂ and 95% humidity at 37°C. The cells after third passage was used for further experimentation. Viability of cells was assessed with trypan blue exclusion test and characterization of MSCs was done by analysis of expression of surface markers on MSCs (CD44, CD 75, CD 105, CD 34 and CD 45) utilizing semi-quantitative RT-PCR using β -actin as reference gene. In vitro mineralization was induced by using specific osteogenic induction media. The presence or differentiation of osteoblasts was confirmed by mineralization staining (Alizarin Red S staining) and alkaline phosphatase activity.

SAS-25

IMMUNITY RELATED GENE EXPRESSION OF IL-6 AND TGF-1 DURING PROGRESSION AND REGRESSION IN CANINE TRANSMISSIBLE VENEREAL TUMOUR

Kanika Tiwari, Pushpa and Arup Kumar Das

*Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences,
G.B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand*

Canine transmissible venereal tumour (CTVT) is a unique, naturally and experimentally transmitted contagious venereal tumour of dogs which commonly observed in stray wild dogs exhibiting unrestrained sexual activity. The present study was conducted on clinical cases of twenty four dogs of either sex or age naturally affected with CTVT to evaluate the genetic expression of TGF- β 1 and IL-6 cytokines and hemato-biochemical changes during progression and regression of CTVT. Group 1 consists of TVT affected dogs in which vincristine sulphate were not administered. Group-2 consists of normal dogs in which vincristine sulphate were administered. Group-3 consists of TVT affected dogs in which vincristine sulphate were administered. Control group consists of normal dogs in which vincristine sulphate were not administered. Tissue and blood samples were taken for hemato-biochemical changes, diagnostic qualitative reverse transcriptase PCR which were purified and sequenced. On the basis of these parameters, it is concluded that transforming growth factor beta 1 (TGF- β 1) is secreted by CTVT cells during progression

phase which suppressed the lymphokine activated killer (LAK) cytotoxicity, which is suppressed by CTVT cells secreted IL-6 during the regression phase of the tumour. TGF- β 1 and IL-6 cytokines are inversely interrelated with each other.

SAS-26

LYMPHOCYTE PROLIFERATION ASSAY DURING PROGRESSION AND REGRESSION IN CANINE TRANSMISSIBLE VENEREAL TUMOUR

Kanika Tiwari, Pushpa and Arup Kumar Das

Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences, G.B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand

The present study was conducted on clinical cases of twenty four dogs of either sex or age affected with naturally occurring canine transmissible venereal tumour (CTVT) to evaluate the T cell response toward mitogen Concanavalin A. Animals were randomly divided into four groups consisting of 6 dogs each. Group 1 consists of TVT affected dogs in which vincristine sulphate were not administered. Group-2 consists of normal dogs in which vincristine sulphate were administered. Group-3 consists of TVT affected dogs in which vincristine sulphate were administered. Control group consists of normal dogs in which vincristine sulphate were not administered. The assessments were made on the basis of clinical examination, haemato-biochemical and lymphocyte proliferation assay before and after administration of vincristine sulphate in CTVT affected dogs. On the basis of these parameters, it was concluded that T-lymphocytes are associated with the regression phase of CTVT suggested that tumour immunity plays a major role in tumour regression.

SAS-27

SURGICAL MANAGEMENT OF UROLITHIASIS AND FOURIER TRANSFORM- INFRARED (FTIR) SPECTROSCOPIC STUDY IN DOGS

Sudheesh, S. Nair, John Martin K.D., **Lavanya B.**, Sharat Joshi and Devanand, C.B.

Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences, Kerala Veterinary and Animal Sciences University, Mannuthy, Thrissur, Kerala

Eight dogs with a history of stranguria and anuria since few days were presented to University Veterinary Hospital, Kokkalai, and Mannuthy, KVASU. Survey radiographs confirmed the condition as obstructive urolithiasis. Haemato-biochemical parameters and urinalysis was performed. Urethral catheterization and retro hydro propulsion relieved the obstruction. The pH of urine was acidic in two and alkaline in six dogs. Elevated BUN and Creatinine values were seen in four cases. Surgical interventions like cystotomy, urethrotomy or a combination of both was performed based on the site of obstruction. Post-operatively pH modulators, antibiotics, analgesics and antispasmodics were administered. Indwelling catheter was maintained for three days in all animals with regular flushing with normal saline. All the animals

had an uneventful recovery. Uroliths retrieved from surgery were subjected to Fourier Transform Infrared Spectroscopy (FT-IR). Six were found to be struvite and two were calcium oxalate. FT-IR spectroscopy was helpful to make dietary changes and to prevent recurrence.

SAS-28

LIFE SAVING SPLENECTOMY FOR THE MANAGEMENT OF MULTICENTRIC LYMPHOMA IN A NON- DESCRIPT DOG

Sandeep Saharan, Ribu Varghese Mathews, Maneesh Sharma, **Dishant Saini**,

Babu Lal Jangir, Gaurav Kumar and Amit Kumar

*Department of Veterinary Surgery and Radiology, College of Veterinary Sciences,
Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, Haryana*

Lymphoma is one the most common tumours found in dogs. It accounts for 7 to 24% of all cancers in the canines. A five years old non-descript dog was presented to the Department of Veterinary Clinical Complex, College of Veterinary Sciences of Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar with a history of recurrent fever, swelling in the face and extremities, inappetence, lethargy, polydipsia and polyuria. The thorough clinical examination, radiography and ultrasonography (USG) of the dog revealed the generalized enlargement of lymph nodes and splenomegaly. The cytological examination of impression smear from enlarged lymph nodes revealed a predominance of large immature lymphoid cells characterized by presence of coarse nuclear chromatin, prominent nucleoli and high nuclear cytoplasmic ratio. Neutrophils were also observed. USG guided biopsy from nodular lesions observed in the spleen revealed neoplastic lymphoid cells characterized by presence of single to multiple prominent nucleoli. It also revealed mitotic figures. Based on clinicopathological, radiography and USG findings, this was diagnosed as multicentric lymphoma with spleen involvement. Ventral midline celiotomy was performed under general anaesthesia which was maintained by isoflurane to remove the spleen. After splenectomy, regression of lymph nodes occurred within 5 days and the dog showed uneventful recovery. In a follow up period of about 4 months dog was alive.

SAS-29

SURGICAL MANAGEMENT OF AURAL HAEMATOMA WITH THREE DIFFERENT TECHNIQUES

Mrunali Kamble, M.O. Kalim, Rukmini Dewangan, Raju Sharda and S.K. Tiwari

*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H.,
Anjora, Durg, Chattisgarh*

In Canines various surgical techniques have been tried for the treatment of aural hematoma with variable results. However, excessive fibrosis and drooping of ear pinna are the most common sequel observed in canines. In present study three different techniques adopted were divided into three groups with six cases in each group. In Group I new minimal invasive technique using stainless steel stapling in six

dogs was reported. After draining the hematoma and removing the complete blood and fibrin clots through a nick incision, the hematoma cavity was flushed with povidine iodine and apply the cyanoacrylate adhesive glue inside the ear pinna and bandage was applied, which was removed after three days, the cavity was observed to be closed with no fluid accumulation after postoperative care and the ear pinna was also erect in all cases in the second group. The third group was treated with standard suturing technique (Macqueen's technique). The recurrence was not observed in follow up period of three months. The study was concluded that stapling method was very effective, economically feasible, the reduced cost of anesthesia and surgical time.

SAS-30

SURGICAL MANAGEMENT OF LARGE SIZE MAMMARY TUMORS IN DOGS

Mrunali Kamble, Raju Sharda, M.O. Kalim, Rukmini Dewangan and S.K. Tiwari

*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H.,
Anjora, Durg, Chattisgarh*

A 7 years Pomeranian female dog was reported with the complaints of dull depressed, intappetance since 5 days, reduce water intake, occasional vomiting, non responsive to medicinal treatment and large growth since two months on the abdomen. Clinical examination revealed fever, dyspnea, auscultation of chest revealed consolidation of lungs on either side and large tumor in left caudal abdominal mammary gland. With taking all aseptic precautions surgical intervention under dissociative anaesthesia using Inj. Ketamine and Inj. Diazepam remove the large tumor weighing 2.1 kg and suturing of the surgical wound with standard manner. Postoperative therapy intravenous infusions with Inj. R1 and Inj. D5, antibiotics, analgesics and multivitamin was given for 6 days. The histopathological examination revealed proliferation of mesenchymal cells along with tubular epithelial type representing fibrosarcoma of mammary gland. Uneventful recovery was seen after 12 days with successful surgical intervention. A 11 and 1/2 years Pomeranian female dog was reported in the clinic with the complaints of anorexia and reduce water intake since 3 days, occasional vomiting, dull, depressed, non responsive to medicinal treatment and large growth was since two months. Clinical examination revealed fever, dyspnea, auscultation of chest revealed consolidation of lungs on either side and large tumor in left caudal abdominal gland and subsequent small tumors on other mammary gland. Under the dissociative anaesthesia surgical intervention was given on the tumor mass and remove the large tumor weighing 2 kg and suturing of the surgical wound was done with standard manner. Postoperative therapy consisted of intravenous infusions, antibiotic and analgesics was given for 5 days. The histopathological examination revealed excessive proliferation of mesenchymal cells along with tubular epithelial type representing fibrosarcoma of mammary gland. Uneventful recovery marked the successful surgical intervention after removal of sutures after complete postoperative care.

SAS-31

MANAGEMENT OF PERIODONTAL DISEASES IN DOGS**Manisha Thakur**, Adarsh Kumar, Amit Kumar, S.P. Tyagi and Kanika Singh*Department of Veterinary Surgery and Radiology, Dr. G.C. Negi College of Veterinary and Animal Sciences, CSK Himachal Pradesh Agricultural University, Palampur, HP*

As the world of oral hygiene is steady evolving among human race, likewise it is now being realized by the veterinarians and pet owners that orodental health and general health of an animal are closely interrelated. The present study was conducted on 120 patients presented to the Department of Veterinary Surgery and Radiology, DGCN College of Veterinary and Animal Sciences, CSKHPKV, Palampur, India in a period spanning 20 months. Age of the pet was directly correlated with the incidence and severity of the periodontal disease as it was found to be the major health problem in dogs over the age of 5 years. Dogs fed with pure vegetarian and only homemade food were more prone to oral affections. Dental polishing followed by scaling considerably improved the oral health of the patients, relieved them from chronic discomfort and wasting and further decreased the susceptibility to repeated periodontal diseases. The tartar samples processed for microbiology revealed the common occurrence of *Staphylococcus* spp., *Streptococcus* spp., *Pseudomonas* spp., *Klebsiella* spp., and *E. coli*. Amoxicillin and Clindamycin were found to be the most effective antibiotic for countering the periodontal diseases.

SAS-32

PERINEAL HERNIA IN DOGS AND ITS SURGICAL CORRECTION – REVIEW OF EIGHT CASESK.D. John Martin, Sudheesh S. Nair, Laiju M. Philip, **M.R. Manasa**, C.B. Devanand, Soumya

Ramankutty, K.M. Dileep Kumar, Anvitha Hansoge, M.K. Praveen and Sharat Joshi

Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences, Kerala Veterinary and Animal Sciences University, Mannuthy, Thrissur, Kerala

Eight uncastrated male dogs aged nine to eleven years were presented to the University Veterinary Hospital, Mannuthy and Kokkalai, KVASU, with the history of perineal swelling, tenesmus and anuria since three days to one month of presentation. Out of eight cases two were bilateral. Contents of the swelling were differentiated by the aid of radiography and ultrasonography. Under general anaesthesia standard herniorrhaphy in seven cases and hernioplasty in one case was performed. The hernial contents were bladder, prostate gland, retroperitoneal fat, intestinal loops, para-prostatic cyst and rectal diverticulum. Castration was performed in all the cases along with repair of hernia. Postoperatively antibiotics and analgesics were given orally. Recurrence was not recorded in any of the cases and all dogs made an uneventful recovery.

SAS-33

INGUINAL HYSTEROCELE WITH PYOMETRA AND ITS SURGICAL TREATMENT IN A CHINESE PUG

Sudheesh S. Nair, Soumya Ramankutty, **M.R. Manasa** and C.B. Devanand

Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences, Kerala Veterinary and Animal Sciences University, Mannuthy, Thrissur, Kerala

A 6 year old intact female Chinese Pug weighing 10.5 kg was presented to University Veterinary Hospital, Mannuthy, KVASU with a complaint of reducible swelling in inguinal region and pus discharge from vulva. Clinical examination, radiography and ultrasonography confirmed the condition as inguinal hysterocele with pyometra. Under general anaesthesia, ventral midline approach was performed. On incising hernial sac, intestinal loops, sacculated uterus with pus, left cystic ovary and fat were found as hernial contents protruding through the left inguinal ring. Kelotomy was performed and intestinal loops were reduced back to abdominal cavity and panovariohysterectomy was performed. Herniorrhaphy was done by number 1 polyglactin 910 followed by subcuticular sutures and the skin was apposed. Post-operatively animal was treated with Cephalexin at 25mg per kg body weight twice daily for 5 days, Meloxicam at 0.2mg per kg body weight daily for 3 days and supportive fluid therapy. The animal had an uneventful recovery.

SAS-34

LINEAR FOREIGN BODY ALONG WITH INTUSSUSCEPTION IN A DASCHUND DOG

D.R. Manjunath, N. Nagaraju, Harshitha, G. Naghbushan H.V. and Chandrashekhara

Department of Veterinary Clinical Complex, Veterinary College, Hassan, Karnataka

A nine months old Daschund was presented to the Department of Veterinary Surgery and Radiology, Veterinary College, Hassan with the history of chronic reduction in appetite, intermittent vomiting and diarrhea noticed since a week. On detailed examination pet was dehydrated, with congested mucous membranes. Abdominal palpation suggested mass of about 4cm in length was palpable which indicated abnormal intestines. A survey radiography revealed no radiopaque object but contrast radiography taken showed barium coated mass in the small intestine also streaks were observed. Fluid therapy was indicated prior surgery and upon exploratory laparotomy intussuscepted mass, with severe plication's were noticed throughout the intestines. Milking of the intussuscepted part was done and a nick incision was made near the mass and removed, belt like material (foreign body) attached with long thread from then duodenum till the colon. Incision site was sutured using vicryl no 2-0 interrupted pattern and checked for leakage. Surgical site was closed as per the standard procedures. Post operatively fluid therapy, and antibiotics were administered and pet recovered without any complications.

SAS-35

INCIDENCE OF HIP DISORDERS IN DOGS

N. Nagaraju, Makkena Sreenu, M.S. Vasantha M. Srinivas and N.K.B. Raju

Department of Veterinary Surgery and Radiology, Veterinary College, Hassan, Karnataka

A total of 198 cases of hip dysplasia were reported during the study period at Department of Surgery & Radiology, NTR College of Veterinary Science, Gannavaram from January 2016 to December 2018 and the conditions like osteoarthritis, hip dysplasia, subluxation of hip, luxation of hip, hip fractures, etc. were commonly recorded. The incidence of hip dysplasia was further analysed based on breed, sex and age. Higher incidence of hip disorders was found in male dogs (62.12%) than in female dogs (37.87%) and was due to preference of the people to keep males as companion animals than females, aggressiveness of males and tend to wander more than female dogs. Breed wise incidence of hip dysplasia in Labrador Retriever (28.28%); Non-descriptive (17.68%); German Shepherd (8.00%); Spitz (9.09%); Pomeranian (6.57%); Great Dane (1.52%); Rottweiler (3.54%); Saint Bernard (1.01%); Pitbull (1.52%); Pug (3.03%); Chihuahua (1.01%); Doberman (4.04%); Golden retriever (5.05%); Dalmatian; (3.54%); Dachshund (1.52%) and Boxer (4.55%) were observed. Hip dysplasia were more in giant breeds could be due to fast growth during development than small breeds. Higher incidence of hip disorders was observed in dogs aged above five years (47.47%) followed by dogs of age 0-1 year (31.31%) and between above one year to five years (21.21%). Higher incidence in aged dogs was due to cartilage wear and tear, owners presenting the dogs in advanced stage and confirmation by radiography after conservative treatment.

SAS-36

MANAGEMENT OF SUPERFICIAL CUTANEOUS NEOPLASMS – A RETROSPECTIVE STUDY

S.B. Akhare, S.V. Upadhye, M.R. Kate, **A.M. Kshirsagar** and G.S. Khante

*Department of Veterinary Surgery and Radiology, Nagpur Veterinary College,
Maharashtra Animal and Fishery Sciences University, Nagpur, Maharashtra*

An extensive study on management of superficial cutaneous neoplasms was conducted over a period of five years 2014-2019 at TVCC, NVC, Nagpur. The various therapeutic modalities like intravenous chemotherapy, nano-particulate induced targeted intra-tumoral drug administration, adjunct chemotherapy, electrochemotherapy and surgical excision of superficial cutaneous neoplasms by conventional and LASER were undertaken in 72 dogs. The assessment of different treatment modalities were carried out on the basis of clinical observations, haemato-biochemical indices, histopathological observations, regression, recurrence and quality of life. The efficacy of different treatment regimen is depicted in the results of the study.

SAS-37

EVALUATION OF IRON OXIDE NANO-PARTICLES DOXORUBICIN COMPLEX AND INTRAVENOUS ADMINISTRATION ALONG WITH ORAL ANTIOXIDANT SUPPLEMENTATION

M.R. Kate, S.B. Akhare, S.V. Upadhye, Gauri Khante and P.E. Taksande

*Department of Veterinary Surgery and Radiology, Nagpur Veterinary College,
Maharashtra Animal and Fishery Sciences University, Nagpur, Maharashtra*

The clinical study was conducted at TVCC, NVC, Nagpur on 12 dogs divided in two equal groups, suffering from superficial malignant tumour. In group A, two doses of doxorubicin @ 30mg/m² were administered intravenously at the interval of 20 days. In group B, iron oxide nano-particles Doxorubicin complex was administered intratumorally on day 0, 7 and 20. In both the groups oral antioxidant supplementation @ 1ml/5kg body weight for 30 days was given. In group A, significant reduction in haematological indices was noted while significant elevation was observed in biochemical parameters whereas in group B, no significant changes were noted in any of the haemato-biochemical parameters. In group A, side effects like symptoms of weakness, lack of energy and decreased ability to perform physical work, vomiting were seen after every cycle which reduced gradually. Also, generalized alopecia started after second cycle and dogs regained the hair coat after the fifth week. In group B, inappetence for 2 days was observed after administration of complex. Histopathological features indicated reduction in mitotic figures, reduction in vessels and increased necrotic cells more pronounced in iron oxide nano particle doxorubicin complex. The overall response of treatment protocol using iron oxide nanoparticles-doxorubicin complex intratumorally along with oral antioxidant supplementation indicated that it is an effective modality in skin and appendage tumour with minimum cytotoxic effect.

SAS-38

EVALUATION OF LASER FOR EXCISION OF SUPERFICIAL TUMOURS IN DOGS

A.M. Kshirsagar, S.B. Akhare, P.T. Jadhao, S.V. Upadhye, Gauri Khante and M.R. Kate

*Department of Veterinary Surgery and Radiology, Nagpur Veterinary College,
Maharashtra Animal and Fishery Sciences University, Nagpur, Maharashtra*

The study was conducted on 18 clinical cases of dogs with superficial tumours during the period December 2018 to July 2019 at TVCC of Nagpur Veterinary College, Nagpur. The cases were randomly divided in three equal groups and subjected to surgical excision by different incisional tools viz. scalpel blade, diode continuous wave mode and diode pulse wave mode. All surgeries were performed using Xylazine-Ketamine-Diazepam combination anaesthesia. Group I was subjected to excision of superficial tumour with the conventional scalpel blade as an incisional tool. Superficial tumours in group II were excised with the help of LASER surgical unit by using 15-25W continuous wave (CW) mode; whereas, group III cases were subjected to similar procedure with 15-25W pulsed wave (PW) mode of

LASER. Haemato-biochemical parameters were unaltered in all the groups pre and post-operatively. Scalpel excision procedures took the longest duration of procedure followed by Pulsed wave of laser. CW mode procedures were quickest among three. Intra operative haemorrhages were considerably less in laser excision than that of the scalpel group. LASER surgical excision with Diode laser Continuous or Pulsed wave mode, was found superior over the conventional Scalpel excision on the basis of various parameters such as duration of the surgical procedure, intraoperative haemorrhage and ease of surgical process.

SAS-39

SURGICAL MANAGEMENT OF OBSTRUCTION AT ILEO-CAECOCOLIC JUNCTION DUE TO IMPACTION

Ambika Arvind, P.T. Jadhao, S.V. Upadhye, S.B. Akhare, M.R. Kate and Gauri Khante

*Department of Veterinary Surgery and Radiology, Nagpur Veterinary College,
Maharashtra Animal and Fishery Sciences University, Nagpur, Maharashtra*

A dog was presented to the Teaching Veterinary Clinical Complex, Nagpur Veterinary College with history of anorexia, constipation, vomiting. The dog was dull, depressed and presented with a mildly distended abdomen. Physical examination and abdominal palpation revealed a hard impacted intestinal segment. Ultrasonography examination revealed gas and fluid filled intestinal loops however cause of impaction could not be determined. Dog was initially stabilised and an exploratory laparotomy was performed. During the laparotomy, it was observed that the intestinal loops were distended and fluid filled. At the ileo-caeco-colic junction, an external obstruction caused by a band of mesentery looped around the intestine was found. There was no strangulation and the loops were not found to be ischaemic or devitalized. The band of mesentery was clamped and cut to relieve the obstruction. The surgical site was routinely closed. Dog resumed food intake within 7 days and recovery was uneventful.

SAS-40

SURGICAL MANAGEMENT OF LOWER URINARY TRACT AFFECTIONS IN MALE DOGS WITH REFERENCE TO URETHROCYSTOSCOPY

Reena Nathani, S.V. Upadhye, S.B. Akhare, P.E. Taksande, G.S. Khante and A.M. Kshirsagar

*Department of Veterinary Surgery and Radiology, Nagpur Veterinary College,
Maharashtra Animal and Fishery Sciences University, Nagpur, Maharashtra*

Study on management of lower urinary tract affections in male dogs was carried out at TVCC of Nagpur Veterinary College was conducted. Male dogs of various breeds presented with clinical signs related to lower urinary tract affections were subjected to urinalysis, haemato-biochemical estimations, radiographic, ultrasound examination and endoscopic examination. Endoscopic examination aided visualization of various conditions such as urolithiasis, cystitis, urethral stricture and neoplasm. Endoscopic

guided basket retrieval of small uroliths was also possible in few cases. Cases of cystitis and urinary tract infection were medicinally managed, whereas cases managed by surgical methods were discussed and presented.

SAS-41

SURGICAL MANAGEMENT OF COLON OBSTRUCTION DUE TO A SEROSAL TUMOUR IN A LABRADOR PUP

Gauri Khante, Reena Nathani, S.V. Upadhye, S.B. Akhare, A.M. Kshirsagar and Ushma Patel

*Department of Veterinary Surgery and Radiology, Nagpur Veterinary College,
Maharashtra Animal and Fishery Sciences University, Nagpur, Maharashtra*

Intestinal tumours are of the less common causes of intestinal obstruction or intussusception in young canines. A three-and-a-half-month-old male Labrador was presented at TVCC, Nagpur with a history of anorexia and vomition since a week. Clinical examination showed the pup to be moderately dehydrated and anaemic, with a firm mass palpable in the mid-abdominal region. Ultrasonography detected a possible mass adhered to the intestine. The pup was subjected to exploratory laparotomy and a tumour mass attached to the serosa of the colon was surgically excised. Recovery was uneventful with no reported recurrence or obstruction for three months post-surgery.

SAS-42

OESOPHAGEAL FOREIGN BODY (BONE) IN DOGS- A REVIEW OF FIVE CASES

S. Kokila, S. Dharmaceelan, **D. Vishnugurubaran**, A.R. Ninu, M. Bharathidasan, R. Ramprabhu

*Department of Veterinary Surgery and Radiology, Veterinary College and Research Institute,
Tamil Nadu Veterinary and Animal Sciences University, Tirunelveli, Tamil Nadu*

The most common oesophageal foreign bodies in dogs are bones. They may cause partial or complete obstruction of the oesophageal lumen. Five dogs were presented to the Veterinary Clinical Complex, VC&RI, Tirunelveli aged between 8 months - 2 years with the history of salivation, retching, regurgitation, inappetance, dehydration and restlessness. Physical examination of two animals revealed a foreign body in the cervical oesophagus. Survey radiography was taken for all the five cases which revealed radioopaque bone pieces in different parts of the oesophagus. Manual retrieval through oral cavity was attempted in two cases of which one was successfully retrieved under general anaesthesia. Four dogs were subjected to surgery of which oesophagotomy was performed in two dogs and gastrotomy in two cases under Isoflurane anaesthesia. Post operative fluid therapy, antibiotics, antihistamine, and analgesics were administered to all the dogs. Three dogs made an uneventful recovery except two that underwent gastrotomy died after 2 days.

SAS-43

MEDICINAL DISSOLUTION AND SURGICAL MANAGEMENT OF URINARY CALCULI IN DOGS**J.J. Parmar**, P.V. Parikh, P.B. Dabhi, Angel Parmar and Kavita Kurup*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H., Anand Agricultural University, Anand, Gujarat*

The dogs (n=29) with urolithiasis and having urine pH ranging from 7.5 to 8.5 (Group 1A, n=9) subjected for medicinal dissolution using Ammonium Chloride @ 5 mg/kg body weight orally and urine pH ranging from 6.5 to 7.0 (Group 1B, n=10) using Di Sodium Hydrogen Citrate @ 0.03 mg/kg body weight orally for 60 days and extended treatments for 30 days more if required monitored radiographically. Complete dissolution within sixty days reported in 10 dogs and 3 dogs required up to three months medication. Two dogs from Group 1A and four dogs from Group 1B did not responded, hence, subjected for surgical management (Group 3, n=6) comprised pre-and post-scrotal urethrotomy (n=1, each) and cystotomy (n=4). The dogs (n=10, Group 2), having large sized, one to multiple calculi subjected to surgical removal according to location of urinary calculi, comprising cystotomy (n=8), pre-and post-scrotal urethrotomy (n=1, each).

SAS-44

TREATMENT OF TRANSITIONAL CELL CARCINOMA WITH IMMUNOTHERAPY USING BCG VACCINE IN DOGS**J.J. Parmar**, P.V. Parikh, P.B. Dabhi, Angel Parmar and Kavita Kurup*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H., Anand Agricultural University, Anand, Gujarat*

The seven dogs having transitional cell carcinoma treated with immunotherapy using Bacillus Calmette–Guerin (BCG) Vaccine diluted in 50 ml of normal saline and injected into bladder through urinary catheter with minimum three medications at a weekly intervals. All the dogs were screened ultrasonographically to monitor the recovery from the disease. Out of seven dogs, five dogs (71.43 %) dogs recovered with medications of three cycles, whereas two (28.57 %) dogs required repetition of immunotherapy for one more additional cycle. The results of the present findings are indicative of efficacy of immunotherapy using BCG vaccine for transitional cell carcinoma in canines and can be recommended as a choice of management strategy for neoplasia of bladder.

SAS-45**RELATIONSHIP BETWEEN MINERAL COMPOSITION OF CALCULI WITH BREEDS AND DIET OF DOGS****J.J. Parmar**, P.V. Parikh, P.B. Dabhi and J.K. Mahla*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H., Anand Agricultural University, Anand, Gujarat*

The mineral composition of urinary calculi (n=24) revealed calcium oxalate highest in Pomeranian (33.33 %, n=4) breed followed by Labrador, Pug and German shepherd (16.67 %, n=6, each), and Non-descript and Himalayan mastiff (8.33 %, n=2, each). Struvite type of urinary calculi found higher in Labrador (50.00 %, n=4), followed by Pug (37.50 %, n=3) and Lhasa Apso (12.50 %, n=1). The urate, combinations of struvite and carbonate apatite in Pug (n=1, each), combination of calcium oxalate and carbonate (n=1), struvite and calcium oxalate (n=1) in Labrador. Among the dogs having calcium oxalate calculi found highest (41.67 %, n=5) in dogs fed a combination of vegetarian and commercial feed, followed by vegetarian diet (33.33 %, n=4), commercial diet (16.66 %, n=2) and combination of vegetarian and non-vegetarian diets (8.33 %, n=1). Struvite calculi found highest in dogs fed commercial diet (50.00 %, n=4) followed by vegetarian diet, combinations of vegetarian and non-vegetarian diets, and combination of vegetarian and commercial available diets (12.50%, each, n=1).

SAS-46**PERINEAL HERNIA IN DOGS: REPORT OF SIX CASES****I. Nath**, S.S. Behera, B. Jena, S.N. Varun, D.K. Sahu, A. Shukla, P. Sao and M. Rout*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H., Odisha University of Agriculture and Technology, Bhubaneswar, Odisha*

Perineal hernia conditions were recorded in five male and a female dog. All cases had soft reducible swelling. Structures visible in plain radiography included small intestine, urinary bladder and prostate. Contrast radiography studies were conducted to confirm presence of urinary bladder and intestine using negative contrast and positive contrast respectively. Ultrasonography was useful in identification of presence of contracting intestines, urinary bladder and omental structures. Surgical corrections were conducted in sternal or lateral recumbency under general anesthesia using mixture of atropine (0.04mg/kg), xylazine (1mg/kg) and ketamine (5mg/kg). Anesthesia maintained with Ketamine. Long curvilinear incision was made over the swelling. Hernial contents were reduced by dissecting subcutaneous and fibrous attachments. Hernial ring was closed by suturing external anal sphincter with levatorani and coccygeal muscles using polyglactin 910 2-0. Skin incision were closed using polyamide 2-0. Post-operatively animals were kept on laxatives and semi-liquid diet, and uneventful recovery noticed.

SAS-47

PERINEAL URETHROSTOMY IN TOM CATS

Samar Mahendran, Vikash Chauhan, Correia Salisha, Vaibhav Bishnoi and Shriram Ganesan
CGS Hospital, Gurugram, Haryana

Six male cats were presented to CGS Hospital with the history of stranguria since 1-3 days. Physical examination revealed altered mentation, distended abdomen, abdominal pain, urethral spasms. Emergency ultrasound guided cystocentesis was done. Haematology and urine analysis was performed. Abdominal radiographs revealed Cystoliths in 1 case. Abdominal Ultrasonography showed cystitis, urinary casts and urinary tract infection. Perineal urethrostomy with castration was performed in all cases under inhalant general anesthesia. Sutures were removed 2-3 weeks post surgery. Complications included suture dehiscence, urine scalding and stricture in 1 case, death due to toxemia in 1 case, 4 cats recovered uneventfully. Perineal urethrostomy can be an effective surgical option for recurrent stranguria and feline lower urinary tract disease.

SAS-48

VASCULAR RING ANOMALY DUE TO PERSISTENT RIGHT AORTIC ARCH WITH LEFT LIGAMENTUM ARTERIOSUM IN A PUPPY- ITS SURGICAL MANAGEMENT THROUGH LEFT 4TH INTERCOSTAL THORACOTOMY

Sooryadas S., **Jinesh Kumar N.S.**, Reji Varghese, Anikshit Verma, Souljai J.S., Anjana Satheesh,
 Rahul Rao, Nagashree V. and Dinesh P.T.

*Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences,
 Kerala Veterinary and Animal Science University, Pookode, Wayanad, Kerala*

Persistent right aortic arch with left ligamentum arteriosum is reported to be the most common vascular ring anomaly, causing encircling and constriction of the oesophagus at the base of the heart, and resultant oesophageal dilation cranial to it. Regurgitation of undigested food is the clinical sign associated with this disorder, and is manifested following weaning. A German shepherd puppy aged two months was presented with similar signs of post-prandial regurgitation of solid food following weaning. Survey radiograph of thorax revealed severe dilatation of oesophagus along with radio-opaque foreign bodies, cranial to the base of the heart. Constriction of the oesophagus at base of the heart was also noticed. From the history, clinical signs and radiographic findings, it was diagnosed as vascular ring anomaly due to persistent right aortic arch with left ligamentum arteriosum. Under general anaesthesia and controlled ventilation, surgical correction was performed through left 4th intercostal thoracotomy. The ligamentum arteriosum was resected after double ligation, to open the vascular ring and relieve the constricted oesophagus. The procedure in detail is reported here.

SAS-49

SURGICAL MANAGEMENT OF UROLITHIASIS IN CANINES

Prabha Sharma, R.P. Pandey, S. Purohit, Gulshan Kumar, Chetan Sharma,
Raveendra R.T. and Atul Yadav

*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H.,
DUVASU, Mathura, Uttar Pradesh*

Four dogs suffering from urolithiasis was presented with history of anorexia, stranguria, dysuria and urine retention. Out of these 3 dogs were males, Dalmatian (10 year), Labrador (4 year) and cocker spaniel (2.5 year), and one female labrador (4 year). Abdominal palpation reveals distended bladder. Radiographic and ultrasonographic examination revealed calculi in the urinary bladder. In one, the urethral calculi was also present just caudal to os penis. Custotomy was performed under general anaesthesia to retrieve the calculi. In one case, urethrotomy was also performed. All the cases recovered uneventfully.

SAS-50

**CHEMOTHERAPEUTIC EFFECTS OF DOCETAXEL AND GENE
EXPRESSION DURING REGRESSION OF MAMMARY TUMOR IN
CANINE**

Prachi Upadhyay, N.S. Jadon, Priyanka Pandey, **R.S. Sandhu**, Deepti Bodh,
Manjul Kandpal and Jyotsana Bhatt

*Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences,
G.B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand*

Sixteen dogs suffering from canine mammary tumour were randomly divided into two groups and subjected to following treatment protocol: Group I (Docetaxel (@ 30mg/m² weekly four consecutive cycles); Group II (surgical excision of tumor followed by chemotherapy with Docetaxel (@ 30mg/m² weekly four consecutive cycles). Clinically, better response and survival rates with more down-regulation of EGFR gene involved in tumor invasion and metastasis was observed in animals that underwent surgery followed by chemotherapy with docetaxel. Combination therapy i.e. surgery with chemotherapy using docetaxel may be used safely by veterinarians under proper observation for the treatment of mammary tumor in canine.

SAS 51

COMPARATIVE STUDY OF AUTOLOGOUS PRF THERAPY AND STEM CELL THERAPY ALONG WITH FULL THICKNESS MESH GRAFTING FOR REPAIR OF LARGE DEFECT WOUNDS IN DOGS

Bajekal N.S., Ulemale A.H., Suryawanshi R.V., Wani M.R., Mote C.S and Mehere P.V

Department of Veterinary Surgery and Radiology, KNP College of Veterinary Science, Shirwal, Satara, Maharashtra

The present clinical study was carried on twelve dogs with variable superficial extremities wounds and subjected to autologous full thickness mesh grafting with autologous PRF therapy in group I and c-ADMSCs therapy in group-II. All the wounds were dressed till they achieve healthy granulation bed and immobilized with wet to dry bandage and splint wherever necessary. Adherence of graft to recipient site was assessed on basis of various gross parameters on days 0, 4, 7, 10, 14 and 21 and histomorphological examination of graft junction was carried on day 7 and 14. Blood picture in both the groups of dogs showed non-significant difference in haemoglobin and total platelet counts in both the groups, however, group II showed significant increase in the total platelet count on day 0 and day 7 might be due to the action of ADMSCs. The mean time taken for preparation of the recipient bed was 5.83 ± 1.38 days in both groups with varying color of graft from healthy pink to mottled pink to pale pink to healthy pink over the days except two cases. Out of 12, 10 cases showed adequate hydrated graft featured by healthy pink, mottled pink and pale pink while two wounds showed desiccation and maceration due to self-mutilation. In both the groups, graft were mobile on day 0 and 5 cases (83.33%) immobile on subsequent days with minimum amount of exudation in group II could be due to the anti-inflammatory properties of ADMSCs. The amount of scar formation were less group II as compare to group I might be due to the anti-scarring abilities of ADMSCs while two cases showed excessive scar formation from both group. The cosmetic appearance of the skin grafts was excellent and histologically uneven epithelial tissue, infiltration of inflammatory cells, presence of fibrous connective tissues and granulating tissues on 7th day while bridging of gap between host and graft characterized with collagen fiber deposition and fibrous connective tissue proliferation was observed on day 14th in both groups. Comparatively group II showed less inflammation, edematous accumulation and increase the rate of proliferation as well as collagen fiber could be due to injection of ADMSCs. To concludes, both the therapies are equally effective in autologous full thickness graft acceptance due to increased angiogenesis, blood perfusion and collagen proliferation in wound healing for management of extremities wound in canine. However, ADMSCs showed minimum scar and excellent cosmetic appearance of healed wounds as compare to PRF therapy and it needs to be supported greater sample size to consolidate treatment modality.

SAS-52

CHANGES IN STEROIDAL HORMONE LEVEL IN CYSTIC ENDOMETRIAL HYPERPLASIA(CEH-P) COMPLEX AND AFTER OVARIOHYSTERECTOMY

Pushpa, Kanika Tiwari and Arup Kumar Das

*Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences,
G.B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand*

The study was conducted on eighteen female dogs which were divided into two groups. Group A include animals affected with CEH-P complex and group B include normal female dogs as control group. Clinical, haemato-biochemical, histopathological examination and hormonal profile were done in both the groups before and after 45 days of the ovariohysterectomy. The hormonal profile revealed significant ($P < 0.05$) difference in the level of steroid hormones mainly progesterone and estrogen in female dogs suffering from cystic endometrial hyperplasia complex (CEH-P) as compared to normal female dogs. The level of these hormones was higher in the affected animals as compared to unaffected animals and the level of LH and FSH were significantly higher in both the groups after 45 days of ovariohysterectomy. Histopathological examination revealed hyperplastic changes in the endometrium and cystic degeneration of endometrial walls. On the basis of above mentioned parameters, it is concluded that the level of steroidal hormones are the main factors in the development of CEH-P complex.

SAS-53

CAMPARISON OF ALTERNATIVE LAPAROTOMY APPROACHES FOR OVARIOHYSTERECTOMY IN CANINES

**Raju Sharda, Dhaleshwari Sahu, Rukmani Dewangan, M.O. Kalim.,
Shiv. K. Sidar and Nutan Panchkhande**

*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H.,
Anjora, Durg, Chattisgarh*

Twelve adult bitches aging 1-2 years were subjected to ovariohysterectomy by alternative laparotomy approaches referred to department of Veterinary Surgery & Radiology. The animals were randomly divided into two groups consisting of six animals in each group. Group I animals were subjected to right flank laparotomy and group II to left flank laparotomy. Surgical parameters like length of surgical incision, operative haemorrhage, ease of exteriorization of uterus and ovaries, ease of ligation of ovaries and uterus and duration of surgical procedure were recorded. Further nature of wound, duration of healing, post operative haematoma/evisceration, clinico-physiological and haemato-biochemical parameters were assessed. From the observations it was concluded that right flank approach is better and safe for performing ovariohysterectomy in bitches as compared to left flank approach.

SAS-54

REGENERATIVE POTENTIAL OF HEPATOCYTIC MESENCHYMAL CELLS IN LIVER DEGENERATION AND DELINEATION OF THEIR GENE EXPRESSION IN CANINE

Rashmi Saini, N.S. Jadon, M. Kandpal, Deepti Bodh, Akansha Godiyal,
R.S. Sandhu and Arun Kumar

*Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences,
G.B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand*

Twenty four dogs of either sex naturally suffering from hepatic dysfunction were used in this study. The animals were randomly divided into four groups administered with different drug or drugs combination viz. control (Group A); pepsid-C @ 1ml /10 kg body weight, IM alternatively for fifteen days (Group B); hepatocytic stem cells @ 5×10^7 cells, intraperitoneally animal thrice at an interval of 5 days (Group C) and hepatocytic stem cells @ 5×10^7 cells, intraperitoneally + pepsid-C @ 1ml /10 kg body weight, IM alternatively for fifteen days (Group D). The clinical signs, haematobiochemical parameters were studied at 0, 3rd, 6th, 10th, 15th and 20th day by using standard protocol. Radiographic and ultrasonographic changes were studied at 0 and 20th day following treatment. Gene expression of CD44 gene was evaluated via real time PCR. On the basis of parameter observed in this study, it was concluded that the effectiveness of treatment at 15th and 20th day interval was more in the animals treated with combination of hepatocytic stem cells + pepsid-C (Group D) and hepatocytic stem cells (Group C) alone as compared to pepsid-C alone (Group B). Gene expression of CD44 associated with regeneration was evident in animals where liver derived hepatocytes were administered and not evident in other group (A and B) while GAPDH, being a housekeeping gene was evident in all groups. Hepatocytic stem cells are necessary for the creation of new cells for growth, development and regeneration. Thus the combination of hepatocytic stem cells and pepsid-C may be used safely by field veterinarian for the treatment of hepatic dysfunction in canine.

SAS-55

SURGICAL MANAGEMENT OF KERATOCANTHOMA IN AN ALBINO MICE

R.S. Sandhu, N.S. Jadon, Arun Kumar, Rashmi Saini, **Bharti Negi**, Siakat Kundu,
Shivam Kartikey Bhardwaj and Animesh Mishra

*Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences,
G.B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand*

An albino mice weighing 340 grams was presented to TVCC Pantnagar with the history of subcutaneous growth on the left part of thorax. On palpation it was observed that the growth is superficial and not connected to the thoracic cage. The animal was administered general anaesthesia (Xylazine @ 10mg/kg body weight + Ketamine @ 75mg/kg body weight). the tumorous growth was resected under general anaesthesia and sent for histopathological evaluation. The weight of the resected tumor was 28 grams. The animal started taking normal feed 6 hours after the procedure. The treatment was followed up with antibiotic

(Amoxiclav @10mg/kg body weight) for 5 days and sutures were removed 7 days after the procedure. The growth was benign and recurrence was not observed after 1 month of the surgery.

SAS-56

SURGICAL MANAGEMENT OF DOUBLE INTUSSUSCEPTION IN TWO DOGS

**Raveendra R.T., R.P. Pandey, S. Purohit, Gulshan Kumar, Chetan Sharma,
Prabha Sharma and Atul Yadav**

*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H.,
DUVASU, Mathura, Uttar Pradesh*

Two Labrador pups aged 4 and 5 months presented with history of anorexia, diarrhoea, tenesmus, mucoid bloody faeces and recurrent rectal prolapse from past few days. Clinical and ultrasonographic examination revealed as cases of intussusception. Enterectomy and anastomosis was planned to resect out the intussusception portion of the intestine. The operative site was prepared in routine manner. The dogs were premeditated with atropine sulphate (@0.04 mg/kg body weight) and xylazine (@ 1.5 mg/kg body weight) intramuscularly at 10 minute interval. The general anaesthesia was induced using ketamine hydrochloride (@ 5 mg/kg body weight) intramuscularly and maintained on isoflurane (1-2%) inhalational anaesthesia. The midline laparotomy was performed and intussusception part was taken out from the laparotomy wound. Two intestinal clamps were placed on 4 cm away from the intussusception on proximal and distal portion of the healthy intestine. The intussusception portion was dissected out and end to end and side to side anastomosis were performed, respectively. Post-operatively, the animals were managed on liquid and semi solid diet. Antiseptic dressing along with antibiotic, anti-inflammatory therapy was given for 5 days. The antiseptic dressing of the suture line was done till healing. Sutures were removed on 12th post-operative day. Eventless recover was observed in these cases.

SAS-57

PORCINE BLADDER ACELLULAR MATRIX GRAFT (BAMG) FOR EXPERIMENTAL CYSTOPLASTY IN RABBITS

**Rukmani Dewangan, A.K. Sharma, Naveen Kumar, Himani Singh,
Amit Kumar and Rajendra Singh**

Division of Surgery, Indian Veterinary Research Institute, Izatnagar, Bareilly, Uttar Pradesh

The present experiment was aimed to investigate the use of porcine bladder acellular matrix graft (BAMG) for repair of experimentally created urinary bladder defect in rabbits. A total of 12 healthy adult New Zealand rabbits of either sex divided into Group I and Group II (control group). In group I, a 10 mm x 10 mm urinary bladder defect was repaired by same size of BAMG using 4/0 PGA sutures with continuous suturing pattern. The defect in group I were repaired with autograft. The healing was evaluated on the basis of physiological, haemato-biochemical, cystogram, ultrasonographic and laparoscopic examination. For

gross and histopathological observation, rabbit from both groups were euthanized at 30 and 90 days after surgery. In both groups, all rabbits recovered uneventful without any complication. Histopathological examination revealed that BAMG turned into normal urinary bladder tissue. Therefore, it could be concluded that porcine BAMG can be safely used for cystoplasty in rabbits as successfully accepted by host tissue without any immunological rejection.

SAS-58

TREATMENT OF CANINE TRANSMISSIBLE VENEREAL TUMOUR USING DIFFERENT SURGICO-CHEMOTHERAPEUTIC PROTOCOLS

Nutan Punchkande, Rukmani Dewangan, Raju Sharda, M.O. Kalim, D.K. Johle, H.K. Ratre, Dhaleshwari Sahu, S.K. Sidar, S.K. Yadav and Devendra Yadav
Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H., Anjora, Durg, Chattisgarh

The present study was conducted to compare the efficacy of different surgico-chemotherapeutic protocols for treating canine transmissible venereal tumour. The study was performed on 18 canines of various breeds, irrespective of age, sex and divided into three groups consisting 6 animals in each group. Group A was treated with surgical excision of tumour only whereas Group B and Group C were treated with surgical excision of tumour followed by administration of Doxorubicin (30mg/m²) BSA and Vincristine sulphate (0.025 mg/kg) intravenously along with DNS at 7th and 14th post-operative days respectively. Physiological and haemato-biochemical parameters showed transient changes before, post surgery and post chemotherapeutic management which was within normal range. Histopathological examination revealed confluent sheet of tumour cells arranged in large round oval or polyhedral shaped distributed in tight clusters or cords. Group A showed mild to moderate reoccurrence while Group B showed minimum reoccurrence. Group C showed no reoccurrence. Thus, surgery combined with vincristine therapy is most effective for treating dogs suffering with transmissible venereal tumour.

SAS-59

SURGICO-CHEMOTHERAPEUTIC MANAGEMENT OF MAMMARY TUMOURS IN CANINES

Nutan Punchkande, Rukmani Dewangan, M.O. Kalim, Raju Sharda, D.K. Johle, H.K. Ratre, Dhaleshwari Sahu, S.K. Sidar, S.K. Yadav and Devendra Yadav
Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H., Anjora, Durg, Chattisgarh

The study was performed to evaluate different surgico-chemotherapeutic regimens for management of mammary tumour in canines. The study was conducted on 18 clinical cases of mammary tumour of various breeds, irrespective of age, sex and divided into three groups consisting 6 animals in each group. Based on treatment regimens, animals were divided into three groups. Group A in which only surgery was

performed while Group B and Group C in which surgery followed by administration of Doxorubicin (30mg/m²) BSA and Vincristine sulphate (0.025 mg/kg) intravenously alongwith DNS at 7th and 14th post-operative days respectively. Histopathological examination revealed more cases of adenocarcinoma followed by mixed carcinoma. All haematological and biochemical parameters were recorded preoperatively, post surgery and post chemotherapy which remained within normal physiological range. Surgery alongwith chemotherapy (doxorubicin and vincristine) showed minimum to no reoccurrence with few adverse reactions such as inappetance, vomition, anaemia and alopecia. However, these conditions were managed by supportive therapy. The present studied showed that surgery combined with vincristine therapy is best for management of mammary tumour in canines as effectively regresses the tumour without relapse.

SAS-60

GASTROINTESTINAL FOREIGN BODY OBSTRUCTION AND ITS SURGICAL MANAGEMENT IN NINE DOGS

Sudheesh S. Nair, Soumya Ramanakutty, **Sharat Joshi**, Lavanya, B., Praveen, M.K., John Martin K. D., Laiju M. Philip and Devanand C.B.

Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences, Kerala Veterinary and Animal Sciences University, Mannuthy, Thrissur, Kerala

Nine dogs were presented to University Veterinary Hospital, Kokkalai and Mannuthy, KVASU with history of anorexia, vomiting and scanty loose faeces. Abdominal palpation revealed painful freely moving mass in all dogs. Plain radiograph demarcated radioopaque foreign body in eight cases and with contrast radiography for one. Under general anaesthesia laparo-gastrotomy for three dogs and laparo-enterotomy for six dogs was performed. Mango-kernel, padlock, stones, nails, toy wheel, ball, thread were retrieved from surgery. The obstructed segment of ileum and jejunum were devitalised in one dog in which enterectomy and end to end anastomosis were performed. Closure of laparotomy was done in routine manner. Post-operatively NPO for 72 hours, intravenous fluid therapy, antibiotics and proton pump inhibitors for five days were administered. All animal had uneventful recovery.

SAS-61

PARAGASTRIC MESENTERIC ABSCESS IN A GERMAN SHEPHERD DOG AND ITS SUCCESSFUL SURGICAL TREATMENT

Devanand C.B., Soumya Ramanakutty, **Sharat Joshi**, Lavanya B., Praveen M.K., John Martin K.D. and Dileep Kumar K.M.

Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences, Kerala Veterinary and Animal Sciences University, Mannuthy, Thrissur, Kerala

A four year old German Shepherd dog was presented to University Veterinary Hospital Mannuthy, KVASU with history of anorexia and weakness. Abdominal palpation revealed a large fluctuating mass extending from xiphoid to umbilicus was palpable. Hematological examination revealed leucocytosis,

lymphocytosis, thrombocytopenia and anaemia. Radiographic examination revealed a large moderately radio-opaque sac ventral to stomach. Ultrasonography revealed a hypo-echoic sac found near stomach and ultrasound guided aspiration expressed purulent material. Under general anesthesia exploratory laparotomy was performed. A dehusked coconut size (18 x 12cm) fluid filled mass with mesenteric adhesion adjacent to stomach was found and exteriorized. All major blood vessels radiating to the mass were ligated and it was resected. Laparotomy was closed in routine manner. Histopathology examination confirmed mesenteric abscess and culture and sensitivity of purulent material containing gram negative bacilli sensitive to amoxicillin and clavulanate. Post-operative antibiotic, fluid therapy and multivitamins were continued for one week. Animal had an uneventful recovery.

SAS-62

FAST SPLEENECTOMY IN CANINES USING LIGASURE

Samar Mahendran, Vikash Chauhan, Vaibhav Bishnoi, Shriram Ganesan and Correia Salisha
CGS Hospital, Gurugram, Haryana

Ten dogs were presented to CGS Hospital, Gurgaon with the history of weight loss (6/10), abdominal distension (4/10), decreased appetite (10/10). Physical examination, blood analysis were performed at presentation. Abdominal radiographs and ultrasonography revealed gastric dilatation and volvulus (3/10), haemobdomen (1/10), splenic masses (7/10). Emergency stabilization of GDV dogs was done. Under general anaesthesia, splenectomy using Covidien Ligasure was performed. Post-operative treatment included antibiotics, aggressive fluid therapy, blood transfusion (2/10), multivitamins, haematinics and analgesics. Splenic histopathology revealed haemangiosarcoma (4/7), congested spleen (1/7), hemangioma (1/7) and lymphoproliferative disorder (1/7). Use of Ligasure ensured faster surgical time, reduced anesthesia, reduced suture material and faster recovery. All dogs recovered uneventfully.

SAS-63

STUDY ON THE ACCESS TO PULP CAVITY IN INCISORS, CANINE AND CARNASSIAL TEETH IN DOGS

Sunil Kumar, Arun Anand, Vandana Sangwan and J. Mohindroo
*Department of Veterinary Surgery and Radiology, College of Veterinary Sciences,
Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, Punjab*

The study was undertaken to evaluate the access to pulp cavity in dog. Lot of work has been done in human dentistry with respect to access to pulp pathways and endodontics but less literature is available for access to pulp cavity and endodontics in dogs. No work has been done regarding this field in India so, present study was conducted on dogs cadaver. Access point to the pulp cavity of different teeth was studied by using the dental work station and dental radiography. This study will help in establishment of Root canal treatment procedures and restorative dentistry in veterinary field.

SAS-64

SURGICAL MANAGEMENT OF TRAUMATIC OPEN PNEUMOTHORAX IN A DOG

Badal Patle, R.V. Raulkar, I.P. Sarode and S.A. Waghmare

Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences, Parbhani, Maharashtra

Two year old non-descript dog weighting 16kg was presented TVCC, COVAS, Parbhani with the traumatic incised wound at ventral aspect of lower neck region up to thorax. A lung lobe was exposed. Laboured breathing was present. On basis of clinical signs and symptoms the case was diagnosed as traumatic open pneumothorax. In preoperative inj. antihistamine @ 0.5 mg/kg, inj. Meloxicam @ 0.2 mg/kg, inj. Botropase 1ml, inj. Ceftriaxone @ 25mg/kg, inj. Atropine sulphate @ 0.04mg/kg was given. Sedation was done with inj. Xylazine @ 1mg/kg bw. Both induction and maintenance was done with inj. Propofol @ 4 mg/kg. The lung lobe was replaced in position and tube was placed inside the thoracic cavity to achieve negative pressure. Muscle layer was sutured in lock stitch pattern and the tube was removed. The dog recovered uneventually.

SAS-65

STUDIES ON SURGICAL MANAGEMENT OF OBSTRUCTIVE UROLITHIASIS IN DOGS: A REPORT OF NINE CASES

Thajunnisa A.S., Laiju M. Philip., Sudheesh S. Nair., Dileep Kumar K.M., John Martin K.D., Anoop S., and Devanand C.B.

Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences, Kerala Veterinary and Animal Sciences University, Mannuthy, Thrissur, Kerala

Nine dogs with signs of obstructive urolithiasis presented to University Veterinary Hospitals Mannuthy and Kokkalai, KVASU over a period of six months formed subject for the present study. All the animals were having history of difficult urination with clinical signs like stranguria, pollakuria, anuria and/or haematuria. Survey radiographs were helpful in the location of obstruction and ultrasonography revealed intact urinary bladder in all the cases except one case with uroabdomen. Haemato-biochemical, blood gas analysis and urinalysis were conducted in all the cases and surgical interventions were done under general anaesthesia using either urethrotomy, cystotomy or a combination of both depending up on the site of obstruction. Post-operative pH modulators, anti-spasmodics, antibiotic and anti-inflammatory therapy was employed depending upon the condition of patient and all the animals had an uneventful recovery except the one with bladder rupture. Stones retrieved through surgery were subjected to Fourier Transform Infrared (FT-IR) Spectroscopy and microscopic analysis. Identification of Specific calculi composition was Using FT-IR Spectroscopy was helpful in prevention of recurrence through managerial practices once the obstruction was relieved.

SAS-66

CLINICAL EVALUATION OF RIGHT LATERAL FLANK AND VENTRAL MIDLINE APPROACH FOR OVARIOHYSTERECTOMY IN DOG

G.D. Khatal, M.G. Thorat, S.D. Chepte, F.A. Fani, R.K. Fulsunge, S.R. Vaidya,
N.P. Bhavé and A.A. Jadhav

*Department of Veterinary Surgery and Radiology,
Post Graduate Institute of Veterinary and Animal Sciences, Akola, Maharashtra*

The present study was carried out on 12 clinical canine patients presented for elective ovariohysterectomy at TVCC, PGIVAS, Akola. These cases were randomly divided into two equal groups, irrespective of age, breed and body weight. In group A ventral midline approach was undertaken while in group B Right lateral flank approach was done. Qualitative assessment of techniques and clinico-physiological parameters were studied. The average score of surgical wounds based on swelling, exudation, pain, irritation, and wound dehiscence were recorded postoperatively. In ventral midline approach length of incision and duration of surgery was significantly ($P < 0.05$) increased as compared to right flank approach. However, clinico-physiological parameters varied non-significantly in both the groups. On the basis of merits and demerits of two surgical approaches, it can be concluded that the right lateral flank approach can be a good alternative to ventral midline approach for ovariohysterectomy in bitches.

SAS-67

SUCCESSFUL UNILATERAL NEPHRECTOMY IN A LABRADOR WITH RENAL CELL CARCINOMA

P.V. Parikh, **K.P. Patel**, J.K. Mahla, J.J. Parmar, Ashwathkumar S.N., R.R. Anjana
*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H.,
Anand Agricultural University, Anand, Gujarat*

An eight year old, spayed Labrador dog was presented with history of intermittent haematuria since four week. Physical examination revealed presence of a large dorsal intra- abdominal mass near left lumbar transverse process. Radiographic and ultrasonographic evaluation revealed large oval shaped mass in the left renal field, the interior of mass was irregular and somewhat lobulated, while right kidney had normal echotexture. Kidney function tests were within normal range. Unilateral renal neoplasm was suspected and an exploratory celiotomy was performed under general anaesthesia. The left kidney was enlarged with prominent blood vessels. Unilateral nephrectomy was performed and the surgical recovery was uneventful. Histopathological examination revealed renal cell carcinoma. Four week postoperatively, the dog recovered well.

SAS-68

URINARY BLADDER TUMORS IN DOGS: REPORT OF 2 CASES

Shivangi Jorwal, **Sakar Palecha**, Mahendra Tanwar, Narendra Singh, P. Bishnoi,
S.K. Jhirwal and Tushar Goyal

*Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences,
Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan*

Two clinical cases of urinary bladder tumors were presented with the following history and clinical signs; Case 1- Labrador female dog aged 4.5 years and 36 kg body weight initially with dysuria, later progressed to anuria with straining to urinate. The condition was refractory to the medicinal treatment given. Case 2 – Labrador female dog aged 8 years and 41 kg body weight presented with dysuria, blood stained urine and mild abdominal pain. Radiography, CT examination (1 case) and Ultrasound examination (1 case) was done. Clinico-pathological tests were also conducted to correlate with the clinical condition. The presumptive diagnosis in both the cases revealed tumors of urinary bladder. Surgery was performed and the histopathology confirmed the squamous cell carcinoma at the neck of urinary bladder and spindle cell neoplasm at the ventral wall of the urinary bladder. No metastasis was present. Post operatively, the dogs were followed up with chemotherapy with Cisplatin (@50 mg/m²) at 21 days interval, intravenously. Recurrence was observed in the first case, and the animal was euthanised, 15 days after surgery. The other case survived and followed up to 3 months after surgery.

SAS-69

SURGICAL MANAGEMENT OF ABDOMINAL SKIN TUMOUR USING SKIN FLAP TECHNIQUE IN DOG- A REVIEW OF TWO CASES

P. Sankar, **R. Vinilkumar**, S. Kathirvel, A. Kumaresan, K. Jayakumar, S. Vigneshwaran,
K. Monikakrish and C. Saranya

*Department of Veterinary Surgery and Radiology, Veterinary College and Research Institute,
Namakkal, Tamil Nadu*

A Six year old Dashchund and Eight year old spitz dogs were brought to the Veterinary Clinical Complex (VCC), VCRI, Namakkal with the history of progressive swelling in the ventral abdomen for past two months. Clinical examination revealed that the mass was ulcerated in nature, necrosed wound margins with serous discharge in both the dogs. Vital signs were within the normal range for both the dogs. Radiographic examination revealed absence of pulmonary metastasis. Fine needle aspiration biopsy confirmed the mass as Mast cell tumor (Dashchund) and mammary tumour (spitz). Under general Anaesthesia, induction was achieved by Midazolam (0.2 mg /kg) and Propofol (4 mg/ kg) and maintenance with 2% Isoflurane. In Dashchund dog after complete excision of the tumour with clean histologic margins the defect was reconstructed by bipedicle advancement skin flap (H plasty) and in spitz rotational skin flap technique was done after tumor excision. In both the cases flaps were raised and using walking suture the

defect were reconstructed using absorbable suture material catgut. Post operatively antibiotics and analgesics were administered for five days with appropriate wound care. Both the dogs made an uneventful recovery.

SAS-70

EVALUATION OF WOUND HEALING PROPERTIES OF EARTHWORM (*Eisenia Fetida*) COELOMIC FLUID IN RABBIT(*Oryctolagus Cunnichulus*) MODEL

Ujala Nabi, D.M. Makhdoomi, Showkat Nabi, Sabia Qureshi,

Mohsin Ali Gazi and Syed Mudasir Andrabi

*Division of Teaching Veterinary Clinical Complex, Faculty of Veterinary Science and A.H.,
SKUAST-K, Srinagar, J&K*

The development of effective therapeutics with wound healing potential has been highly expected since significant levels of wound inducing morbidity and mortality averted intense economical and social damages on entire society throughout world. In our study randomized grouping of animals was done and topical application of earthworm coelomic fluid, regeneration tissue homogenate from earthworms and 0.5% simple povidone iodine was done/ applied on wound. The primary concern of our study was to observe the relationship between protein expression and molecular signaling pathways involved in wound healing and to identify the wound healing properties from the head regenerating earthworm tissue homogenate and earthworm coelomic fluid through proteomic analysis and genomics. All the topical agents were applied to the wounds using gauze pieces from day 0 until complete healing and wound healing analysis was studied in detail.

SAS-71

SURGICAL AND MEDICAL MANAGEMENT OF CANINE MAMMARY NEOPLASM

Gaurav Kumar, R.N. Chaudhary, Priyanka Duggal, Deepak Kumar Tiwari, Neeraj Arora,

Deepak Kaushik, Dishant Saini and Preeti Chaudhary

*Department of Veterinary Surgery and Radiology, College of Veterinary Sciences,
Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, Haryana*

The study was conducted on the two clinical cases of spontaneous canine mammary neoplasm of Labrador breed irrespective of age and sex presented to Department of Veterinary Surgery and Radiology, LUVAS, Hisar with the history of freely movable or fixed, single or multiple masses attached to the skin or body which were hard to move in the mammary glands. Clinical staging of the animals was performed by using TNM classification (WHO) which revealed that both the animals were in Stage-V. Depending upon the size of tumour, they were subjected to either lumpectomy, mastectomy, episiotomy, surgical removal of tumour mass followed by chemotherapy. The surgical site was aseptically prepared and tumour mass was excised in the dogs premedicated with atropine sulphate, induced with a mixture of xylazine and ketamine,

and maintained under isoflurane anaesthesia. Histopathology of the excised tumour masses revealed fibro-lipoma and adenocarcinoma. Surgical excision combined with vincristine therapy was very effective leading to complete regression of tumour mass and metastases in canine as evident by routine haematological, biochemical and radiographic parameters. Fibro-lipoma showed uneventful recovery, while adenocarcinoma showed significant regression after one month.

SAS-72

APPLICATION OF MORGAN'S MODIFIED POCKET TECHNIQUE AND MODIFIED KASWAN TECHNIQUE FOR CORRECTION OF "CHERRY EYE" IN 6 DOGS

Asit Kumar Maji, Md. Kazem and Rabiul Khan

Department of Veterinary Surgery and Radiology, Faculty of Veterinary and Animal Sciences, West Bengal University of Animal and Fishery Sciences, Kolkata, West Bengal

Cherry Eye or prolapsed of 3rd eye lid gland – bilateral in a Mongrel of 1.5 years, in 2 Beagle of 6.5 and 7 months and in 2 St Bernard of 6 and 7 months as well as unilateral in an adult Labrador Retriever was surgically managed by Pocket Technique of Morgan in above young dogs and modified Kaswan Technique of anchoring to orbital periosteum in the adult. None of these nine prolapse showed any tendency to recur or cornea and lacrimation were normal up to 6 months of post operation with normal pre and post-operative physiological parameters. One-centimetre-long parallel each palpal and bulbar incision, repositioning by continuous suture and buried knots away from the corner are the key words in pocket technique whereas proper needle insertion, T- cartilage and ventral orbital periosteal anchorage in Kaswan technique are the key words of these success.

SAS-73

SURGICAL MANAGEMENT OF TRACHEAL RUPTURE IN A DACHSHUND DOG

Nagaraju N., B.R. Balappanavar, D.R. Manjunatha, Nagabhushana, H.V., Ramya, M.N. and Rakesh, T.

Department of Veterinary Surgery and Radiology, Veterinary College, Hassan, Karnataka

A Dachshund dog of aged one year was presented to Department of Veterinary Surgery and Radiology, Veterinary College, Hassan, with history of wild animal attack one week back, since then dog was having swelling around the neck region and reduced appetite. Physical examination revealed subcutaneous emphysema and external wound at tracheal region and base of left ear. Radiological examination revealed air pockets around the ventral neck region suggestive of tracheal rupture. Dog was anaesthetized with 2.5% thiopental sodium and intubated. The tracheal rupture was identified and sutured using no 2-0 polypropylene. Post operatively analgesics and antibiotics were administered and dog recovered uneventfully.



Wild and Zoo Animal Surgery Session

MEET THE SPEAKER**Dr. K.K. Sarma***Professor & Head*

Department of Veterinary Surgery and Radiology

College of Veterinary Science, AAU,

Khanapara, Guwahati-781022

ISVS-2019

Dr. K. K. Sarma, was born in 1961 and graduated from College of Veterinary Science, Assam Agricultural University, Khanapara, Guwahati in the year 1984, obtained Masters degree in Veterinary Surgery & Radiology in 2006 and PhD in 1994. He has joined his alma mater as Assistant Professor in 1987 and presently serving as the Professor & Head. Dr. Sarma worked on elephant anaesthesia for his PhD and attends over 700 elephants in a year for over three decades, has the record 140 subjugation of rogue elephants to his credit, led the vet team in ambitious rhino translocation program of Assam and UP, has 20 National and International awards including FISVS, travels extensively for wildlife issues worldwide, served as international elephant expert in Indonesia, acted as guest lecturer in North Carolina and New Mexico Universities, US Fish & Wildlife Services, Washington DC, authored over 150 research papers, 13 books, over 100 popular scientific and wildlife adventure stories, conducted 19 national and international training programmes, guided 45 students for MVSc & PhD and delivers on elephant healthcare, immobilization & surgery, management and welfare, human elephant conflict, wildlife disaster management, rescue and translocation of wild animals etc. all over the world. He is known for his services to the wildlife in general and elephants in particular and the Governor of Assam has given him the title “Elephant Man of Asia”.

CHALLENGES OF HANDLING STRAY WILD ANIMALS IN HUMAN DOMINATED LANDSCAPE

K.K. Sarma

*Department of Veterinary Surgery and Radiology
College of Veterinary Science, AAU, Khanapara, Guwahati, Assam*

Man has understood, that it cannot survive as a single species and at least the remaining biodiversity has to be maintained only if it has to secure its own existence for the future. In this principle, every individual animal of every individual surviving species has become valuable. Hunting of wild animals for pleasure and even for food is not acceptable any more. The International Union for Conservation of Nature (IUCN) has prepared list of the endangered species and asked all the member countries to enact laws for their protection. The Government of India has enacted the Wildlife Protection Act (WPA-1972) to extend the umbrella of protection to these wild species, imposing severe punishment for violation by “killing or causing any harm” to them. Wild animals have been classified in different schedules and offering highest degree of protection to the animals of Schedule-I which means that their status is “highly endangered” and that nobody should cause any direct or indirect harm to them.

Now entering a protected area for hunting or poaching is one issue, and handling of a wild animal that has strayed into human dominated landscape is another. Wild animal venturing out to villages and crop fields is not a new phenomenon, it was always there. Centuries back, the entire planet primarily belonged to them, now we have occupied every inch of the earth leaving some small islands of isolated forested areas for them, how are they supposed to comprehend that? They move out of a designated habitat for various reasons like dispersal to establish new population, inter-species or intra-species antagonism, natural calamities like flood, manmade calamities like forest fire etc. As I mentioned above, these animals are now to be treated with utmost importance and the topmost priority is to restore them back to their original habitat, hence these has become a herculean task of the wildlife veterinarian to handle such animals.

Crowd: Out of the several hindrances, an Indian wildlife vet faces the greatest challenge from the crowd in safely handling the situation. The animal in question might have already killed some people or livestock or may have damaged properties including dwelling houses or standing crops. This causes the infuriated people to come out and demand to kill the animal. In many places inquisitive people throng the area in thousands making it impossible to have a safe working situation. If the darted animal runs into the crowd, some people will be injured or killed. The dart may also miss the target and end up in the crowd, which is an invitation of serious trouble. The vet therefore, must assess the situation relating to the crowd and get the civil/police authorities to clamp some prohibitory orders under IPC144 to prevent trouble caused by the crowd. Security personal in good numbers is a must, but they should be engaged only to control the crowd and not the wild animal. They often open fire easily at the animal and that could even make the vet their target if he comes in between the animal in question and the security personnel.

Quite often, the vet’s opinion or decision in such situation is influenced by the pressure of the crowd which may also include the wildlife officials or security personnel. The most common dictate is to go

for repeated shots with tranquillizers without consideration to the induction period of the particular drug used, which is often modified by extreme disturbances by the crowd. Disturbances during the induction period or extreme painful injuries may delay the induction period and/or often produce inadequate induction. In such situations the experience of the vet is very crucial. A novice should consult some experienced vet over phone or by other means if faced with this.

Topography: A large wild animal requires special arrangement for recovery after it is immobilized. A forklift, crane/hydra, trucks etc. are required if you are handling a stray adult elephant. The movement of these machines needs a dry wide road and dry fields; without which simply immobilizing the elephant might create serious threat to its safety. Other large herbivores like rhino, wild buffalo, bison *etc.* also need transport vehicles; these animals are however not so heavy and barring the Great Indian one horned rhinos, other animals can be transported even in tractor trolleys. The topography of the area is otherwise also very vital for the safety and success of the darting procedure, where both the darting team as well as the target animals are considerably vulnerable. The use of a drone may come in handy to have an aerial survey of the area and know the location of open fields, water bodies, woodlands etc. which are very vital in preparing the darting and recovery plan.

Physical versus chemical restraint: The stray animal is required to be restrained safely without causing any unnecessary stress and if it is free from any injury or infection, should be released to a nearly suitable habitat without any delay. There are many traditional tricks which can be used to physically trap a wild animal like reptiles and birds etc. some small mammals like small felines, ant-eaters, hog-badgers, porcupines, pangolins, hispid hare and even monkeys can be trapped in well designed and well placed trap cages. The trapped animal can later be mildly sedated to avoid the psychological stress of entrapment till they are released. The higher mammals, however, react violently to the physical restraint and thus suffer severe physical and mental trauma. In the physical capture, these animals have higher vulnerability to “capture myopathy” characterized by anaerobic metabolism of muscle glycogen which can kill the animal in question in a day or even after a month. The experts, therefore, prefer to use chemical restraint which has been proven to be much efficient and safe.

For chemical capture, you need an assortment of immobilizing and sedative drugs and a variety of delivery systems popularly known as “tranquillizing guns or syringe projectors”. No single drug is capable of immobilizing all the species of wild animals; interestingly a drug very efficient in one species may not be useful in another species. For example, opiates are the drugs of choice for immobilizing rhinoceros and the elephants but the same group of drugs is contraindicated in the felines as they will cause only maniacal excitement. The choice of syringe projector is also similarly dictated by the thickness of the skin of the target animal and the type of drug to be used. Felines are very elusive and dangerous for the darting team; therefore, wherever the vet team is faced with rescuing a large feline, provision should also be available for trap cages. When the topography makes it extremely difficult to dart the animal without endangering the life of the sniper, they can place trap cages at strategic places with a prey animal as bait.

Recovery, transport and release: The vet team is responsible in the entire procedure of immobilization, recovery, transport and release. *The person capturing or administering drugs to a wild animal*

simultaneously assumes the responsibility for the life of that animal (Richard K. Clark). Accidents can happen at any stage; darted animal may get drowned, roll down a steep cliff, asphyxiated, get a fracture, wounded, and so on. The vet team must be well equipped to face all these situations. Similar critical situation might happen during lifting, transport or even release. The vet team should accompany the animal in the entire period, from capture until release.

It should be borne in mind that physical or chemical restraint of wild animal is a specialized branch of veterinary science and one should not take responsibility of such a task without adequate knowledge and skill. Simultaneously, the availability of appropriate drugs and drug delivery system is also a must, without which one should face serious danger and also endanger the lives of his team members and the public.

MEET THE SPEAKER

**Dr. Jayakrushna Das***Associate Professor*

Department of Veterinary Surgery and Radiology

Odisha University of Agriculture and Technology

Bhubaneswar, Odisha-751003

Dr. Jayakrushna Das S/o Sh. Dhaneswar Das born on 9th June 1965 at BIRAJA KSHYETRA, Jajpur; the ancient capital of Odisha. After completion of MVSc (Surgery & Radiology) he joined in service in 1992 in Animal Disease Research Institute, Vety Hospitals and Dispensaries in 5 districts under ARD dept of Odisha Govt. and thereafter joined in the College. He is having keen interest for the farmers up-liftment through livestock development by providing proper & timely service and through public awareness. Organised and participated no of Animal Health Camps in different places and in different capacities since 1992. Established many MPCSSs, PPCSSs, Fodder plots, SHGs, Farmers Awareness camps and also through Farmers-Scientist Interactions. He did his PhD in OUAT in stem cell therapy. Stem cell therapy particularly in bovines is acclaimed as the first report in our country and globally. He has worked on nanotechnology in association with ICAR-CIFA, Kausalyaganga, Bhubaneswar and with KIIT University, Bhubaneswar and applied for patent. Its therapeutic applications in Veterinary practice have showed tremendous result in different types of wounds with various durations in animals. He has established sophisticated Vety Ophthalmology Unit for livestock and pets which is remarkable achievement of its kind through RKVY project. He is working with 4 nos of research projects and Life members of 11 scientific societies. He has contributed a large extent in the field of wild lives health management and they are been published in leading scientific journals and daily newspapers. For his long standing contributions to the field of Vety Surgery, he was conferred with National Fellowship (FISVS) in 2017 at Tirupati and Awarded with Dr MuralidharBaliarsinghSmrutiSamman as Successful Educationist 2018 by Akhila Chakra, Jajpur, conferred with KrushakBandhuSamman 2018 by BharatiyaKrushakSamaj's state branch and National Fellowship of Indian Proctology Society (FIPS) in 2019 at OUAT, Bhubaneswar for contribution to one Health System. He was appointed as state observer for VidyarthiVigyanManthan (VVM) programme supported by Dr. A. P. J. Abdul Kalam, Hon'ble Ex-President of India. Guided 14 nos of MVSc and one PhD student and out of this 4 nos are working as Asst Professors in the surgery dept. Published more than 79 nos of research and case reports in International and national peer reviewed journals of repute. Delivered Lead Papers in nos of scientific symposiums/seminars. He was given with many responsibilities of his institution. He is a regular live commentator of Sri GundichaRathaYatra, Puri in a number of leading Odia Television Channels and also Ashokastami Sri Lingaraj, Bhubaneswar and Jajpur Sri BirajaRathayatra and the First and only person as live commentator in 3 nos of Rathayatra in Odisha till yet. He used to deliver various talks regarding care and management of pet animals and birds. Acting as a regular technical expert of 'Namaskar Odisha' programme telecasted in Taranga Channel (O- tv), and farmers related programme in DD-1 (Odia).

SURGICAL CARE AND MANAGEMENT OF TRAUMA AND OTHER AFFECTIONS IN SNAKES *vis-a-vis* SNAKE BITE TREATMENT

Jayakrushna Das

Department of Veterinary Surgery and Radiology

College of Veterinary Science and Animal Husbandry, OUAT, Bhubaneswar

Introduction

Snakes are elongated, legless, carnivorous reptiles of the sub-order Serpentes under order Squamata, that can be distinguished from legless lizards by their lack of eyelids and external ears. Like all Squamates, snakes are ectothermic, amniote vertebrates covered with overlapping scales. There are 3500 species of snakes seen worldwide, out of which 250 nos of species are venomous. All the snakes seen worldwide either in land, water or on trees are divided into poisonous and non-poisonous snake. In India 216 species are found and out of which there only 52 species are poisonous snakes. The poisonous snakes are divided into 5 families.

1. Crotonidae: Rattle snakes, pigmy rattle snakes, cotton mouths, pit viper. These are found in Asia and America.
2. Viperidae: Russel's viper, Pit viper, Echis viper, Gaboon viper, Saw scaled viper, Puff adder. They are found in all parts of world except America.
3. Elapidae: Cobra, King cobra, kraits, mambas, tiger snake, death adder, coral snakes. They are found in all parts except Europe.
4. Hydrophidae/Sea snakes: All sea snakes are poisonous but seldom bite.
5. Colubridae: Boom slangs, bird snake of African continent.

In India 5 species are dangerous viz King cobra, Common cobra, Common krait, Russel's viper, Saw scaled viper. In broad sense, 3 poisonous common varieties seen in India are cobra, krait and viper. The most common poisonous snake is common krait. With the advent of rapid urbanization many a time's wild lives enter into human habitation. Among these, incidences of snakes are increasing now a days. They are beaten, injured by human beings and sometimes rescued by snake helpline people for treatment.

Integument

The snake is covered by an elastic skin that permits stretching where large objects are swallowed. As with all reptiles, snakes are covered with scales, which offer protection from desiccation and injury. The epidermal surfaces may be smooth or rough. Scales may be large and knoblike with a dermal core or osteoderm or partially overlapping and keeled. Periodically, the entire skin is shed (ecdysis). On occasion the ocular shields fail to come free and remain as opaque covers over the eyes.

Moulting

Moulting serves a number of functions. Firstly, the old and worn skin is replaced; secondly, it helps get rid of parasites such as mites and ticks. Renewal of skin by molting is supposed to allow growth in some animals such as insects; however, this has been disputed in the case of snakes.

Nervous System

The brain is elongated and consists externally of three major regions: forebrain, midbrain and

hindbrain. There may be an accessory olfactory bulb that receives fibres from the vomero-nasal organ, which is well developed in snakes. Although reptiles have 12 pairs of cranial nerves like mammals, but snakes lack the spinal accessory nerves because they have no shoulder or sterna muscles.

Sense organs

The tongue of a snake is long, cylindrical and deeply forked. It lies in a sheath beneath the glottis and is protruded through a median notch in the lower lip. The tongue functions for vomero-nasal chemo-reception and plays no role in swallowing.

Smell

Snakes use smell to track their prey. They smell by using their forked tongue to collect airborne particles, then passing them to the vomero-nasal organ or Jacobson's organ in the mouth for examination. The fork in the tongue gives snake a sort of directional sense of smell and taste simultaneously. They keep their tongues constantly in motion, sampling particles from air, ground and water, analyzing the chemicals found and determining the presence of prey or predators in the local environment. In water-dwelling snakes, such as Anaconda, the tongue functions efficiently under water.

Eyesight

Snake vision varies greatly from only being able to distinguish light from dark to keen eyesight, but the main trend is that, their vision is adequate, although not sharp and allows them to track movements. Generally, vision is the best in arboreal snakes and weakest in burrowing snakes. Some snakes, such as Asian vine snake (genus *Ahaetulla*), have binocular vision with capable of focusing on the same point. Most snakes focus by moving the lens back and forth in relation to the retina, while in the other amniote groups, the lens is stretched. Many nocturnal snakes have slit pupils, while diurnal snakes have round pupils.

Venom

Cobras, vipers, and closely related species use venom to immobilize or kill their prey. The venom is modified saliva, delivered through fangs. The fangs of advanced venomous snakes like viperids and elapids are hollow to inject venom more effectively, while the fangs of rear-fanged snakes such as boomslang, merely have a groove on the posterior edge to channel venom into the wound. Snake venoms are often prey specific and their role in self-defense is secondary. Venom, like all salivary secretions, is a pre-digestant that initiates the breakdown of food into soluble compounds, facilitating proper digestion.

Snake venoms are complex mixtures of proteins and are stored in poison glands at back of the head. In all venomous snakes, these glands open through the ducts into grooved or hollow teeth in the upper jaw. These proteins can potentially be a mix of neurotoxins (which attack the nervous system), hemotoxins (which attack the circulatory system), cytotoxins, bungarotoxins and many other toxins that affect the body in different ways. Almost all snake venom contains hyaluronidase, an enzyme that ensures rapid diffusion of the venom. Venomous snakes that use hemotoxins usually have fangs in the front of their mouths, making it easier for them to inject the venom into their victims. Some snakes that use neurotoxins (such as the mangrove snake) have fangs in the back of their mouths, with the fangs curled backwards. This makes it difficult both for the snake to use its venom and for scientists to milk them. Elapids, however, such as cobras and kraits are proteroglyphous; they possess hollow fangs that cannot be erected towards the front of their mouths and cannot "stab" like a viper. They must actually bite the victim. Venomous snakes are classified in taxonomic families Elapids, Colubrids and Viperids.

Digestive System

The mouth of a snake can open widely and it is lined with folds of mucosa that hide numerous teeth on the jaws and palate. The teeth of snakes are rather delicate, pointed and re-curved. The most highly specialized teeth are the fangs of poisonous snakes, particularly the vipers and pit vipers. Poison fangs are attached to the maxilla, one on each side and they have an opening near each end for entrance and exit of the venom. Several salivary glands associated with oral cavity may serve to kill and lubricate the prey, aid digestion and excrete salt. The oesophagus is thinly walled and long. It blends imperceptibly with thicker-walled, spindle-shaped stomach. Liver of snakes is very elongated and may be divided into two or three separate lobes. The small intestine has several short transverse loops tightly enveloped by the dorsal mesentery. The large intestine has no distinctive features except for its considerable width. Cloaca receives the digestive wastes, uro-genital products and cloacal gland secretions.

Reproductive System

The right and left gonads of snakes lie at different levels of the body; the right is cranial to left. The ovaries may overlap each other on occasion but the testes do not. The testes are elongated and light-coloured. Courtship in snakes is initiated by the male and involves moving his body over the female's tactile alignment of the tail regions and assorted rubbing movements, tail-waving or head-jerking. Sexual dimorphism is absent in almost all snakes and the only way to tell a male from a female is to squeeze the base of the tail to extrude the hemipenes or to insert a blunt probe into them through the vent.

Urinary System

The paired, meta-nephric kidneys of snakes are elongated and show segmental lobules. The ureter extends from each kidney to the uro-genital papilla of cloaca. There is no urinary bladder, however the cloaca can hold the excretory products for a while before voiding.

Respiratory System

The nostrils lead into small nasal cavities that open into the pharynx. During swallowing of large food items, when the pharynx is occluded, respiration is accomplished by periodically lowering a jaw and extending the glottis momentarily to inspire. As a general rule, boids have two lungs of almost equal length, colubrids show a reduction of left lung and viperids have lost the left lung and pulmonary artery entirely. The right lung may extend for two thirds of the length of snake within dorsal mesentery. Since there is no diaphragm, rib action is required for inspiration and expiration.

Surgical affections

1. One electrocuted male Indian rat snake was presented for emergency treatment. Fluid therapy, steroid, cardiopulmonary resuscitation and antibiotic therapy were carried out as soon as possible. But as the rescue process and presentation at hospital was too late and snake was in severe shock, recovery was not possible.
2. One viper snake was presented with severe injury and protrusion of gut along with oviduct. The affected oviduct along with eggs was removed and the wound was closed in standard manner.
3. One cobra was presented with swelling of one eye with deposition of pus. Under general anaesthesia the pus was drained and on regular dressing the snake regained its vision.
4. One python was rescued in shock condition with multiple injuries over its body. The snake was properly examined and treated in emergency which recovered well on subsequent treatment.
5. Another large rat snake was presented with complain of swelling on body. It was examined & seen

that the alimentary tract was disrupted. It was then surgically repaired for intestinal anastomosis. It was recovered with proper post surgical care and management.

6. One rat snake was found trapped with its head inside one cold drink can; it was retrieved by careful cutting the can.
7. One cobra was rescued from roadside which was soiled with coal-tar. It was washed & cleaned after proper restraining.
8. Another snake was presented with multiple wounds on different parts of body. It was rescued and required dressing was done with proper restraining. It was maintained for 7 days and after recovery was released.
9. A large rat snake was presented with bulging of abdomen and in very emaciated condition. Under C-arm it was examined for any fracture to the vertebral column, but there was no fracture but a skeleton was found inside the gut. It was maintained with ORS, glucose and egg yolk. After recovery was released.
10. A cobra was presented with fracture of mandible. But owing to the condition of the animal surgical correction was not initiated.
11. One snake was presented with prolapsed cloaco-colonic portion. It was washed and cleaned with mild antiseptic lotion thoroughly. Then it was washed with NSS and massaged with ice. After decrease of the size of the prolapsed mass applied with glycerine lotion and pushed into the cloaca and pressed for sometime.

Due to advent of these challenging jobs the life of snakes could be saved which act as an element in ecosystem.

Snake bite

Many times livestock are encountered with snake bite and are presented to veterinarians for treatment. These types of cases are now increasing day by day. Hence it is necessary to keep updated with the treatment protocol. In snake bites the signs and symptoms depends on the nature, location, depth, nos of bites, length of time the snake holds on, amount of venom injected, species and size of snake, condition of its fangs and venom glands, age and size of the victim, pathogen in the snake. First-aid, vet care and management. There are no clinical signs for diagnosis of snake bites in animal's body, mostly because of body hairs. In dogs and cat pupils are dilated and there is ataxia, vomiting and dyspnoea. The fang marks produced by the snake are not always visible because of local tissue swelling. In general the common symptoms are distal to the site of bite may become oedematous, salivation, diarrhoea, muscle tremors and shock due to leakage of blood and serum.

The snake venom invades the body through lymphatic channels but not by circulation. Traditional treatment like application of tourniquet, incision at biting site and aspiration from the site are not recommended now. The treatment includes neutralization of venom, dilution of venom, cardiopulmonary stabilization of patient and treatment of wound. The wound is cleaned and washed with KMnO_4 solution. Administration of poly-valent anti-snake venom (ASV) to neutralize the toxin is effective against cobra/krait/viper prepared by Hoffman Institute, Bombay. The anti Snake venom is slowly administered I/V mixed with saline as a drip. The snake venom is poisonous only when injected and harmless when taken by mouth as it is not absorbed from stomach. It is excreted by kidney, milk, salivary gland and mucous membrane. By adoption of prompt medico-vet health care the animals may be survived.

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WZA-1

AMPUTATION OF TRAUMATIZED GANGRENOUS TAIL IN INDIAN GRAYLANGUR**Mamta Mishra**, Akash, Amolak Sharma, Raveendra Tadagani and R.P. Pandey*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H.,
DUVASU, Mathura, Uttar Pradesh*

An Indian GrayLangur of about 1.5 yrs of age was presented to TVCC, Kothari Veterinary Hospital with history of trauma at the base of tail, wound was 2 weeks old, it was smelly full of dirt and also there was tail drop. Amputation of the tail was indicated. Non HumanPrimateanesthesia is generally broken into premedication (sedation), anesthetic induction, and anesthetic maintenance. Animal was premedicated with glycopyrrolate (0.004-0.01 mg/kg IM), sedated using Ketamine: 7 mg/kg + Xylazine: 0.6 mg/kg, induction with 2-4% isoflurane followed by maintenance using 1-2% isoflurane. Standard mammalian monitoring techniques were applied to maintain cardiovascular homeostasis and core body temperature. After amputation the recovery was smooth. Post operative antibiotic and analgesic were given for 7 days.

WZA-2

DETOMIDINE- BUTORPHENOL – AZAPERONE ANAESTHESIA AND ITS REVERSAL WITH ATIPAMEZOLE IN ASIAN RHINO (*R. unicornis*)**Bhupen Sarma** and B. Choudhury*Department of Veterinary Surgery and Radiology, College of Veterinary Science,
Assam Agricultural University, Khanapara, Guwahati, Assam*

Five one-horned Asian rhinoceros (*R. unicornis*) of either sex weighing 600 – 650 kg in CWRC of Kaziranga were anaesthetized with a combination of Detomidine (30 mg) + Butorphenol (10mg) + Azaperone (40 mg) to find out an effective combination of anaesthesia. These drugs were drawn into a syringe mixed and put into a 5 ml dart. The rhinos are darted into the neck muscle for injection of the drugs. The effects of anaesthesia were started at 2 minutes of injection, where the rhinos became standstill with head down condition and ataxia. The animals came to the sternal recumbency at 4 minutes of anaesthetic injection and anaesthetized for 60 minutes. During unconsciousness, analgesia was complete, which was ascertained during fitting of ear tag. Paedal and anal reflexes were absent from 30 minutes. Muscle relaxation was excellent. Tongue was protruded where sensor of pulse oximeter was fitted to the tip of the tongue for recording of peripheral oxygen saturation without any disturbance. Lower jaws relaxed completely touching the ground. Radio collar was fitted to the neck and blood collected from ear vein. Heart beat and SpO₂ were recorded from pulse oximeter. Respiration was recorded by putting hands in nostrils and temperature by putting thermometer in rectal mucosa. The heart beat reduced from 63±2.17 to 58±3.04 at 30min and returned to almost normal at 60 minutes. Respiration reduced from 19±2.78 to 17±1.4 per minute. Temperature showed slight variation from 37.7±2.03 to 38.0±.05 æ°C. SPO₂ remained normal as 89 ± 1.19 %. Atipamezole 15mg total dose was injected into the ear vein at 60 min of anaesthesia

following completion of ear tagging and radio collaring. The rhinos raised head at 2 minutes and stand at 7 minutes and walked away slowly. The rhinos became drowsy after 15 ± 2.05 min of reversal. Detomidine-Butorphenol-Azaperone combination could produce balanced anaesthesia and lower dose of Atipamezole reversed the rhinos but exhibited rebound effects.

WZA-3

MARATHON RESCUE OF PREGNANT RUSSELL'S VIPER (*Daboia russelii*) TANGLED IN COAL TAR

I. Nath, S. Mallik, B. Jena, S. S. Behera, S. Dhanalaxmi and S. Sahoo

*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H.,
Odisha University of Agriculture and Technology, Bhubaneswar, Odisha*

A Russell's viper was rescued, after it had tried to slither through melted coal tar. After being rescued, it was presented to Dept. of Veterinary Surgery & Radiology, C.V.Sc. & A.H., OUAT, Bhubaneswar with a thick smear of coal tar over its body. As the snake was dehydrated and under shock, the thick smear of tar was removed under manual restraint which was very dangerous for the handlers as two big fangs were visible to outside. Upon removal of tar, it was observed that there was distension along with some movement inside abdomen just cranial to vent region. Radiograph revealed presence of heavily packed litter. Hence, it was decided to perform caesarean section to deliver the young snakes under chemical immobilization. Ketamine was administered @ 40 mg/KBW I/M to induce anaesthesia and surgery was performed at mid flank region. 19 live young ones were delivered. But due to shock, dehydration and sustained trauma; the mother Russell's viper couldn't be saved. After proper neonatal care, the young Russell's viper was released to their natural habitat.

WZA-4

SUCCESSFUL SURGICAL MANAGEMENT OF OPEN PYOMETRA IN AN ASIATIC LIONESS

D.N. Kelawala, D.B. Patil, V. Suthar, A. Patel and R. Kadivar

*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H.,
Anand Agricultural University, Anand, Gujarat*

An eight years old captive Asiatic lioness was found anorectic since 7/10 days with unhealthy uterine discharge, lethargy, scooting along the ground, all indicative of open pyometra was not responding to medical management. On CBC and ultrasound pyometra was confirmed. After necessary approvals, the lioness was subjected to surgical intervention under general anaesthesia. The lioness was kept caged under observation for 15 days and all the post-operative care was given. Grossly, the endometrium of uterus appeared to be cystic suggestive of cystic endometrial hyperplasia and was confirmed on histopathology. The suture line was healthy on 15th post-operative day and the lioness recovered uneventfully. Later it was shifted to open paddock on 30th post-operative day.

WZA-5

**MANAGEMENT OF CORNEAL OPACITY COMPLICATED WITH
ULCER IN AN OLD AGED CAPTIVE ELEPHANT**

Somil Rai, V.P. Chandrapuria and Sandeep Agarwal
Kanha Tiger Reserve Mandla, Madhya Pradesh

A corneal opacity or scar will prevent the light and the image from being formed the retina. Trauma and vitamin A deficiency are considered to be the main cause of corneal opacity in case of elephant. Opacity of cornea may lead to temporary or permanent loss of vision if not treated. A case of seventy year-old captive elephant was attended at Kanha Tiger Reserve, with the history of photophobia, and profuse lacrimation on the left eye. The anamnesis revealed an unknown injury at about 4 months back and didn't respond for local treatment. Detailed clinical examination revealed complete corneal opacity with an apparent corneal ulcer. The surgical procedure was done under general anaesthesia in right lateral recumbancy. The edges of the corneal ulcer were cauterized by silver nitrate solution and placentrx injection was injected subconjunctival. The corneal ulcer was covered with fine sutures of nictitating membrane and tarsorrhaphy was done to avoid exposure and contamination. There was anxiety for three post operative days but the case recovered as the opacity was clear in one month postoperatively.

WZA-6

**SURGICAL MANAGEMENT OF CHONDROMYXOSARCOMA IN
HIMALAYAN BEAR**

S.K. Jhala, V.S. Dabas, D.N. Suthar, R.A. Patel, D.J. Chauhan and P.D. Vihol
*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H.,
Navsari Agricultural University, Navsari, Gujarat*

Twenty four years old male Himalayan bear was presented with the history of gradually increasing swelling over the pole region since four years. Clinical examination revealed non-painful, coconut size hard fluctuating growth over the pole. The growth was surgically excised under xylaxine-ketamine combination. Histopathological examination revealed chondromyxosarcoma with osteoid metaplasia. The animal recovered uneventfully after 20 days and no recurrence observed since three months.

WZA-7

SURGICAL MANAGEMENT OF IRREPARABLE INJURIES OF LEFT HIND LIMB AND TAIL IN A BLACK FOOTED GRAY LANGUR (*Semnopithecus hypoleucos*)

R.K. Gosai, A.M. Patel, P.T. Sutaria, J.B. Patel, P.B. Patel, N.S. Chaudhari,
Abhishek Patel and Kirat Chaudhari

*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H.,
S.D. Agricultural University, Sadar Krushinagar, Gujarat*

A 32 kg male monkey was presented with history of accidental irreparable injury over the left hind leg and broken tail since 7 days. Detailed clinical examination revealed foul smelling discharge with necrosis and sloughing of skin at the fourth coccygeal vertebrae. The left hind limb was fractured from tarsal joint with contamination. Physiological parameters were within normal in range. Under general anesthesia, left hind limb from the mid shaft of the tibia fibula and tail from the 2nd inter coccygeal space were amputated. The fluid therapy, antibiotic and analgesic were administered for three consecutive days. The monkey was recovered uneventfully.

WZA-8

MANAGEMENT OF BALANOPOSTHITIS IN ASIAN WILD ELEPHANT

I. Nath, S.S Behera, Pritish Rath, **Anshul Sukla**, Dillip K. Sahoo and Varun S.N.

*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H.,
Odisha University of Agriculture and Technology, Bhubaneswar, Odisha*

A wild Asian elephant aged about 25years at Madhopur Range under Athamallick forest division was sighted with symptoms of lameness in its hind limb. The animal was walking with abducted hindlegs, swelling at ventral abdomen with shedding of purulent whitish discharge. The Animal was tranquilized with a mixture of xylazine hydrochloride and ketamine hydrochloride by using dart gun mod 60. The onset of standing sedation was marked with complete penile protusion. On examination, the preputial cavity revealed excessive foul smelling whitish smegma accumulation and the shaft of penis appeared inflamed due to contamination. Then the penis and prepuce cavity was gently scrubbed with diluted povidone iodine solution to remove the deposited smegma followed by application of glycerine and chloramphenicol solution to control localized infection. Parenterally acting antibiotics and NSAID were given. Prepuce area sprayed with fly repellants. Makhna was revived with 2ml of Yohimbine Hydrochloride. Oral antibiotic and analgesics administered in Banana stem kept on its natural path for 15 days resulted in recovery.

WZA-9

MANAGEMENT OF CARAPACE FRACTURE IN AN INDIAN STAR BACKED TORTOISE

Abhishek M. Patel, P.T. Sutaria, J.B. Patel, A.M. Patel, P.B. Patel, R.K. Gosai, H.M. Barot K.R.,
Chaudahri and Bahiravi N. Saudagar
*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H.,
S.D. Agricultural University, Sadar Krushinagar, Gujarat*

An adult Indian star backed tortoise weighing 3.6 kg was presented with a compound depression fracture of carapace involving the second costal scute and second and third vertebral scutes. The celome was exposed. The wound was lavaged with normal saline to remove dirt and debris. Under xylazine sedation tension band wiring with screw was undertaken to align the fractured scutes as much as possible.

WZA-10

SURGICAL MANAGEMENT OF RECURRENT HEMIPENES PROLAPSE IN AN INDIAN POND TERRAPIN

Tista Joseph, S.V. Upadhye, S.B. Akhare and Gauri Khante
*Department of Veterinary Surgery and Radiology, Nagpur Veterinary College,
Maharashtra Animal and Fishery Sciences University, Nagpur, Maharashtra*

This case study describes a rare case of surgical management of prolapsed hemipenes in an Indian Pond Terrapin. A young male kept as a pet, weighing 520 grams was presented with the complaint of a dark prolapsed mass from the base of the tail. Two prior attempts had been made by the caregivers to correct the prolapse locally, with eventual relapse within a few days. Clinical examination revealed the mass to be hemipenes which had started drying up and the chelonian to be severely dehydrated and anorexic. The causative factors for a recurrent prolapse were identified and management was corrected. The mass was then surgically reduced. Post-operative care was continued for a month. There has been no recurrence of the prolapse till 3 months post-procedure and the animal was released back into the wild. A successful management of recurrent hemipenes prolapse in an Indian Pond Terrapin was reported.

WZA-11

ORTHOPAEDIC SURGERIES IN WILDLIFE: EXPERIENCES, CHALLENGES AND SOLUTIONS

Upadhye, S.V., Ushma Patel, S.B. Akhare, Gauri Khante, V.M. Dhoot and G.R. Bhojne
*Department of Veterinary Surgery and Radiology, Nagpur Veterinary College,
Maharashtra Animal and Fishery Sciences University, Nagpur, Maharashtra*

Wildlife surgical cases with special reference to orthopaedic injuries have been on a rise along with the increase in human-wildlife conflict. This includes automobile accidents, illegal poaching snares, man-made structures etc. Although the basic principle of fracture reduction and immobilization remains the same

as that of their domestic counterparts, conditions in wildlife requires different approach. The anaesthesia, postoperative care, self-immobilization, etc. are the issues to be addressed. Both herbivores and carnivores have the same process of bone healing but different approaches are required with respect to treatment, surgical interventions and post operative care. Avian wildlife orthopaedic cases require a specialized approach. The paper presents an amalgamation of few surgeries of captive and free ranging wild animals and birds, that have been managed. This compilation also highlights the challenges faced while treating wild animals and how they were overcome.

WZA-12

SURGICAL MANAGEMENT OF TRAUMATIC EVISCERATION IN RHESUS MONKEY (*Macacamulatta*)

Rajesh Kumar, N.K. Verma, Akash, Kalaiselvan E, Mohar Singh and M. Hoque

Division of Surgery, Indian Veterinary Research Institute, Izatnagar, Bareilly, Uttar Pradesh

Rhesus monkey is a sand-coloured primate native to forests but also coexisting with humans in northern India. About 85 to 88 % of the population live in commensal or semi-commensal habitats and only 12 to 14 % of our population lived in non-commensal habitats like forests. A rhesus monkey weight around 4.0 kg was reported to Referral Veterinary Polyclinic of Indian veterinary research institute izatnagar having history of dog bite at para costal region of left side with omentum and fatty tissue eviscerate from distal to last rib in left hypochondric region. Monkey was premeditated with atropine sulphate at the dose rate of I/M 0.04 mg/kg body weight. After 10 minute inj. animal was also premeditated with Xylazine injected at the dose rate of I/M 1.0 mg/kg body weight. General anaesthesia achieved by Ketamine 5.0 mg/kg body weight and sedated within 4 minutes. Anaesthesia was maintained with ketamine hydrochloride. The devitalised part was removed from the rest part of omentum after proper ligation. Now rest eviscerated contents were lavaged with warm normal saline solution mixed with antibiotic. The abdominal tear was slightly enlarged and the contents were placed back into the abdominal cavity. The animal was recovered uneventfully within 8 days.

WZA-13

CHEMICAL IMMOBILIZATION AND TRANSLOCATION OF A BONNET MACAQUE – A CASE REPORT

**S. Senthil Kumar, S. Muthukrishnan, A. Arun Prasad, Gali Venkata Sriharsha,
K. Hari Prasad and P. Tamil Mahan**

*Department of Veterinary Clinical Complex, Veterinary College and Research Institute,
Orathanadu, Thanjavur, Tamil Nadu*

A male Bonnet Macaque aged about 5 years suspected to be a separated emerging dominant Alpha monkey from the troop entered and started dwelling at Tennalakudi village of Sirkazhi Taluk, Nagapattinam District, Tamil Nadu. The monkey was observed to be rage and had bitten 18 villagers and many stray dogs of the village. The havoc caused by the monkey resulted in panic among the villagers. The attempts to catch the monkey with cages and snares by the forest officials failed and expert assistance for

chemical immobilization was sought from Veterinary College and Research Institute, Orathanadu. The monkey was tranquilized successfully with xylazine and ketamine cocktail after two unsuccessful attempts due to the hyperactive aberrant behaviour of the monkey. The tranquilized monkey was advised to be maintained on a cage for observation and subsequent release. The animal was maintained on a cage for one week to assess the health and behavior and was found apparently healthy for release. The captured monkey was translocated and released in the mangrove forest of Muthupettai range of Tamil Nadu.

WZA-14

SUCCESSFUL SURGICAL MANAGEMENT OF PARAPHIMOSIS IN A BARASINGHA (*Cervus duvaucelli*)

I. Nath, B. Jena, Dhanalakshmi S., **Pritish Rath**, Anshul Shukla and Varun S.N.

Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H., Odisha University of Agriculture and Technology, Bhubaneswar, Odisha

A 7 years old Barasingha of Nandan Kanan zoo was anorectic with sustained penile protrusion since 3 days during rut season. The animal was tranquilized with mixture of 50 mg. xylazine and 200mg of ketamine by darting. The animal was sternally recumbent after 15 minutes. On Physical examination, the glans penis was edematous and prepuce was ulcerated. A large penile haematoma was noticed cranial to scrotum. The site was prepared aseptically. Two parallel circumferential incisions were done on prepuce, elastic tissue layers were dissected out and haemorrhage was controlled by ligation. Anastomosis of the prepuce was performed with 2-0 polyglactin 910. A purse string suture was applied to the preputial orifice after reducing the penis. Postoperatively Inj. Enrofloxacin @ 5 mg/kg b.wt, Inj. Meloxicam @ 0.2 mg/kg b.wt administered intramuscularly. The preputial area sprayed with fly repellents. The animal was isolated for sexual rest and uneventful recovery was noticed.

WZA-15

SUCCESSFUL MANAGEMENT OF VERTEBRAL COLUMN FRACTURE OF GREEN VINE SNAKE (*Ahaetullanasuta*)

I. Nath, S. Mallik, B. Jena, S.S. Behera, S. Sahoo and D. Dwivedy

Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H., Odisha University of Agriculture and Technology, Bhubaneswar, Odisha

A green vine snake was presented with history of trauma and difficulty in movement. Physical examination revealed mild deviation of vertebral column at cranial one third of snake's body. Radiograph revealed presence of an incomplete fracture in the vertebral body caudal to the cardiac region. Fracture was managed by application of plastic half cast on both dorsal and ventral aspect of the site of fracture, after application of adequate cotton padding. The length of half cast extended 10 vertebrae cranial and caudal to the site of fracture in order to provide immobilization. Routine antibiotic, analgesic and supportive therapy were provided. The snake was kept in a close confinement for 3 weeks. Upon removal of the cast it revealed complete union of vertebral fracture, affirmed by radiograph with normal movement.

WZA-16

SUCCESSFUL MANAGEMENT OF SNARE INJURIES IN THE TIGERS FROM THREE WILD ADULT ROYAL BENGAL TIGERS (*Panthera tigris*)**Chetan Patond**, Parag Nigam, Bilal Habib, R.S. Govekar, P.B. Panchbhai,

A. Dubey and Ushma Patel

Pench Tiger Reserve, Nagpur, Maharashtra

Royal Bengal Tigers are the most priced in the illegal market for their skin, meat, nails and other body parts. On three different occasions three Tigers were reported with snare injuries in the wild. In first case a subadult male tiger was noticed with limping. On close photographic observations of the leg, a snare was noticed which had caused a deep laceration on the front leg. Another subadult male tiger had observed with a clutch wire snare around the abdomen caused deep wound due to snare through camera trap images. The third adult tigress was found with a nylon snare around neck. Attempts were undertaken to capture and to treat Tigress but due to many reasons Tigress could not be captured. After two months the animal was found in a weak and depilated condition with a maggot wound on her neck. All these were tranquillized using Ketamine and Xylazine combinations using a dart gun. Nylon snare /poacher's trap was removed from tiger and the wound was flushed, cleaned and dressed; anti-inflammatory and antibiotics were administered intramuscularly. This was followed by injecting Atipamazole @0.15mg/kg body weight. Two males started hunting and other regular activities from the very next day, however, the female could not survive as wound was severely maggot infested and extremely deep exposing the Atlanto-axial joint. Non-captive tigers and their treatment require a great deal of planning and precise execution. Challenges are faced at every step which need to be overcome to work in tough field conditions.

WZA-17

SUCCESSFUL MANAGEMENT OF FISH HOOK ENTRAPMENT IN BUCCAL CAVITY OF A TURTLEB.P. Shukla, **Reshma Jain**, A.S. Parihar and U.K.S. Lakshmi*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H. Mhow, Madhya Pradesh*

A turtle was brought to the Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H. Mhow, with fish hook entrapment in buccal cavity. Few boys were trying to catch fish in a well; unfortunately, this turtle got engaged with the fish hook. The turtle was anaesthetized to restrain and examine the foreign body in buccal cavity. The anaesthesia was induced by giving Inj. Diazepam @ 0.4 ml I/M (@ 120 mg/kg b.wt.) and Inj. Ketamine 1.5 ml I/M (@120 mg/kg b.wt.) using tuberculin syringe. After induction of anaesthesia mouth was opened; the deeply entrapped fish hook was removed using mosquito forceps. Removal of this fish hook required backward and then forward pulling, as it had 'U' turn. Hexigel was applied locally at the wounded site. Antibiotic cefixime 5 drops twice a day and analgesic melonex 3-4 drops once a day was advised for 5 days. Fish hook retrieval was mandatory for saving the life of the turtle and to reduce the suffering.

WZA-18

SURGICAL MANAGEMENT OF CHRONIC WOUNDS IN TIGER

Shobha Jawre, Rajesh Tomar, Randhir Singh, Dharmendra Kumar,

A.B. Shrivastava Richa Chaurasia and Asha Badheria

*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H.,
Nanaji Deshmukh Veterinary Science University, Jabalpur, Madhya Pradesh*

Two chronic wounds with many dead pockets in both hind limbs were reported in a tiger ageing approx 12 years which was earlier treated by the local veterinarian in White Tiger Safari Mukundpur, Rewa (M.P.). Tiger was under medicinal treatment for around 3-4 months but the wounds were not healing in spite of regular anti septic dressings. So a surgery was planned to deride the wounds, obliterate the dead space and closure of wounds. Tiger was sedated using xylazine hydrochloride and anesthesia was induced with ketamine hydrochloride. During surgery all the dead space was debrided, cauterized and underlying muscles was sutured together followed by the closure of skin with the provision of drainage. Slight exudation and suture dehiscence of skin was found after 3-5 days of surgery. Afterwards, the wound was dressed using topical oxytetracycline and fresh aloe vera. Finally, the wound was successfully healed after 30 to 45 days of surgery.

WZA-19

**MANAGEMENT OF CORNEAL OPACITY COMPLICATED WITH
ULCER IN AN OLD AGED CAPTIVE ELEPHANT AT KTR**

Somil Rai, V. P. Chandrapuria and Sandeep Agarwal

*Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H.,
Nanaji Deshmukh Veterinary Science University, Jabalpur, Madhya Pradesh*

A corneal opacity or scar will prevent the light and the image from being properly transmitted to the retina. Trauma and vitamin A deficiency are considered to be the main cause of corneal opacity in case of elephant. Opacity of cornea may lead to temporary or permanent loss of vision if not treated. A case of seventy year-old captive elephant was attended at Kanha Tiger Reserve, with the history of photophobia, and profuse lacrimation on the left eye. The anamnesis revealed an unknown injury at about 4 months back and didn't respond for local treatment. Detailed clinical examination revealed complete corneal opacity with an apparent corneal ulcers. The surgical procedure was done under general anaesthesia in right lateral recumbancy. The edges of the corneal ulcer were cauterized by silver nitrate solution and placentr injection was injected subconjunctival. The corneal ulcer was covered with fine sutures of nictitating membrane and tarsorrhaphy is done to avoid exposure and contamination. There is anxiety in three post operative days were noticed but the case recovered as the opacity is clear in one month postoperative.



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1.	A UNIQUE CASE OF INVASION OF BOVINE OCCULAR SQUAMOUS CELL CARCINOMA IN THE PAROTID LYMPH GLAND IN A KHILLAR BULL <i>Salvekar. S.P., A.H. Ulemale, Suryawanshi R.V., V.S. Dhaygude, C.S. Mote, B.P. Kamdi, A. Mali, K.N. Jiddimani, Gauri Pandey, G.S. Ubhare</i>
2.	A STUDY ON REPAIR OF UMBILICAL HERNIATIONS IN BOVINES <i>Salvekar. S.P., Gauri Pandey, A.H. Ulemale, Suryawanshi R., K.N. Jiddimani, G.S. Ubhare, S. Pant, and T. Attar</i>
3.	TEAT SIPHON TURNED FOREIGN BODY IN A JAFARABADI BUFFALO <i>Gauri Pandey, Salvekar. S.P., A.H. Ulemale, Suryawanshi R., Kamalkumar Jiddimani and Gauri Ubhare</i>
4.	SUCCESSFUL REPAIR OF LATERAL HERNIA INVOLVING LIVER, GALL BLADDER AND ABOMASUMS IN 1MONTH OLD CALF <i>G.S. Ubhare, K.N. Jiddhimani, S.P. Salvekar, R.V. Suryawanshi and A.H. Ulemale</i>
5.	SURGICAL CORRECTION OF TAIL DERMOID CYST IN A BUFFALO: A CASE REPORT <i>Satpal, Satbir Sharma, Priyanka, Deepak Kaushik and Ojasvita</i>
6.	DIAGNOSIS AND MANAGEMENT OF LIPOSARCOMA IN ORAL CAVITY OF A BUFFALO <i>Sandeep Kumar, Pooja Yadav, Dinesh, Amit Kumar and B.L. Jangir</i>
7.	SURGICAL MANAGEMENT OF PATELLAR LUXATION IN A 3.5 YEAR H.F. CROSS CATTLE <i>Harmanpreet Singh Sodhi, Vinod Kumar Shukla and Arun Anand</i>
8.	CAESAREAN SECTION IN MARE SUFFERING FROM DYSTOCIA DUE TO FOETAL POSTURAL DEFECT <i>Naveen Kumar Verma, E. Kalaiselvan, Rajesh Kumar, Aakash, Aakansha and Amarpal</i>
9.	DIAGNOSIS AND MANAGEMENT OF ACTINOMYCOSIS IN BOVINE <i>Sandeep Kumar, Prem Singh, R.N. Chaudhary and Babu Lal Jangir</i>
10.	SURGICAL MANAGEMENT OF LATERAL LUXATION OF PATELLA IN GOAT <i>Amit Sangwan and Rajender Yadav</i>
11.	SURGICAL MANAGEMENT OF STRANGULATED TAIL INJURY IN A KANGEYAM BULL <i>D. Vishnugurubaran, S. Kokia, A.R. Ninu, M. Bharathidasan and S. Dharmaceelan</i>

12. **RECONSTRUCTIVE SURGERY FOR SUCCESSFUL MANAGEMENT OF ANAL TUMOUR IN CATTLE**
B.P. Shukla, Reshma Jain, Astha Chaurasia, Atul Singh Parihar and Nishant Shukla
13. **SURGICAL RESECTION AND DRAINAGE OF CHRONIC KNEE HYGROMA IN A CATTLE**
Anjan Kour and Amantaj Singh
14. **SURGICAL MANAGEMENT OF PREPUCLIAL PROLAPSE IN BULL**
Ankit Negi, S. Purohit, R.P. Pandey, Puli Vishnu Vardhan Reddy, Kaushal and Arpit Kaushal
15. **RECONSTRUCTION FOR CONGENITAL ANOMALY IN A CALF**
Apra Shahi, Apoorva Mishra, Shobha Jawre, Randhir Singh and Babita Das
16. **PRESURGICAL DIAGNOSIS – POLYTHENE IMPACTION IN RUMEN**
Atul Yadav, R.P. Pandey, S. Purohit, Gulshan Kumar, Prabha Sharma, Chetan Sharma and Raveendra R.T.
17. **SUCCESSFUL SURGICAL EXCISION AND MANAGEMENT OF CARPAL HYGROMA IN A BUFFALO**
Ashwani Kumar
18. **ODONTOMA IN A BUFFALO AND ITS SURGICAL MANAGEMENT**
M.O. Kalim, Rukmani Dewangan, Raju Sharda and Devendra Yadav
19. **EIGHT CASES OF CONTRACTED TENDON OF TOE(KNUCKLED TOE) AND THEIR SURGICAL CORRECTIONS IN CALVES**
Abdul Khyum N.M., Agiwale S.M., Pitlawar S.S., Chaudhari K.S. and Borakhede S.S.
20. **DYSTOCIA DUE TO SCHISTOSOMA REFLEXUS IN A SAHIWAL COW AND MURRAH BUFFALO: A STUDY OF TWO CASES**
Gyan Singh, Amit Kumar, Sandeep Kumar, Hariom, Arjun, V.K. Jain and R.K. Chandolia
21. **HERNIORRHAPHY FOR PERVIOUS URACHUS AND TENOTOMY FOR KNUCKLING IN BOVINE CALVES**
Bhagavantappa B., Dilipkumar D., Jahangirbasha Dodamani, B.V. Shivaprakash, Kartik Bidari, C.N. Vijaykumar, Neelkanth, Pallavi, Karan Hosmani, Kumarswamy, Swaroop. L, Tokappa, Birappa and Venkatgiri
22. **AFFECTION OF HORN IN CATTLE AND ITS MANAGEMENT: TWO CASE REPORT**
Satyaveer Singh, Y. P. Singh, M.C. Parashar, Vimlesh Kumar and Madhu Kumari

23. **SURGICAL MANAGEMENT OF INTUSSUSCEPTION IN A NINE MONTH PREGNANT HOLSTEIN FRIESIAN COW UNDER FIELD CONDITIONS - A CASE REPORT**
Indu Bhushan Bassan and Kuldeep Kumar
24. **CLINICAL AND ULTRASONOGRAPHIC STUDY OF LIVER ABSCESS IN A CAMEL**
J.B. Patel, P.T. Sutaria, A.M. Patel, P.B. Patel, R.K. Gosai, Bhairavi N. Saudagar, H.M. Barot, Abhishek M. Patel and K.R. Chaudahri
25. **SURGICAL MANAGEMENT OF AGENESIS OF VULVA AND TERMINAL URETHRA IN A MURRAH BUFFALO CALF**
J. Khurma, Deeksha, Priyanka Rajput and K.P. Singh
26. **LIMB AMPUTATION IN A BLUE BULL (NILGAI): A CASE REPORT**
Rajnish Kumar, Shivangi Diwedi, Gaurav Sharma, Kuldeep, P. Bishnoi and A.K. Bishnoi
27. **SUCCESSFUL SURGICAL MANAGEMENT OF UNUSUAL SWELLING OF UDDER IN CROSSBRED COW**
Manjunatha, D.R., Basavaraj B. Balappanavar, Nagaraju, N., Shivakumar, M. and Ranganath, L.
28. **INCIDENCE OF TEAT AFFECTIONS IN BOVINES**
Nagaraju N., Manjunatha, D.R., Sasikala R., Priyanka N. and Chandrashekar M.
29. **SURGICAL MANAGEMENT OF VENTRO-LATERAL HERNIA IN A PREGNANT COW**
S.V. Upadhye, G.S. Khante, A.M. Kshirsagar, S.B. Akhare and M.R. Kate
30. **RANULA IN BUFFALO: A RARE CASE**
R.K. Gosai, A.M. Patel, J.B. Patel, P.T. Sutaria, P.B. Patel, H.M. Barot Abhishek M. Patel, K.R. Chaudahri, and Bhairavi N. Saudagar
31. **PERINEAL HERNIA AS COMPLICATION OF ATRESIA ANI AND ITS SURGICAL MANAGEMENT IN A FEMALE CALF**
S.S. Behera, A.K. Sahoo, I. Nath, D.K. Sahu, P. Rath and S. Dhanalakshmi
32. **SURGICAL MANAGEMENT OF OCULAR DERMOID IN A CALF**
Wahengbam Pipelu, Rekha Pathak, A.M. Pawde, Jagdeep Saini, Akshay Kumar, Mohar Singh, Prakash G.V. and Azam Khan
33. **HISTIOCYTOMA IN A HARIANA BULLOCK- A CASE REPORT**
Pooja Yadav, Rakshita, Amit Dhatarwal, Priyanka Duggal and Dinesh

34. **SURGICAL TREATMENT OF HERNIA IN BOVINES BY ONLAY POLYPROPYLENE MESH GRAFTING- A REPORT OF FOUR CASES**
John Martin K.D., Sudheesh, S. Nair, Laiju Philip M., M.K. Praveen, Soumya R., Dileepkumar, K.M. and Devanand, C.B.
35. **SURGICAL MANAGEMENT OF OESOPHAGEAL OBSTRUCTION IN A COW**
Puli Vishnu Vardhan Reddy, R.P. Pandey, S. Purohit, Kaushal, Arpit Kaushal and Ankit Negi
36. **PULSION DIVERTICULA OF ESOPHAGUS IN A RATHI COW – A CASE REPORT**
Vilas D., Dr. Shivangi Dwivedi, Rohit Kumar Sharma and Sakar Palecha
37. **MANAGEMENT OF CERVICO-VAGINAL PROLAPSE IN MURRAH BUFFALO**
Gyan Singh, Rishipal, Sandeep Kumar, Neeraj Arora, R.K. Chandolia and V.K. Jain
38. **PVC PROSTHESIS FOR MANAGING LEFT HIND LIMB AMPUTATION IN A CALF – A CASE REPORT**
S. Senthil Kumar, P. Tamil Mahan, M. Vijayakumar, S. Vigneshwaran, R. Ishwarya and A. Arun Prasad
39. **DELIVERY OF A MACERATED FETUS THROUGH LEFT FLANK IN A SAHIWAL COW**
Sonu Kumari, Gyan Singh, Shivangaura S. Patil and R.K. Chandolia
40. **SUCCESSFUL MANAGEMENT OF AN ORAL SINUS TRACT IN A BULLOCK**
S.A. Waghmare, R.V. Raulkar, I.P. Sarode, Badal Patle and C.A. Avhad
41. **SURGICAL MANAGEMENT OF OESOPHAGEAL OBSTRUCTION IN CATTLE – A REVIEW OF FOUR CASES**
P. Raja Guru and D. Vishnugurubaran
42. **SURGICAL MANAGEMENT OF UMBILICAL HERNIA IN HOLSTEIN-FRIESIAN CALF - A CASE REPORT**
F. A. Asodiya, K.B. Thakor and Greeshma Patel
43. **AFFECTIONS OF TAIL IN LARGE RUMINANTS-A REVIEW OF 12 CASES**
Kalaiselvan E., Naveen Kumar Verma, Surendra D.S., Rajeshkumar, Prakash G.V., Azam Khan and Tushar Rawat
44. **A RARE CASE OF CUTANEOUS MELANOMA IN CATTLE**
Sandeep Potliya, R.S. Bisla, Ankit Kumar, Harpreet Singh, Swati Ruhil and R.P. Gupta
45. **ANAL LEIOMYOMA IN A BUFFALO**
Sandeep Potliya, R.S. Bisla, Ankit Kumar, Swati Ruhil, Harpreet Singh and Rakshita Sharma

46. **EXTRAORDINARY LARGE SIZE DENTAL TUMOR AND ITS SURGICAL EXCISION IN A 19-YEAR COMMUNITY BULL**
Asit Kumar Maji, Durga Das Mandal, Mritunjay Mandal and Prasenjit Mukherji
47. **SURGICAL MANAGEMENT OF RUMINAL IMPACTION DUE TO INDIGESTIBLE FOREIGN BODIES IN COW**
Ashwani Kumar
48. **SUCCESSFUL MANAGEMENT AND SURGICAL REMOVAL OF LARGE TUMOUR IN BUFFALO**
Ashwani Kumar
49. **TRAUMATIC SUPERFICIAL AND DEEP DIGITAL FLEXOR TENDON RUPTURE-TWO CASE REPORTS**
D.R. Manjunath, N. Nagaraju, Harshitha G, Naghbushan H.V. and Rakesh, T.
50. **SURGICAL CORRECTION OF LACERATED TONGUE IN TWO CATTLE**
N. Nagaraju, D.R. Manjunath, Ramya. M.N. and Priyanka, N.
51. **ATRESIA ANI AND ITS SURGICAL MANAGEMENT IN MALE CALF - A REPORT OF FOUR CASES**
Rukmani Dewangan, Devendra Yadav, M.O. Kalim, Raju Sharda, Nutan Panchkhande and S.K. Yadav
52. **MANAGEMENT OF OBSTRUCTIVE UROLITHIASIS IN TWO BUFFALO BULLOCKS BY POST SCROTAL URETHROTOMY**
M.O. Kalim, Rukmani Dewangan, Raju Sharda, Devendra Yadav, Dhaleshwari Sahu, S.K. Sidar and S.K. Yadav
53. **SURGICAL MANAGEMENT OF HORN AFFECTIONS IN BOVINE- A REPORT OF SIX CASES**
Rukmani Dewangan, Raju Sharda, M.O. Kalim, Nutan Panchkhande, Devendra Yadav and S.K. Yadav
54. **XYLAZINE-KETAMINE INDUCTION AND XYLAZINE-KETAMINE-GUAIFENESIN TRIPLE DRIP CRI MAINTENANCE FOR OBSTRUCTIVE EQUINE COLIC SURGERY**
D. Vishnugurubaran, S. Dharmaceelan, S. Kokila, A.R. Ninu, M. Bharathidasan, S. Senthil Kumar and R. Ramprabhu
55. **TRACHEAL AND OESOPHAGEAL REPAIR IN A BUFFALO**
Neeraj Arora, Amit Kumar, Satbir Sharma, Deepak Kumar Tiwari and Deepak Kaushik



Award Session

M.R. PATEL BEST FIELD VETERINARIAN AWARD

1. **Surgical management of peri-anal affections in bovines in field condition: Review of 29 cases**
Brihaspati Bharti
Veterinary Assistant Surgeon, Poly Clinic, District Veterinary Hospital, Satna, M.P.
2. **Surgical Management of Intussusception in Cattle under field conditions: A Review of 48 Clinical Cases**
Indu Bhushan Bassan
Veterinary Assistant Surgeon, Animal Husbandry Department, Jammu, J&K
3. **Successful surgical excision and management of carpal hygroma in a buffalo**
Ashwani Kumar
Veterinary Assistant Surgeon, Department of Animal Husbandry, J&K
4. **Successful clinical management of Bullet injury sustained by Mare during cross border Indo-Pak firing at R.S. Pura-Arnia International Border in J&K**
Ashwani Kumar
Veterinary Assistant Surgeon, Department of Animal Husbandry, J&K

BEST CLINICIAN AWARD

1. **Limb prosthesis in cattle**
Shobha Jawre, Apra Shahi, V.P. Chandrapuria, Randhir Singh, Babita Das and Pallavi Vats
Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H., Nanaji Deshmukh Veterinary Science University, Jabalpur, M.P.
2. **Maxicofacial surgery by titanium mini plate in Pug**
Apra Shahi, Randhir Singh, Shobha Jawre and Babita Das
Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H., Nanaji Deshmukh Veterinary Science University, Jabalpur, M.P.
3. **Surgical management of splenic bloody nodules in dogs**
Prajyot S. Dakhane
Department of Veterinary Surgery and Radiology, Mumbai Veterinary College, Parel, Mumbai, Maharashtra
4. **An approach to diagnosis and management of diverse ocular disorders in cattle in gaushala**
S.K. Jhirwal
Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences, Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan

YOUNG SURGEON AWARD

1. **Use of Foley's catheter in different conditions of thorax and abdomen other than urinary system surgeries in ruminants**
Manjunath, S.P.
Veterinary Officer, Veterinary Dispensary, Anathi, Hassan, Karnataka
2. **Clinical studies on management of urolithiasis in 30 male kankrej bovines**
Prajawalita T. Sutharia
Assistant Professor, Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H., Sardarkrushinagar Dantiwada Agricultural University, Sardar Krushinagar, Gujarat
3. **Evaluation of PRP drop and L-PRF membrane for aggressive ulcerative keratitis in dogs**
Apoorva Mishra
Post graduate Scholar, Department of Veterinary Surgery and Radiology, College of Veterinary Science and A.H., Nanaji Deshmukh Veterinary Science University, Jabalpur, M.P.

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Dogs :- 0.5 - 2.2 mg / kg I.V. once.
For surgical pain, 1 mg / kg IV, SC or IM once, subsequent doses 1 mg / kg.
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Camels :- 1.1 - 2.2 mg / kg by slow IV or IM every 24 hrs for 3 to 5 days.
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Sea flora	Zingiber officinale (Shunthi)	960 mg
Choline Chloride		

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Dosage :

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- Increases serum calcium & magnesium level within 15 minutes.
- Supplies calcium, magnesium & Vitamin C to ensure normal level before during and after calving.
- Provides Ionic Calcium, Magnesium & Vitamin C which are ready available to the body.



INDICATIONS

- Prevention of hypocalcemia & milk fever.
- Treatment of milk fever as follow up therapy after I.V. Calcium.
- To support normal parturition, to prevent uterine inertia, ROP, metritis & delayed involution.
- To improve milk yield.



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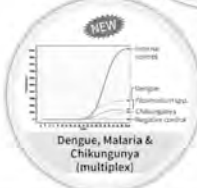
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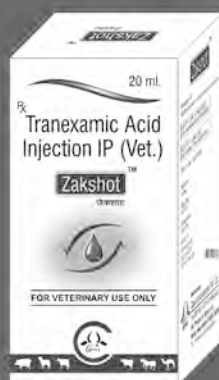
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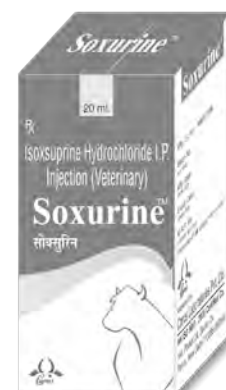
Presentation :
20 ml. & 50 ml.

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Isoxsuprine hydrochloride 5 mg./ml. Injection



The
Uterine
Relaxant



Presentation : 20 ml.

Herbal Remedy for Letting Down of Milk in Dairy Animals

MILKOPLEX BOLUS

**Powerful Galactagogue
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**Unique Remedy for
Psychological Disturbance**

INDICATIONS :

- ◆ Death of Calf
- ◆ Change in Place & Milker
- ◆ Oxytocin Dependent Animal
- ◆ Long Journey Sickness
- ◆ Parturition Stress
- ◆ Fear due to Unexpected Noise

Presentation :
20 Bolus x 1 Packet
10 Packets x 1 Box

Dosage :
2 to 4 Bolus twice a day.
(Prefer to Give 2 hours before Milking)



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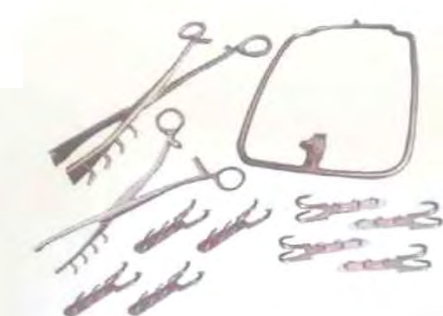


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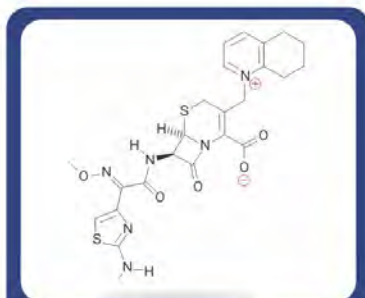
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Route: IM/IV use only

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for 3-5 days

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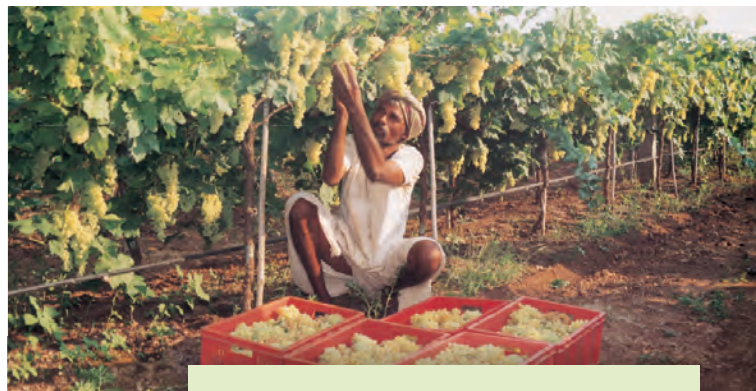
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