

**XXXVI Annual Congress of ISVS  
&  
International Symposium  
on**

**Ruminant Surgery in Polyclinics, Co-operative Dairies  
& Shelters: Perspective 2020**

**1-3, November 2012**

**at**

**ANAND**

***Organized by***

**Department of Veterinary Surgery and Radiology  
College of Veterinary Science & Animal Husbandry  
Anand Agricultural University, Anand 388 001  
Gujarat (India)**

***In collaboration with***

***Indian Society for Veterinary Surgery (ISVS)***

# **COLLEGE OF VETERINARY SCIENCE AND ANIMAL HUSBANDRY**

**Anand Agricultural University, Anand**

## **A GLIMPSE....**

The college was established by the Government of Gujarat in August, 1964 and was formerly affiliated to Sardar Patel University. It became constituent college of Gujarat Agricultural University in 1972. Presently, since May 2004, it is a constituent college of Anand Agricultural University. Excellent faculty, advanced infrastructure facilities for academics, advanced research and well equipped Library are salient features of this institute of repute, making it adjudged as a front runner by the Veterinary Council of India, attracting savvy, versatile candidates from far and wide.

### **Academic Opportunities:**

The College offers graduate study programme in Veterinary Science and Animal Husbandry. The college has intake capacity of 82 students/yr (60 state students + 7 VCI nominees + 17 Payment/NRI students). The college also offers post graduate study programmes leading to Masters and Doctorate degree in all the subjects of Veterinary Science and Animal Husbandry. A total of 1825 graduate students and 481 post graduate students (including 110 for Doctorate students) have so far earned their degrees from this college.

### **Infrastructure for Academic Excellence:**

The lush green campus houses Administrative building, Seventeen Departments, Four Research Stations, Clinical Complex, excellent Instructional Farm and a Library in altogether 65 acres of land. All Departments have well established with Under Graduate and Post Graduate Laboratories as well as direct access to internet. A separate Computer Lab. with eight internet connections provides excellent opportunity to the students for communication and access to scientific information from world over. Six class rooms, separate examination hall, seminar hall (AC) and conference room (AC) are valuable assets for class room teaching and other academic activities. Use of multi media is a common practice for effective communication with the faculty making enormous use of multi media rendering our class room teaching and communication extremely effective and invaluable. The Information Technology Centre of the University is also located on the campus. The Clinical Complex of the college attracts about 15000 animals for treatment and 2500 cows and buffaloes for artificial insemination every year. The Indoor Patient Home has facility to accommodate large as well as small animals and birds including isolation ward for contagious diseases.

### **Academic Programmes:**

The college follows regulations of Veterinary Council of India. The study programme for graduate degree (B.V.Sc. & A.H.) is for 5 years. This includes nine-semester study of theory and practicals and six months Internship Programme. Students of B.V.Sc. & A.H. complete 188 credits of different courses, with the best integration of practicals and theory in different courses. The Master degree programme is for four semesters and Doctorate degree programme is for six semesters. The Master and Doctorate students have to submit research dissertation as an academic mandatory requirement for these degrees.

### **Students' Amenities:**

The college campus has three UG and one PG boy's hostels and a separate girl's hostel. All these buildings are close to the main building. Each hostel is equipped with mess facility, television set and phone connection. A separate reading room facility with computer has been the pet choice for reading lovers in their leisure for technical as well as non technical (fiction – non fictional books) reading. A large cricket ground, indoor sports facilities and gymnasium provide ample opportunity for physical fitness to the students. The post office is also located on the campus.

### **Faculty:**

The college has excellent, highly qualified and ardently committed faculty. The faculty positions include Professors (13), Associate Professors (20) and Asstt. Professors (32), involved in teaching. In addition to this, 10 Scientists working at research stations are making significant contribution to teaching. A total of 73 faculty members hold Ph.D. degree in respective subjects. This faculty is also supported by large many Junior Res. Assistants, Senior Research Assistants, Research Fellows, Research

Associates etc. in different projects.

### **Research Capabilities:**

Our research programmes focus on general as well as specific issues of the state and country and are designed to meet even the most formidable challenges of 21st century. The excellent research laboratories and well organized research stations are the highly distinguished attributes of this institution. The college has Livestock Research Station, Poultry Complex, Animal Nutrition Research Station, Reproductive Biology Research Unit, Advanced Molecular Genetic Lab., Virology Lab., Frozen Semen Laboratory, Wild Animals Disease Diagnostic Lab. and Instructional Farms. All these laboratories and research stations are equipped with sophisticated equipments. The various agencies i.e. Indian Council of Agricultural Research (GOI), Department of Biotechnology (GOI), Department of Science and Technology (GOI), Gujarat State Biotechnology Mission (GOG) and Gujarat Government (Anand Agricultural University Plan and Non Plan schemes) are funding 34 research projects. The research workers are also benefited from substantial support and co-operation from State Government, Co-operative Milk Producers Union, and Industries etc. The commitment and dedicated work of the scientists, faculty members and PG students have produced meaningful results from these projects. The projects have been extremely advantageous in grooming post graduate students to attain splendid professional excellence. The faculty members contribute to scientific world in form of 85 – 95 research papers in national and 10 – 12 research paper in international journals.

### **Contribution in Research and Development of Horse**

Varies department have contributed in development of horse and improving health statues. Important contributions are genetic and phenotypic survey of Kathiawadi horse, nutritional requirements, surgical techniques to reduce fractures, abdominal surgery, diagnosis of causative organisms for infective diseases etc.

All Research features and activities have made this collage a “HUB OF ACADMIC EXCELLENCE IN VETERINAY AND ANIMAL SCIENCE” and final destination for higher studies.

### **Placement Cell:**

The college is keen on getting its graduate and post graduate students suitable jobs. Hence, a separate Placement Cell headed by an Associate Professor prepares brochure for out going students and it is handed out to all prospective employers and companies, who are invited for campus interview on the day of valedictory function of the graduating students. So far, maximum numbers of students of this college have been offered jobs through placement cell by many leading enterprises and firms. Interestingly enough, every year, many students opt either for higher studies or settle as independent veterinarians and consulting professionals, in spite of being offered lucrative job opportunities.

### **Extension Services:**

The scientists and faculty members actively contribute in dissemination of scientific knowledge skill and information through various activities. Some of the important activities/services are ambulatory veterinary services to villages, Laboratory disease diagnostic services, Poultry post mortem diagnostic services, Poultry Training Centre for village youth, animal feed analysis laboratory, Women Training Programmes, addressing calf rallies and animal shows at villages, writing of popular articles for farmers, radio talks, T.V. Every year, nearly 800 village women are given one week hands on training in management of animals under the programme founed by GCMMF. In addition, faculty members and PG students participate in “Krushu Mahotsava” the Mega Farmers’ Festival of the State. Organization of more than 10 - 12 animal health campus in various parts of Gujarat during week end reflect our commitment to and reaching out to rural people of state. Organization of ophthalmic diagnostic and dental treatment camps are special features of this collage. During Uttrayan, 5 teams of teachers and student large many injured birds due to kite threads. More than 5000 farmers visit research stations and Instructional Farms every year. The faculty has brought out many recommendations for farmers and scientists. The students and faculty members actively participate in mass vaccination programmes for animals during flood, outbreak of diseases and other natural calamities. Refresher courses are also being conducted every year for Government and Dairy veterinarians to impart hands on experience and knowledge about latest developments in frontier areas.

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| <b>S. No.</b> | <b>Session</b>                   | <b>Chairman</b>    | <b>Co-chairman</b>      | <b>Rapporteur</b>     |
|---------------|----------------------------------|--------------------|-------------------------|-----------------------|
| 1.            | Dr. R.P.S. Tyagi Oration         | Dr. M. R. Patel    | Dr. Dr. T. K. Gahlot    | Dr. Amarpal           |
| 2.            | Theme session                    | Dr. Jit Singh      | Dr. G. R. Singh         | Dr. S. V. Upadhye     |
| 3.            | Anaesthesiology                  | Dr. N. S. Jadon    | Dr. Prakash Kinjavdekar | Dr. R. V. Sureshkumar |
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| 5.            | Equine surgery                   | Dr. S. S. Rathore  | Dr. L. Rangnath         | Dr. V. S. Dabas       |
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| 7.            | Avian surgery                    | Dr. N. H. Kelawala | Dr. N. Rajendran        | Dr. G. S. Khandekar   |
| 8.            | Ruminant surgery session         | Dr. L. B. Sarkate  | Dr. B. V. Shivprakash   | Dr. D. Dilipkumar     |
| 9.            | Orthopaedic surgery              | Dr. M. S. Vasant   | Dr. S. K. Tiwari        | Dr. B. P. Shukla      |
| 10.           | Wild & zoo animal surgery        | Dr. K. K. Sarma    | Dr. Prem Singh          | Dr. D. U. Lokhande    |
| 11.           | Young Scientist Award            | Dr. S. M. Usturge  | Dr. Indramani Nath      | Dr. J.M. Doifode      |
| 12.           | Best Clinician Award             | Dr. S. Thilagar    | Dr. D. K. De            | Dr. A.K. Das          |

## SCIENTIFIC PROGRAMME

| Time                                 | Programme   | Venue                           |
|--------------------------------------|---|---------------------------------|
| <b>1<sup>st</sup> November, 2012</b> |   |                                 |
| 08:30-09:30                          | Registration & Refreshment  |                                 |
| 10:00-12:00                          | Inauguration  | Sardar Patel Monument, Karamsad |
| 12:00-12:15                          | High Tea  | Sardar Patel Monument, Karamsad |
| 12:15-13:00                          | Dr. R.P.S. Tyagi Oration Award - 2011                             | Sardar Patel Monument, Karamsad |
| 13:00-14:00                          | Lunch   |                                 |
| 14:00-15:00                          | Theme Session   | Shushrut Hall                   |
| 15:00-15:15                          | High Tea  |                                 |
| 15:15-18:30                          | Anaesthesiology Session   | Ashwini Hall                    |
|                                      | Radiology & Imaging Techniques Session                            | Shushrut Hall                   |
|                                      | Equine Surgery Session  | Kapila Hall                     |
|                                      | Large animal poster session                                       | Kapila Block                    |
| <b>2<sup>nd</sup> November, 2012</b> |   |                                 |
| 08:30-09:30                          | Refreshment   |                                 |
| 09:30-13:30                          | Small Animal Surgery Session                                      | Shushrut Hall                   |
|                                      | Ruminant Surgery Session  | Ashwini Hall                    |
|                                      | Avian Surgery Session   | Kapila Hall                     |
|                                      | Award Session   | Kapila Hall                     |
| 13:30-14:30                          | Lunch   |                                 |
| 14:30-18:30                          | Orthopaedic Surgery Session                                       | Ashwini Hall                    |
|                                      | Wild and Zoo Animal Surgery Session                               | Kapila Hall                     |
|                                      | Small Animal Poster Session                                       | Kapila Block                    |
| 20:00-22:00                          | Cultural Programme  | Sushrut Hall                    |
| <b>3<sup>rd</sup> November, 2012</b> |   |                                 |
| 08:30-09:30                          | Refreshment   |                                 |
| 09:30-13:30                          | Demonstrations  | Surgery Department              |
|                                      | Plenary Session   | Ashwini Hall                    |
|                                      | General Body Meeting  | Ashwini Hall                    |
|                                      | Interactive Session with Scientists and Progressive Dairy Farmers | Sushrut Hall                    |
|                                      | Interactive Session with Panjrapole Managers                      | Kapila Hall                     |
| 13:30-14:30                          | Lunch   |                                 |



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| <b>3.</b>  | <b>Anaesthesiology Session</b>                    |  |
| <b>4.</b>  | <b>Radiology &amp; Imaging Techniques Session</b> |  |
| <b>5.</b>  | <b>Equine Surgery Session</b>                     |  |
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| <b>13.</b> | <b>Award Session</b>                              |  |



## 1. Current Trends in Large Animal Fracture Treatment

*Dr Hari Prasad Aithal*

Senior Scientist, Division of Surgery, Indian Veterinary Research Institute, Izatnagar- 243 122 (UP)

Fracture of long bones is one of the common surgical conditions encountered in large animal practice. In large animals, fractures are more difficult to treat and healing of fracture takes more time than in small animals or human beings. Till recently, most cattle and horses with severe fractures were euthanized, largely because it was difficult to restrict the animal's movement or keep its weight off the fractured leg during healing. Today fracture fixation in large animals has changed significantly. Internal fixation, using nails and plates, or external skeletal fixation permits an adult cattle or horse to stand on a broken leg while it heals, often making previously life-threatening fractures treatable. New devices, mainly adapted from the human field, have been successfully introduced into large animal practice. Further, new devices such as intramedullary interlocking nail (ILN) and external skeletal fixation (ESF) have also been developed exclusively for large animal fracture management. Some other advances in equine orthopedic surgery include the more frequent use of arthroscopy in repair of articular fractures, development of locking compression plate, and advances in management of laminitis and arthrodesis techniques. Magnetic resonance imaging, computed tomography and computerized surgical guidance systems are being integrated into surgery to allow less invasive surgical treatments of difficult fractures. Additionally, new anaesthetic protocols and methods of anaesthetic recovery have greatly reduced the complications like development of re-fractures during recovery in large animals. Nevertheless, many problems related to fracture fixation and healing are yet to be resolved and need concerted efforts to improve.

### Types of Fracture

Fractures involving the limbs are common in cattle and buffaloes. The cause of fracture is mostly an automobile accident; in young calves, they often occur due to trauma during dystocia or handling. The fractures are most commonly seen in metacarpus and metatarsus (about 50%), tibia (10-15%), radius and ulna (7-10%), femur, humerus, pelvis and phalanges, and fractures of axial skeleton are less frequently seen. Incomplete fractures, caused by long-term repeated stress, are fairly common in performance horses, whereas complete fractures commonly occur during intense exercise or result from a kick or severe accident. In large animals, fractures of lower limb are most likely to get open, where the end of a broken bone generally penetrates the skin. Equine skin is thin and easily penetrated by sharp bone fragments.

### Diagnosis of Fracture

Most complete fractures are easily diagnosed. The first sign of a fracture is generally a non-weight bearing lameness. The fracture site generally has swelling and the animal shows distress with carrying of affected leg. An animal with a complete fracture often attempts to move on three legs. Incomplete fractures, though infrequent, can be difficult to detect, as they usually cause only mild lameness. Early diagnosis is critical to prevent an incomplete fracture leading to a complete fracture. Confirmative diagnosis of a fracture can be done by radiographic examination. Generally both medio-lateral and cranio-caudal or dorso-plantar/dorso-palmar views are indicated. In recent years digital X-ray has increased the accuracy of diagnosing a fracture. Modern diagnostic methods like digital X-ray, CT scan, nuclear scintigraphy and MRI are particularly useful, where sometimes a survey radiograph fails to diagnose a fracture, especially an occult fracture or fracture/luxation of axial skeleton.. However, they are generally beyond the reach of a common veterinary surgeon.

### First Aid

The chance of a successful repair often depends largely on how the animal is handled before it gets on to the operating table. If the animal is forced to walk on the broken bone or if it is transported to the hospital without a proper splint, a relatively simple fracture might become a comminuted or compound fracture, which may be irreparable. The animal may attempt to use its broken leg to regain balance, which can cause severe damage to surrounding soft tissues, vessels and nerves. Arteries can stretch



and get damaged leading to bleeding and impaired blood flow to the fracture site. Fortunately, severe bleeding is unusual in large animals even with compound fractures.

First step should be stabilization of the fractured limb by applying splint to the fractured leg to reduce the animal's anxiety and further damage. It allows the animal to regain control of the leg even though it can not put complete weight on it. Once the limb is stabilized, most animals will rest the leg rather than try to use it for support. In excited animals it might be necessary to sedate the animal to reduce the anxiety and for splinting. A rigid splint (any lightweight, relatively strong, rigid material, such as wood or PVC pipe split lengthwise) should never be used directly against the animal's skin. Instead, a layer of cotton roll is applied over the skin, and gauze is tightly wrapped over the cotton, then the splint is placed over the bandage and wrapped with a cotton/elastic bandage. A splint requires at least two pieces of wood/PVC tubing that must be placed 90° apart, never 180°; one along the outer surface and the other along the front or the back of the leg. Placing the splint along the inner and outer surface of the leg is ineffective, as it does not prevent the leg from bending.

### Factors to be considered before fracture fixation

The outcome of a fracture and fracture fixation depends on many factors that vary from case to case. Many animals with simple fractures recover with rest and proper care. Others with much more serious injuries have to undergo surgical fixation at the earliest. The timing of surgical fixation of fracture is often dictated by multiple factors, particularly in the presence of other injuries. Nevertheless, early care and fracture fixation to stabilize the bone fragments is essential to minimize fracture complications. Several factors that should be considered while selecting the technique of fracture management, like, species of the animal, location and type of fracture, presence or absence of soft tissue and neuromuscular trauma, closed or open fracture environment, body weight and behavioural nature of the animal, the facilities available and above all the experience of the surgeon with a particular technique.

**Ability of the animal to stand and walk:** Large animals, cattle, buffaloes and horses, can walk on three legs easily, even after severe fracture in one leg; such animals have good prognosis after fracture fixation. Prognosis is generally poor in cases which remain recumbent for prolonged period. An animal lying down for few days without being able to get up, may or may not be able to get up on its own even after bone fixation. Hence every attempt should be made to make the animal stand at the earliest after splinting the fractured leg. Nevertheless, undue movement of the animal should be restricted.

**Type, severity and location of fracture:** Generally simple (closed) diaphyseal fractures of long bones below the stifle or elbow joint are amenable to treatment. A cast or any other external fixation technique is easily applied and may provide stable fixation of such fractures, especially in fore limbs. Animals with open comminuted and infected fractures with severe soft tissue injury are generally difficult to treat and recover slowly; external skeletal fixation (ESF) is generally advised to treat such cases. A fractured scapula can often be healed with 3-6 months of stall rest. However, a broken femur or humerus is difficult or nearly impossible to treat in large animals, especially in horses. Fortunately femoral or humeral fractures are more frequently seen in relatively young calves and foals, which can be managed with an internal fixation technique. The fractures at one end of the bone and those involving the joint generally lead to permanent arthritis and lameness. Treatment of such fractures should be done by providing stable and rigid fixation, and in most cases a trans-articular fixation is preferred.

**The possible outcome of fracture fixation, and the purpose and quality of life after recovery:** Generally cattle are excellent patients for treatment of fractures as they spend most of the time lying down, have a tremendous potential for bone healing and are most resistant to contralateral limb breakdown and stress laminitis, and usually well tolerate the fixation devices. Further, they are temperamentally less agile and powerful, and relatively less susceptible to infection than horses. Postoperative care and management is also relatively easy in cattle than horses. Infection and pain management are significant problems that the surgeon must address with equine patients. In horses, laminitis of the 'good leg' (support limb) is one of the most serious complications. Generally younger animals recover better and faster after a fracture than adults, more often because of lesser weight. One should also consider the purpose and quality of life after recovery from fracture. Broken bones can often mean



the end of a horse's athletic career. Further, possible arthritis problems, laminitis, recurring infections, and recurring injuries are more common in horses after a fracture. However, persistence of slight lameness or deformity is 'acceptable' in a cow or a buffalo. Amputation of a severely traumatized limb can be an option in cattle (due to socio-economic and religious concerns), but is never acceptable in a horse. These factors should be weighed before attempting and deciding on the surgical fixation of fractures in large animals.

**Economics:** The cost of fracture treatment and economics is a major concern in veterinary practice, more so in large animals. The cattle and buffaloes are reared mostly for production purpose and generally reared by poor farmers, exuberant cost of fracture treatment will jeopardize the poor farmer. Even in horses, treatment of a simple fracture may sometimes cost thousands of rupees. The cost of implants and the drug is also very high because of animals' heavy weight. When dealing with such a situation one must discuss with the animal owner about the severity of fracture, the realistic outcome and cost, and treatment should be attempted only with the owner's willingness and consent. Nevertheless, veterinarian should keep in mind the cost of treatment before deciding on the treatment. In bovines particularly, more often the choice of fracture treatment is dictated by the cost of treatment rather than the optimum level of fixation.

### **Challenges in large animal fracture management:**

**Need for immediate weight bearing:** One of the biggest challenges veterinary surgeons facing today with regards to fracture repair is that the animals need to be able to put weight on the fractured limb immediately after surgery. This is further compounded by the fact that many large animal patients have heavy body weight and the challenges become obvious. Even if the fracture could be repaired, the opposite (good) leg needs to be able to bear weight. If the corresponding leg supports too much of the body weight for long time, the support structures of that leg may break down leading to laminitis, especially in horses.

**Non-availability of implants:** It is another biggest challenge confronting the veterinary orthopaedic surgeon. There are very few implants used in fracture repair in cattle and horses that are designed specifically for them, most are adapted from human practice. Though large animals would need much bigger plates, the laws of physics and the amount of skin present limit the size of the plates that may be used. Plates and screws, or IM nails are most often not sufficient to allow a large animal to bear weight after surgery. Hence it is always advisable to use some type of cast/external fixation technique along with internal fixation to provide additional support to the limb.

**Open fractures:** The occurrence of open fractures is relatively more in large animals than in small animals. This is mainly attributed to heavy body weight, less soft tissue covering of lower limbs and also more possibilities of post-injury complications (inadequate first aid and delayed treatment etc.). Open fractures have a much lower prognosis and a higher cost associated with treatment, mainly due to higher incidence of infection of implants and soft tissues. Some of the biggest recent advances in fracture repair in large animals have been in the treatment and prevention of infections. In such cases effective antibiotic therapy along with early bone stabilization is recommended, which can be accomplished by ESF that allows drainage of open wounds. Whenever possible, early closure of open wounds is done to decrease the rate of infection.

**Recovery from surgical fixation:** Another major problem confronting large animal fracture management is the recovery from anaesthesia after surgical bone fixation. It is always the most anxious and stressful moment for the surgeon when a large animal gets from the operating table till it is back on its feet. Some of the methods used for smooth recovery include pool recovery systems, recovering in a sling, or using a system of ropes to assist in standing. First 24-48 hours of bone fixation is critical in large animal fracture fixation, and most of the implant failures occur during the period. During the early post-fixation period, the animal feels discomfort, and tries to adapt to the fixation device and learn to sit, lay, stand and walk with the device. Hence careful monitoring and assistance should be provided to the animal to get it accustomed to the fracture fixation/device.



### Methods of fracture fixation:

The first step in treating a complete fracture is to reduce the bone fragments into proper alignment. The animal is usually placed under deep sedation or general anesthesia to perform the open reduction, and specialized equipments might be required to pull large bones into position. Closed bone reduction is generally not possible in large animals due to heavy muscular pull and severe overriding of bone fragments. Once the bone fragments are properly aligned, they are fixed in position either with an external or an internal fixation device.

**External fixation techniques:** *Plaster cast* is the most widely used both in bovines and equines. Indicated in immobilization of fractures below the mid-diaphysis of radius or tibia. Under sedation/anaesthesia, cast is applied with the help of an assistant to maintain alignment of the limb. In large ruminants, the bone reduction can be achieved and the limb held in tension during casting by placing wires through the holes drilled in the hoof wall and applying tension. The thickness of the cast is usually based on clinical judgement. Casts 6-8 layers thick may be adequate for calves  $\leq$  150 kg body weight, but adult cattle may require casts 12-16 layers thick. Casts used on the hind limbs must be thicker because of stress concentration by the angulation of the hock. Incorporation of splints (wooden/metal) within the cast (2 rods placed  $90^\circ$  to each other) can increase the strength of the cast. Complete drying/hardening of the cast (attaining full strength) may require 24-72 hrs. Use of a walking bar ('U' shaped bar placed under the hoof and incorporated into the cast) will increase the distribution of loading forces into the cast and away from the distal limb. Fractures in adult cattle may heal within 8-10 weeks, but often require 12-16 weeks for clinical union to occur. Plaster is removed after radiographic fracture union takes place.

A *fiberglass cast* is a lighter, synthetic alternative to the more traditional plaster cast. It is done by padding the extremity with cotton or waterproof padding material, followed by wrapping several layers of knitted fiberglass bandages impregnated with a water-soluble, quick-setting resin. It is lighter and more durable than plaster, so fiberglass has quickly become the preferred type of casting with many large animal practitioners. It offers greater strength, less time for setting, and requires less maintenance than a plaster cast. However, the synthetic materials leave less room for swelling. Plaster is more moldable than the knitted fiberglass and resin bandages, so a more comfortable fit can sometimes be achieved with plaster.

**Internal fixation:** Internal fixation offers several advantages. A fracture repaired under compression heals more quickly and does not form a bony callus, which could interfere with tendons sliding over the bone. An animal with an internally fixed fracture can bear weight on the injured leg and return to work more quickly than an animal whose fracture is repaired with a cast or external fixation. In addition, internal fixation avoids the complications of cast application, such as pressure sores. Unlike in humans and small animals, in large animals, however, bone density rarely reduces (no stress protection), because no bone plate available is strong enough to take more than a fraction of an adult cattle's or horse's weight off the bone. Large animal surgeons constantly look for stronger, more rigid implant.

*Intramedullary nails*, though are the most widely and commonly used fixation devices in small animal practice since long time, it has gained acceptance in large animal practice only quite recently. Kuntscher nails, hollow IM nails, were earlier used in large animal fracture fixation due to the advantage of light weight and three point fixation. They have been used in transverse or short oblique fractures of long bones, especially femur, humerus and tibia, where the cortex is good with no longitudinal cracks. In recent years, intramedullary interlocking nails (ILN) have replaced the K-nails due their better mechanical advantage of prevention of collapse of the fracture site by the locking effect. An ILN is basically an intramedullary pin secured in position by proximal and distal transfixing screws, which engage the bone to the nail to provide axial bending and torsional stability. The ILN is best suited for diaphyseal fractures of femur and humerus in calves and foals, and is especially useful in fractures with extensive comminution of the diaphysis. Angled tibial ILN for bovine tibia has also been developed and is under investigation. Because screws are placed at either end of the nail, fractures of the metaphyseal or epiphyseal regions may not be amenable to repair with ILN if there is not sufficient bone for screw placement. Nevertheless, in distal femoral fractures, ILN introduced by normograde technique through the intercondylar fossa could provide greater purchase of the nail in the small distal fragment. ILN permits early return to limb function with the added advantage of minimal soft tissue morbidity. The outcome after surgical





repair of mid diaphyseal humeral and femoral fractures can be improved by the use of ILN and ILN-plate combinations; overall results are up to 75% with animal as large as 300 kg being successfully treated. Unfortunately these systems are not commercially available and evaluated extensively; hence their utility is limited at the moment. Non-availability of nails with proper size and shape, and the heavy cost of the instruments, however, limit their use in large animal practice.

*Dynamic compression plate (DCP)* having oval screw holes of special geometry has been used for rigid internal fixation of long bone fractures in large animals. Use of single plate, however, may not provide stable fixation in heavy animals. Hence, double plates have been used sporadically for fixation of tibial, radial, metatarsal and metacarpal fractures, both in bovines and equines. Plate luting, a technique that uses polymethylmethacrylate (PMMA) interposed between the plate and bone as well as between the screw head and the plate hole, to improve contact, stability and fatigue resistance to cyclic loading has been used to improve the outcome of plate fixation in equine long bone fractures. This method of increasing the contact area of the screw head with the plate hole, and increasing the contact surface between the plate and bone, provides a mechanism that prevents micro-motion at the screw head as well as movement of the plate on the bone. Plate luting could increase the fatigue life of the implants by 300–1200 % without additional negative biological effects that would influence bone healing. Presently, the use of plate luting is a standard technique in treating long bone fractures with plates. Incorporation of antibiotics into the PMMA has the added benefit of continuous local antibiotic coverage within the wound of potentially infected fractures postoperatively.

The use of *Locking Compression Plate* system has perhaps been the most important advancement in the past decade. Locking compression plates have threaded screw holes, which allow screws to thread to the plate and function as a fixed-angle device. These plates may have a mixture of holes that allow placement of both locking and traditional nonlocking screws (combi plates). Fixed angle screw plate constructs do not rely on the screw thread bone interface or plate bone friction to provide stability in fracture repair. The significant result of this is improved holding strength of constructs with a much lower risk of implant loosening or constructs failure even in the face of sepsis. The fixed angle screw-plate constructs have been used in the repair on most long bone fractures in foals, arthrodesis techniques, as well as revision surgeries for failed orthopedic repairs. While locking plates have been used for years in specialized research trials, they have been available for general orthopaedic applications only in the last 5 to 10 years. This system has not yet been used in large animals as a clinical entity but may have promise. The concept of mechanically locked screws should provide stronger and more certain stability than plate luting. This locking compression plate concept might even allow the use of biological fixation. Locking plates can be considered as external fixators placed underneath the skin, further they are more stable as a result of the shorter distance between the plate and the bone. Continued efforts to develop locking plate specifically for large animals may improve the outcome of fracture fixation.

**External skeletal fixation:** It refers to the stabilization of musculoskeletal injury using percutaneous fixation pins that are connected outside the body to form a rigid frame or scaffold, spanning the region of instability, e.g. transfixation pinning and casting, bilateral linear fixators and circular fixators. This type of fixation is indicated for the management of long bone fractures especially of tibia and radius, where cast immobilization is not appropriate or does not provide optimal level of fixation (fractures proximal to the distal radial or tibial physis, with soft tissue injuries and open fractures).

External skeletal fixation is another area of exploration for use in large animals, though it has not been widely embraced in large animal orthopedics. The use of human and small animal fixators adapted for use in adult large animals did not succeed in the hands of different surgeons and have gone unreported in the literature. However, more recently ESF devices are exclusively being developed for use in large animals. A resurgence of interest in ESF occurs every time a clinician is faced with an unstable, severely comminuted open or closed fracture of a weight supporting bone where reconstruction using internal fixation is technically impossible. 'Pins in plaster' method has been used in large animals, including horses, as a treatment modality. It is the use of a walking bar incorporated into a cast using transfixation pins above the fracture. Transfixation pinning and casting (TPC) may be applied either as a 'hanging limb pin cast' or as external skeletal fixator. Hanging limb pin cast refers to placement of transfixation pins through the bone proximal to the injury, followed by application of a full limb cast. The advantage of using pin-casts compared with hanging limb casts is that the fracture is more stable and the fracture fragments are not able to move within the pin-cast, and the pin-cast may not need to span adjacent joints. For management of open fractures, daily dressing of



the wound may be carried out by leaving a hole in the cast (window cast) at the site of injury. However, this gives unsatisfactory access to the wound and is uncomfortable to the patient because the swelling in the limb becomes concentrated at the defect in the cast. An ESF device specifically designed for equine use in distal limb fractures has also been reported. This device incorporated transfixation pins in the intact bone above the fracture, with sidebars and a base plate that allowed the transfer of weight-bearing forces around the fracture to the ground. This allowed the animal to bear weight immediately after fixation via the pins and sidebars without loading the fracture. Modified ESF design was also developed using the concept of loading the ESF pin in shear instead of bending, which involved using large diameter sleeves over the transfixation pins.

At Indian Veterinary Research Institute, concerted efforts were made to develop different designs of linear, circular and hybrid external fixators specifically for use in large ruminants. The results with the use of these devices were encouraging, especially in those open infected long bone fractures where no other fixation technique could be effective. Advantages of ESF include: early return to function of the affected limb with excellent mechanical properties; ability to adjust the frame after bone fixation, allowing correction of rotational or angular deformities; avoidance of surgical trauma to the injured tissue; avoidance of infection associated with buried implants; ease of implant removal after fracture union; provision for transarticular fixation in the presence of severe soft tissue trauma or severe comminution of the proximal or distal end of the affected bone; preservation of joint motion and multiple applications with reusability of components.

**Epoxy-Pin fixation systems:** Standard ESF devices with stainless steel components provide rigid fixation but are heavy. Aluminum and carbon fiber components are lighter; however there is higher cost with carbon fiber. Regardless, the size and shape of the connecting bars/rings are similar and fixation of transosseous pins is dictated by the size and location of clamps or rings. To overcome these limitations, other materials like acrylic (eg, polymethylmethacrylate) and epoxy putty have been used for use in light weight animals like calves and foals. Advantages of free form fixation include contouring the connecting bars to match any fracture configuration, pin direction not influenced by connecting bar location, and pin diameter not influenced by clamp size. Free form fixators have been generally used for mandible and maxilla fractures in dogs and for fractures of small bones in birds. But in recent years, they have been found effective for management of open, infected long bone fractures in calves and foals.

Epoxy-pin fixators (bilateral multiplanar and circular designs) can be used for repair of open fractures/dislocations distal to the stifle and elbow joints. Fractures and dislocations are reduced and immobilized using 2.0-3.0 mm K-wires (depending on the animal's weight) fixed at different levels (at least at 2 points in each fragment). Fixation wires in the same plane are bent and joined; and using additional wires, connecting bars/rings are constructed to make a temporary scaffold. Thoroughly mixed epoxy putty is then applied using the scaffold as guide and by incorporating the wires within the epoxy mold. The fixation of epoxy-pin ESF is easy, less cumbersome, needs minimal instrumentation, economical and also provides stable fixation of fractures in animals weighing at least up to 100 kg, hence can be practiced by a veterinary surgeon at any remote corner in the field.

### Conclusions:

Even though fracture repair has made tremendous advances in recent years, it remains a great challenge to treat fractures in large animals, and the risks and benefits should be thoroughly analyzed before choosing repair. It is a tough task to repair fractures especially those associated with upper part of limbs, including that of tibia. It seems strange that although much of the technological advancement has taken place in the field of veterinary and medical fields, there is not much development in the field of large animal orthopaedics. Efforts are being made to develop fracture fixation techniques and devices/implants custom made for large animals, nevertheless still there is a long way to go. There is also need to impart training and develop specialists in large animal fracture repair. It is expected that next few years will be exciting for large animal orthopaedics in terms of technology development. Until then treatment of fractures in large animals will remain a huge challenge for veterinary surgeons.



## 2. Ruminant Surgery

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In this paper an over view of ruminant surgery primarily cattle and buffalo in shelters/co-operatives vis-à-vis teaching /research institutions/referral hospital will be given. The cost of productive cattle and buffaloes has increased significantly during the last decade or so, primarily due to improvement in the milk production. The animal owners have become aware of the significance of proper treatment of sick animals including diagnosis and surgical operation. Significant developments in the diagnosis and surgical treatment of abdominal affections of ruminants have taken place in India during the last decade or so. Commonly adopted diagnostic procedures and routinely performed abdominal surgeries are practically done in all the institutions of India and even in the state Animal Husbandry polyclinics. The scope of ruminant surgery in shelters and co-operatives is limited by availability of resources/equipment/manpower and to some extent knowhow of the latest techniques and the ruminant surgery is limited to minor procedures. However, the advantage that majority of ruminant surgeries can be performed under local anaesthesia can be exploited by the veterinarians. Procedures such as rumenotomy, caesarian section, claw trimming, treatment of foot lesions, urine retention cases, intestinal surgery, rectal prolapse, teat and udder surgery, minor hernias, abscess opening, lacerations etc. can be effectively performed under field conditions. Major surgeries requiring general anesthesia such as pre-pubic tendon rupture, diaphragmatic hernia, fracture repair requiring internal fixation, major tendon surgery etc. are best performed in well equipped institutions, may call them teaching /research/referral hospitals. The concept of well equipped referral hospitals or the referral practice therefore becomes important. The information technology has eased the job of referring as well as the specialist to a greater extent. The mind set of the referring as well as the specialist must now change to give best service to the farmers/animals. At the same time unnecessary referring a case with unfavourable prognosis may be undesirable. Basic work on historical data, preliminary clinical examination and probable diagnosis can help the specialists a great deal. Veterinary surgeons in institutions/university hospitals can be a busy lot, the field veterinarians can help them save a lot of time by referring proper cases and with adequate and relevant information on diagnostics drawing valid conclusion.

Diagnostic procedures and laboratory tests, introduction of digital/computerized radiography for precise diagnosis of ruminoreticular diseases has strengthened the diagnosis. Developments, in the diagnosis of diaphragmatic hernia, diffuse peritonitis, reticular abscess, reticular adhesions, pericarditis, Caecal dilatation and impaction, intestinal obstruction, impaction of omasum and abomasum, have come with the use of diagnostic ultrasound. These developments have played a significant role in the early and precise diagnosis of abdominal diseases and also in determining the prognosis of clinical cases. This should really form the basis of referring a case to a referral hospital. This paper will cover some of the recent changes which may also help the veterinarians working in field hospitals.

List of common surgical procedures that can be dealt with at field hospital and also some examples of cases unsuitable for referring is given below:

| Field hospital surgery  | Cases not to be referred  |
|---|---|
| Teat and udder surgery (fistulae/obstruction/udder abscess), Caesarean section, Rumenotomy  | Recumbent with musculoskeletal disorders e.g. fractures/bilateral fractures, GIT cases, debilitated and considered of unfavourable outcome., Cases which may not be managed even at referral hospitals eg bilateral prepubic tendon rupture., wherever in doubt <b>Consult the specialist before referring.</b> |
| Intestinal obstruction, Hoof trimming and hoof lesions Tail and horn affections, Atresia-ani, Contracted tendons, Plaster application, Minor hernia eg. umbilical hernia, Tooth rasping, Disbudding |   |
| Castration, Parotid duct ligation, Buccal fistula   |   |
| Lacerations, Abscesses, etc. etc.....   |   |





In shelters or gowshala, the veterinarian must consider the population that can be accommodated at the shelter/gowshala and also the budget provisions for feeding etc. Welfare of animals may be paramount in these cases. Therefore it may be very useful to limit the population by adopting procedures such as castration of male animals. Disbudding should be viewed as an important procedure that can prevent serious injuries to animals. Zoonosis may a major issue particularly such as TB, Brucellosis positive cases are mixed with healthy animals. A brief account of some of the important surgical disorders is given below:

### Surgical Procedures

As indicated earlier a large number of surgical procedures can be performed by field veterinarians under local anaesthesia but some cases are such which require referring to the referral hospital. Attempting a surgery, unless life threatening, should avoided without adequate instrumentation and man power.

**Rumenotomy:** Rumenotomy is performed routinely from left flank for traumatocreticulitis (hard ware disease, wire, metallic foreign bodies) removal of plastics, ropes etc., acute rumen acidosis, ingestion of chemicals/pesticides/ insecticides, acute rumen tympany (rumenotomy/rumenostomy), drainage of reticular abscess, evacuation of rumen for diaphragmatic herniorrhaphy, diagnosis of rumen papilloma and ulcers etc. During the last decade or so, impaction of omasum and abomasums has emerged as a major problem in the northern states. Techniques developed for drainage of impacted omasum and abomasums through rumen by hydrating the contents and kneading followed by slowly evacuating the contents into rumen are now routinely used. Mineral oil/vegetable oil and salt solutions (glauber's salt and common salt) can be infused into omasum or abomasum. Biopsy of omasum leaves and wall has helped to determine prognosis of cases of omasal impaction.

**Abomasal displacement:** Right or left displacement of abomasum (LDA and RDA) is a disease of high yielding cattle. Ultrasound has been used for diagnosis of LDA and RDA. Left flank, right flank, right-left flank and ventral approach for abomasopexy, omentopexy are used. In Indian conditions LDA and RDA are less commonly encountered in cattle and buffaloes.

**Diaphragmatic herniorrhaphy:** During the last decade or so diaphragmatic hernia (DH) in buffaloes and cattle have been treated by following different surgical approaches which include abdominal and thoracic approach. Diaphragmatic herniorrhaphy in cattle and buffalo have been successfully performed under local anesthesia as well as in standing animal. General anaesthesia remains the preferred choice for performing herniorrhaphy in bovine. Despite different surgical approaches adopted for herniorrhaphy, anaesthetic protocols adopted for administration and monitoring of general anaesthesia are probably the most significant. Use of halothane and isoflurane has not only facilitated smooth and early recovery of animals from general anaesthesia, this has helped to enhance the survival rate in DH cases. The abdominal approach under general anaesthesia remains the most popular approach for repair of DH in bovine. Recently linear incision for diaphragmatic herniorrhaphy has been successfully used by surgeons at Hissar and Ludhiana.

**Intestinal Surgery:** Small and large intestinal obstruction by fecoliths, intussusceptions, volvulus and torsion have been reported. Surgical resection and end to end or side to side anastomosis are routinely done in bovine. Drainage of dilated and impacted caecum in cattle and buffaloes is also common. Almost all surgical procedures in bovine are performed from right flank in standing animals. Although they can be done in lying animals as well. Surgeons from SKAUST-Jammu have reported side to side anastomosis of small intestine in cases of intussusceptions without resecting the affected segment of intestine with fair amount of success. The left flank approach after evacuation of rumen contents to the extent of 80-90% can also be used for intestinal surgery particularly the small intestinal obstruction and even caecal dilatation cases.

*Repair of perineal laceration, recto-vaginal fistulae, rectal tears and resection of rectal prolapse have been carried out successfully in cattle and buffaloes.*

**Abdominal hernia:** Ventral abdominal hernia, umbilical hernia and perineal hernia are successfully treated surgically. Synthetic non-absorbable mesh (polypropylene mesh, improvised synthetic mesh) for repair of massive tear in the abdominal wall have been used successfully. The mesh can be placed in the subcutaneous area and sutured to the muscle sheath to reinforce the suture line. This has been found to give better results in abdominal hernia.



**Pre-pubic tendon rupture:** Rupture of pre-pubic tendon is seen more commonly but not exclusively in buffaloes after calving. In fact pre-pubic tendon rupture can be viewed as massive ventral abdominal hernia. The repair of prepubic tendon is done under general anaesthesia in the dorsal recumbency. Use of synthetic mesh (polypropylene) has been successfully used to reinforce the suture line in pre-pubic tendon rupture repair in bovine. Drainage tube can be helpful in draining excess fluid accumulated at the site. Bilateral rupture of pre-pubic tendon in buffaloes has a poor prognosis. Such cases should therefore not be referred to the referral hospital.

**Caesarean section:** Caesarean section for delivery of calf can be performed through flank in standing animal. Alternately, as is most commonly practiced in India, Caesarean section can be performed through a linear incision parallel to left milk vein in the recumbent (right lateral recumbency) animal. This technique is more useful in cases of fetal emphysema and uterine torsion.

**Urinary system:** Urethrotomy in bullock and buffalo bulls is performed through post scrotal, prescrotal or ischial approach. The rupture of urinary bladder, a sequellae to urine retention, can be repaired through flank or perineal approach. Flank approach is more popular in adult animals. In calves however, retention of urine and rupture of urinary bladder have been successfully treated by placing an intra-cystic foley's catheter through parmedian incision and subsequent dietary management. In buffalo bulls usually stones are located near the glans penis and in such cases ultrasound can be used to locate the stone followed by surgical removal.

**Neonatal surgery:** Atresiani, atresiani et recti, pervious urachus, rupture of urinary bladder, resection of infected naval cord and congenital hernia have been successfully treated surgically in newly born calves.

**Pericarditis:** Usually the cases have unfavourable prognosis. But such cases if detected early can be successfully treated by drainage and use of suitable antibiotics. Rib resection thoracotomy in the standing animal or anaesthetized animals may be less rewarding.

**Fracture repair:** Long bone fracture repair with external fixator, trasfixation, K-nailing for femur humerus fracture have been done successfully. More recently intramedullary interlocking nailing using indigenously designed jig or C-arm have been successfully used for repair of femur, humerus, tibia fractures with excellent outcome.

**Tendon and ligament injuries:** Besides medial patellar desmotomy, severed deep and superficial flexor tendons and also achilles tendon using different suture patterns including locking loop pattern have been done successfully with very good out come.

#### **Conclusion:**

Ruminant surgery in most of cases can be successfully performed at shelters/and co-operatives. However, for major surgical procedures the cases may have to be referred to referral hospitals. The surgeons working under field conditions should have a good contact with the specialist. Where ever in doubt the field veterinary surgeon should contact the specialist. Those cases suitable for major surgery may only be referred to avoid unnecessary trouble/financial loss to the farmer and a frank opinion about the prognosis should be given by the veterinary surgeon. Welfare of animals in shelters and resources for feeding and housing should be given due weightage.



## Decision making in Equine colic patients

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Before understanding decision making in equine colic patients it is important to review applied anatomy of gastrointestinal tract of horse. For a surgeon the part(s) of large or small intestine which is/are commonly obstructed due to sudden changes in diameter of lumen, displacement of intestine, exploration and land marks in identification of parts of intestine, abdominal wall etc. are important to understand. A brief review of gastrointestinal tract is as under:

**Stomach and small Intestine:** The stomach in horses lies on the left side of abdomen below the rib cage and has a capacity of about 2-3 gallons in adult horse. The cardia is a one way valve Small intestine consists of duodenum, ileum and jejunum. The duodenum is located on the right side and suspended by mesentery which does not allow it to be displaced (volvulus). Distended duodenum (proximal enteritis) can be palpated rectally in the right paralumber fossa at the base of cecum. The mesentery of jejunum and ileum is fan like and allows the small intestine to rest on the ventral abdomen. The jejunum is 60-65 feet long and last 18 inch of small intestine with mesentery on both ends is ileum. The ileum joins the large intestine (cecum) and is identified by ileo-cecal fold from ileum to the dorsal band of cecum

**Large Intestine:** It consists of cecum, colon, rectum and anal canal. It extends from the ileum to anus, and functions to dehydrate fecal contents by absorbing water.

**Cecum:** A huge, comma shaped structure occupying much of the right abdominal cavity. It is also known as the "water gut" or "hind gut." It is a cul-de-sac pouch, about 4 feet (1.2 m) long that holds 7 to 8 gallons. These bacteria feed upon digestive chyme, and also produce certain fat-soluble vitamins which are absorbed by the horse. The reason horses must have their diets changed slowly is so the bacteria in the cecum are able to modify and adapt to the different chemical structure of new feedstuffs. Too abrupt a change in diet can cause colic as the new food is not properly digested.

It consists of **base**, **body** and **apex**. **Base:** is the bulbous beginning of the cecum in the right paralumber fossa. **Body:** the continuation of the base cranially along the right wall and floor of the abdominal cavity. **Apex:** The tapered end of cecum on the floor of the abdominal cavity, caudal to xiphoid cartilage. The ventral colon wraps around it. So, cecum is a blind sac that functions as a fermentation vat, and in some ways is similar to a cow's rumen. The fermenting material then passes from the cecum to the large colon. **Ileo-cecal opening:** The ileal opening into the base of cecum. In other domestic species, the ileum opens into the colon. **Cecocolic opening:** The opening at the base of the cecum to the ascending colon.

**Colon:** a highly modified structure with great capacity in the horse. The main site of fermentation - the process of breaking down "structural carbohydrates" in the diet such as cellulose. The large colon is 10-12 feet long and holds up to 20 gallons of semi-liquid matter. Due to its many twists and turns, it is a common place for impaction.

**Ascending colon (Large colon):** due to its size, also called the great colon. Imagine the generalized short ascending colon grasped in its middle stretched out. The formed loop is then again folded on itself. This gives the double horseshoe loop of the ascending colon. The two loops lie on top of each other, with the front of loops towards the diaphragm, and turns between the two loops at pelvic inlet. The different portion of the ascending colon listed as they receive food are- right ventral colon - sternal flexure - left ventral colon - pelvic flexure - left dorsal colon - diaphragmatic flexure - right dorsal colon.

**Right ventral colon:** the beginning of the ascending colon at the cecocolic opening and extending cranially on the right abdominal floor to the sternum. **Sternal flexure:** The connection between right and left ventral colons curving around the apex of the cecum. **Left ventral colon:** The continuation of the sternal flexure that ends into pelvic flexure. **Pelvic flexure:** The connection



of the left ventral and the left dorsal colon in the left paralumbar fossa near the pelvic inlet. **Left dorsal colon:** The continuation of the pelvic flexure cranially on the top of the left ventral colon, and against the left abdominal wall. **Diaphragmatic flexure:** the continuation of the left dorsal colon on the top of the sternal flexure. **Right dorsal colon:** The greatly expanded continuation of the diaphragmatic flexure caudally to the transverse colon. The ampulla coli (stomach like dilation) is the expanded terminal portion of the right dorsal colon. **Transverse colon:** The segment of colon curving from right to left cranial to the root of the mesentery.

**Descending colon (Small colon):** the continuation of the transverse colon to the rectum. Smaller than the ascending colon, the descending colon is called the small colon. The small colon is 10–12 feet in length and holds only 5 gallons of material. It is the area where the majority of water in the horse's diet is absorbed, and is the place where fecal balls are formed. Compared to the domestic species the horse's descending colon is long with long mesocolon, allowing it a wide range of motion. **Rectum:** the terminal portion of the intestines located in the pelvic cavity. The terminal dilation of it is known as rectal ampulla. The rectum is about one foot long, and acts as a holding chamber for waste matter, which is then expelled from the body via the anus. **Mesocolon:** The connecting peritoneum arising from the abdominal roof and extending between the dorsal and ventral colons.

**Bands or teniae:** The variable number of longitudinal smooth muscle cords on the cecum and the different segments of the colon. Some of these are hidden in the mesentery attached to different segments. On the ventral colon there are two bands on mesocolon and two free are free. The small colon has a mesocolon and a free band. The cecocolic fold connects the right ventral colon to the lateral band of cecum. The ileocecal fold connects the ileum to the dorsal band of the cecum. **Sacculatons or haustra:** The series of pouches in the walls of the cecum and ventral colon formed by the bands of these intestinal segments.

**In brief,** in horses the stomach, duodenum, diaphragmatic flexor, sternal flexure along with associated parts of large colon cannot be exteriorised. Similarly the transverse colon cannot be exteriorised. The cecum, pelvic flexor and associated parts of large colon are the main parts of large intestine which can be explored and opened for drainage. The pelvic flexure and transverse colon get obstructed due to sudden changes in lumen. The pelvic flexure and associated parts of large colon left ventral colon and left dorsal colon easily are displaced (LDDLC and RDDLC). The loose mesentery of small intestine allows mainly jejunum to move into epiploic foramen and mesenteric rents causing strangulation. Majority of small intestine and small colon can be easily exteriorised and can be opened to relieve obstruction. The Careful identification of omentum, mesentery, bands of cecum and colon are important for systematic exploration of abdomen. Location of abdominal incision and suturing plays important part in colic cases.

Colic is abdominal pain, but it is a clinical sign rather than a diagnosis/disease. The term colic can encompass all forms of gastrointestinal conditions which cause pain as well as other causes of abdominal pain not involving the gastrointestinal tract. The most common forms of colic are gastrointestinal in nature and are most often related to colonic disturbance. There are a variety of different causes of colic, some of which can prove fatal without surgical intervention. Colic surgery is usually an expensive procedure as it is major abdominal surgery, often with intensive aftercare. Among domesticated horses, colic is the leading cause of death. The incidence of colic in the general horse population has been estimated between 10 and 11 percent on an annual basis.

**Classification of colic:** The list of types of colic is exhaustive but details of some of the types which may be encountered is given as under.

### ***Pelvic flexure impaction***

This is caused by an impaction of food material (Water, Grass, Hay, Grain) at a part of the large bowel known as the *pelvic flexure* of the left colon where the intestine takes a 180 degree turn and narrows. Impaction generally responds well to medical treatment, but more severe cases may not recover without surgery. If left untreated, severe impaction colic can be fatal. The most common cause is when the horse is on box rest and/or consumes large volumes of concentrated feed, or the horse has dental disease and is unable to masticate properly. This condition could be diagnosed on rectal examination by a veterinarian.



### **Spasmodic colic**

Spasmodic colic is the result of increased peristaltic contractions in the horse's gastrointestinal tract. It can be the result of a mild gas buildup within the horse's digestive tract. The signs of colic are generally mild and respond well to spasmolytic and analgesic medication.

**Ileal impaction:** The ileum is the last part of the small intestine that ends in the cecum. Ileal impaction can be caused by obstruction of ingesta. Other causes can be obstruction by ascarids (*Parascaris equorum*) or tapeworm (*Anoplocephala Perfoliata*).

**Sand impaction:** This is most likely to occur in horses that graze sandy or heavily grazed pastures leaving only dirt to ingest. The ingested sand or dirt accumulates in the pelvic flexure, right dorsal colon and the cecum of the large intestines. As the sand or dirt irritates the lining of the bowel it can cause diarrhea. The weight and abrasion of the sand or dirt causes the bowel wall to become inflamed and can cause a reduction in colonic motility and in severe cases even peritonitis. Historically medical treatment of the problem is with laxatives such as liquid paraffin or oil and psyllium husk. The doctors are also treating cases with specific symbiotic (pro and prebiotic) and psyllium combinations. Some cases may need surgery. Horses with sand or dirt impaction are predisposed to *Salmonella* infection. Horses should not be fed from the ground in areas where sand, dirt and silt are prevalent although small amounts of sand or dirt will still be ingested by grazing.

**Enterolith:** Enteroliths in horses are round balls of mineral deposits often formed around a piece of ingested foreign material, such as sand or gravel. When they move from their original site they can cause obstruction of the intestine. Enteroliths are not a common cause of colic, but are known to have a higher prevalence in states with a sandy soil and where an abundance of alfalfa hay is fed, such as California. Once a horse is diagnosed with colic due to enterolith it usually requires surgery to correct the condition.

**Large roundworms:** Occasionally there can be an obstruction by large numbers of roundworms. This is most commonly seen in young horses as a result of a very heavy infestation of *Parascaris equorum* that can subsequently cause a blockage and rupture of the small intestine. Deworming heavily infected horses may cause a severe immune reaction to the dead worms, which can damage the intestinal wall and cause a fatal peritonitis. Veterinarians often treat horses with suspected heavy worm burdens with corticosteroids to reduce the inflammatory response to the dead worms. Blockages of the small intestine, particularly the ileum, can occur with *Parascaris equorum* and may well require colic surgery. Large roundworm infestations are often the result of a poor deworming program. Horses develop immunity to parascarids between 6 months age and one year and so this condition is rare in adult horses.

**Tapeworms:** Tapeworms at the junction of the cecum have been implicated in causing colic. The most common species of tapeworm in the equine is *Anoplocephala perfoliata*. However, a 2008 study in Canada indicated that there is no connection between tapeworms and colic, contradicting studies performed in the UK.

**Cyathostomes:** Acute diarrhoea can be caused by cyathostomes or "small Strongyle type" worms that are encysted as larvae in the bowel wall, particularly if large numbers emerge simultaneously. The disease most frequently occurs in winter time. Pathological changes of the bowel reveal a typical "pepper and salt" colour of the large intestines. Animals suffering from cyathostomiasis usually have a poor de-worming history. There is now a lot of resistance to fenbendazole.

**Left dorsal displacement of large colon (LDDLC):** Left dorsal displacement is a form of colic where the left dorsal colon becomes trapped above the spleen and against the nephrosplenic ligament. It may necessitate surgery although often it can be treated with exercise and/or phenylephrine, at times anaesthesia and a rolling procedure must be performed to correct the condition medically. This condition can be diagnosed on rectal examination or through ultrasonography by a veterinarian. Surgery is also indicated in cases of LDDLC.

**Right dorsal displacement of large colon (RDDLC):** Right dorsal displacement is another displacement of part of the large bowel. Although signs of colic may not be very severe, surgery is usually the only available treatment. The prognosis in delayed





cases is usually unfavourable.

**Torsion:** Torsion is common after foaling in mares but can occur spontaneously. Various parts of the horse's gastrointestinal tract may twist upon themselves. It is most likely to be either small intestine or part of the colon. Occlusion of the blood supply means that it is a painful condition causing rapid deterioration and requiring emergency surgery.

**Intussusception:** Intussusception is a form of colic in which a piece of intestine "telescopes" within a portion of itself. It most commonly happens in the small intestine of young horses and requires urgent surgery. Ileo-cecal intussusception is also seen in horses.

**Epiploric foramen entrapment:** On rare occasions, a piece of small intestine can become trapped through the epiploric foramen. The blood supply to this piece of intestine is immediately occluded. The intestine becomes trapped and surgery is the only available treatment.

**Strangulating lipoma (Pedunculated lipoma):** Mostly seen in old horses, benign fatty tumors known as lipomas can form on the mesentery. As the tumor enlarges, it stretches the connective tissue into a stalk which can wrap around a segment of bowel, typically small intestine, cutting off its blood supply. The tumor forms a button that latches onto the stalk of the tumor, locking it on place, and requiring surgery for resolution.

**Mesenteric rent entrapment:** The mesentery is a thin sheet attached to the entire length of intestine, enclosing blood vessels, lymph nodes, and nerves. Occasionally, a small rent (hole) can form in the mesentery, through which a segment of bowel can occasionally enter. As in epiploric foramen entrapment, the bowel first enlarges, since arteries do not occlude as easily as veins, which causes edema (fluid build up). As the bowel enlarges, it becomes less and less likely to be able to exit the site of entrapment. This problem also requires surgical correction.

**Gastric ulceration:** Gastric ulceration of the stomach fairly commonly in young horses. Risk factors include confinement, infrequent feedings, a high proportion of concentrate feeds, excessive non-steroidal anti-inflammatory drug use, and the stress of shipping and showing. Most ulcers are treatable with medications that inhibit the acid producing cells of the stomach. Antacids are less effective in horses than in humans, because horses produce stomach acid almost constantly, while humans produce acid mainly when eating. Dietary management is critical. Bleeding ulcers leading to stomach rupture are rare.

**Other causes that may show clinical symptoms of colic:** Strictly speaking colic refers only to signs originating from the gastrointestinal tract of the horse. Signs of colic may be caused by problems other than the GI-tract e.g. problems in the kidneys, ovaries, spleen, testicular torsion, pleuritis, or pleuropneumonia. Diseases which sometimes cause symptoms which appear similar to colic include laminitis and exertional rhabdomyolysis.

**Pathophysiology of equine colic:** This can be divided broadly into simple obstructions, strangulating obstructions, and non-strangulating infarctions.

### **Simple Obstruction**

This is characterised by a physical obstruction of the intestine, which can be due to impacted food material, stricture formation, or foreign bodies. The primary pathophysiological abnormality caused by this obstruction is related to the trapping of fluid within the intestine oral to the obstruction. This is due to the large amount of fluid produced in the upper gastro-intestinal tract (around 125l daily), and the fact that this is primarily re-absorbed in parts of the intestine downstream from the obstruction. The first problem with this degree of fluid loss from circulation is one of decreased plasma volume, leading to a reduced cardiac output, and acid-base disturbances. There also occur serious effects on the intestine itself, which becomes distended due to the trapped fluid, and by gas production from bacteria. It is this distension, and subsequent activation of stretch receptors within



the intestinal wall, that leads to the associated pain. With progressive distension of the intestinal wall, there is occlusion of blood vessels, firstly veins, then arteries. The difference in time to onset of occlusion is due to the relatively more rigid walls of arteries compared with veins. This impairment of blood supply leads firstly to hyperaemia and congestion, and ultimately to ischaemic necrosis and cellular death. The poor blood supply also has effects on the vascular endothelium, leading to an increased permeability. This results initially in leakage of plasma, and eventually blood into the intestinal lumen. In the opposite fashion, gram-negative bacteria and endotoxins can enter the bloodstream, leading to further systemic effects.

### ***Strangulating Obstruction***

Strangulating obstructions have all the same pathological features as a simple obstruction, but the blood supply is immediately affected. Both arteries and veins may be affected immediately, or progressively as in simple obstruction. Common causes of strangulating obstruction are intussusceptions, volvulus and displacement of intestine through a hole, such as a hernia, a mesenteric rent, or the epiploic foramen.

### ***Non-strangulating Infarction***

In a non-strangulating infarction, blood supply to a section of intestine is occluded, without any obstruction to ingesta present within the intestinal lumen. The most common cause is infection with *Strongylus vulgaris* larvae, which develop within the (primarily cranial) mesenteric artery.

**Diagnosis:** Many different diagnostic tests can be used to diagnose the cause of equine colic, which may have greater or lesser value in certain situations. The most important distinction to make is whether the condition should be managed medically or surgically. If surgery is indicated, then it must be performed with utmost haste, as delay is a dire prognostic indicator.

### ***History***

A thorough history is always taken, including age, sex, recent activity, diet, any recent dietary changes, and routine anthelmintic treatment. However, the most important factor is time elapsed since onset of clinical signs, as this has a profound impact on prognosis, and the type of treatment that will be undertaken.

### ***Cardiovascular Parameters (Main prognostic factor)***

Heart rate rises with progression of colic, in part due to pain, but mainly due to decreased circulating volume, decreased preload, and endotoxemia. The rate should be measured over time, and its response to analgesic therapy ascertained. A pulse that continues to rise in the face of adequate analgesia is considered a surgical indication. Mucous membrane colour can be assessed to appreciate the severity of haemodynamic compromise. Reddening of membranes reflects worse prognosis, and cyanotic membranes indicate a very poor chance of a positive outcome.

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.

### ***Rectal Examination***

Repeated rectal examinations are a cornerstone of colic diagnosis, as many large intestinal conditions can be definitively diagnosed by this method alone. Other non-specific findings, such as dilated small intestinal loops, may also be detected, and can play a major part in determining if surgery is necessary.



### ***Nasogastric Intubation***

Passing a nasogastric Tube (NGT) is useful both diagnostically and therapeutically. Fluid is refluxed from the stomach, and any more than 2 litres of fluid is considered to be significant. Increased fluid is generally as a result of backing up of fluid through the intestinal tract, due to a downstream obstruction. This finding is important as it represents a relatively advanced stage of colic, and is often a surgical indication. Therapeutically, gastric decompression is important, as if fluid build up occurs, gastric rupture may occur, which is inevitably fatal.

### ***Abdominocentesis***

The extraction of fluid from the peritoneum can be useful in assessing the state of the intestines. A sanguinous fluid represents an infarction, and usually indicates surgery is necessary. A cloudy fluid is suggestive of an increased number of white blood cells, which indicates the disease is relatively advanced. The protein level of abdominal fluid can be analysed, and may also give information as to the integrity of intestinal blood vessels.

### ***Abdominal Distension***

Any degree of abdominal distension is usually indicative of a condition affecting the large intestines, as distension of structures upstream of here would not be large enough to be visible externally.

### ***Auscultation***

Auscultation of the abdomen, usually performed in a four quadrant approach, can be a useful tool. Increased gut sounds may be indicative of spasmodic colic. A decreased amount of sound, or no sound, may be suggestive of serious changes.

### ***Faecal Examination***

The amount of faeces produced, and its character can be helpful, although as changes often occur relatively distant to the anus, changes may not be seen for some time. In areas where sand colic is known to be common, or if the history suggests it may be a possibility, faeces can be examined for the presence of sand, often by immersion in water, or simply by its texture.

### ***Clinical signs***

Pawing and/or scraping, stretching, frequent attempts to urinate, flank watching: turning of the head to watch the stomach and/or hind quarters, biting/nipping the stomach, pacing, repeated flehmen response, repeated lying down and rising, rolling, groaning, bruxism, excess salivation, loss of appetite, decreased fecal output, increased pulse rate, dark mucous membranes etc.

### **Dealing with a colicky horse: (Steps involved in management of a colic case)**

**Step I:** Detailed history, General physical examination (Temperature, Heart rate, Pulse rate, Mucous membranes, Capillary refill time, Respiration rate and character, Dehydration, Behaviour) Auscultation of intestine, Rectal examination, Peritoneal fluid collection. **Laboratory test:** Blood; TLC and DLC, PCV, total proteins, Electrolyte analysis, Blood gas and acid base analysis, Lactate, Peritoneal fluid examination (total cell count, blood, proteins, Microbes).

**Step II:** Intravenous fluid administration, Gastric intubation, Analgesics etc. (Xylazine, Opioid derivatives eg butorphanol, Flunixinin, Non steroidal analgesics) Decompression of intestine if required.

**Step III:** Decision making: Based on history, clinical signs, Laboratory data and various parameters evaluated and re-evaluated at different intervals and then decision to continue with medical treatment or refer for surgery is reached

**Step IV:** Treatment

### **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:** 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.

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**1. Management of bilateral dermoid in a pup**

*Kachwaha K, Parashar M. C., Kumavat S., Qureshi S. M. and Gahlot T. K.*

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**2. Surgical management of rectal tumour in a dog**

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**3. Surgical management of umbilical hernia in kitten**

*G. D. Kaushal, S. K. Tiwari, Deepak Kumar Kashyap, Raju Sharda and Dilip Kumar*

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**4. Congenital prepucial stenosis in a puppy and its surgical management**

*Srinivasa Murthy, L. Suresha, Nair S S and M. S. Vasanth*

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**5. Surgical management of an abnormal rhabdomyoma on the dorso-lumbar region of a doberman dog : case report**

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**6. Surgical management of femoral fracture by intramedullary pinning in a labrador dog**

*Govina Dewangan, Devesh Kumar Giri, Deepak Kumar Kashyap, S. K. Tiwari and R. M. Tripathi*

Department of Veterinary Surgery & Radiology, Arawali Veterinary College, Sikar, Rajasthan

**7. Scar revision – a cosmetic approach for hypertrophic scar**

*Mohsina A., Dayamon D. Mathew, Remya V., Arundeeep P. S., Naveen Kumar, A. K. Sharma, Raja Aijaz Ahmad, Vineet Kumar, BabuLal Jahangir and A. K. Gangwar*

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**8. Intra-medullary pinning of tibia in a rabbit – a case report**

*Remya V, Raja Aijaz Ahmad, Dayamon D. Mathew, H. P. Aithal, Amarpal, P. Kinjavdekar, Ninu A. R., Sivanarayanan T. B., Naveen Kumar and A. K. Sharma*

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**9. External Fixation of tibia a clinical case report.**

*Sanjay J Gaikwad & Sanjay S Kasar, Nashik, Maharashtra*

**10. Surgical management of cystic calculi in bitches-two case reports**

*Mohsina. A., Tamil Mahan. P., Kiranjeet Singh, Aswathy Gopinathan*

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**12. Surgical treatment of clinical cases of small animals**

*Dilipkumar D., Shivaprakash B. V., Vijay and Rajesh*

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**13. Surgical management of supracondylar femur fracture using methyl methacrylate t-plate in a dog – a case report**

*B. N. Nagaraja, A. S. Patil, Ramesh Rathod, B. Rajapeer, H. C. Shivaiah and L. Ranganath*

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**14. Surgical management of thoracic vertebral (t-13) fracture in a dog by laminectomy and external skeletal fixation using pmma block**

*B. N. Nagaraja, A. S. Patil, M. S. Vasanth, D. N. Srinath, Ramesh Rathod and S. Angirus*

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**15. Successful surgical management of traumatic posterior paralysis in a cat by dorsal laminectomy**

***B. N. Nagaraja, A. S. Patil, Ramesh Rathod, M. S. Vasanth, B. Nandeesh and S. Ravikumar.***

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**16. Surgical management of bilateral mandibular fracture in a dog**

***K. S. Ramakrishnan, R. Thangadurai, S. Dharmaceelan, K. J. S. Kathirvel and N. Rajendran***

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**17. Surgical management of inguinal hernia in a pup under general anaesthesia**

***N. Rajendran, R. Thangadurai, S. Kathirvel, S. Senthilkumar, S. Dharmaceelan, K. Jayakumar and A. Kumaresan***

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**18. Surgical excision of capped elbow in dogs**

***V.S. Dabas, J. N. Mistry, S.K. Tyagi, D. N. Suthar, S.K. Jhala, R. H. Bhatt and J.A. Vala***

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**19. Surgical management of unusual histiocytoma in a dog- case report**

***Samantha R. J., T. P. Balagopalan, N. Arul Jothi, R. M. D. Alphonse, B. Ramesh Kumar and R. Kumar***

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**20. Surgical management of bilateral conjunctivo-corneal dermoid in a German shepherd dog.**

***Deepesh Kumar, Mohd. Shiyad, Rahul Kumar, Neeraj Awasthi and R.P. Pandey***

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**21. Arrow nail for the management of distal third femoral fracture in a dog.**

*Deepesh Kumar, Rahul Kumar, Mohd. Shiyad, NeerajAwasthi and R.P. Pandey*

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**22. Surgical treatment of aural hematoma in russian grey giant pet rabbit - a case report**

*Manjunatha, D. R., V. Mahesh, K. M. Srinivasmurthy and L. Ranganath.*

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**23. Surgical management of recurrent perineal hernia in a non – descript dog**

*A. K. Sharma, L. L. Dass and DayanandTuri*

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**24. Squamous Cell Carcinoma in a Bitch**

*Jaiswal, S., Singh, H. N. and Jadon, N. S.*

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**25. Splenic hematoma with microabscessation in 11 years old Spitz: A case report**

*Ketki Vishwas Raje, Jitender Mohindroo, Kiranjeet Singh, Naresh Kumar Sood, Narinder Singh Saini, Anuj Pratap Singh*

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**26. Primary grade 3 splenic hemangiosarcoma with metastasis to liver in a 7 years old Labrador: Diagnosis and treatment**

*Ketki Vishwas Raje, Shashi Kant Mahajan, Narinder Singh Saini, Naresh Kumar Sood, Anuj Pratap Singh, Anil Kumar Bishnoi*

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**27. Ovariohysterectomy in a pet guinea pig – case report**

*Ramesh Rathod, K. M. Srinivasamurthy L. Ranganth , A. S. Patil and D. N. Srinath*

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**28. Successful surgical management of lipoma in a German Shepherd dog**

*Raju Sharda, S. K. Tiwari, Yugesh. K. Choudhary, K. K. Varma and C. S. Singh*

**29. Successful neutering a male guinea pig**

*Raju Sharda, R. K. Gupta, Yogesh Chaudhary, Harinder Singh and Gangadhar Kaushal*

**30. Surgical management of intussusception in a dog - case report**

*V. S. Dabas, S. K. Jhala, R. H. Bhatt, M. M. Ferrao and C. A. Bhanderi*

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**31. Repair of traumatic diaphragmatic hernia in a 3-month-old kitten**

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Kerala Veterinary and Animal Sciences University, Pookode, Lakkidi, Wayanad, Kerala.

**32. Diagnosis and Surgical management of a unique case Ovarian Fibroid in a Bitch.**

*D. U. Lokhande; S. D. Tripathi, Natasha Coutinho and S. R. Chavan.*

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**33. Management of an extensive wound of extremity by pinch grafting in a labrador retriever dog**

*M. Choudhury and D. Kalita*

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**34. Management of a compound comminuted tibial fracture in a dalmatian dog**

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**35. A unique case of chronic suppurative inflammation of submucosa of ileum in a pug**

*S. D. Tripathi, D. U. Lokhande, Khandekar G. S., Pawar Ashish, Shital Navale and S. R. Chavan*

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**36. A unique case of mesenteric histiocytoma causing constipation in a female dog**

*S. D. Tripathi, D. U. Lokhande, Khandekar G. S., Pawar Ashish and S. R. Chavan*

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**37. Successful Surgico-medical management of chronic intussusception in a Doberman**

*D. U. Lokhande, S. D. Tripathi; Khandekar G. S., Natasha Coutinho, Kulkarni Mugdha and S. R. Chavan*

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**38. Diagnosis and correction of diaphragmatic hernia in a mongrel dog.**

*Chaudhary P. S., Varshney J. P. and Deshmukh V. V.*

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**39. Successful treatment of Pyometra in Rabbit**

*Talekar S. H., Gaikwad R. V., Mali H. V., Ekta Thakker and Ashwini K. Sharma*

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**40. Removal of interdigital Squamous cell carcinoma in Ten years old mongrel bitch**

*Talekar S. H., Gaikwad R. V., Mali H. V., Meshram P. V., Ashwini K. Sharma and Pandey Nitin*

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**41. Removal of multiple ovarian cyst and mammary tumor in six years old queen Cat**

*Talekar S. H., Gaikwad R.V., Mali H.V., Meshram P. V., Ashwini K. Sharma and Pandey Nitin*

Teaching Veterinary Clinical Complex, Bombay Veterinary College, Parel Mumbai

**42. Successful treatment of large size Haematoma in eight years old German Shepherd male Dog**

*Talekar S. H., Gaikwad R. V., Mali H. V., Meshram P. V., Ashwini K. Sharma and Pandey Nitin*

Teaching Veterinary Clinical Complex, Bombay Veterinary College, Parel Mumbai





- 43. Successful removal of large size Testicular tumor in a two German Shepherd Dog**  
*Talekar S. H., Gaikwad R. V., Mali H. V., Meshram P. V., Ashwini K. Sharma and Pandey Nitin*  
Teaching Veterinary Clinical Complex, Bombay Veterinary College, Parel Mumbai
- 44. Dietary Cause of Cystic calculi with daily feeding of half kilo black forest cake with high fat, sugar & calcium and it's Surgical Management in a Female Labrador retriever.**  
*Talekar S. H., Gaikwad R.V., Mali H. V. and Ashwini K. Sharma*  
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- 45. Successful management of urinary bladder fully packed with cystoliths in a labrador dog**  
*Jayakrushna Das, Sidhartha S. Behera, Prasanta K. Sika, AnjanSahu, AshishPandey*  
Department of Veterinary Surgery and Radiology, College of Veterinary Science and Animal Husbandry, OUAT, Bhubaneswar-751003
- 46. Congenital agenesis of umbilical region and its repair in a newborn pup**  
*Jayakrushna Das, Sidhartha S Behera, Prasanta K. Sika, AnjanSahu, Harish Mathor*  
Department of Veterinary Surgery and Radiology, College of Veterinary Science and Animal Husbandry, OUAT, Bhubaneswar-751003.
- 47. Successful Surgical Management of Gastric Dilatation and Surgical retrieval of a dip tea bag in a Doberman.**  
*Pawar A. A., Khandekar G. S., Raibole D. P., Raut S. S., Tripathi, S. D., Lokhande, D. U. and Sarkate L. B.*  
Department of Veterinary Surgery & Radiology, Bombay Veterinary College, Parel, Mumbai-400 012
- 48. Successful Surgical Management of Extensively large Liposarcoma in a Golden Retriever**  
*Pawar A. A., D. P. Raibole, G. S. Khandekar, D. U. Lokhande, S. D. Tripathi, L. B. Sarkate*  
Department of Veterinary Surgery & Radiology, Bombay Veterinary College, Parel, Mumbai-400 012



Anaesthesiology Session

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| 2       | <b>Comparison of diazepam-ketamine and xylazine-ketamine with pre-emptive butorphanol for oophorectomy in pig</b><br>H. Bayan, B. Saikia and B. Konwar   |
| 3       | <b>Evaluation of diazepam-ketamine anaesthesia in buffalo calves</b><br>Amresh Kumar, Ashok Kumar, Ram Nazar and Sukhbir Singh   |
| 4       | <b>Evaluation of midazolam-ketamine anaesthesia in buffalo calves</b><br>Amresh Kumar, Ashok Kumar, Sukhbir Singh and Ram Nazar  |
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| 6       | <b>Clinicophysiological and haemodynamic effects of fentanyl with xylazine, medetomidine and dexmedetomidine in isoflurane anaesthetized waterbuffaloes (<i>Bubalus bubalis</i>)</b><br>G. D. Singh, P Kinjavdekar, Amarpal, H. P. Aithal, A. M. Pawde, M. M. S. Zama, Jasmeet Singh and R. Tiwary |
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LEAD PAPER

## 1. CURRENT TRENDS IN RUMINANT ANAESTHESIA

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General anaesthesia is the controlled and reversible loss of consciousness, which is helpful in ruminants for many surgical procedures that warrant effective control of pain and movement. General anaesthesia is indicated when the demands of technical and anatomical aspects of surgical procedure exceed the capabilities of sedative drugs and local analgesia. Moreover, the patient co-operation and systemic analgesia are generally greater with general anaesthesia compared to local analgesia. The advances in large animal anaesthesia procedures are required to be available to ruminants essentially because of the considerable cost of the high producing dairy cattle and owner's sentimental attachment with the animals in countries like India.

### PHYSIOLOGICAL CONCERNS WITH RUMINANT ANAESTHESIA

- ✓ Regurgitation of reticulo-ruminal contents
- ✓ Aspiration of refluxed material or saliva, leading to aspiration pneumonia
- ✓ Hypersalivation
- ✓ Ruminal tympany
- ✓ Hypoventilation
- ✓ Hypotension
- ✓ Neuropathy
- ✓ Fluid and electrolyte imbalances

### REDUCING THE RISKS ASSOCIATED WITH RUMINANT ANAESTHESIA

#### PRE-ANAESTHETIC STARVATION

- ❖ Withholding food for 24 hours and denying access to water for 12-18 hours in adult cattle reduces the reticuloruminal bulk and fermentation rate and the subsequent development of ruminal tympany.
- ❖ Starvation for longer than 24 hours may result in: ketocidosis in high producing animals; alkalosis in less metabolically stressed animals; hypothermia and change in metabolic rate; increased fluidity of ruminal contents and likelihood of regurgitation; adverse effect on rumen motility and acid base status.
- ❖ Properly fasted cattle are less likely to bloat during recumbency and anaesthesia

#### REGURGITATION MANAGEMENT

- ❖ **Sellick's Manoeuvre** – Pushing hard against the larynx in order to squash close the oesophagus to prevent further regurgitation.
- ❖ Placing a cuffed endotracheal tube (ET) into the oesophagus, to duct the refluxed material away from the pharynx. The reflux tends to stream around the outside of the tube if cuff inflation is inadequate and has to be managed appropriately.





- ✿ Endotracheal intubation with a cuffed ET.
- ✿ Active regurgitation may occur when attempts are made to intubate the trachea at light planes of anaesthesia. Proper induction technique, eliminating gag reflex and maintaining the animal in sternal recumbency with the head elevated during tracheal intubation may avoid regurgitation.

#### AVOIDING ASPIRATION

- ✓ Endotracheal intubation with a cuffed ET.
- ✓ Positioning the head so that saliva runs out of the mouth by placing a pad under the head-neck junction so that the opening of the mouth is below the level of the larynx. This also reduces the risk of facial nerve paralysis.
- ✓ Proper extubation technique.

#### MANAGING HYPERSALIVATION

Saliva production is copious in cows producing about 50-150 litres of saliva per day depending on the diet. The secretion tends to continue under anaesthesia and could potentially form a source of material for aspiration and obstruction of the respiratory tract. The continual outflow of saliva represents a substantial fluid, electrolyte and buffer loss and need to be replaced. Use of anticholinergics is not indicated as they (reduce only the aqueous part of salivary secretion) tend to render saliva more viscous which could result in airway blockade, if aspiration occurs. Also, anticholinergics reduce mucociliary function and thus reduce the clearance of material from respiratory tract.

#### RELIEVING TYMPANY

The bloated rumen decreases venous return and interferes with the movement of diaphragm and decreases its excursions and causes hypoventilation. Relieving the tympany with the trocar and canula or gastric tube may improve the cardio pulmonary function.

#### COUNTERACTING HYPOVENTILATION

Ruminants have a rapid, shallow pattern of breathing awake and under anaesthesia. They tend to hypoventilate to a greater degree than other domestic animals during anaesthesia. Small increase in breathing rate during anaesthesia to compensate hypoventilation is not adequate and mechanical ventilation is indicated when there is significant hypoventilation. Mechanical ventilation with a tidal volume setting of 1 to 1.5 litre per 100kg body weight, 10 breaths per minute and end tidal CO<sub>2</sub> monitoring could be employed to maintain normal ventilation. Due to the rapid shallow pattern of breathing deep sighs are not warranted in anaesthetized ruminants during mechanical ventilation. Ruminant lungs contain less fibrous connective tissue than horse lungs. Hence, they are more prone to alveolar rupture and pneumothorax if inadvertently high peak airway pressures are delivered during IPPV. The recommended PIP in ruminants is less than or equal to 30cm H<sub>2</sub>O. The high gas flow velocity of ruminant ventilation generates significant resistance causing increased respiratory effort when smaller sized breathing tubes are used during inhalation anaesthesia. Moreover, the upper airway of ruminants is relatively large and larger endotracheal tubes are preferred to reduce the airway resistance and work of breathing.

#### AVOIDING HYPOTENSION

Hypotension during anaesthesia is reported when large doses of xylazine or acepromazine is included in the anaesthetic protocol and as well during very deep planes of anaesthesia. Selecting appropriate premedicants and avoiding very deep planes of anaesthesia could prevent the potential effects of hypotension. Inotropes such as dobutamine at the rate of 1 to 3 micro grams per kg per minute can be infused in hypotensive patients to augment cardiac output and improve tissue oxygen delivery. Calcium gluconate may also be administered to augment cardiac output.



#### NEUROPATHY PREVENTION

Large body weight places adult cattle at greatest risk for developing post anaesthetic myopathy and neuropathy. Proper patient positioning with sufficient padding and avoiding undue prolonged recumbency could avoid these complications. Radial nerve paralysis like syndrome may occur if due consideration is not given for patient positioning during prolonged anaesthesia. Placing an inflated rubber tube beneath the dependent shoulder could possibly avoid the injury to the radial nerve and post anaesthetic complication.

#### FLUID REPLACEMENT

The continuous outflow of saliva and regurgitation of reticuloruminal contents alter the fluid, electrolyte and pH status of the patient during anaesthesia. Intravenous crystalloids at the rate of 5-10ml per kg per hour should be administered during anaesthesia with electrolyte and pH monitoring.

#### PREMEDICATION

Premedication in ruminants is employed to enhance patient co-operation and modify the response to the induction bolus. Premedication can intensify or extend the effects of the induction bolus while minimizing its side effects. Apprehension and activity alter the distribution of cardiac output, directing a greater portion of blood flow to skeletal muscle. Centralization of cardiac output, directs a greater portion of the intravenously administered anesthetic induction agent to the target sites in the central nervous system, is desirable and is achieved by suitable premedication protocol.

#### COMMONLY USED DRUGS FOR PREMEDICATION AND INDUCTION OF ANESTHESIA IN CATTLEXYLAZINE

Xylazine is an alpha 2 adrenoceptor agonist and is a sedative analgesic with muscle relaxant properties. It is the most commonly used drug for sedation in large animals. Ruminants are 10 times more sensitive to xylazine than horses due to the differences in the post receptor signaling mechanism. The dose ranges from 0.05 to 0.2 mg per kg body weight. Titrated administration of xylazine minimizes the risk of over dosing in compromised patients. Xylazine increases airway resistance and may cause pulmonary hypertension and edema which could result in hypoxaemia under general anesthesia; increases uterine tone in both pregnant and non-pregnant cattle; causes vasoconstriction of utero-placental blood vessels compromising placental perfusion and fetal viability. The oxytocin like effect of xylazine increases the risk of abortion in the last trimester of pregnancy. Xylazine reduces reticulo-ruminal activity favoring the development of tympany. It reduces laryngeal activity increasing the risk of aspiration. Xylazine produces dose dependent cardiovascular depression and intravenous xylazine produces a biphasic changes in blood pressure (initial increase due to peripheral vasoconstriction followed by gradual decrease because of reduction in sympathetic tone). The sympatholytic effect of xylazine can exacerbate brady-arrhythmia and hence should be avoided in patients with hyperkalemia.

#### GUAIFENESIN (GLYCERYL GUAIACOLATE)

Guaifenesin is a milder sedative with strong muscle relaxant properties. Central muscle relaxation occurs due to blockade of internuncial neurotransmission in the spinal cord and brain stem. It produces minimal cardio-respiratory / GI depression making 'better sedative of choice' in compromised patients. Guaifenesin is administered as a five per cent solution. Concentrations above five per cent may cause haemolysis in ruminants. Guaifenesin is administered intravenously (I/V) to effect. The usual doses are 30 to 100 mg per kg body weight, it is cumulative and high doses could cause problems and hence a maximum dose of 100 mg per kg body weight, should not be exceeded in any 24 hr period. If doses in excess of 150 mg per kg body weight were given, recoveries could be prolonged and cardiac arrhythmia, CNS excitement reactions (opisthotonus/ paradoxical muscle rigidity) and apneustic breathing pattern can all occur.

#### ACEPROMAZINE





Acepromazine is the 2 acetyl derivative of promazine and has a marked sedative property. At low doses it produces behavior modification and as the dose is increased sedation occurs but the dose-response curve rapidly reaches a plateau after which higher doses do not increase, but only lengthen sedation and increase side effects. The dose of acepromazine is chosen based on the duration of sedation required and purpose for which it is needed. The dose ranges from 0.03 to 0.1 mg per kg body weight. Acepromazine produces dose dependent hypotension mediated through vasodilation due to peripheral alpha1 blockade. It causes paralysis of retractor penis muscle and protrusion of penis. Acepromazine has a little antihistaminic activity but has a powerful spasmolytic effect on smooth muscle including that of gut. It has antiarrhythmic effects and protects against adrenaline induced fibrillation. Acepromazine causes peripheral vasodilation and hypothermia and its concomitant administration during regional block is not recommended. Acepromazine decreases the oesophageal sphincter tone and increases the likelihood of regurgitation in cattle.

#### **BENZODIAZEPINES**

Diazepam and midazolam are moderate sedatives and centrally acting skeletal muscle relaxant. They produce minimal cardio-respiratory/GI depression at clinically used doses. The dose rates of vary widely from 0.02-0.25 mg per kg body weight I/V. Lower doses are favored in adult cattle possibly because of the hypersalivation and ruminal atony associated with higher doses. Occasionally animals may become 'excited' due to disinhibition. Diazepam has a poor bioavailability if administered intramuscularly (I/M) but midazolam can be administered by this route. Benzodiazepines are a very usual adjunct to ketamine anesthesia counteracting the muscular hypertonus associated with ketamine.

#### **OPIOIDS**

The principal use of opioid in the anaesthetic protocol is to provide effective analgesia. Systemic administration of opioids can be used to increase the level of analgesic support for ruminant patients experiencing moderate levels of pain. The important undesirable side effect associated with opioid administration is respiratory depression. Increasing the dose of pure opioid agonists increases analgesia but, unfortunately also increases respiratory depression. Butorphanol, an opioid agonist-antagonist is the commonly used opioid in large animals practice. Butorphanol is a kappa and sigma opioid receptor agonist and a mu opioid receptor antagonist. Butorphanol at the rate of 0.05 to 0.1mg per kg body weight I/V or I/M in small ruminants, 0.02 to 0.05 mg per kg body weight I/V or I/M in large ruminants can provide total relief of milder levels of pain and a marked reduction in moderate levels of pain. Concomitant administration of NSAID can be used to provide additional analgesic support in ruminant patients with moderate levels of pain.

#### **KETAMINE**

Ketamine produces catalepsy which is defined as a characteristic akinetic state with loss of orthostatic reflexes but without impairment of consciousness in which the extremities appear to be paralysed by motor and sensory failure. Spontaneous involuntary muscle movement and hypertonus are not uncommon during induction with ketamine. Mild respiratory depression has been associated with ketamine administration and in clinical practice this is usually manifested by an increased rate which does not compensate for a decreased tidal volume. Although ketamine preserves, and even enhances cranial nerve reflexes, it will not guarantee a protected airway and endotracheal intubation with a cuffed endotracheal tube is warranted. Ketamine can be used as a part of intravenous infusion for maintenance of anaesthesia. Ketamine does cause direct myocardial depression, but this is not usually noticeable because of the sympathetic stimulation by ketamine. The dose recommended is 2 to 5 mg per kg body weight in cattle.

#### **THIOPENTAL SODIUM**

Thiopental produces unconsciousness in one injection site – brain circulation time. Aqueous solutions are strongly alkaline and are incompatible with acids such as most analgesics, phenothiazines, adrenaline and some neuromuscular blocking drugs. The duration and depth of anaesthesia are governed by the amount of the drug administered, speed of



induction, rate of distribution to non-fatty tissue of the body and rate of uptake of thiopental by the body fat. The induction dose varies between 5 to 10 mg per kg body weight and the dose needs to be adjusted based on the premedication. All barbiturates cause respiratory depression and a short period of apnea usually follows the intravenous administration of thiopental. Rapid intravenous administration causes a fall in blood pressure. The drug has a direct depressant effect on the myocardium. Thiopental does not effectively block motor nerve impulses and muscle relaxation achieved could be due to excessive central nervous depression. The incidence of hepatic damage is related to the dose administered and hepatic dysfunction always follows the use of large dose. It is preferred to use low concentration solution for administration as higher concentration solution may cause necrosis and sloughing of tissue if accidental perivascular injection occurs.

#### PROPOFOL

Propofol is an intravenous anaesthetic agent unrelated to barbiturates, eugenols or steroid anaesthetic agents. The active ingredient, 2,6 diisopropylphenol exists as an oil at room temperature. Like thiopental, propofol is a rapidly acting agent producing anaesthesia of shorter duration without side effects. Propofol is compatible with wide range of premedicants, inhalation agents and neuromuscular blocking drugs. Propofol is now accepted as a most useful agent in all domestic animals, although its current price precludes its widespread use in adult farm animals. The dose varies from 4 to 6 mg per kg body weight.

#### INHALATION ANAESTHESIA

The need for quality anaesthesia of longer duration warrants the use of inhalation agents to cater the demands of complex surgical procedures. Inhalation anaesthesia in ruminants is considered to be superior to injectable techniques because it,

- ✓ Provides a patent airway,
- ✓ Improves oxygenation,
- ✓ Facilitates control of ventilation,
- ✓ Controls depth of anaesthesia,
- ✓ Ensures smooth and rapid recovery &
- ✓ It does not depend on tissue metabolism for its elimination.

The Minimum Alveolar Concentration (MAC) is the concentration of inhaled anaesthetic (measured as a percentage at one atmospheric pressure i.e. Partial pressure) that prevents the reaction to surgical stimuli in 50% of subjects. The MAC is a measure of inhalant anaesthetic's potency. The anaesthetic effects are a result of the partial pressure of the anaesthetic at the site of drug effect. Although MAC in terms of per cent inspired gas is used commonly, the per cent will change as a function of the ambient atmospheric pressure. The maintenance level of anaesthetic (i.e. Vapourizer setting) required for surgical plane of anaesthesia can be estimated from the MAC value of the inhalant anaesthetic. The vapourizer setting during maintenance is in the range of 1.5 to 2 times the MAC value and may be reduced by the administration of preanaesthetic and induction agents. Halothane and isoflurane are routinely used as maintenance agent in ruminant anaesthesia. The higher cost of sevoflurane and desflurane limits its use in ruminants.

#### MONITORING DURING ANAESTHESIA

Monitoring the anaesthetized patient was a custom from earliest days of anaesthesia and advances in the electronic technology today have made reasonably reliable, easily attachable, non invasive monitoring devices for the safe and efficient anaesthetic practice. Routines should be developed to ensure that each aspect of apparatus function is checked before use. Due consideration to the monitoring of cardiovascular, respiratory and CNS function such as heart rate, cardiac output, respiratory rate, oxygenation, ventilation status, blood pressure, arrhythmia and body temperature could avoid potential hazards associated with the general anaesthesia in ruminants.

## Therapeutic Management of Inflammation and Pain in Farm Animals

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### INTRODUCTION

Nonsteroidal anti-inflammatory drugs (NSAIDs) are a mainstay in the treatment of inflammatory diseases and are among the most widely used drugs worldwide. They have anti-inflammatory, antipyretic, and analgesic properties and are prescribed as first choice for surgical affections and in general, inflammation. The main limitation in using NSAIDs consists in their side-effects, including gastrointestinal ulcerogenic activity and bronchospasm. The mechanism of action of these drugs is attributed to the inhibition of cyclooxygenase (COX) and consequently, the conversion of arachidonic acid into prostaglandins. It is hypothesized that the undesirable side-effects of NSAIDs are due to the inhibition of COX-1 (constitutive iso form), whereas the beneficial effects are related to the inhibition of COX-2 (inducible iso form).

Recent studies have suggested that Arachidonic acid is also be converted to leukotrienes (LTs) by the action of 5-lipoxygenase (5-LOX). LTC<sub>4</sub>, LTD<sub>4</sub>, and LTE<sub>4</sub> are potent bronchoconstrictors, whereas LTB<sub>4</sub> is chemotactic for leukocytes and plays an important role in the development of pain contributing to the aggravation of inflammatory process. Thus, developing dual inhibitor compounds that will simultaneously inhibit COX and 5-LOX could enhance their individual anti-inflammatory effects and maximise the inhibition of pain in animals

However, NSAIDs also act on other COX- or LOX independent systems to help inhibit the transmission of pain. On a population basis, all NSAIDs are equally effective, but there is considerable individual variation. Thus we often see “individual responses” in terms of efficacy of NSAIDs.

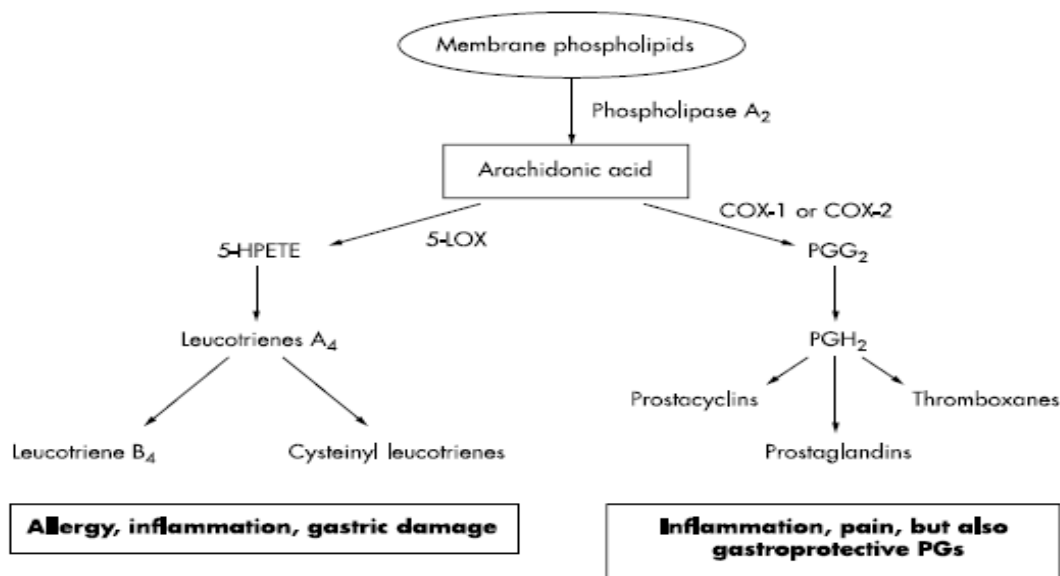


Fig1-Products and enzymes of arachidonic acid metabolism involved in the inflammatory process

### EFFECTS OF LEUCOTRIENES IN INFLAMMATION

Leucotrienes (LTs) play a major part in the inflammatory process (fig 2). They are synthesised via the 5-LOX. However, this enzyme requires the presence in intact cells of the 5-LOX activating-protein (FLAP). Indeed, the activity of 5-LOX is stimulated by calcium in intact cells, whereas this is not required in in vitro experiments with broken cells. Likewise, although the drug MK-866 inhibits 5-LOX in intact human leucocytes, it failed to inhibit its activity in broken cells.

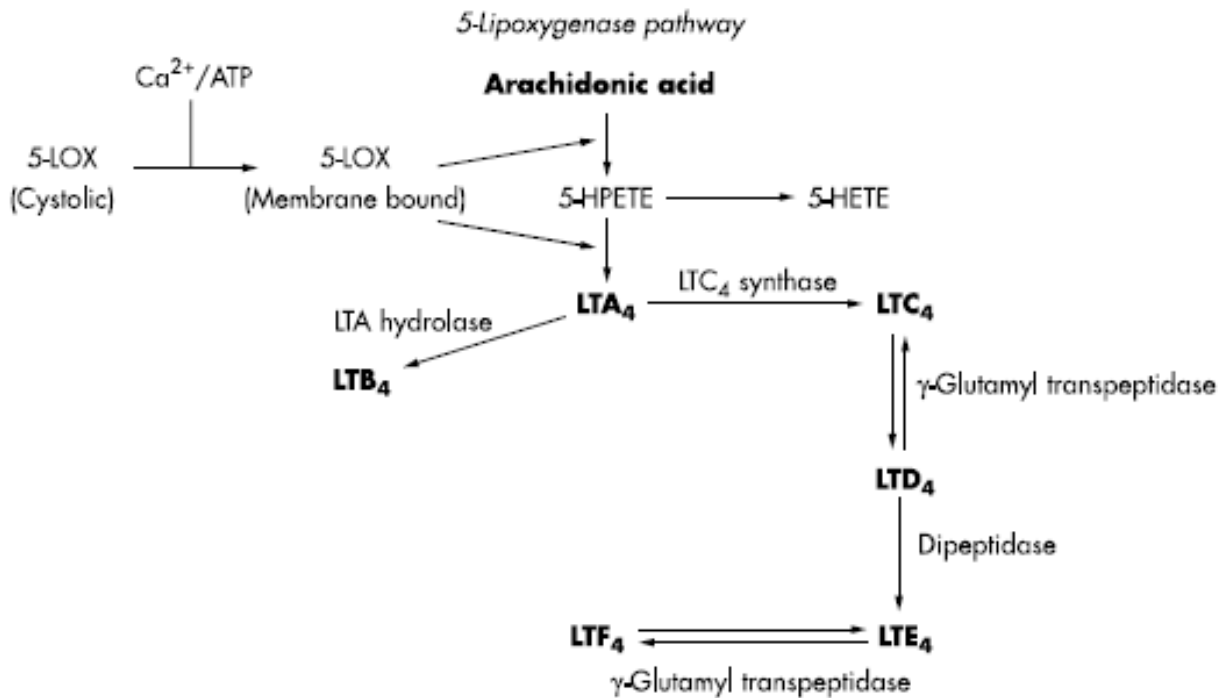


Fig 2: Products and enzymes of the 5 LOX pathway

### EMERGING ROLE OF LIPOXINS

Lipoxins (lipoxygenase interaction products (LXs)) are yet another group of lipid mediators formed during arachidonic acid metabolism. They are generated during the cellular interactions that occur as part of the multicellular host response to inflammation. Lipoxins are formed by transcellular metabolism from an intermediate derivative (5(6)-epoxytetraene), which gives rise to the metabolically active products, LXA<sub>4</sub>, LXB<sub>4</sub>, or 15(R)-HETE for 15-epi-Lipoxins. They are synthesised not only through the 5-LOX pathway, but also by the action of two other enzymes, 12-LOX and 15-LOX. In Lipoxins formation, 15-LOX is a pivotal enzyme that initiates lipoxin biosynthesis and converts the leucotrine intermediate LTA<sub>4</sub> to Lipoxins. 15-LOX is positively controlled by PGE<sub>2</sub>. Although it has been previously shown that LXA<sub>4</sub> can share binding to the LTD<sub>4</sub> receptor, a seven transmembrane G protein coupled LXA<sub>4</sub> receptor has recently been cloned from a human colonic adenocarcinoma cell line. This receptor has also been identified in synovial fibroblasts, suggesting a potential local immunoregulatory role in those cells.

Lipoxins can be considered as stop-signal mediators, which possess anti-inflammatory effects in particular, LXA<sub>4</sub> and LXB<sub>4</sub> have an inhibitory action on LT mediated effects in inflammation by reducing the production and chemotaxis of granulocytes and by stimulating monocyte activation. These lipoxins are potent blockers of neutrophil function, leucocytes and cell proliferation. As result provide additional anti-inflammatory and analgesic benefits.

### DUAL INHIBITORS: RATIONALE FOR USE

Both the conventional NSAIDs and the selective COX-2 inhibitors primarily exert their activity by reducing the production of PGs induced in the inflammatory process. In recent years, it has been clarified that PG synthesis is only one part of the arachidonic acid pathway, this precursor being a substrate that gives rise to many other lipid mediators, such as the LTs and the LXs. Leucotrienes themselves have a major role in the development and persistence of the inflammatory process, and it is now clear that PGs and LTs have complementary effects, whereas the production of lipoxins can counteract the inflammatory actions of leucotrienes.

In view of these concepts, it has been suggested that blocking both LT and PG production might have synergistic effects and achieve optimal anti-inflammatory activity. In addition, taking into account the roles of LTB<sub>4</sub> and cysteinyl LTs (against which neither selective nor non-selective NSAIDs are effective) in the inflammatory process, dual inhibition of the COX and 5-LOX



pathways could produce a wider spectrum of anti-inflammatory and analgesic effects .

Dual inhibition of COX and 5-LOX may limit the vascular changes seen during inflammation and leucocyte induced GI damage. It has been suggested that cysteinyl LTs, by inducing local vasoconstriction and thus reducing blood flow, can enhance the susceptibility of gastric mucosa to injury, whereas LTB<sub>4</sub> can potentiate this damaging process by its effects on leucocyte infiltration.

However, it can be expected that blocking both pathways would limit the potential for COX-1/COX-2 inhibitors NSAIDs, to produce an excess of leucotrienes in a shunt process. Interestingly, the PGE<sub>2</sub> levels were no more reduced than after a short treatment. The biological properties of Leucotrienes, together with their formation in a variety of diseases, suggest that 5-LOX inhibitors should have a therapeutic potential in a range of inflammatory conditions. 5-LOX/COX blockers have an excellent preclinical GI safety profile.

Thus, the discovery of compounds that can inhibit both the main metabolic pathways of the arachidonic acid metabolism is worthy of interest. Moreover, dual inhibition of 5-LOX/COX does not block the 12-LOX and 15-LOX pathways, which contribute to the synthesis of metabolically active Leucotrienes; thus, the non-inhibited production of LXA<sub>4</sub>, LXB<sub>4</sub> 15-epi-LXs, continues to attenuate any remaining Leucotriene effects.

In the past few decades, several compounds have been developed to block both COX and 5-LOX. Prototype experimental dual inhibitors have proved effective in preventing the production of both PGs and LTs and the consequent inhibition of migration and activation of inflammatory cells (mainly PMN and monocyte macrophages) into inflamed sites. Importantly, the inhibition of migration of inflammatory cells towards the affected sites has translated into a reduction of tissue damaging or necrosis in a model of tissue damage and foreign body rejection.

**Tolfenamic acid** is the only dual inhibitor of COX and 5-LOX currently in Veterinary practice with potent anti-inflammatory and analgesic activity with an excellent gastric tolerance pattern in animal models treated for long periods at doses higher than those required to produce anti-inflammatory effects.

#### CONCLUSIONS

The pharmacological properties and unwanted side effects (GI ulcerogenic activity and broncho-constriction) of classical NSAIDs and aspirin-like products which act, respectively, through non-reversible and reversible inhibition of COX activity, and the conversion of arachidonic acid into biologically active PGs and TXs, have been well established.

Classical NSAIDs and selective COX-2 inhibitors block the cascade originating from arachidonic acid that leads to the production of PGs. Besides their inflammatory properties, PGs generated by COX-2 are also involved in several physiological functions, such as protecting the integrity of the gastric mucosa, homeostasis of renal blood flow, and antiaggregation of platelets. Consequently, the inhibition of COX-2 produces a lower rate of GI adverse effects, but may impair gastric ulcer healing and may result in altered glomerular function and platelet properties. Furthermore, COX inhibition probably shunts arachidonic acid metabolism towards an excess production of LTs. The proinflammatory role of LTB<sub>4</sub> and cysteinyl LTs, their chemotactic action, and their recruitment of inflammatory cells have recently been elucidated. Furthermore, it has been shown that metabolically active LXs, also derived from arachidonic acid metabolism, have anti-inflammatory properties; 5-LOX blockage does not impair the synthesis of LXs, which are the products of the activation of other enzymatic pathways.

The dual 5-LOX/COX inhibitors act by blocking the formation of both PGs and LTs without affecting LX formation. The sparing effects on the gastric mucosa are probably due to the inhibition of the synthesis of 5-LOX products. It can, therefore, be concluded that dual blockers induce an enhanced anti-inflammatory and analgesic effect without side effects reported with other NSAIDs





## 1. Restraint, translocation and post-capture management of wild buffaloes

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Restraining wild buffaloes and simultaneously safeguarding the life of the general public and the animal is a challenging task under field condition. One wild buffalo joined with a herd of domestic buffaloes while grazing in a forest land. It was so aggressive that the domestic buffaloes could not be segregated and brought back to their owners home and in this attempt many of the villagers were got injured by the wild buffalo. So, the wild buffalo was tranquilized, lifted and loaded in a truck with needful arrangements and sufficient precautions. Journey was started and physiological parameters were monitored at hourly interval throughout the journey. Water was sprayed on the buffalo at an interval of three hours. A distance of 600kms was travelled in a period of 26hours and the buffalo safely reached at Nandankanan Zoological Park. The rectal temperature was measured and water was sprayed on the buffalo. The buffalo was kept inside an enclosure, however, it was found dead on the next day. PM examination revealed death due to stress and dehydration. Similarly, another wild buffalo of Kantabanji area killed a person and created law and order situation demanding immediate control of the animal. As no darting equipments were in-hand, a new innovative approach was thought of to tranquilize the animal and the buffalo was approached with a bulldozer and controlled with a noose of rope and was successfully tranquilized inspite of limited facilities. Fluid therapy and anti-stress drugs were administered and the buffalo was rehabilitated in the nearby forest.

## 2. Comparison of diazepam-ketamine and xylazine-ketamine with pre-emptive butorphanol for oophorectomy in pig

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The study was conducted on twelve Yorkshire gilts weighing 14-23 kg subjected to oophorectomy. The animals were divided into two groups viz. group BDK and B XK. All the animals received intramuscular butorphanol @ 0.2mg/kg b. w. fifteen minutes prior to induction. Group BDK received diazepam @ 2 mg /kg and ketamine @10 mg /kg IV. Group B XK received xylazine @ 2 mg / kg and ketamine 10 mg /kg IV. Induction time, duration of analgesia and recovery times were compared between the groups. Heart rate, respiratory rate, rectal temperature, systolic and diastolic pressure and SPO2 level were also monitored at 0(baseline), 5, 15, 30 and 60 minutes post induction. The duration of analgesia was more in B XK group as compared to BDK group, however recovery time was significantly longer in BDK group. Both the groups provided satisfactory analgesia for the surgical procedure. Both the combinations were safe for use in pig for surgical procedure but B XK provided shorter recovery time.

## 3. Evaluation of diazepam-ketamine anaesthesia in buffalo calves

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The study was undertaken on six clinically healthy male buffalo calves of 6 to 12 months of age, and weighing between 105 to 135 kg. Diazepam (0.75 mg/kg, IV) was administered which was followed by ketamine (6.0 mg/kg, IV) after 10 minutes. The parameters were behavioural changes, rectal temperature, heart rate, respiratory rate, Hb, PCV, plasma glucose, urea nitrogen, creatinine, total plasma proteins, albumin, inorganic phosphorus, calcium, magnesium, sodium, potassium, chloride,



SGPT, SGOT, alkaline phosphatase and bilirubin. All the animals went into sternal recumbency immediately after diazepam administration with drooping of lower lip at  $1.41 \pm 0.14$  minutes and lowering of head with chin on ground at  $2.40 \pm 0.76$  minutes. Animals went into lateral recumbency at  $6.89 \pm 1.18$  minutes. There was copious watery salivation. Relaxation of muscles was excellent. Swallowing reflex was also abolished. Ketamine was administered 10 minutes after diazepam. The analgesia remained for  $21.47 \pm 2.11$  minutes. Complete recovery took  $142.36 \pm 7.38$  minutes (114 to 164 minutes). Rectal temperature remained significantly lower during anaesthesia. Heart rate increased significantly ( $60.67 \pm 2.4$ /minute) at 5 minutes of ketamine administration which was earlier lowered by diazepam ( $47.17 \pm 2.6$ /minute). There was non-significant hyperglycaemia ( $107.07 \pm 21.57$  mg/dl) at 5 minute of ketamine administration. A significant increase in SGPT, SGOT and bilirubin level was observed during anaesthesia. The magnesium level was significantly lower ( $2.95 \pm 0.16$  mEq/L) at 24 hour after recovery. Diazepam-ketamine combination produced anaesthesia of longer duration ( $37.72 \pm 3.29$  minutes) and appears to be safe for general anaesthesia in buffalo calves with minimum cardiopulmonary and biochemical changes.

#### 4. Evaluation of midazolam-ketamine anaesthesia in buffalo calves

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The study was conducted in six clinically healthy male buffalo calves of 6 to 12 months of age and weighing between 105 to 135 kg. Midazolam (0.3 mg/kg, IV) was administered followed by ketamine (6.0 mg/kg, IV) after 10 minutes. The parameters were behavioural changes, rectal temperature, heart rate, respiratory rate, Hb, PCV, plasma glucose, urea nitrogen, creatinine, total plasma proteins, albumin, inorganic phosphorus, calcium, magnesium, sodium, potassium, chloride, SGPT, SGOT, alkaline phosphatase and bilirubin. All the animals went into sternal recumbency immediately after administration of midazolam with drooping of lower lip at  $1.27 \pm 0.23$  minutes and lowering of head with chin on ground at  $6.37 \pm 1.35$  minutes. The animals appeared sleepy with eyes completely closed at  $5.34 \pm 0.59$  minute. There was copious watery salivation and slight drop wise lacrimation after ketamine administration. There was complete relaxation of muscles, and swallowing reflex and palpebral reflex were abolished. The analgesia remained for  $10.85 \pm 1.03$  minutes. Complete recovery took  $87.20 \pm 4.77$  minutes (68 to 100 minutes). There was non-significant hyperglycaemia at 10 minutes of midazolam administration. A significant increase in chloride and potassium levels was observed. A non-significant increase was observed in SGOT value at 10 minutes of midazolam and 5 minutes of ketamine administration and at recovery. Alkaline phosphatase showed non-significant decrease at 5 minute of ketamine administration and at recovery. Midazolam-ketamine combination produced anaesthesia for shorter duration ( $17.47 \pm 2.97$  minutes) and appears to be safe for general anaesthesia in buffalo calves with minimum cardiopulmonary and biochemical changes.

#### 5. Evaluation of lorazepam-ketamine anaesthesia in buffalo calves

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Six experimental trials were undertaken on clinically healthy male buffalo calves of 6 to 12 months of age, and weighing between 115 to 145 kg. Lorazepam (2.0 mg/kg, IV) which was administered followed by ketamine (6.0 mg/kg, IV) after 10 minutes. The parameters were behavioural changes, rectal temperature, heart rate, respiratory rate, Hb, PCV, plasma glucose, urea nitrogen, creatinine, total plasma proteins, albumin, inorganic phosphorus, calcium, magnesium, sodium, potassium, chloride, SGPT, SGOT, alkaline phosphatase and bilirubin. All the animals went into sternal recumbency immediately and followed by lateral recumbency at  $5.37 \pm 0.82$  minutes of lorazepam administration. Drooping of lower lip and lowering of head with chin on ground was observed at  $0.68 \pm 0.24$  minutes and at  $0.59 \pm 0.13$  minutes respectively. There was copious





watery salivation. Ketamine was administered 10 minutes after lorazepam. The relaxation of muscles was of good quality and swallowing reflex was abolished. Palpebral reflex was abolished at  $15.55 \pm 2.33$  minutes. The analgesia remained for  $14.04 \pm 1.20$  minutes. Complete recovery took  $107.83 \pm 5.53$  minutes (90 to 130 minutes). Heart rate decreased non-significantly at 10 minute of lorazepam administration. Respiratory rate decreased during induction of anaesthesia. A non-significant hyperglycaemia was observed during anaesthesia. A significant increase in calcium, SGPT, SGOT, bilirubin and chloride levels was observed whereas; alkaline phosphatase was significant lower during anaesthesia. Lorazepam-ketamine combination produced anaesthesia of intermediate duration ( $33.69 \pm 3.81$  minutes) and appears to be safe for general anaesthesia in buffalo calves with minimum cardiopulmonary and biochemical changes.

## 6. Clinicophysiological and haemodynamic effects of fentanyl with xylazine, medetomidine and dexmedetomidine in isoflurane anaesthetized waterbuffaloes (*Bubalus bubalis*)

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The present study was undertaken to investigate the sedative, analgesic and clinical effects of xylazine, medetomidine and dexmedetomidine with fentanyl as preanaesthetics in water buffaloes and to compare the dose sparing effect of xylazine, medetomidine and dexmedetomidine on thiopental for induction and isoflurane for maintenance of anaesthesia in water buffaloes. Six male water buffaloes randomly received intravenous fentanyl ( $5 \mu\text{g}/\text{kg}$  body wt) and xylazine ( $0.05 \text{ mg}/\text{kg}$  body wt), fentanyl ( $5 \mu\text{g}/\text{kg}$  body wt) and medetomidine ( $2.5 \mu\text{g}/\text{kg}$  body wt), fentanyl ( $5 \mu\text{g}/\text{kg}$  body wt) and dexmedetomidine ( $5 \mu\text{g}/\text{kg}$  body wt) at weekly interval in groups I1, I2 and I3 respectively. After 15 min anaesthesia was induced by 5% thiopental sodium, intravenously. The intubated animal was connected to the large animal anaesthesia machine and isoflurane in 100% oxygen ( $5 \text{ L}/\text{min}$ ) was insufflated for 60 minutes. Fentanyl-medetomidine and fentanyl-dexmedetomidine produced more depression of cardiovascular system during preanaesthetic period but lesser depression of cardio-respiratory parameters in the post induction and maintenance period. Quicker recovery was recorded in I2 and I3 groups. Lesser dose of thiopental was required in group I3 ( $4.33 \pm 0.66 \text{ mg}/\text{kg}$ ) than groups I2 ( $4.41 \pm 0.98 \text{ mg}/\text{kg}$ ) and I1 ( $4.83 \pm 0.79 \text{ mg}/\text{kg}$ ). The dose of isoflurane was less in group I3 ( $45.50 \pm 5.45 \text{ mL}$ ) than group I1 and I2 ( $48.66 \pm 5.10 \text{ mL}$  and  $48.00 \pm 6.38 \text{ mL}$ ). Better anaesthesia was recorded with fentanyl-dexmedetomidine-thiopental-isoflurane (group I3) than fentanyl-medetomidine-thiopental-isoflurane (group I2) and fentanyl-xylazine-thiopental-isoflurane (group I1). Fentanyl-medetomidine and fentanyl-dexmedetomidine were better preanaesthetic agents in comparison to fentanyl-xylazine for thiopental and isoflurane anaesthesia. Fentanyl-dexmedetomidine-thiopental-isoflurane and fentanyl-medetomidine-thiopental-isoflurane produced effective surgical anaesthesia and were found safe in water buffaloes.

## 7. Effects of fentanyl and dexmedetomidine in halothane and isoflurane anaesthetized water buffaloes (*Bubalus bubalis*)

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Six clinically healthy male water buffaloes were used. All the animals received two treatments randomly at weekly interval in groups H (Halothane) and I (Isoflurane). In both groups sedation was accomplished by fentanyl ( $5 \mu\text{g}/\text{kg}$  body wt) and dexmedetomidine ( $5 \mu\text{g}/\text{kg}$  body wt) intravenously. Induction of anaesthesia was achieved by 5% thiopental sodium in both groups. Maintenance of anaesthesia was done by halothane in group H and by isoflurane in group I respectively in 100% oxygen



through a large animal anaesthesia machine. Dexmedetomidine and fentanyl produced more depression of cardiopulmonary parameters with halothane than isoflurane. Quicker recovery was recorded in group I than group H. It is concluded that dexmedetomidine-fentanyl-thiopental and isoflurane provided better clinical, physiological and haemodynamic stability than dexmedetomidine-fentanyl-thiopental and halothane in water buffaloes.

## 8. Clinicophysiological and haemodynamic effects of fentanyl and medetomidine in halothane and isoflurane anaesthetized water buffaloes (*Bubalus bubalis*)

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Six water buffaloes received fentanyl (5 µg/kg) and medetomidine (2.5 µg/kg) randomly in groups H and I where anaesthesia was induced by 5% thiopental and maintained by halothane (2%) in group H and by isoflurane (2%) in group I with 100% oxygen through a large animal anaesthesia machine. Fentanyl and medetomidine produced more depression of cardiovascular system during the preanaesthetic period but lesser depression of cardio-respiratory dynamics in the post induction and during maintenance period. Quicker recovery was recorded in group I. Fentanyl and medetomidine reduced the dose of induction and maintenance agents. Lesser dose of thiopental was required in group I (4.41±0.98 mg/kg) than group H (6.83±2.79 mg/kg). Maintenance dose of halothane and isoflurane were 38.50±7.35 mL and 48.00±6.38 mL respectively in groups H and I. Better anaesthesia was recorded with fentanyl, medetomidine and thiopental during the maintenance with isoflurane (group I) than fentanyl, medetomidine, thiopental and halothane (group H). Cardiopulmonary functions were very well preserved during maintenance anaesthesia with group I. None of the drug combination produced any deleterious effect on vital organ functions and was found safe in water buffaloes.

## 9. Potential use of dexmedetomidine for different levels of sedation, analgesia and anaesthesia in dogs

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The objective of the study was to investigate the potential of dexmedetomidine to produce different levels of sedation, analgesia and anaesthesia when used with midazolam, fentanyl and ketamine in dogs. In a prospective, blinded, randomized study 12 dogs were divided into three groups to receive the following treatments. In group I 20 µg/kg dexmedetomidine, in group II 20 µg/kg dexmedetomidine+0.2 mg/kg midazolam+4 µg/kg fentanyl and in group III 20 µg/kg dexmedetomidine+0.2 mg/kg midazolam+4 µg/kg fentanyl+10 mg/kg ketamine were administered intramuscularly. Clinical and physiological parameters were assessed in all the groups. Onset of sedation time decreased in groups II and III but recovery time did not differ significantly among the groups. Muscle relaxation, sedation and analgesia increased from group I to group II and group III. A significant ( $p<0.05$ ) decrease in heart rate was observed in groups I and II while it increased initially in group III. Respiratory rate decreased significantly ( $p<0.05$ ) in all the groups. Mean arterial pressure decreased consistently in group II, but an initial increase in MAP was followed decrease in groups I and III. Addition of midazolam and fentanyl enhanced sedation and analgesia and facilitated intubation but complete anaesthesia was produced on addition of ketamine. It was concluded that dexmedetomidine can be used safely with midazolam, fentanyl and ketamine to produce different levels of sedation, analgesia and anaesthesia as per clinical need in dogs.



## 10. Evaluation of midazolam-dexmedetomidine and fentanyl with ketamine for anaesthesia in dogs

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In a prospective randomized blinded study, twelve adult dogs of either sex were divided into three groups (n=4). Animals of group A received 0.4 mg/kg midazolam and 10 µg/kg dexmedetomidine, group B received 0.4 mg/kg<sup>-1</sup> midazolam and 20 µg/kg dexmedetomidine and group C received 0.4 mg/kg midazolam + 20 µg/kg dexmedetomidine + 4 µg/kg fentanyl intramuscularly. Ketamine was administered, 10 min later, in all the groups through intramuscular route. Significantly (p<0.05) shortest weak time, down time and standing recovery time were recorded in animals of group C. Muscle relaxation and sedation were better in group C as compared to groups A and B. The duration of anaesthesia was longer in group C as compared to groups A and B. Intubation was possible only in groups B and C. Induction dose of ketamine was minimal in group C. Heart rate decreased significantly for longer duration in the animals of group B as compared to that of group C. Respiratory rate and Rectal temperature decreased significantly (p<0.05) in all the groups. Mean arterial pressure (MAP) was maintained within physiological limits in all the groups. It was concluded that dexmedetomidine (10 µg/kg)-midazolam-ketamine can produce anaesthesia in dogs for about 45 min. Increasing the dose of dexmedetomidine from 10 to 20 µg/kg does not enhance the depth or duration of anaesthesia. However, addition of fentanyl not only reduces the induction dose of ketamine but also increases the depth and duration of anaesthesia and facilitates recovery from anaesthesia. Dexmedetomidine-midazolam-fentanyl-ketamine can be used safely for prolonged duration of anaesthesia in dogs.

## 11. A comparison between midazolam-xylazine-ketamine and diazepam-xylazine-ketamine in pig

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The clinical and physiological effects of midazolam-xylazine-ketamine (MXK) and diazepam-xylazine-ketamine (DXK) combinations were compared in 12 pigs, brought to the Department for repairing of hernia were divided into 2 groups, comprising six animals in each group. The pigs in MXK group received midazolam @ 0.1mg/kg, xylazine @ 2mg/kg and ketamine @ 10mg/kg and the DXK group received diazepam @ 0.5mg/kg, xylazine @ 2mg/kg and ketamine @ 10mg/kg intravenously respectively and all the group received glycopyrolate @ 0.01mg/kg IM 15 minutes prior to anaesthesia. The efficacy of anaesthesia were evaluated on the basis of clinical (weak time, muscle relaxation, onset and duration of analgesia, sleeping time, and standing time) and physiological (temperature, heart rate and respiratory rate) parameters were observed at 0, 5, 15, 30, 60 and 90 minutes of anaesthesia. Non significant different for weak time was observed between MXK and DXK groups. Muscle relaxation was adequate and analgesia was good for both combinations. Anaesthesia were produced for 25.84 ± 2.72 and 32.50 ± 4.95 minutes respectively and significant (P<0.05) difference between the groups 49.17 ± 3.31 and 56.67 ± 4.95 minutes respectively for recovery time were recorded. Significant difference (P<0.05) were observed between the groups 56.17 ± 3.98 and 63.12 ± 6.09 minutes respectively for sleeping time and 61.13 ± 4.69 and 68.17 ± 6.16 minutes respectively for standing time. There was significant decrease in heart rate; rectal temperature and respiratory rate were also recorded in both the groups. On the basis of the results it can be concluded that diazepam-xylazine-ketamine produced superior quality of anaesthesia than midazolam-xylazine-ketamine.



## 12. Clinical evaluation of triflupromozane hcl and diazepam premedication for propofol anaesthesia in dogs

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Propofol (2,6-di-isopropyl phenol), is a short acting general anesthetic with quiet, rapid onset of action with complete recovery and lack of cumulative effects even after prolonged administration. A study was undertaken in 16 clinical cases of dogs undergoing different surgical interventions irrespective of age, sex and breed. Animals were randomly divided into two groups of 8 dogs each. TriflupromazineHcl-Propofol combination was used in dogs of group A, whereas Diazepam-Propofol was used in group B to produce surgical Anaesthesia. The clinical, haematological and biochemical parameters were compared between the two groups. Even though, both the anaesthetic combinations were found to be safe and effective with smooth and stress free recovery in the study, Triflupromazinehcl premedication for propofol anesthesia was proved to be more effective with quick sedative effect, long duration of anaesthesia, less induction dose of Propofol and shorter recovery time than diazepam.

## 13. Isoflurane anaesthesia in dexmedetomidine-pentazocine and midazolam-pentazocinepremedicated water buffaloes

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Six clinically healthy male water buffaloes used in groups T1 and T2 were premedicated with intravenous dexmedetomidine (2.5µg/kg) and pentazocine (0.05mg/kg), and midazolam (0.05mg/kg) and pentazocine (0.05mg/kg) respectively followed by induction with 5% thiopental sodium and maintenance with isoflurane in 100 % oxygen through a large animal anaesthetic machine. Excellent sedation, analgesia and suppression of ocular reflexes along with a lower dose of thiopental and isoflurane were recorded in group T1 than in group T2. However, there was no significant difference in recovery and sternal recumbency time between groups but a significantly longer standing time was recorded in group T1. A non-significant decrease in heart rate was recorded in group T1 whereas it significantly increased in group T2. Respiration rate decreased during the preanaesthetic period, which increased after isoflurane administration. In both groups a significant fall in rectal temperature was recorded. A significant fall in MAP was recorded in group T1, while in group T2 MAP decreased non-significantly. A significant increase in CVP was recorded in group T1 as compared to non-significant changes in group T2. A significant decrease in SpO<sub>2</sub> was recorded after premedication but values improved during the maintenance period. It is concluded that dexmedetomidine and pentazocine produced better sedation, analgesia and muscle relaxation and had more dose sparing effect on thiopental and isoflurane anaesthesia as compared to midazolam and pentazocine. However, both combinations can be safely used in buffaloes.



## 14. Comparative evaluation of butorphanol-dexmedetomidine and butorphanol-midazolam premedication in isoflurane maintained water buffaloes

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The study was conducted to compare the effects of 2 different premedication groups (A and B) in water buffaloes. Sedation was accomplished by intravenous administration of butorphanol (0.05 mg/kg body wt) and dexmedetomidine (2.5 µg/kg body wt) or midazolam (0.05 mg/kg body wt) in groups A and B respectively. Induction was done by 5% thiopental sodium in both groups. Maintenance was done by isoflurane in both groups in 100% oxygen. Better sedation was recorded in group A and the analgesia and muscle relaxation were comparable in both groups. A significantly lower dose of thiopental sodium was required for induction in group A. However, there was no significant difference in the isoflurane concentration needed for maintenance of anaesthesia. There was no significant difference in recovery time however, sternal recumbency time and standing time was significantly higher in group A. Heart rate remained significantly higher in group B and there was no significant difference in respiratory rate and rectal temperature in both groups. A non-significant difference in MAP was recorded in both groups while CVP remained significantly higher in group A. There was no significant difference in SPO<sub>2</sub> between both groups. It was concluded that despite initial cardiopulmonary depression, butorphanol-dexmedetomidine combination provided better clinical, physiological and haemodynamic stability as compared to butorphanol-midazolam combination in thiopental and isoflurane anaesthetized water buffaloes.

## 15. Balanced general anaesthetic technique for orthopaedic surgery in large ruminants

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Orthopaedic surgery in large ruminants is a prolonged procedure which requires a balanced anaesthetic technique to produce adequate depth of anaesthesia of longer duration with minimal effects on different body systems. The present study was therefore, undertaken to evaluate butorphanol-midazolam premedication for thiopental and isoflurane anaesthesia in clinical cases (n=10) in large ruminants suffering from orthopaedic affections. Mild sedation with excellent analgesia and muscle relaxation was recorded in these animals. The dose of thiopental required for induction was 5.76±0.30 mg/kg and isoflurane concentration required for maintenance of anaesthesia was 2.79±0.14%. Ocular reflexes were depressed after premedication followed by completely absent reflexes during the maintenance period. Mild to moderate salivation was recorded throughout the observation period. An initial decrease in heart rate and respiratory rate was recorded followed by improvement in both parameters during the maintenance period. Rectal temperature significantly decreased throughout the observation period. Mean arterial blood pressure did not reveal significant changes throughout the observation period. An initial decrease in SPO<sub>2</sub> followed by improvement in SPO<sub>2</sub> was recorded during the maintenance period. All the animals recovered uneventfully. Median recovery time and sternal recumbency time for the clinical cases was 7.00±2.03 min and 14.00±3.03 min respectively, while the median time for surgery was 73.00±9.17 min. It was concluded that butorphanol-midazolam premedication followed by thiopental induction and isoflurane maintenance provides adequate depth of anaesthesia to perform orthopaedic surgery in large ruminants with minimal effects on different body systems.





## 16. Haemato-biochemical effects of medetomidine and midazolam as premedicant to propofol anaesthesia in paediatric dogs

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The study was conducted on three groups comprising of five number of healthy paediatric dogs of either sex aging between three to six months and weighing about 3 to 6 kg. A pilot study for standardization of the dose was conducted and minimum effective dose was selected for the study. Atropine sulphate @ 0.04 mg/ kg i/m was administered 15 min. prior to treatment in all the groups of animals. In group I, Propofol was given @ 4 mg/ kg by slow i/v injection. In group II and III, Medetomidine@10 µg/ kg body weight I/M and Midazolam @ 0.2 mg/ kg body weight I/M. was given respectively followed 15 min. later by i/v injection of Propofol @ 4 mg/kg body weight I/M. Haematological parameters viz-haemoglobin (Hb), total erythrocyte count (TEC), total leucocyte count (TLC) and differential leucocyte count (DLC) showed non significant changes in all three groups whereas Packed cell volume (PCV) showed significant changes in II and III groups. Biochemical parameters viz- serum glucose, serum total protein, serum urea nitrogen, alanine amino transferase (ALT) showed non significant changes in all three groups. Creatinine and aspartate amino transferase (AST) showed significant changes in group II whereas non significant changes in group I and III. However, the values were compensated and returned towards preadministration level in all three groups. Therefore, the combination of medetomidine-propofol and medazolam-propofol can be safely used in the paediatric dogs for major surgical interventions and surgical procedure of short duration respectively.

## 17. Clinicophysiological, hemodynamic and biochemical effects of dexmedetomidine alone and along with butorphanol for ketamine anaesthesia in uraemic goats

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The present study was undertaken to evaluate the suitability of dexmedetomidine (2.5µg/kg, IV) alone (Group D1) and along with butorphanol (0.05mg/kg, IV) (Group D2) premedication for ketamine anaesthesia in clinical cases of goats suffering from urethral obstruction. Induction as well as maintenance with continuous intravenous infusion (CII) was carried out with 1% ketamine in both groups. The scores of jaw relaxation were comparable between 2 groups. However, ocular and pedal reflex were suppressed to a greater degree following premedication but values were comparable following induction till completion of the observation period. A comparatively lower dose of ketamine was required for induction as well as maintenance of anaesthesia in the animals of group D2. The recovery time, sternal recumbency time and standing time were non-significantly lower in the animals of group D1. Heart rate and respiration rate reduced significantly following premedication but they increased gradually following induction and continued to remain so till completion of the observation period. Rectal temperature fluctuated around the base values throughout the observation period. Blood urea nitrogen and creatinine were comparable between both groups. Mean arterial pressure reduced followed premedication and it increased gradually following induction till the end of the observation period. SpO<sub>2</sub> fluctuated around the baseline in both groups. It was concluded that addition of butorphanol can enhance the sedative and analgesic properties of dexmedetomidine for ketamine anaesthesia in uraemic goats none of the drug combination produced any deleterious effects on different body systems.





## 18. Comparative evaluation of dexmedetomidine alone and along with butorphanol for propofol anaesthesia in uraemic goats

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The study was conducted on 16 male goats suffering from urethral obstruction divided randomly into 2 groups. Premedication was accomplished by intravenous administration of dexmedetomidine (2.5 µg/kg body wt) alone or along with butorphanol (0.05 mg/kg body wt) in groups A and B respectively. Induction and maintenance of anaesthesia was done by 1% propofol in both groups. Adequate jaw relaxation along with better suppression of pedal and palpebral reflexes were recorded in both groups however, the values were non-significantly higher in group B. The required dose of 1% propofol for induction and maintenance was comparatively lower in group B. The recovery time, sternal recumbency time and standing time were non-significantly lower in the animals of group A. Pronounced bradycardia was recorded in both groups. However, respiratory rate and rectal temperature were non-significantly higher in group B as compared to group A. Mean arterial pressure and SpO<sub>2</sub> were non-significantly higher in group B. Blood urea nitrogen was non-significantly higher in group B while creatinine was comparable in both groups. Both drug combinations produced adequate surgical anaesthesia along with preservation of cardiopulmonary functions. However, it was found that butorphanol can augment sedation and analgesia produced by dexmedetomidine and has more dose sparing effect than dexmedetomidine alone (group A) on propofol anaesthesia for induction and maintenance in uraemic goats. Dexmedetomidine and butorphanol combination along with propofol may be recommended for balanced anaesthesia in uraemic goats.

## 19. Evaluation of a combination of xylazine, ketamine, along with retrobulbar block for intraocular surgery in rabbit.

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The purpose of the study was to assess ketamine, xylazine combination along with retrobulbar block using 4% lignocaine HCl for performing intraocular surgery in rabbits. Ten healthy adult New Zealand White rabbits aged 1.5-2 years of either sex weighing 2-3 kgs were selected for unilateral cataract extraction by phacoemulsification. Xylazine HCl was used as preanesthetic at a dose rate of 5 mg/kg, IM, followed by Ketamine HCl at a dose rate of 35mg/kg, IM. A retro bulbar block was performed with 4% lignocaine HCL. The anesthetic depth was judged by ear pinching reflex. The time for onset and duration of anesthesia was 7±0.5 minutes and 35.5±1.2 minutes respectively. A central eyeball fixation following retro bulbar block was obtained in all the cases. The mean values recorded before induction of anesthesia and during anesthesia of rectal temperature (38.09°C±0.2 vs. 37.29°C±0.2), heart rate in beats per minute (276±1.2 vs. 272±1.1), arterial blood pH (7.35±0.02 vs. 7.32±0.02), bicarbonate (16.2±1.2 vs. 20.3±1.8), PaCO<sub>2</sub> (26.09±2.3 vs. 27.52±2.3) and PaO<sub>2</sub> (84.79±1.9 vs. 80.39±1.1) did not vary significantly (P>0.05). Recovery was smooth and complete in 32.5±2.8 minutes. The anesthetic regimen provides adequate condition for conducting intraocular surgery in rabbits.



## 20. Propofol and Thiopentone sodium as induction agents in water buffaloes (Bubalus bubalis): a comparative study

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Propofol and thiopentone sodium as induction agents was evaluated in 12 water buffaloes of either sex (3 to 5 years; 350-500 kg). Midazolam (0.2 mg/kg) + butorphanol (0.02 mg/kg) combination was used as premedicants in both groups. Induction was done by 1% propofol (3 mg kg<sup>-1</sup>) and 5% thiopentone sodium (10 mg kg<sup>-1</sup>) in PRO and THIO group, respectively. Anaesthetic efficacy was assessed on the basis of induction quality, recovery quality, time taken for induction and recovery and incidence of side-effects. Induction was smooth and rapid in all with exception of two buffaloes receiving thiopentone sodium. Intubation time was significantly (p<0.05) less in PRO group. Apnea and regurgitation was more pronounced in THIO group. Recovery was faster and smoother in PRO group while transient struggling was seen in THIO group. To conclude, propofol being superior can be used safely as an alternative to thiopentone sodium for induction in water buffaloes.

## 21. Comparative evaluation of tramadol and pentazocine as preemptive analgesics with propofol anesthesia following ovariohysterectomy in female dogs

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The present study was conducted in twelve healthy female dogs weighing between 10-15 kilograms and aged between eight months to two years. The animals were randomly divided into two groups with six animals in each group. Group I animals were administered tramadol at 1 mg/kg body weight intramuscularly. Thirty minutes later tropinesulphate at 0.04 mg/kg subcutaneously followed by diazepam at 1.5 mg/kg body weight intravenously, after 15 minutes general anaesthesia was induced by using propofol (6 mg/kg body weight intravenously). In group II animal's pentazocine lactate at 2 mg/kg body weight intramuscularly was used. The rest of the regime used after thirty minutes was same as that of the group I animals. The animals of both the groups were subjected to panhysterectomy through the left flank. The animals of group II showed slight hypothermia during various intervals of study. However the rectal temperature remained within physiological limits. Bradypnoea (P <0.05) was observed at various intervals of study when compared to pre-emptive analgesia and tachycardia immediately after surgery. The heart rate returned to normal after 24 hours surgery. Both the combinations that were used in the present study caused minimal physiological disturbance indicating the combination were well tolerated by the animals. Both combinations used in the present study produced haemato-biochemical changes within normal limits suggesting that the combinations were well tolerated by cardiovascular, renal and hepatic system. Hyperglycaemia was the only alarming biochemical change observed in both the combinations. The pain assessment parameter revealed that tramadol as pre-emptive analgesia was more effective than pentazocine lactate in controlling post-operative pain after panhysterectomy.



## 22. Evaluation of various preanaesthetics for ketamine-isoflurane general anesthesia in equines

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The study was conducted on 13 clinical cases of equine presented for various surgical interventions to evaluate use of xylazine, acepromazine and midazolam as pre-anesthetics for ketamine-isoflurane anesthesia in equines. The animals were randomly divided into three groups having atleast 4 animals each. In group I acepromazine @ 0.04mg/Kg bwt, in group II midazolam @ 0.2 mg/Kg bwt and in group III xylazine @ 1.1 mg/Kg bwt were administered as preanesthetics. Induction was done by ketamine (2.2 mg/Kg) and maintenance by isoflurane (2.5-4%) in all groups. Use of xylazine provided better sedation and induction quality than other drugs. Analgesia and muscle relaxation was adequate in all the groups. Transient respiratory acidosis was seen in all the groups. Xylazine was found to be a better premedication agent in terms of clinicophysiological, haematobiochemical, acid base and electrolyte status than midazolam and acepromazine. None of the drug combinations produced any deleterious effect on vital organ function and were found safe in equines. Xylazine-Ketamine-Isoflurane combination could be recommended for equine surgery because of good sedation, moderate analgesia and excellent muscle relaxation along with smooth recovery.

## 23. Blood gas, acid base and electrolyte changes during diazepam, midazolam premedication and halothane, isoflurane maintenance in bovine subjected to diaphragmatic herniorrhaphy

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The present study was designed to find the acid base and electrolyte changes in bovine subjected to general anaesthesia while performing diaphragmatic herniorrhaphy. The study was conducted in 24 clinical cases of buffaloes subjected to general anaesthesia for the repair of diaphragmatic hernia. Diazepam and midazolam @ 0.2 mg/kg bwt. were used as preanaesthetic, 5% Thiopental was administered for induction. Halothane and Isoflurane were administered as inhalation anaesthesia. Heparinised arterial blood samples were collected for estimation of blood gas and acid base status at various intervals. No significant alterations in plasma electrolyte concentrations indicated that these anaesthetic combinations did not have any untoward effect on the blood electrolyte values. However, significant decrease in blood pH, PaO<sub>2</sub> and increase in PaCO<sub>2</sub> noticed during the observation period primarily indicated the respiratory acidosis. These changes were less marked in animals maintained with isoflurane as compared to halothane. The maintenance of adequate ventilation is therefore recommended for the animals subjected to general anaesthesia in diaphragmatic herniorrhaphy.





## 26. Efficacy of visceral blockade and lignocaine spray for pain management during enterectomy and anastomosis in cattle

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A clinical study was conducted in 18 cattle with intussusception to evaluate appropriate measures to manage the pain during enterectomy and entero-anastomosis. The animals were randomly divided into three groups of six animals each. All the animals were subjected to right flank laparotomy, enterectomy and end to end anastomosis under right paravertebral nerve block in standing position. In addition to this, in group I, visceral blockade was performed using 0.5 % lignocaine in normal saline at the dose rate of 1 ml/ kg body weight intraperitoneally. Injection was given through the right paralumbar fossa 2-3 cm below the transverse process of 3<sup>rd</sup> or 4<sup>th</sup> lumbar vertebra. In group II, lignocaine 15% spray was used on the mesentery during ligation and resection. Both visceral blockade and 15 % lignocaine spray were used during the surgical procedure in group III. The visceral blockade reduced the pain during exploration of the peritoneal cavity and exteriorization of the intussuscepted mass to the surgical site, but failed to control the pain during ligation and resection of mesentery. Lignocaine spray controlled the pain during ligation and resection of mesentery but during manipulation, exploration and exteriorization of the intestinal loops animal evinced pain. In group III animal evinced no pain during manipulation, exploration and exteriorization of the intestinal loops as well as during ligation, resection of the mesentery and end to end anastomosis of the intestinal loops. To conclude, combining of visceral blockade and 15 % lignocaine spray with right paravertebral nerve block reduced the pain during the surgical management of intussusception in cattle under standing position.

## 27. Cardiopulmonary and haematological assesment during thoracotomy in cattle with traumatic pericarditis under general anaesthesia with IPPV-a review of 26 cases

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The study was conducted in 26 cattle divided into four unequal groups (I, II, III and IV) based on the pregnancy status. The non-pregnant animals were assigned to group I. The anaesthetic protocol was formulated with xylazine hydrochloride (0.1 mg / kg body weight i.v), diazepam (0.1 mg / kg body weight i.v), midazolam (0.1 mg / kg body weight i.v), acepromazine maleate (0.04 mg / kg body weight i.v), guaifenesin (50 mg/ kg body weight i.v to effect as 5% solution in 5% dextrose) and ketamine hydrochloride (4 mg/kg body weight i.v. to effect). The anaesthesia was maintained with isoflurane 2% with fresh gas flow of oxygen 10% for first 3 minutes later on 3% was given. Cardiopulmonary changes like reduction in rectal temperature, heart rate, respiratory rate and mean arterial pressure compared to preanaesthetic mean values were noticed during general anaesthesia for thoracotomy in cattle with traumatic pericarditis. Haematological parameter like haemoglobin, packed cell volume and total erythrocyte count were also significantly reduced when values compared to their respective preanaesthetic mean during IPPV.





## 28. ECG studies during thoracotomy in cattle with traumatic pericarditis under general anaesthesia-a review of 26 cases

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Electrocardiography was performed in all the 26 cattle employing base- apex lead system using Welch Allyn Atlas Vital sign monitor. The electrocardiography was recorded continuously during anaesthesia with paper speed of 25 mm per second and amplitude of 1 cm equal to 1 Mv. The ECG parameters viz. PR interval, QRS complex and ST interval were calculated. The electrocardiography revealed ST prolongation (0.3 to 0.4 mV) in comparison with healthy cattle. The PR (0.11 to 0.14 sec) and QRS complex (0.16 to 0.17 sec) duration in all the groups were normal when compared to healthy cows.

## 29. Stress evaluation during thoracotomy in cattle with traumatic pericarditis under general anaesthesia with ippv- a review of 26 cases

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Serum cortisol concentration were analysed before induction, after induction, during maintenance, after recovery (60 min after discontinuation of isoflurane) and 24 h after anaesthesia. The serum was separated out by centrifugation for analysis of cortisol concentration using immunoassay kit. (Labor Diagnostika Nord GmbH and Co. Germany). The intensity of color development and absorbance as optical density (O.D) was measured using ELISA plate reader at 540nm (BIO-RAD, I MARK<sup>TH</sup>, Germany). Serum samples of all the animals were estimated for cortisol concentration in duplicate. There was a significant (P< 0.05) increase in serum cortisol after induction and 24 hrs after recovery from the baseline value recorded before induction in all the groups.

## 30. Anaesthesia qualities and complications of xylazine/diazepam/midazolam/ acepromazine maleate to guaifenesin-ketamine induction and isoflurane maintenance in cattle during thoracotomy - a review of 26 cases

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The quality of anaesthesia was assessed during general anaesthesia by nature of induction, presence or absence of salivation, tympany and regurgitation, and was graded as excellent, good and fair. Anaesthetic complications was assessed by regurgitation of ruminal contents, development of tympany during anaesthesia, abortion after recovery and mortality if any were recorded as anaesthetic complications. The quality of anaesthesia was good in four animals and fair in two animals of group I. In group II animals the quality of anaesthesia was excellent in five animals and good in two animals. In group III animals the quality of anaesthesia was good in all the seven animals. In group IV animals the quality of anaesthesia was good in five animals and





fair in one animal. The common anaesthetic complications encountered in the present study were salivation, development of ruminal tympany and regurgitation of the ruminal contents. In group I salivation was noticed in four animals, ruminal tympany was noticed in four animals and regurgitation was noticed in two animals. In group II salivation was noticed in two animals and no ruminal tympany and regurgitation were noticed in any animals. In group III salivation was noticed in two animals, ruminal tympany was noticed in two animals and regurgitation was noticed in all the animals during maintenance of anaesthesia. In group IV salivation was noticed in two animals, ruminal tympany was noticed in two animals and regurgitation was noticed in three animals. Two animals in group I and two animals in group IV died during induction.

### **31. Clinicophysiological effects of ropivacaine and its combination with medetomidine and buprenorphine for inducing epidural anaesthesia in goats**

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A total of fifteen clinically healthy non-descript goats of either sex aging 1 to 2 years and weighing 15 to 25 kg body weight were selected to evaluate the clinicophysiological effects of Ropivacaine alone and in combination with Medetomidine and Buprenorphine for lumbosacral epidural analgesia in goats. The animals were randomly divided into three groups each comprising of 5 animals. The animals of group G1, were treated with epidural injection of Ropivacaine @ 0.75 mg/kg body weight. The animals of group G2 were treated with epidural injection of Ropivacaine @ 0.5 mg/kg body weight with Medetomidine @ 20µg/kg body weight, and in group G3 animals, Ropivacaine and Buprenorphine combination was administered @ 0.75mg/kg and 0.2mg/kg body weight respectively and the drugs were injected at the lumbosacral epidural space after making the volume upto 6ml with distilled water. The onset of analgesia was quicker in group G2 animals (4.08 ± 0.12 min) followed by group G3 (5.50 ± 0.15 min) and group G1 (5.93 ± 0.10 min). Duration of analgesia was 108.23±2.85, 188.68±4.25, and 160.73±3.18 minutes in group G1, G2 and G3 respectively. All the animals of group G1 and G3 were able to stand during the entire post injection period with a mild incoordination. Whereas, animals of group G2 showed strong incoordination and two animals became recumbent also. Sedation was very mild, mild and strong in group G1, G3 and G2 respectively. Salivation was observed only in animals of group G2. The order of complete recovery was (205.31± 4.65 min) for Ropivacaine alone followed by Ropivacaine and Buprenorphine combination (220.45±4.88min) and by Ropivacaine in combination with Medetomidine (389.24± 6.83 min) Ruminal movements were non significantly decreased in group G1 and G3 which was significant (P<0.05) in group G2 animals. The mean respiration rate and heart rate decreased significantly in groups G2 and G3. Whereas, the rectal temperature decreased non significantly in all the three treatment groups. Therefore, it is concluded that Ropivacaine alone or in combination with Medetomidine and Buprenorphine can safely be used for epidural analgesia in goats.

### **32. Studies on dissociative anaesthesia with different premedicants in canine – a clinical study**

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The study was conducted to evaluate and compare analgesic, sedative and muscle relaxant effect of midazolam, acepromazine and haloperidol as premedicants to dissociative anaesthesia and also to study its effect on clinico-physiological and haemato-biochemical parameters.



Eighteen clinical cases were randomly divided in three equal groups and were subjected to dissociative anaesthesia. In group I, xylazine (@ 0.5 mg/kg b.wt., i.m.) after pause of 10 min. midazolam (@ 0.3 mg/kg b.wt.) and ketamine (@ 4 mg/kg b.wt.) intravenously was administered. In group II, acepromazine (@ 0.05 mg/kg b.wt.) and in group III, haloperidol (@ 0.8 mg/kg b.wt.) intravenously was given along with xylazine and ketamine as in group I.

Onset of anaesthesia was  $2.66 \pm 0.16$ ,  $2.83 \pm 0.10$  and  $2.44 \pm 0.19$  minutes in group I, II and III, respectively. Duration of anaesthesia was  $18.33 \pm 0.49$ ,  $18.00 \pm 0.36$  and  $19.66 \pm 1.49$  minutes in group I, II and III, respectively. The recovery period was  $33.66 \pm 1.5$ ,  $47.83 \pm 3.60$  and  $36.5 \pm 2.17$  minutes in group I, II and III, respectively. The average complete recovery took place in  $40.33 \pm 2.26$  minutes,  $50.5 \pm 1.38$  minutes and  $33.66 \pm 1.85$  minutes in group I, II and III, respectively.

The haematobiochemical changes during the study period were recorded in all the groups.

The study concludes that midazolam, acepromazine and haloperidol can be administered in combination with ketamine for induction of dissociative anaesthesia. Dissociative anaesthesia along with acepromazine causes deep sedation as compared to midazolam and haloperidol. Muscle relaxation and analgesia observed in midazolam was poor as compared to acepromazine and haloperidol. It can be concluded that ketamine along with premedicant have only transient effect on clinico-physiological and haemato-biochemical parameters and these combination can be safely used in dog.

### **33. Comparative haemato-biochemical studies of glycopyrrolate-xylazine-pentazocine-ketamine, glycopyrrolate-xylazine-butorphanol-ketamine and glycopyrrolate-xylazine-dipyrone-ketamine anaesthetic combinations in buffaloes undergoing diaphragmatic herniorrhaphy.**

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The study was conducted in eighteen buffaloes undergoing diaphragmatic herniorrhaphy which were categorized into three groups of six animals each. The drugs were used in three combinations: Glycopyrrolate-Xylazine-Pentazocine-Ketamine, Glycopyrrolate-Xylazine-Butorphanol-Ketamine and Glycopyrrolate-Xylazine-Dipyrone-Ketamine. Glycopyrrolate @ 0.01 mg/kg body weight i/m, Xylazine @ 0.04 mg/kg body weight i/m, Pentazocine lactate @ 0.75 mg/kg body weight i/v, Butorphanol tartrate @ 0.075 mg/kg body weight i/v, Dipyrone @ 35 mg/kg body weight i/v and Ketamine @ 2 mg/kg body weight i/v were given as per protocol. Slight non-significant decrease in Hb, TLC, TEC and PCV in all three groups during anaesthesia was observed. Non-significant hyperglycaemia was observed in all the groups after 15 minutes of Pentazocine/ Butorphanol/ Dipyrone injection and at 5 minutes of Ketamine administration. In group 1, significant increase in plasma chloride was observed after 15 minutes of Pentazocine administration, five minutes after Ketamine administration and the values remained elevated at recovery in comparison to the base value. In group 2 plasma albumin showed non-significant increase after 15 minutes of Butorphanol administration and non-significant decrease at recovery. The values of all other biochemical parameters such as total plasma proteins, cholesterol, inorganic phosphorus, calcium, magnesium, sodium, potassium, alanine amino transferase (ALT/SGPT), aspartate amino transferase (AST/SGOT), alkaline phosphatase and bilirubin fluctuated non-significantly within the normal physiological range in all the three groups.



### **34. Clinical studies on behavioral and sedative effects of glycopyrrolate-xylazine-pentazocine-ketamine, glycopyrrolate-xylazine-butorphanol - ketamine and glycopyrrolate-xylazine-dipyrone-ketamine anaesthetic combinations in buffaloes undergoing diaphragmatic herniorrhaphy.**

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Clinical studies were done to compare behavioral and sedative effects of Glycopyrrolate-Xylazine-Pentazocine-Ketamine (Group I), Glycopyrrolate-Xylazine-Butorphanol-Ketamine (Group II) and Glycopyrrolate-Xylazine-Dipyrone-Ketamine (Group III) anesthetic combinations in 18 adult female buffaloes undergoing diaphragmatic herniorrhaphy. To evaluate the efficacy and safety of these combinations, Glycopyrrolate @ 0.01 mg/kg body weight i/m, Xylazine @ 0.04 mg/kg body weight i/m, Pentazocine lactate @ 0.75 mg/kg body weight i/v, Butorphanol tartrate @ 0.075 mg/kg body weight i/v, Dipyrone @ 35 mg/kg body weight i/v and Ketamine @ 2 mg/kg body weight i/v were given as per protocol. In all the groups, rectal temperature, heart rate and respiratory rate fluctuated non-significantly during the entire period of observations. All groups produced comparable analgesia of 46.23±2.10, 47.24±2.14 and 44.24±2.78 minutes duration, respectively but anaesthesia remained for longer duration in Group I (81.5±5.60 minutes), intermediate for Group II (66.83±4.05) and shorter in Group III (58.66±3.29 minutes). Complete recovery was earliest in Group III in 90±2.51 minutes followed by Group II in 98.7±6.98 minutes and Group I in 122.33±6.87 minutes. Based on various parameters it was concluded that Butorphanol and Pentazocine had comparable analgesic effects in combination of Glycopyrrolate-Xylazine-Ketamine during peri- and postoperative period. Butorphanol and Pentazocine were better analgesics than Dipyrone in buffaloes undergoing diaphragmatic herniorrhaphy.

### **35. Haemato-biochemical response of detomidine and tramadol in combination with bupivacaine for inducing epidural anaesthesia in goats**

*Narendra K. Naik, Raju Sharda, S. K. Tiwari, and Deepak K. Kashyap*

The present study was conducted on fifteen healthy non-descript goats aged 1 to 2 years for evaluating the efficacy of bupivacaine alone and in combination with detomidine and tramadol for inducing epidural anaesthesia. The goats were randomly allotted in three treatment groups i.e. N1 (Bupivacaine @ 1mg/Kg B.W.), N2 (Bupivacaine @ 1mg/Kg B.W. and Detomidine hydrochloride @30 µg/Kg B.W.) and N3 (Bupivacaine @ 1mg/Kg B.W. and Tramadol @ 2 mg/Kg B.W.) respectively. Haematological studies revealed a non significant decrease in haemoglobin and packed cell volume in group N1 and N3 on the contrary a significant decrease was recorded in values of group N2 animals between 60 to 120 min post injection. Total leucocyte count showed a non significant decrease in all the three groups. Differential leucocyte count showed a non significant decrease in lymphocyte and increase in neutrophil count at 60 min post injection in all the groups. Among biochemical parameters serum glucose increased significantly between 60 to 120 min in all the three groups while Alanine Aminotransferase recorded a significant increase between 60 to 120 min in animals of group N1 and N3 which became highly significant between 60 to 120 min in group N2. A significant increase in Aspartate Aminotransferase was recorded between 60 to 120 min in group N2 only. The Serum urea nitrogen and serum creatinine values showed a significant increase in animals of group N2 between 30 to 120 minutes post injection. Serum total protein decrease non significantly in all the three treatment groups. However, all the values were compensated and returned towards preadministration level by 24 hrs.



## 36. Effects of romifidine and its combination with ketamine in asian elephants (*Elephas maximus*)

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Effects of Romifidine @ 20µg/kg, i.m (R20) was compared with combination of Romifidine @ 20µg/kg and ketamine 200 mg/elephant i/m (RK), in two groups of Asian elephants consisting of five elephants in each group. The induction times in the two groups were recorded as, 11.4 ± 0.4 and 8.8 ± 0.73 minutes; duration of anaesthesia 92.4 ± 4.5 and 100 ± 6.8 minutes and recovery times were 132.4 ± 8.59 and 155.4 ± 16.34 minutes in R20 and RK groups respectively. Induction and recovery were smooth in both the groups. Muscle relaxation and analgesia was insufficient in the elephants of R20 group, as the elephants exhibited resistance during recording of rectal temperature and responded to needle pricks during collection of blood, compared to less resistance in the elephants of RK group, where minor surgical procedures could be performed. There was protrusion of penis/clitoris, cessation of movement of tail and ear, relaxation of trunk touching ground, loud snoring, shifting of weight bearing, widening of legs for dispersion of body weight and ataxia. Pulse rate reduced non-significantly ( $P > 0.05$ ) in (R20) group and significant ( $P < 0.05$ ) reduction was recorded in (RK) group. Respiration and temperature decreased non-significantly ( $P > 0.05$ ) in the elephants of both the groups. Hb, TEC and creatinine decreased non-significantly ( $P > 0.05$ ), while GGT, glucose and ESR increased significantly ( $P < 0.05$ ) in both the groups. PCV, TLC and BUN decreased non-significantly ( $P > 0.05$ ) in (RK) group, but significant ( $P < 0.05$ ) decrease of these parameters were recorded in (R20) group. Significant ( $P < 0.05$ ) decrease in total protein was recorded in group (R20) while non-significant ( $P > 0.05$ ) decrease was recorded in the elephants of RK group. Based on the findings of this study, combination of Romifidine @ 20 µg/kg + Ketamine 200 mg / elephant, i.m could be suggested for clinical use for minor surgical procedures. Romifidine 20µg/kg b wt. i.m was useful for restraining of elephants and for examination purpose.

## 37. Biochemical changes after epidural administration of bupivacaine, bupivacaine-ketamine and bupivacaine-tramadol in buffalo calves

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The present study was performed on six healthy buffalo calves of either sex weighing 40-60 kg and biochemical parameters viz glucose(mg/dl), total protein(g%), blood urea nitrogen(mg/dl) and creatinine (mg/dl) were studied at 0min, 10min, 20min, 40min, 60min, 80min, 2hrs, 3hrs, 4hrs, 12hrs, 24hrs and 48 hrs. after epidural administration of bupivacaine and its combination with ketamine and tramadol. Calves were divided in three treatment groups in treatment I (bupivacaine alone), treatment II (bupivacaine and ketamine), and in treatment III (bupivacaine and tramadol) were administered in sacrococcygeal space and significant ( $P < 0.05$ ) changes were observed in glucose, blood urea nitrogen, creatinine level and non-significant ( $P > 0.05$ ) changes were observed in total protein level.



### **38. Clinicophysiological changes following epidural administration of analgesia bupivacaine, bupivacaine-ketamine and bupivacaine-tramadol in buffalo calves**

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The present study was performed on six healthy buffalo calves of either sex weighing 40-60 kg and clinicophysiological changes *viz.* analgesic effect, rectal temperature ( $^{\circ}\text{F}$ ), Heart rate (per minute) and Respiration rate (per minute) were studied at 0min, 10min, 20min, 40min, 60min, 80min, 2hrs, 3hrs, 4hrs, 12hrs, 24hrs and 48 hrs. After epidural administration of bupivacaine and its combination with ketamine and tramadol. Calves were divided in three treatment groups in treatment I (bupivacaine alone), treatment II (bupivacaine and ketamine), and in treatment III (bupivacaine and tramadol) were administered in sacrococcygeal space. Long duration of analgesia was obtained in treatment III as compare to treatment I and treatment II and onset of analgesia was minimum in treatment I as compare to treatment II and treatment III. significant ( $P < 0.05$ ) changes were observed in rectal temperature, heart rate and respiration rate.

### **39. Anaesthetic management for diaphragmatic hernia repair in a 3-month old kitten weighing 877g**

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A three-month-old female kitten weighing 877 g was diagnosed having diaphragmatic hernia, and surgical repair under general anaesthesia was resorted to. Premedication was performed using glycopyrrolate @ 0.01 mg/kg followed 15 minutes later by acepromazine @ 0.04 mg/kg and butorphanol @ 0.1 mg/kg intramuscularly. Twenty minutes later, anaesthesia was induced using midazolam @ 0.1 mg/kg intravenously, immediately followed by propofol, intravenously "to effect". The animal was pre-oxygenated throughout the period of premedication and induction. Immediately following induction, oro-tracheal intubation was performed, and anaesthesia was maintained with isoflurane in oxygen using Magill breathing circuit with a minor modification and manual intermittent positive pressure ventilation.

### **40. Isoflurane anaesthesia during surgical management of kite string injury - a study of 32 Indian peafowls (*Pavocristatus*).**

*Patel P. B., Kavechiya V. P., Chaudhary, D. A., Barvalia D. R., Raval J. D. and Raval N. J.*

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Indian peafowls (*Pavocristatus*) inflicted with kite string trauma during kite festival between July 2009 to August 2012 were rescued and brought to the Jivdaya Charitable Trust, Ahmedabad, Gujarat for surgical management. Indian peafowls were mask induced, intubated and maintained under isoflurane anaesthesia using Jackson Rees modified T-piece anaesthesia circuit. Physiological parameters like respiration rate, heart rate and rectal temperature were monitored throughout the surgery. Requirement of isoflurane concentration, O<sub>2</sub> flow, duration of anaesthesia and time as well as quality of recovery were also discussed.





## 41. Isoflurane anaesthesia during surgical management of kite string injuries: study of 25 White-rumped Vultures (*Gyps bengalensis*)

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Vultures (*Gyps bengalensis*) with kite string trauma during kite festival were presented to the Jivdaya Charitable Trust, Ahmedabad, Gujarat during the period between July 2009 to August 2012. Surgical management was carried out under general anaesthesia. Twenty five birds were mask induced, intubated and maintained with isoflurane using Jackson Rees modified T-piece anaesthesia circuit. Physiological parameters like respiration rate, heart rate and rectal temperature were monitored throughout the surgery. Requirement of isoflurane concentration, O<sub>2</sub> flow, duration of anaesthesia and time as well as quality of recovery were also discussed.

## 42. Ketofol as an induction agent in diazepam or midazolam-premedicated and halothane-anaesthetized dogs

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This study was done in 12 dogs presented to TVCC, Palampur for various surgical procedures. The animals were randomly divided into two test groups for evaluation of two anaesthetic combinations. Inj. Atropine Sulphate (0.04mg/kg S/C) and Butorphanol (0.2mg/kg I/M) were given to all animals and after 10 minutes Inj. Diazepam (0.5mg/kg I/V) was administered in group I and Midazolam (0.5mg/kg I/V) in group II. Thereafter, Inj. Ketofol (Ketamine and Propofol mixture 1:1) was used to induce general anaesthesia in all the animals and Halothane was used for maintenance throughout the surgical procedure. The paper contains the effect of both anaesthetic combinations on various sedative, clinical and haematobiochemical parameters in dogs.

## 43. Comparative evaluation of dexmedetomidine-ketamine and diazepam-ketamine anaesthesia in anaemic dogs

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16 mongrel dogs used in this study were divided into two groups (A and B). The animals of group A were subjected to the intramuscular administration of atropine sulphate @ 0.04 mg/kg body weight followed by the intravenous administration of dexmedetomidine @ 0.01 mg/kg body weight and ketamine @ 5-6 mg/kg body weight. The animals of group B were subjected to the intramuscular administration of atropine sulphate @ 0.04 mg/kg body weight followed by the intravenous administration of diazepam @ 2 mg/kg body weight and ketamine @ 5-6 mg/kg body weight. The efficacy of anaesthetic combination was evaluated by determining clinical parameters (induction time, onset of anaesthesia, duration of anaesthesia, recovery time, and various reflexes), physiological parameters (heart rate, respiration rate, rectal temperature and ECG) and the haematobiochemical parameters (Hb, PCV, TLC, TEC, DLC, BUN, creatinine, glucose and ALT). On the basis of above mentioned parameters it was revealed that combination of dexmedetomidine and ketamine is better than the combination of diazepam and ketamine as it has comparatively less deleterious effects on different body systems.





#### **44. Safety and efficacy of butorphanol-acepromazine-glycopyrrolate as premedicant combination to midazolam-ketamine induction and isoflurane maintenance in canine orthopaedic surgery**

*J. J. Ranpariya, D. R. Barvalia, D. B. Patil, P. V. Parikh, P. H. Tank, N. R. Padaliya and C. B. Javiya*

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The clinical study was carried out to evaluate anaesthetic safety and efficacy in 18 canine orthopaedic cases. The dogs were premedicated with intramuscular injection of butorphanol, acepromazine and glycopyrrolate (BAG) @ 0.2, 0.04 and 0.01 mg/kg, respectively mixed in a single syringe. Anaesthesia was induced with combination of midazolam – ketamine @ 5mg/kg and 0.28 mg/kg, respectively administered intravenously and maintained with isoflurane. The preanaesthetic combination provided moderate to profound sedation. Induction was smooth and satisfactory in all the dogs with ketamine-midazolam and maintenance was stable with isoflurane during orthopaedic procedures viz., intramedullary pinning, limb amputation setting Ilizarov circular external fixator and type II external fixator. It was concluded that BAG as preanaesthetic to ketamine-midazolam induction and isoflurane maintenance proved safe and effective in orthopaedic surgery in dogs.

#### **45. Comparison of post-operative analgesic efficacy of meloxicam, ketoprofen and carprofen in management of canine orthopaedic cases**

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Present clinical study was carried out on 18 animals to compare analgesic efficacy of meloxicam, ketoprofen and carprofen for post-operative orthopaedic pain management. Animals in group I, II and III received meloxicam (@ 0.2 mg/kg), ketoprofen (@ 1-2 mg/kg) and carprofen (@ 2.2-4 mg/kg), respectively as post-operative analgesic for five days. Among three meloxicam was found to be best analgesic followed by ketoprofen and carprofen for alleviating pain during post-operative period.

#### **46. ECG changes during Total Intravenous Anaesthesia (TIVA) with propofol for day care surgical interventions in sheep**

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Electrocardiographic changes during surgical interventions {viz., placement of central venous catheters (CVC, Group-B), docking/ tail amputation (Group-C), bilateral orchietomy (Group-D)} and no surgical stimuli (control, Group-A) with propofol anaesthesia were assessed in twenty-four (n=24) apparently healthy male sheep. Each sheep was premedicated with glycopyrrolate (@ 0.02 mg/kg body weight, IM) and, five minutes later anaesthesia was induced with propofol (@ 4.00 mg/kg body weight, IV). Propofol was not able to induce any significant changes in P-wave, QRS wave and T-wave amplitude in any of the groups. P-wave amplitude increased significantly in animals performed with central venous catheterization. T-wave amplitude increased non-significantly in CVC group while decreased in docking and castration groups. P-wave and T-wave duration has not exhibited any significant difference throughout the course of experiment. However, QRS wave duration, non-significantly, decreased in control group while no significant changes were observed in surgical groups. PR segment length reduced, non-significantly, in castration group only and none of the other groups exhibited any significant changes. ST segment



length exhibited significant ( $P<0.05$ ) increase in control group, non-significant increase in CVC while exhibiting significant ( $P<0.05$ ) fall in castration and docking groups. RR interval exhibited reduction in all the four groups, non-significantly in control while significantly ( $P<0.05$ ) in the three surgical groups. Heart rate increased in all the four groups. All the animals recovered uneventfully and on the basis of above findings it can be stated that propofol and may be useful in surgeries related to husbandry practices/ day-case surgery. On the basis of above findings it can be concluded that propofol have minor effects on electrocardiographic parameters and can be used for day care surgeries/minor husbandry purposes in sheep.

#### **47. Clinical evaluation of dexmedetomidine-butorphanol or xylazine-butorphanol in ketamine induced halothane anesthetized dogs**

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The study was conducted on 32 adult client owned dogs scheduled for various surgical procedures. The animals were divided into two groups namely BXX ( $n=17$ ) and BDK ( $n=15$ ). Animals were pre-anesthetized with Inj. Atropine sulphate (0.04 mg/kg S/C) and butorphanol (0.2 mg/kg I/M). After 10 minutes, they were premedicated with Inj. Xylazine (1 mg/kg I/V) in BXX group and Inj. Dexmedetomidine (375  $\mu\text{g}/\text{m}^2$  I/V) as per BSA according to FDA approved dose conversion chart for dexmedetomidine) in BDK group. The general anesthesia was induced with Inj. Ketamine (till effect I/V) and animals were maintained throughout the surgery on halothane mixed with oxygen. Induction dose of ketamine utilized to facilitate endotracheal intubation was 3.7 mg/kg b.wt in BXX and 2.9 mg/kg b.wt. in BDK group respectively. Uniform and pronounced muscle relaxation along with typically safe and steady pattern of sedation was better in BDK group. The anesthesia produced in both groups was marked by bradycardia (9.44 and 7.18 per cent), respiratory depression (33.82 and 25.44 per cent), fall in rectal temperature and hypotension (8.20 and 4.64 per cent), though these alterations were not of statistically significant. Increased CVP and IOP values were found in both the groups but they remained within physiological limits. The average SPO<sub>2</sub> was 94.94 (%) and 95.32 (%) in BXX and BDK groups. The mean vaporizer setting of halothane required to maintain the anesthesia was 2 per cent and 1.26 per cent in BXX and BDK groups respectively. Following discontinuation of the halothane, the extubation was facilitated in  $5.87 \pm 0.52$  min in BDK group while  $8.71 \pm 0.69$  min in BXX group and animal regained the feet within  $31.60 \pm 2.12$  min and  $46.18 \pm 2.11$  min respectively. The animals of group BDK showed smooth and fast recovery as compared to BXX. The quality of induction, transfer and recovery was superior in BDK group in comparison to BXX group.

#### **48. Sonolocation guided axillary brachial plexus block using bupivacaine and hyperbarci bupivacaine in goats**

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The present clinical study evaluated the efficacy of bupivacaine HCl (0.5%) and hyperbaric bupivacaine (0.5%) for axillary brachial plexus block in 12 goats (six goats in each group) under ultrasonographic guidance with aid of peripheral nerve stimulator (PNS). The axillary brachial plexus was identified as three rounded hyperechoic structures with axillary artery as pulsative hypoechoic structure kept as land mark with use of 7.5-10 MHz linear ultrasound transducer, also located with the maximum muscle twitching at 0.4 mA current with aid of peripheral nerve stimulator in all animals. Axillary BPB performed using bupivacaine HCl (0.5%) in six goats, showed complete BPB at dose rate of 3.0 mg/kg b.wt. in five goats with mean full onset of  $180 \pm 40$  minutes; while in six goats, wherein hyperbaric bupivacaine, all six goats showed a complete BPB at dose rate of 3.0 mg/kg b.wt. with mean full onset of  $100 \pm 40$  minutes. Bupivacaine HCl provided longer duration of action



for axillary BPB as compared to hyperbaric bupivacaine in goats suggesting that bupivacaine has more pronounced post operative analgesia than hyperbaric bupivacaine. Hyperbaric bupivacaine takes shorter time for onset of axillary BPB without any complications as compared to bupivacaine HCl which was reported through assessment of sensory and motor block at specific intervals. Ultrasonography provides better visualization of axillary brachial plexus with aid of peripheral nerve stimulator, hence precise location of brachial plexus increased success rate of axillary BPB, decreased performance time and decreased failure rates.

## 49. Sonolocation guided axillary brachial plexus block using bupivacaine and hyperbaric bupivacaine in dogs

*N. B. Padiya, P. V. Parikh, D. B. Patil, Mehraj-u-din dar, D. K. Tiwari and Dharmendra Kumar*

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The present clinical study evaluated the efficacy of bupivacaine HCl (0.5%) and hyperbaric bupivacaine (0.5%) for axillary brachial plexus block in 12 dogs (six dogs in each group) under ultrasonographic guidance with aid of peripheral nerve stimulator (PNS). The axillary brachial plexus was identified as three rounded hyperechoic structures with axillary artery as pulsative hypoechoic structure kept as land mark with use of 7.5-10 MHz linear ultrasound transducer, also located with the maximum muscle twitching at 0.4 mA current with aid of peripheral nerve stimulator in all animals. Axillary BPB performed using bupivacaine HCl (0.5%) in six dogs, showed complete BPB at dose rate of 2.5 mg/kg b.wt. in four dogs only with mean full onset of  $140 \pm 40$  minutes; while in six dogs, wherein hyperbaric bupivacaine was used, five dogs showed a complete BPB at dose rate of 3.0 mg/kg b.wt. with mean full onset of  $100 \pm 40$  minutes. Bupivacaine HCl provided longer duration of action for axillary BPB as compared to hyperbaric bupivacaine in dogs suggesting that bupivacaine has more pronounced post operative analgesia than hyperbaric bupivacaine. Hyperbaric bupivacaine takes shorter time for onset of axillary BPB without any complications as compared to bupivacaine HCl which was reported through assessment of sensory and motor block at specific intervals. Ultrasonography provides better visualization of axillary brachial plexus with aid of peripheral nerve stimulator, hence precise location of brachial plexus increased success rate of axillary BPB, decreased performance time and decreased failure rates.

## 50. Evaluation of xylazine+ketamine with isoflurane anaesthesia in laparoscopic assisted and conventional cryptorchidectomy

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Total twelve dogs were presented for evaluation of anaesthesia. In this study total twelve Cryptorchid cases were operated by conventional method and laparoscopic assisted method of cryptorchidectomy. Dogs were preanaesthetised with inj. Dexamethasone, inj. Atropine sulphate and Xylazine (1 mg/kg, IM) and anesthetized with ketamine (10 mg/kg, IV). Further, maintenance of anaesthesia was done by 2% isoflurane. Anaesthetic parameters such as quality of anaesthesia, duration of maintenance of anaesthesia, quality of recovery and time of recovery were studied in both the methods. Physiological parameters, hematological parameters and biochemical parameters were observed during conventional method & laparoscopic assisted technique for cryptorchidectomy under xylazine-ketamine-isoflurane anaesthesia. The non significant decrease in the rectal temperature, heart rate, respiratory rate and pulse rate was observed in both the methods during surgical procedure and maintenance of anaesthesia and this parameters rich to normal range after 48hrs. There was no significant difference in blood parameters and they also appeared to normal range after 48hrs. The quality of anaesthesia and muscle relaxation was



good in both the methods, and it served the purpose of conventional and laparoscopic cryptorchidectomy effectively. Good to excellent degree of muscle relaxation was observed in both the methods. Smooth recovery in both the groups could have been due to the use of pre-anesthetics. All the dogs recovered fully within twelve to thirty minutes and walked out of the operation theatre without any support. Xylazine-ketamine and Isoflurane appears to be the safe and effective combination of induction and maintenance of general anaesthesia for conventional and laparoscopic assisted method of cryptorchidectomy in dogs.

## 51. Sono-and- electrolocation guided blockade of axillary brachial plexus using bupivacaine and ropivacaine in dogs

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The present clinical study evaluated the efficacy of bupivacaine HCl (0.5%) and ropivacaine HCl (0.2%) for axillary brachial plexus (BPB) in 12 dogs under ultrasonographic guidance with aid of peripheral nerve stimulator (PNS). Dogs undergoing BPB, the axillary region was scanned with ultrasonography using 7.5-12 MHz linear transducer. In dogs undergoing BPB, Three rounded hyperechoic structures were observed dorsal and close to the axillary vessels; these were presumed to be the C7, C8, and T1 roots of the brachial plexus. The axillary artery as pulsative hypoechoic structure kept as land mark was also located by the maximum muscle twitching at 0.4 mA current with aid of peripheral nerve stimulator in all animals. Axillary BPB performed using bupivacaine HCl (0.5%) @ 3 mg/kg b.wt resulted in complete block. The onset of the sensory block in four dogs was at 140 minutes and in two dogs at 180 minutes. With the same dose the complete motor block i.e. ptosis was seen at 100 minutes in four dogs and at 140 minutes in two dogs. The duration of the block lasted for about 680 minutes in all dogs. In six dogs BPB using ropivacaine HCl 0.2% @ 3 mg/kg b.wt, showed complete sensory and motor blocks. The onset of the sensory block in three dogs was at 100 minutes and in other three at 140 minutes. Complete motor block i.e. ptosis was seen at 140 minutes in five dogs and at 180 minutes in one dog. The duration of the block lasted for about 600 minutes in all dogs.

## 52. Sono-and- electrolocation guided blockade of femoral nerve using bupivacaine and ropivacaine in dogs

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The present clinical study evaluated the efficacy of bupivacaine HCl (0.5%) and ropivacaine HCl (0.2%) for femoral nerve block (FNB) in 12 dogs under ultrasonographic guidance with aid of peripheral nerve stimulator (PNS). For FNB, inguinal area was scanned ultrasonographically with in-plane technique. A hyperechoic nodular structure presumed to be the femoral nerve was identified deep and cranial to the femoral artery, kept as land mark, and also located by the maximum muscle twitching at 0.4 mA current with aid of peripheral nerve stimulator in all animals. FNB performed using bupivacaine HCl (0.5%) and ropivacaine HCl (0.2%) @ 3 mg/kg b.wt resulted in complete block. Using bupivacaine full onset of sensory block was at 60 minutes in four dogs, and at 50 and 100 minutes in one dog each. Onset of motor block was at 50 minutes in four dogs and at 60 minutes in two dogs. While in ropivacaine group, onset of sensory block in four dogs was at 50 minutes and in two dogs at 60 minutes. Onset of motor block was at 60 minutes in three dogs and at 100 minutes in other three. Duration of the block lasted for nearly 600 and 500 minutes for bupivacaine and ropivacaine, respectively.



### 53. Sono-and- electrolocation guided blockade of axillary brachial plexus using bupivacaine and ropivacaine in goats

*Mehraj u din dar, D. B. Patil, P. V. Parikh, D. K. Tiwari, and N. B. Padiya*

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The present clinical study evaluated the efficacy of bupivacaine HCl (0.5%) and ropivacaine HCl (0.2%) for axillary brachial plexus (BPB) in 12 goats under ultrasonographic guidance with aid of peripheral nerve stimulator (PNS). Goats undergoing BPB, the axillary region was scanned with ultrasonography using 7.5-12 MHz linear transducer. In goats undergoing BPB, Three rounded hyperechoic structures were observed dorsal and close to the axillary vessels; these were presumed to be the C7, C8, and T1 roots of the brachial plexus. The axillary artery as pulsative hypoechoic structure kept as land mark was also located by the maximum muscle twitching at 0.4 mA current with aid of peripheral nerve stimulator in all animals. Axillary BPB performed using bupivacaine HCl (0.5%) and ropivacaine HCl (0.2%) in six goats each, showed complete BPB at dose rate of 3.0 mg/kg b.wt. Using bupivacaine, the full onset of sensory block was at 100 minutes in four goats and at 140 minutes in two goats. Full motor block was seen in five goats at 100 minutes and at 140 minutes in one goat. While in six goats BPB using ropivacaine resulted in full onset of sensory block at 60 minutes in three goats, at 100 minutes in two and at 140 minutes in one. The onset of motor block i.e. ptosis was observed at 140 minutes in all goats of this group. The duration of the block lasted for 680 and 600 minutes for bupivacaine and ropivacaine, respectively.

### 54. Sono-And- Electrolocation Guided Blockade of Femoral nerve Using Bupivacaine and Ropivacaine in Goats

*Mehraj u din dar, D. B. Patil, P. V. Parikh, D. K. Tiwari, and N. B. Padiya*

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The present clinical study evaluated the efficacy of bupivacaine HCl (0.5%) and ropivacaine HCl (0.2%) for femoral nerve block (FNB) in 12 goats under ultrasonographic guidance with aid of peripheral nerve stimulator (PNS). For FNB, inguinal area was scanned ultrasonographically with in-plane technique. A hyperechoic nodular structure presumed to be the femoral nerve was identified deep and cranial to the femoral artery, kept as land mark, and also located by the maximum muscle twitching at 0.4 mA current with aid of peripheral nerve stimulator in all animals. FNB in goats using bupivacaine and ropivacaine @ 3 mg/kg b.wt resulted in complete block. With bupivacaine, onset of sensory block was at 50 and 60 minutes in three goats each, while onset of full motor block was at 40 minutes in five goats and at 50 minutes in one goat. Using ropivacaine, all six goats showed full onset of sensory block at 40 minutes with early onset of sensory block than motor. The onset of full motor block was at 140 minutes in one goat and at 180 minutes in five goats. The duration of sensory and motor blocks in all goats lasted for nearly 680 and 580 for bupivacaine and ropivacaine, respectively.





## 55. Comparative evaluation of isoflurane triple drip of xylazine, ketamine and guaphenesin as a maintenance anaesthetic during different surgical procedures in equines

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Realizing the need for an anaesthetic technique to perform long duration surgeries in equines, ability of isoflurane and triple drip as a maintenance anaesthetic agent in Xylazine -Ketamine- diazepam induced anaesthesia was evaluated. For this, 12 horses were selected, of 6 horses in each group. All the horses were anaesthetized with Xylazine (1mg/kg, 5minutes before the next injections), ketamine (2.0 mg/kg) and Diazepam (0.1mg/kg). In Group I Anaesthesia was then maintained with isoflurane initially, with a flow of 4% isoflurane with oxygen and further depending upon the depth of anaesthesia as 2-4%. Pressure of inspiratory flow and inspiratory to expiratory ratio was adjusted to 20-25cm H<sub>2</sub>O and 1:4 respectively with tidal volume as 6litres. In group II anaesthesia was maintained with triple drip @ 1ml/kg/hr. This resulted in a faster and smooth induction of anaesthesia within  $2.67 \pm 0.33$  minutes. Moreover, the anaesthesia was maintained with minimal effect on rectal temperature, cardiopulmonary and haematobiochemical values in both groups. Thus, the present study showed that maintenance of anaesthesia with isoflurane and triple drip can be safely used for different surgical procedures in hepatorenal impaired horses under field conditions.





**Radiology and Imaging Technique Session**

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|         | Ultrasonography as a preliminary screening tool for thoraco-abdominal disorders in ruminants   |
| 1       | <b>Radiologic diagnosis of thoraco-abdominal disorders in cattle and buffaloes</b><br>Brijesh Kumari Meena and T. K. Gahlot  |
| 2       | <b>Digital radiography and computed tomography of camel foot</b><br>Mukesh Gahlot and T. K. Gahlot   |
| 3       | <b>Dilatation cardiomyopathy in dogs</b><br>M. B. Gugjoo, M. Hoque, A. C. Saxena, M. M. S. Zama, S.Dey and A. K. Mishra  |
| 4       | <b>Functional evaluation of large diameter vascular graft by subtraction aortography in swine model.</b><br>Sachin J. Shenoy, Lekshmi V, Umashankar P. R.  |
| 5       | <b>Evaluation of colour doppler sonography for predicting reducibility of intussusception in dogs</b><br>Jasmine Kaur, J. Mohindroo, S. K. Mahajan, M. Raghunath and Tarunbir Singh  |
| 6       | <b>Doppler ultrasonography in canine renal disease</b><br>Pallavi Verma, J. Mohindroo and Tarunbir Singh   |
| 7       | <b>Echocardiography as a definitive diagnostic tool for dilated cardiomyopathy in canine</b><br>Anuj Pratap Singh, Navdeep Singh and S. K. Mahajan   |
| 8       | <b>Diagnosis of pericardial effusion in canine:- echocardiography as a definitive diagnostic tool</b><br>Anuj Pratap Singh, Navdeep Singh and Ketki V. Raje  |
| 9       | <b>Radiographic study on bone cortex to diameter (C/D) ratio of metacarpals and metatarsals of buffaloes</b><br>Sudhansu Bansal, V. Malik and R. P. Pandey   |
| 10      | <b>Radiographic features of septic joints in cattle</b><br>A. Ramanathan, R. S Kumar, S. Ayyappan, C. Balachandran and Geetha Ramesh   |
| 11      | <b>Ultrasonographic diagnosis and classification of traumatic pericarditis in 34 cattle</b><br>S. Kathirvel, N. Rajendran, S. Dharmaceelan, M. Subramanian, G. A. Balasubramaniam and G. Vijayakumar                                   |
| 12      | <b>Radiographic diagnosis of traumatic pericarditis in 92 cattle</b><br>S. Kathirvel, N. Rajendran, S. Dharmaceelan, M. Subramanian and G. A. Balasubramaniam  |
| 13      | <b>Radiographic diagnosis and surgical management of potential metallic foreign bodies in a bitch</b><br>V. Malik, D. Kumar, S. Purohit, G. Kumar, P. Katiyar, R. P. Pandey and B. Singh   |
| 14      | <b>Radiographic diagnosis and surgical management of partial diaphragmatic rupture in a dog</b><br>V. Malik, D. Kumar, S. Purohit, G. Kumar, P. Katiyar, R. P. Pandey and B. Singh   |
| 15      | <b>Study of normal trachea and bronchus through Tracheobronchoscope in 60 healthy dogs</b><br>Lokhande, D. U. and L. B. Sarkate  |
| 16      | <b>Ocular ultrasonographic biometry in dogs</b><br>Dharmendra Kumar, P. V. Parikh, D. B. Patil, D. K. Tiwari, Mehraj u din Dar, D. D. Rishi, Menguzeno Sale and Shyam Manohar  |
| 17      | <b>Ocular ultrasonographic biometry of indian horse breeds</b><br>Dharmendra Kumar, P. V. Parikh, D. B. Patil, D. K. Tiwari, Mehraj u din Dar, D. D. Rishi Mengozeno Sale and Shyam Manohar  |
| 18      | <b>Clinical studies on videoendoscopy of upper gastro-intestinal tract affections in dogs</b><br>Tejas Shukla, P. V. Parikh, D. B. Patil, D. K. Tiwari, Mehraj u din Dar, Dharmendra Kumar, Nikunj Padiya, D. D. Rishi and Niraj Patel |
| 19      | <b>Ultrasonographic diagnosis of gastro-intestinal tract surgical disorders in bovines</b><br>D. K. Tiwari, P. V. Parikh, D. B. Patil, Dharmendra Kumar, Mehraj u din Dar, H. L. Makwana, Shyam Manohar and Amit Patel                 |



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| 20      | <b>Use of Computed Tomography (CT) for confirmatory diagnosis and successful treatment of pyometra in a thirteen years old Lhasa apso bitch.</b><br>Talekar S. H., Gaikwad R.V., Mali H. V., Ashwini K. Sharma and Pandey Nitin  |
| 21      | <b>Use of Computed Tomography (CT) for diagnosis and successful surgical treatment of large splenic solid tumour involving multiple cysts in nine years old German shepherd male dog</b><br>Talekar S. H., Choudhari P. R., Gaikwad R. V., Mali H. V., Meshram P. V., Ashwini K. Sharma and Pandey Nitin |
| 22      | <b>Use of Computed Tomography (CT) for diagnosis of bone cancer and surgical treatment of affected fore limb in a Mongrel male dog.</b><br>Talekar S. H., Gaikwad R. V., Mali H. V., Meshram P. V., Ashwini K. Sharma and Pandey Nitin   |
| 23      | <b>Radiotherapy of femoral chondrosarcoma in a Rottweiler dog</b><br>D. B. Patil, P. V. Parikh, V. Shankar, Niraj Patel, Amit Patel, Shyam Manohar, N. Sridhar, J. J. Ranpariya, D K.Tiwari, D. J. Ghodasara   |
| 24      | <b>Computed Tomographic evaluation of a massive splenic haematoma in a German shepherd dog</b><br>Bendale K. R., Talekar S. H., Mali H. V., Gaikwad R. V. and Chaudhari P. R.  |
| 25      | <b>Electronmicroscopic Studies In Corneal Ulceration</b><br>Bendale K. R., Talekar S. H., Mali H. V., Gaikwad R. V. and Chaudhari P. R.  |



LEAD PAPER

## Ultrasonography as a preliminary screening tool for thoraco-abdominal disorders in ruminants

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Disorders of the abdomen in bovines are difficult to diagnose. These are presented with vague clinical signs viz. decreased/no defaecation, off-fed and suspended rumination, altered rumen motility, tympany (in majority of the animals), dehydration etc. Per rectal examination is often not conclusive. Radiography sometimes may be conclusive for reticular disorders but is not considered useful for omasal / abomasal / other GIT affections. In the recent years, ultrasonography has emerged as an ideal diagnostic tool for the preliminary investigation of bovine gastrointestinal disorders[1,2]. Ultrasonographic examination reveals the size, shape, echogenicity, position, and internal architecture of the abdominal structures. It provides information about the internal structure of most of the tissue-dense abdominal organs that cannot be obtained from the radiograph. Reports are available on the diagnosis of traumatic reticuloperitonitis [3,4], diaphragmatic hernia[5,6], omasal impaction[7], abomasal disorders[8], ileus of the small intestine and dilatation and displacement of the caecum. Extensive work has been done at GADVASU on the use of ultrasonography for diagnosis of peritonitis[9,10], diaphragmatic hernia[5,6] and omasal impaction[7]. Ultrasonographic examination in bovines is performed on non-sedated, standing animal. The area where the transducer is to be applied is shaved using a razor and transmission gel is applied for optimal transmission of ultrasound waves. A 3.5 MHz linear or microconvex transducer must be used for scanning the bovine abdomen[5].

**Ultrasonography of the Reticulum:** For ultrasonographic examination of the reticulum, the transducer is applied to the ventral aspect of the thorax on the right of the sternum as well as to the right lateral wall at 6<sup>th</sup> intercostal space (ICS) up to the level of the elbow. The scans can similarly be performed from the left side[11]. The normal reticulum appears as a half-moon-shaped structure with an even contour. It contracts at regular intervals and, when relaxed, is situated immediately adjacent to the diaphragm and ventral portion of the abdominal wall. The different layers of the reticular wall usually cannot be imaged, and the honeycomb-like structure of the mucosa is often not seen clearly even on a phantom image when scanning is done in a water bath. Contents of the reticulum cannot be normally imaged because of their partly gaseous composition. Foreign bodies also cannot usually be seen in the reticulum because of the gas content of the reticulum. Radiography is the method of choice for identifying radio dense foreign bodies. From the right ventral thorax, part of the omasum, abomasum, and sometimes the liver are imaged. For an assessment of reticular motility the reticulum is located and observed for 3 min without moving the transducer. The number, amplitude, duration and speed of reticular contractions and the duration of the interval of relaxation between two biphasic reticular contractions are assessed. The reticulum normally contracts once per minute. Thus, in the 3-min-observation period, the reticulum has three biphasic contractions, the first of which is incomplete. Any alterations in this motility pattern may be considered as abnormal and require further investigations. Lack of motility may suggest reticular atony or adhesions while incomplete motility may suggest adhesions.

**Reticular Abscess:** Reticular abscess are relatively difficult to diagnose and the diagnosis depends upon location of the abscess. Reticular abscess have an echogenic capsule of varying thickness, which surrounds a homogeneous hypoechoic to moderately echogenic centre [12]. The contents of an abscess are frequently partitioned by echogenic septa. Abscesses are usually caudoventral to the reticulum, but may be cranial or lateral to the reticulum. Literature says that abscesses are often seen between the reticulum and spleen, reticulum and liver or reticulum and omasum or abomasum. Abscess must be carefully differentiated from localized peritonitis and must be confirmed upon exploratory laparorumenotomy. Percutaneous centesis of the abscess may be performed to confirm the abscess and to drain it.



**Traumatic Reticuloperitonitis:** In cattle with traumatic reticuloperitonitis [3,4], ultrasonography can be used to identify morphological changes in the region of the cranial, ventral, or caudal reticular wall. The changes in the contour of the reticulum depend on the severity of the inflammatory changes. Deposits of fibrinous tissue interspersed with fluid pockets are frequently seen on the reticular wall. B+M mode ultrasonography helps in evaluation of reticular health in bovines. The reticular adhesions can be visualized on the ultrasonogram as fibrinous bands outside the reticular wall [14]. The reticular wall may appear thickened and undulating in animals with reticulitis.

**Diaphragmatic Hernia:** Diaphragmatic hernia can be diagnosed on ultrasonography with fair amount of success provided reticular motility is present [5,6]. For diagnosis of diaphragmatic hernia, the motility of the reticulum is first identified within the abdomen and the motility pattern is recorded. Then scanning of the thoracic cavity is done at the level of the 4<sup>th</sup>/5<sup>th</sup> intercostal space at the level of right elbow slowly scanning down to the midline. The reticular motility should be visualized at this level if the case is to be declared positive for diaphragmatic hernia. In studies conducted at GADVASU a high success rate has been achieved in the diagnosis of diaphragmatic hernia in cows and buffaloes.

**Omasum:** The reticulum, omasum and liver can be imaged from the intercostal spaces of the right thoracic wall. The omasal wall is seen as a circular, distinctly echogenic line, immediately adjacent to the right thoracic wall, adjacent to the liver. The omasal leaves may or may not be scanned depending upon the filling of the omasum. The wall of the omasum is thicker than that of the reticulum and omasum has a very slow churning type of movement. The contents of the omasum cannot usually be imaged. If impacted omasum can be seen with no motility covering a large area with distinct acoustic shadows [7,13].

**Abomasum:** Ultrasonography is a valuable technique for the assessment of the size, position and contents of the abomasum. The abomasum can be visualized approximately 10 cm caudal to the xiphoid process from the left and right paramedian regions and from the ventral midline. The bulk of the abomasum is situated to the right of the ventral midline. The wall of the abomasum appears at the most as a thin echogenic line. The rugal fold of the abomasum can be seen distinctly in most of the cases. The movement of the abomasal contents with motility of the wall may be seen. Percutaneous ultrasound-guided paracentesis with a low pH of the contents usually confirms abomasum.

**Peritoneal Effusion:** It is visible ultrasonographically as an accumulation of fluid without an echogenic margin and restricted to the reticular area. It is relatively easy to diagnose as the reticular wall is separated from the abdominal wall with anechoic fluid. Depending on the fibrin and cell content, the fluid may be anechoic or hypoechogenic. Fibrinous deposits are easily identified in the fluid, and sometimes, bands of fibrin are seen within the effusion. Occasionally, the peritoneal effusion is considerable and extends to the caudal abdomen.

**Intestines:** For ultrasonography of the small intestine in cattle, the area from the tuber coxae to the eighth intercostal space and from the transverse processes of the vertebrae to the linea alba on the right side is examined. The appearance of loops of small intestine and their diameter, contents and motility are assessed. The ultrasonographic appearance of the contents of the small intestine varies. Most commonly, the intestine contains mucus or feed, which appears hyperechogenic. The intestine filled with fluid, appears hypoechogenic. The parts of the small intestine can not be differentiated, although an assessment can be made based on the location. When ileus of the small intestine is suspected, an ultrasonographic examination should facilitate the diagnosis by proving with valuable information like fluid filled intestinal loop having no motility. The site of ileus markedly affects the number of dilated loops of intestine seen in cross-section and longitudinally from either the flank or each intercostal space. When only one or a few, usually markedly dilated, loops of small intestine are seen, ileus of the duodenum is most likely. More than five loops of small intestine seen in one area usually indicates ileus of the jejunum or ileum. Diagnosis of caecal dilatation usually is straightforward. A dilated caecum can always be imaged from the lateral abdominal wall at the flank and in some cases, may be seen from the 12<sup>th</sup>, 11<sup>th</sup> and even 10<sup>th</sup> intercostal spaces. A diagnosis by clinical examination alone may not be possible, but ultrasonography facilitates in the diagnosis of caecal dilatation. It however may be confused with ileus and thorough examination of other portions of the abdomen is required.



### **Ultrasonography of the Thorax:**

The ultrasonography of the bovine thorax helps in identifying and differentiating conditions like pericarditis, pleural effusions, thoracic abscesses and thoracic masses. Pericarditis can be evaluated from both left and right sides with the limb of the animal stretched forward. The heart is scanned at the level of 4<sup>th</sup> /5<sup>th</sup> ICS and the pericardium may be seen as a column preceding the respective ventricle closest to the transducer. The contents of the pericardium may vary from hypo echoic to echogenic to fibrinous. The pericardium may be drained under ultrasound guidance using a 16 G or larger bore needle if the contents are anechoic. A satisfactory recovery is expected if this procedure is followed by the use of appropriate antibiotics.

In case of pleural effusions symptoms like brisket edema and jugular pulsation are present, similar to animals with pericarditis. By ultrasonography it becomes easy to differentiate the pericarditis from pleural effusions. The pericardium appears normal in such animals and free fluid can be seen in the thoracic region especially dorsal to the heart.

Solid masses or cysts can also be identified in the thoracic cavity provided that they are lying close to the thoracic wall. A sonologist may easily miss the cysts lying deep within the thoracic cavity. If thoracic cysts are seen on the ultrasonogram it is imperative to scan the liver to rule out cysts in the liver parenchyma.

### **Ultrasonography of the Liver and Kidneys:**

Ultrasonography is helpful in evaluating the status of the liver and kidneys in bovines. It helps to diagnose and differentiate conditions like hepatomegaly, liver cysts, chronic liver disease, bile duct obstruction, calcifications, hydronephrosis, renal disease etc. Liver is usually scanned from the right dorso-lateral aspect at the level of 7<sup>th</sup>-11<sup>th</sup> ICS. The kidneys are scanned on the dorsal aspect at the 11<sup>th</sup>-12<sup>th</sup> ICS from the right side and often superimpose the hepatic parenchyma on the ultrasonograms.

### **Ultrasound guided aspiration and biopsy**

Ultrasound guidance can assist many interventional procedures such as fine needle aspiration, core biopsies, fluid and abscess drainage and in situ injections of pharmaceuticals. By guiding the needle precisely into the lesion and therefore decreasing the number of geographical misses, diagnostic samples can be obtained more efficiently and safely than by blind technique. The number of post-biopsy complications such as hemorrhage, pneumothorax, peritonitis and gall bladder or GIT perforation significantly decreases when compared with blind biopsy methods.

In the bovine, ultrasound guided biopsy procedure can be performed safely in standing position. Initially, the site of lesion / biopsy site is determined and local anesthesia is achieved by infiltrating 2% lignocaine (15-20 ml) at the site from where needle is to be inserted. After aseptic preparation, a small stab incision with #11 blade is made on the skin. Biopsy gun or needle is inserted at an angle to the transducer and needle is visualized and guided into the lesion to procure biopsy sample for histological study. A post biopsy scan is recommended to assess for possible hemorrhage or hematoma formation. The biopsy sample is stored in a vial containing 10% formalin while from fine needle aspiration biopsy samples slide smears are made.



## 1. Radiologic diagnosis of thoraco-abdominal disorders in cattle and buffaloes

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The radiographic diagnosis of thoraco-abdominal disorders was done in 11 cattle and 6 buffaloes. All animals underwent a lateral radiograph of thoraco-abdominal regions with or without grid. An analysis of radiographs revealed pathologies of thoracic and abdominal regions. These were traumatic pericarditis (4 cases), foreign bodies in thoracic regions (6 cases), foreign bodies in reticulum (3 cases) and foreign body abscess in (4 cases).

## 2. Digital radiography and computed tomography of camel foot

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The radiological anatomy of foot of fore and hind limb was studied by digital radiography and C.T. scans in two adult freshly dead camels. An interpretation of digital radiograph revealed that camel does not possess distal sesamoid bones. The metacarpus and metatarsus remained bifurcated its distal extremity. There were four proximal sesamoid bones present on posterior aspect of fetlock joint. The first phalanx was largest of all and third phalanx was smallest. The thick keratinized sole was visible on ventral aspect of foot. It had a more developed digital cushion. The superficial and deep digital flexor tendon was not visible. C.T. images also confirmed absence of distal sesamoid bone. Various portion across the foot showed metacarpal and metatarsal, divided cannon bone, fetlock joint, proximal and first phalanx, second or middle phalanx and distal and third phalanx, fetlock, pastern and coffin joints, proximal sesamoid bones, Nails or pes, interdigital notch, interdigital septum, deep digital flexure tendon, superficial digital flexure tendon, fibrocartilagenous enlargement of deep digital flexure tendon, middle scutum, digital cushion, common capsule of digital cushion and yellow fibroelastic bed.

## 3. Dilatation cardiomyopathy in dogs

*M. B. Gugjoo, M. Hoque, A. C. Saxena, M. M. S. Zama, S. Dey and A. K. Mishra*

Indian Veterinary Research Institute, Izatnagar-243122

12 dogs of different breeds (7 Labrador retriever, 3 German shepherd and 2 Spitz) were diagnosed with dilatation cardiomyopathy (DCM). The diagnosis was done on the basis of clinical signs and by employing different diagnostic modalities viz., radiography, electrocardiography (ECG) and echocardiography. Electrocardiography and echocardiography was applied in all the 12 cases but thoracic radiography was done only in 5 cases. Physical examination revealed an exaggerated inspiratory effort, severe ascites and hypokinetic femoral arterial pulses. Thoracic auscultation detected tachycardia with muffled heart sounds, without audible cardiac murmurs. Thoracic radiographs showed severe left ventricular enlargement and pleural effusion and the vertebral heart score was found to be higher than normal. On electrocardiography, atrial fibrillation was the most common finding along with wide P wave and wide and tall QRS complex. M-mode echocardiography, done in right lateral recumbency and measurements made in right parasternal long axis left ventricular outflow tract view, revealed increased left ventricular internal diameter, decreased systolic function evidenced by reduced fractional shortening, and increased end point septal separation (EPSS).





#### 4. Functional evaluation of large diameter vascular graft by subtraction aortography in swine model

*Sachin J. Shenoy, Lekshmi V., Umashankar P. R.*

Biomedical Technology Wing, SreeChitraTirunal Institute for Medical Sciences and Technology, Thiruvananthapuram.

This paper puts on record an easy technique for functional evaluation of large diameter vascular graft by subtraction aortography in swine model. The procedures were conducted as part of the preclinical testing of novel vascular graft, after review of Institution Animal Ethics Committee and approval from Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA). Inhouse bred Ankamali swine of both sexes were induced anaesthesia with atropine, midazolam and ketamine followed by propofol. With the animals on lateral recumbency endotracheal intubation was performed. Positive pressure ventilation was adjusted as per to EtCO<sub>2</sub> value and anaesthesia was maintained on 1.5 % isoflurane. Through a linear incision in the juglar furrow, carotid cut downs were performed following a modified Sedlinger technique with a 7 Fr introducer sheath under systemic heparinisation. Implantation of the graft under evaluation was performed after lateral thoracotomy following standard techniques. A 7F Right Judkin's guiding catheter with an easy catch haemostatic Y adaptor and a Teflon guide wire was introduced through the sheath and advanced into the descending aorta under fluoroscopic guidance. The catheter tip was placed proximal to the graft and an aortogram on digital cine mode was acquired. Later a subtraction aortogram was acquired to confirm the patency, coarse, size match of the graft and integrity of anastomosis. The procedure was repeated at the end of different study periods i.e. 2 weeks, 12 weeks and 26 weeks for functional evaluation. After the aortogram the carotid arteriotomy was closed with a figure of '8' interrupted sutures and the wound closed in layers. The technique developed proved to be repeatable and easy to perform.

#### 5. Evaluation of colour doppler sonography for predicting reducibility of intussusception in dogs

*Jasmine Kaur, J. Mohindroo, S. K. Mahajan, M. Raghunath and Tarunbir Singh*

Department of Surgery and Radiology, COVS, GADVASU, Ludhiana

The study was conducted on 10 dogs suffering from intussusception. The age of the dogs ranged from 2 months to 6 months. The reducibility of the intussusception was predicted based on several features seen during B-mode gray scale ultrasonography and the mesenteric colour flow within the intussusceptum. This prediction was correlated with intra-operative findings to assess the value of ultrasonography in predicting the reducibility of intussusception in dogs. Ultrasonography along with Colour Doppler was found to be reliable in predicting reducibility of intussusception. The various features for prediction of reducibility are described.

#### 6. Doppler ultrasonography in canine renal disease

*Pallavi Verma, J. Mohindroo and Tarunbir Singh*

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The study was conducted on 25 dogs with suspected renal affections, presented to the department of Veterinary Surgery and Radiology, COVS, GADVASU. The aim of the study was to assess renal vascular resistance in terms of Resistive Index (RI) and Pulsatility Index (PI), (by Doppler Ultrasonography) in dogs with renal disease. The relationship between RI, PI, grey scale ultrasonographic findings and haematobiochemical parameters was evaluated. Significant correlation was found between RI,



PI, grey scale ultrasonographic findings and haematobiochemical parameters. It was concluded that dogs suffering from renal diseases with RI > 0.7 and PI > 1.0, had a less favourable outcome and these parameters may be used as prognostic indicators for renal disease.

## 7. Echocardiography as a definitive diagnostic tool for dilated cardiomyopathy in canine

*Anuj Pratap Singh, Navdeep Singh and S. K. Mahajan*

Department of Veterinary Surgery and Radiology, GADVASU Ludhiana.

The present study was conducted on 7 clinical cases of dogs of different breeds and ages, showing anorexia, exercise intolerance, lethargy and weight loss. The dogs underwent a thorough physical, hematological, serum biochemical, radiographic and electrocardiographic examination. Selected dogs were examined by 2-D mode, M-mode and Doppler echocardiography. Dilated cardiomyopathy group was further divided into late Dilated cardiomyopathy (n=5) and early dilated cardiomyopathy (n=2). In late dilated cardiomyopathy, both systolic and diastolic left ventricular dimension, EPSS and LA/Ao ratio were increased with reduced fractional shortening (FS). Mild mitral regurgitation was observed in three cases of late DCM. In early dilated cardiomyopathy there was normal diastolic dimension (LVIDD) but increased systolic left ventricular dimension (LVSD) and hence reduced FS was found.

## 8. Diagnosis of pericardial effusion in canine-echocardiography as a definitive diagnostic tool

*Anuj Pratap Singh, Navdeep Singh and Ketki V. Raje*

Department of Veterinary Surgery and Radiology, GADVASU Ludhiana.

The present study was conducted on 2 clinical cases of dogs of Labrador breed age 6.5 and 8 year, showed anorexia, exercise intolerance, lethargy and peripheral edema. The dogs underwent a thorough physical, hematological, serum biochemical, radiographic and electrocardiographic (ECG) examination. On auscultation tachycardia, muffled heart sounds and inspiratory dyspnoea were observed in both the cases. An enormously globoid and sharp cardiac shadow was noted in lateral radiograph. The cardiac silhouette enlarges, loses its angles and waists, and eventually becomes globular in shape ("basketball or soccer ball heart") in VD radiograph. ECG examination showed low amplitude complex, electrical alternans in lead II. These selected dogs were examined by 2-D mode, M-mode and Doppler echocardiography. In case of pericardial effusion (PE), the FS%, EPSS, LA/Ao ratio was in normal range but a hypoechoic column of more than 1 cm was seen around heart between the epicardium and pericardium.

## 9. Radiographic study on bone cortex to diameter (C/D) ratio of metacarpals and metatarsals of buffaloes

*Sudhansu Bansal, V. Malik and R. P. Pandey*

College of Veterinary Sciences, DUVASU, Mathura

The study was conducted on thirty female Murrah buffaloes. These animals were divided into three groups depending on their age, each group comprised of 10 animals. Group A included animals of age from 1.5 to 3 years; Group B: 4 to 6 years and in group C animals of more than 6 years of age. All four limbs of thirty animals (total 120 limbs) were radiographed.



Palmaro-dorsal or plantaro- dorsal radiographs were obtained. Both fore and hind limbs were positioned separately on a digital x ray cassette. The radiographs were visualized using a computed radiography reader (Digital processor, Regius 110 S manufactured by Konica Minolta) and imported in to a computer software programme (Imageworks). Values of total cortical thickness and bone diameters of metacarpal/metatarsal were recorded for each limb of all 30 animals. The cortex to diameter ratio was estimated as ratio between total cortical width and total diameter of the considered bone. Comparison of C/D ratio of metacarpal and metatarsals in different group of animals is reported in the paper.

## 10. Radiographic features of septic joints in cattle

*A. Ramanathan, R. S Kumar, S. Ayyappan, C. Balachandran and Geetha Ramesh*

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Radiographic examination was carried out in 36 cattle with 63 septic joints. Soft tissue swelling was observed in all the affected joints and in 52 joints (82.54%) it was the only finding. The soft tissue swelling was described as severe in 43 joints (68.25%) and moderate in 20 joints (31.75%). Increased intra-articular space was noted in 10 joints (15.87%), intra-articular gas shadow in 6 joints (9.52%) and subchondral osteolysis and blurring of normal bone outline in 3 joints (4.76%). Intra-articular gas shadow observed in the present study was due to gas producing organism such as *E. coli*, *Pseudomonas*, *Streptococci* and *Staphylococci* later confirmed by bacterial isolation studies.

## 11. Ultrasonographic diagnosis and classification of traumatic pericarditis in 34 cattle

*S. Kathirvel, N. Rajendran, S. Dharmaceelan, M. Subramanian, G. A. Balasubramaniam and G. Vijayakumar*

Department of Veterinary Surgery and Radiology, Veterinary College and Research Institute, Namakkal-637 002. Tamil Nadu.

Ultrasonography was performed in 34 cattle employing 3.5 MHz transducer which provided details on the presence of hypoechogenic to echogenic fluid in the pericardium, floating echogenic fibrin deposits or strands, fibrous proliferation bridging the epicardium and pericardium. In eight animals, hypoechogenic pericardial fluid accumulation of about 500 to 4000 ml was noticed and was considered as serous form of pericarditis. In nine animals, strands within pericardium were noticed and pericardial fluid accumulation of about 1000 ml with echogenic deposits were noticed in all the animals and were considered as fibrinous form of pericarditis. In eight animals, echogenic fluid with fibrin deposits and strands were noticed and were considered as suppurative or purulent form of pericarditis. In nine animals, ultrasonography revealed extensive fibrous proliferation with pericardial thickening suggestive of constrictive pericarditis.

## 12. Radiographic diagnosis of traumatic pericarditis in 92 cattle

*S. Kathirvel, N. Rajendran, S. Dharmaceelan, M. Subramanian and G. A. Balasubramaniam*

Department of Veterinary Surgery and Radiology, Veterinary College and Research Institute, Namakkal-637 002. Tamil Nadu.

Radiography was performed in 92 cattle employing left laterolateral exposure of caudoventral thorax and reticulum in standing posture for the diagnosis of radiopaque foreign bodies. In 61 animals (66.30 %) radiopaque foreign bodies could



not be seen and 31 animals (33.70 %) revealed presence of radiopaque foreign bodies. Radiography revealed presence of radiopaque foreign body in reticulum, piercing reticulum and in thoracic cavity in 10 (32.26 %), 4 (12.90 %) and 17 (54.84 %) animals. The machine employed in the present study provided adequate radiographic detail and definition to diagnose the presence of radiopaque foreign body in reticulum, piercing reticulum and in the thoracic cavity.

### **13. Radiographic diagnosis and surgical management of potential metallic foreign bodies in a bitch**

***V. Malik, D. Kumar, S. Purohit, G. Kumar, P. Katiyar, R. P. Pandey and B. Singh***

College of Veterinary Sciences and Animal Husbandry, DUVASU-Mathura

A two year old female mongrel dog was presented to the TVCC of the College with the history of vomiting, anorexia and restlessness since last 4 days. Clinical examination and plain radiography revealed presence of two sharp metallic needles in the caudal abdomen. The animal was anaesthetized with xylazine-ketamine anaesthesia and midline laparo-enterotomy was performed to remove two sewing needles along with a roll of cotton thread. Intususception was also observed at the site of lodgement of the cotton thread roll. Postoperatively the animal was administered with antibiotic and anti-inflammatory agents and was kept on intravenous fluid for three days. The skin sutures were removed 10<sup>th</sup> post-postoperative day. The dog recovered completely from the condition.

### **14. Radiographic diagnosis and surgical management of partial diaphragmatic rupture in a dog**

***V. Malik, D. Kumar, S. Purohit, G. Kumar, P. Katiyar, R. P. Pandey and B. Singh***

College of Veterinary Sciences and Animal Husbandry, DUVASU-Mathura

A five year old male pomeranian dog was presented to the TVCC of the College with the history of fall from the rooftop and paradoxical breathing. Radiographic examination revealed presence of some abdominal content in the thoracic cavity. The animal was anaesthetized with xylazine-ketamine anesthesia and artificial ventilation using ambu-bag. A midline paracostal incision was made and the diaphragm was visualized and texture of the diaphragm was felt. At the left dorsal aspect of the diaphragm the diaphragmatic wall was very thin and bulging in and out during inspiration and expiration. The ruptured wall was reinforced by applying mattress sutures including the tougher part in the adjacent area. A very small rupture indicated by the bubbles was also sutured with a mattress suture using synthetic absorbable suture material. Postoperatively the dog was administered with antibiotics and anti-inflammatory drugs. The dogs showed improvement in the respiratory pattern immediately after the surgery. Sutures were removed 10<sup>th</sup> postoperative day. The dog recovered uneventfully.

### **15. Study of normal trachea and bronchus through tracheobronchoscope in 60 healthy dogs**

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Diagnostic imaging enables the surgeon to have a visual evaluation of normal and abnormal anatomy of the region and thus help in accurate diagnosis of many diseases. Tracheobronchoscopy was found more feasible and advantageous in diagnosis of respiratory disease as compared with that of physical examination, haematology and radiography and allowed descriptive or photographic documentation of findings. It has advantage of providing accurate diagnosis through biopsy, cytological



examination and fluid estimations in dog. The tracheobronchoscopy was performed by fiberscope (Olympus GIF type XP 20) having an ultra-slim insertion tube of 7.9 mm outer diameter and 102 cm working length with 2.0 mm width instrument channel on 60 healthy dogs. The dogs were placed in sternal recumbent position after proper anaesthesia and the neck was supported with soft cushion. The tracheal mucus membrane was found pink (37 cases) to red (23 cases) in color with fine network of sub mucosal vessels and was glistening. The dorsal tracheal membrane was found tight in all the cases. The mean distance of epiglottis from upper incisors was found  $9.77 \pm 0.33$ ,  $15.05 \pm 0.35$  and  $17.67 \pm 0.44$  cm in small, medium and large sized dogs respectively. The distance of part was significantly different ( $P < 0.05$ ) in small, medium and large size dogs, respectively. The mean distance (cm) of carina from upper incisors was measured as  $31.87 \pm 0.96$ ,  $40.65 \pm 0.33$  and  $53.57 \pm 0.90$  cm in small, medium and large sized dog respectively.

## **16. Ocular ultrasonographic biometry in dogs**

***Dharmendra Kumar, P. V. Parikh, D. B. Patil, D. K. Tiwari, Mehraj u din Dar, D. D. Rishi, Menguzeno Sale and Shyam Manohar***

Department of Veterinary Surgery and Radiology, College of Veterinary Science and A. H., Anand Agricultural University, Anand- 388 001 (Gujarat)

The present clinical study was undertaken in 135 dogs of either sex for the ultrasonographic evaluation of the normal and affected eyes. Ultrasonography was performed using linear transducer (7.5-18 MHz) by transcorneal and transpalpebral approaches. In all animals corneal anesthesia was achieved with Proparacaine HCl 0.5% instilled directly on cornea. Different ophthalmic parameters like anterior chamber depth, antero-posterior depth of the lens, latero-medial diameter of the lens, vitreous depth and axial length were studied according to age, sex, breed, left and right eyes and normal and abnormal eyes. Ophthalmic affections were observed more in old aged dogs. Males were more affected as compared to females. Ultrasonographically, ophthalmic affections like cataract, lens luxation, vitreous and retinal degeneration were also diagnosed. Thus, ultrasonography is a safe and non-invasive method for the diagnosis of ocular disorders as complementary to routine ophthalmic examinations in dogs. Further this study established ocular echobiometry dimensions for certain breeds of dogs bred in India.

## **17. Ocular ultrasonographic biometry of indian horse breeds**

***Dharmendra Kumar, P. V. Parikh, D. B. Patil, D. K. Tiwari, Mehraj u din Dar, D. D. Rishi Menguzeno Sale and Shyam Manohar***

Department of Veterinary Surgery and Radiology, College of Veterinary Science and A. H., Anand Agricultural University, Anand- 388 001 (Gujarat)

The present clinical study was undertaken in 50 horses of either sex at the department. In all animals, ocular ultrasonography was performed by transpalpebral approach after corneal anaesthetization with proparacaine HCl 0.5% instilled directly on cornea. Different ophthalmic parameters like anterior chamber depth, antero-posterior depth of the lens, latero-medial diameter of the lens, vitreous depth and axial length were also studied according to age, sex, breed, left and right eyes and normal and abnormal eyes. In five cases retinal Detachment was diagnosed, of which four were Kathiawadi and one Marwari. All cases revealed open-close type of RD. Eight horses diagnosed with Setaria eye worm in anterior chamber (6) and vitreous body (2). Thus ultrasonography is a safe and non-invasive method which can be used in diagnosis of ocular disorders as complementary to routine ophthalmic examinations in horses. Further this study established ocular echobiometry dimensions for horses bred in India.





## 18. Clinical studies on videoendoscopy of upper gastro-intestinal tract affections in dogs

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Department of Veterinary Surgery and Radiology, College of Veterinary Science and A. H., Anand Agricultural University, Anand- 388 001 (Gujarat)

Clinical studies on videoendoscopy were carried out in 28 dogs to evaluate the technique of oesophagoscopy and gastroduodenoscopy for visualization of upper gastro-intestinal tract. Animals having vomiting, diarrhoea, weight loss, lethargy, partial or complete anorexia were initially screened and subjected to haemato-biochemical and radiological/ultrasonographic investigation prior to videoendoscopy.

Oesophagoscopy and gastroduodenoscopy was performed in left lateral recumbency under general anaesthesia after premedication with hyoscine butylbromide five minutes prior to the procedure. Oesophageal foreign bodies, leiomyoma, squamous cell carcinoma, polyps and erosions were diagnosed by oesophagoscopy. Snare polypectomy was performed with the help of fiberoptic endoscope in one case. Gastrosopy enabled diagnosis of entities like gastric ulcer, haemorrhagic gastritis and gastric foreign body. Foreign body was retrieved with the aid of endoscope in one case.

Based on the clinical symptoms, laboratory findings and confirmatory endoscopic diagnosis, management of clinical cases was carried out to achieve optimum success. Out of 28 clinical cases that have undergone endoscopic procedure, 26 cases showed significant clinical progress. It was concluded from the present studies that flexible videoendoscopy is minimally invasive and visualizes precise location of the lesion facilitating appropriate surgical maneuvers to be undertaken and also aids in obtaining multiple pinch superficial mucosal biopsy samples.

## 19. Ultrasonographic diagnosis of gastro-intestinal tract surgical disorders in bovines

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Department of Veterinary Surgery and Radiology, College of Veterinary Science and A. H., Anand Agricultural University, Anand- 388 001 (Gujarat)

The present study was conducted on 45 clinical cases of bovines referred to the department for the diagnosis and management of surgical GIT disorders, which were grouped according to disorders viz., cervical oesophageal obstruction (n=7), ruminal impaction (n=4), foreign body syndrome (n=10), reticular abscess (n=2), diaphragmatic hernia (n=8), omasal impaction (n=3), abomasal impaction (n=2) and intestinal intussusception (n=9). Detailed anamnesis, clinical findings and haemato-biochemical observations were recorded and correlated with radiographic, ultrasonographic and surgical findings. Surgical findings confirmed the clinical, radiographic and ultrasonographic diagnosis in majority of animals. Thus, ultrasonography has emerged as a reliable, non-invasive tool for the diagnosis of gastro-intestinal disorders in bovines.





## 20. Use of Computed Tomography (CT) for confirmatory diagnosis and successful treatment of pyometra in a thirteen years old Lhasa apso bitch.

*Talekar S. H., Gaikwad R. V., Mali H. V., Ashwini K Sharma and Pandey Nitin*

Teaching Veterinary Clinical Complex, Bombay Veterinary College, Parel Mumbai

Thirteen years old Lhasa apso bitch presented to OPD, TVCC with symptoms of distended abdomen, inappetence since last week, and dog was treated in private clinic. Clinically dog shows 102.8°F temperature, weakness, severe dehydration. Herniated soft mass palpated on left median. Haematological study reveals neutrophilia, lymphocytosis, and increased BUN, serum creatinin. Radiological examination confirm large amount of fluid in abdominal cavity. Ultrasonographic study revealed abdominal fluid but not give any confirm diagnosis. The findings of computed tomography confirmed to make the correct preoperative diagnosis of pyometra. Dog was operated under Ketamine Diazepam mixture as a general anesthesia. Incision taken on herniated swelling and extend hernia ring. Herniated mass is left uterine horn, removed 3.2 kg uterus filled with coffee color liquid pus. Post operative dressing with liquid betadine and parenteral antibiotics ceftriaxone @ 20 mg/kg. Dog was recovered uneventfully. The details of findings and operative procedure will be discussed.

## 21. Use of Computed Tomography (CT) for diagnosis and successful surgical treatment of large Splenic solid tumour involving multiple cysts in nine years old German shepherd male dog

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Nine years old German shepherd dog presented in OPD, TVCC with symptom of Distended Abdomen, sluggish gait with normal appetite. Clinically, dog showed dehydration, 103°F temperature. Abdominal palpation revealed large mass in abdominal cavity. Haematological examination reveals neutrophilia, lymphocytosis. Liver and kidney function tests are normal. Radiological examination confirmed that large soft tissue mass in abdominal cavity but mass is very big in size and could not confirm organ adhesion. Ultrasonographic examination also confirmed large tumor like growth in abdominal cavity but can not confirm organ adhesions and origin. The findings of computed tomography confirmed to make the correct preoperative diagnosis of unusual case of multiple cysts presenting as a large multilocular mass with a well-enhanced solid component and a central cleft originated from spleen lobe. Dog was operated under Ketamine Diazepam mixture anesthesia, removed 18x20 inches, twelve kg tumor mass attached with spleen. Dog was recovered uneventfully. Post operative treatment was given with RL, DNS, Metrogl, D-25%, iron dextran with ceftriaxone @ 20 mg/kg for ten days. After two days dog is not able to walk, lying condition shows anemia symptoms. Slowly recovered well and shows normal activity. Details of operative procedure and histopathological findings will be discussed.

## 22. Use of Computed Tomography (CT) for diagnosis of bone cancer and surgical treatment of affected fore limb in a Mongrel male dog.

*Talekar S.H., Gaikwad R.V., Mali H.V., Meshram P.V., Ashwini K Sharma and Pandey Nitin*

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Eight years old mongrel dog presented to OPD, TVCC with history of hard swelling on left fore limb. Affected limb is not



working properly since last month. Initially limping and swelling started, after one month dog was not able to bear weight in affected limb. Clinical study reveals with normal heart rate, respiration rate and temperature. Radiological examination shows all bone up to humerus involved in swelling suggest Bone cancer. Haematological examination shows neutrophilia, lymphocytosis. Dog was operated under Ketamine diazepam mixture anesthesia. Amputated affected limb up to involvement of bone. Required to cut half of humerus bone. Post operative antibiotic ceftriaxone @ 20mg/kg given for a week. Dog shows uneventful recovery. Histopathology of bone cancer and details of surgical procedure will be discussed.

### **23. Radiotherapy of femoral chondrosarcoma in a Rottweiler dog**

***D. B. Patil, P. V. Parikh, V. Shankar, Niraj Patel, Amit Patel, Shyam Manohar, N. Sridhar, J. J. Ranpariya, D K. Tiwari and D. J. Ghodasara***

Department of Veterinary Surgery & Radiology, College of Veterinary Science & Animal Husbandry, A.A.U, Anand-388001

A 10 year old nulliparous female Rottweiler (35 Kg) was presented with hardened right thigh with lameness. Radiography revealed radiolucent lesion of femur with typical chondroid matrix calcification. Histopathology indicated chondrosarcoma of femur. Treatment plan included 16 cycles of radiation therapy which lasted for 37 days. Radiation therapy facilitated comfortable ambulation of the animal.

### **24. Computed Tomographic evaluation of a massive splenic haematoma in a German shepherd dog**

***Bendale K. R., Talekar S. H., Mali H. V., Gaikwad R. V and Chaudhari P. R.***

Teaching Veterinary Clinical Complex, Bombay Veterinary College, Parel Mumbai, Advanced Center for Treatment Research and Education in Cancer, Tata Memorial Center, Kharghar, Navi Mumbai.

A 9 yrs old German shepherd dog was referred at Comparative Oncology clinic at ACTREC for abdominal computed tomography imaging. One month earlier the dog was presented to Teaching Veterinary Hospital, Bombay Veterinary College with the history of unilateral distention of abdomen, shallow breathing, uncoordinated gait and normal appetite. On clinical examination, the dog showed 103 °F rectal temperature and a large soft abdominal mass on palpation. Haematobiochemical examination demonstrated normal liver and kidney function and blood biochemistry except neutrophilia. Radiography and Ultrasonography of abdomen revealed large hyperechoic soft mass in abdominal cavity but information on its size and origin was equivocal. Contrast Enhanced whole body Computed Tomography scan was performed under lateral recumbency. CT scan revealed two large masses arising from caudal end of spleen. Large mass measuring 23 x 17.3 cm extending posteriorly up to rectum occupying majority of abdominal cavity. Second mass measuring 12.3 x 10.3 cm extended anterior up to diaphragm. The both masses appeared to be elongated and well-demarcated with an attenuation value near water without calcification. Cystic wall appeared thin with internal trabeculation which demonstrated no enhancement after an injection of contrast medium. The CT scan was useful for precise localization of the abdominal mass in comparison to abdominal ultrasound. On the basis of valuable information obtained from CT scan, complete splenectomy was performed under general anesthesia.



## 25. Electronmicroscopic Studies In Corneal Ulceration.

*P. Nagaraj, V. Gireesh Kumar, D. S. Tirumala Rao, K. Nalini Kumari, P. Eswara Prasad*

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The study was conducted in dogs over a period of 2 years and 2 months (July 2008 to August 2010) at Teaching Veterinary Clinical Complex, Veterinary Hospital, Bhoiguda, College of Veterinary Science, Rajendranagar, Hyderabad. A total of 2845 dogs were examined in the ophthalmological ward, out of which 726 (25.51%) were identified with specific eye diseases on detailed clinical, ophthalmoscopic and ocular diagnostic methods. Fluorescein stain test conducted during the study revealed superficial (66%) and deep (34%) corneal ulcers in 68 (9%) dogs. Electronmicroscopic (EM) examination of a diseased opaque cornea was undertaken which revealed new data on the pathological and micro-anatomical changes in corneal ulceration attributing to reduced or loss of vision in dogs. The details are discussed.



Equine Surgery Session

| Sr. No. | Title with author   |
|---------|---|
| 1       | <b>Ultrasonographic diagnosis and management of extensive ventral abdominal hernia in a horse</b><br>Prem Singh, Rajender Singh, R. N. Chaudhery, R. K. Chandolia, S. M. Behl and S. K. Chawla                |
| 2       | <b>Enterotomy along with caesarian section in mare</b><br>J. R. Ukani, J. K. Kasundra and M. Y. Mankad  |
| 3       | <b>Management of third degree perineal laceration in mare</b><br>J. R. Ukani, J. K. Kasundra and M. Y. Mankad   |
| 4       | <b>Surgical management of complete open fracture of metatarsal bone in foal</b><br>J. K. Kasundra, J. R. Ukani and M. Y. Mankad   |
| 5       | <b>Caesarean section in a mare under local infiltration anaesthesia</b><br>Ninu, A. R., Binsila B Krishnan, Arundeeep, P. S., Remya, V., John, R., Saxena, A. C., Maiti, S. K. and Zama, M. M. S.             |
| 6       | <b>Treatment of radial nerve paralysis in a stallion by physiotherapy</b><br>A. K. Singh, B. Om Preethi, N. K. Katiyar, G. Patel, S. S. Kale, Nishant Yadav, H. N. Singh, kh. Sangeeta Devi and A. K. Gangwar |
| 7       | <b>A clinical study on musculo-skeletal affections of equines</b><br>M. Nagar and T. K. Gahlot  |
| 8       | <b>Surgical management of eye worms in horses</b><br>V. S. Dabas, C. F. Chaudhari, J. M. Patel, S. K. Jhala, S. K. Tyagi and R. H. Bhatt  |
| 9       | <b>Management of urogenital affections under pudendal nerve block in stallions</b><br>V. S. Dabas, J. N. Mistry, S. K. Tyagi, D. N. Suthar and C. F. Chaudhari  |
| 10      | <b>Equine colic due to unusual faecolith caused by plastics - report of 4 cases</b><br>S. Senthilkumar, S. Kathirvel, K. Jayakumar, A. Kumaresan, S. Dharmaceelan and N. Rajendran                            |
| 11      | <b>Squamous cell carcinoma of penile sheath in a stallion</b><br>B. M. Gahlod, S. B. Akhare, S. V. Upadhye, M. G. Thorat, M. S. Dhakate, M. V. Kamble and Vijay Tailor  |
| 12      | <b>Accidental injury in a horse by train</b><br>Jaiswal, S., Jadon, N. S. and Das, A. K.  |
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## 1. Ultrasonographic diagnosis and management of extensive ventral abdominal hernia in a horse

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Ventral abdominal hernias are frequently observed in domestic animals. The most common location of this type of hernias are near the ribs or just cranial to the stifle joint. Common causes of such type of hernias are traumas. Sometimes in these hernias the ring is very extensive and is present toward ventral side of the abdomen and herniated organ is also very massive then it is very difficult to manage such type of hernias. A adult horse was brought to the hospital with the history of large ventral swelling toward caudo-ventral portion of the abdomen for the last 2 months. The swelling developed after falling of the horse on a blunt object. Initially the swelling was small in size but now there was constant increase in size. At the time of admission there was no problem in defecation and urination. The horse was partly off feed and water. The rectal temperature was slightly elevated. The horse was slightly anaemic and there was slight tendency toward neutrophillia. The blood picture was negative for any blood protozoan. PCV values are indicative of slight dehydration. Ultrasonography showed multiple hypoechoic loops of intestine visible in the swelling. The loops were observed to be floating in the anechoic abdominal fluid. The horse was anaesthetized with xylazine and ketamine combination and hernial sac was opened. The intestinal loops were observed to be protruded out through a big hernial ring. The hernial contents were separated from the skin at the point of trauma and were pushed back into the abdominal cavity. The hernial ring was closed by silk using overlapping sutures. After closing the hernial ring, the overlying muscles and skin were closed in routine manner. The horse was given course of anti-histaminic, antibiotics, anti-inflammatory and multi vitamin & mineral drugs for 14 days. The antiseptic dressing of the surgical wound was also continued for 14 days. The horse was maintained on controlled diet & water till removal of skin sutures up to 14 days. Daily Slight exercise is given. Initially there was slight oedema near the suture line but it got subside later on. The horse recovered well after 15-20 days of surgery. The diet of the horse was increased after 30 days of surgery and adlib feed and water was allowed after 60 days of surgery. Ultrasonography is a good technique to know the contents of ventro-abdominal swelling and then to plan surgery accordingly. To prevent recurrence, oedema and infection, controlled diet & water, course of antibiotic, anti-inflammatory and multivitamin & multimineral drugs should be given for minimum 14 days.

## 2. Enterotomy along with caesarian section in mare

*J. R. Ukani, J. K. Kasundra and M. Y. Mankad*

V4Vets Clinic, Rajkot, Gujarat.

A 5 yrs. old eleven months pregnant mare was presented with the history of colic, anorexia and absence of voidance of faeces since one month.. Clinical examination revealed fever, anemia, haematuria and jaundice. First it was suspected for babesiosis and treated for babesiosis for 5 days. By medical management fever and haematuria were cleared but anorexia and absence of defecation were persisted. So case was diagnosed as obstructive colic and per rectal examination revealed died foetus. Based on above discussion owner was convinced for surgical intervention and enterotomy along with caesarian section were performed under general anaesthesia using intravenous injection of xylazine and ketamine @ 1.1 and 2.2 mg/kg body weight. Dead foetus and three phytobezoars each of approximately 1 kg were retrieved from colon. Colon, uterus and laparotomy wound was sutured as general principle of surgery. Mare was successfully recovered from general anaesthesia after 3 hours of surgery. On very next day of surgery, mare was taking 15 lits. of water along with jaggery. On 4<sup>th</sup> post operative day, owner was advised to drench liquid paraffin. Due to improper handling by owner during drenching, mare was excited and fall down on ground and died immediately.



### 3. Management of third degree perineal laceration in mare

**J. R. Ukani, J. K. Kasundra and M. Y. Mankad**

V4Vets Clinic, Rajkot, Gujarat.

A 7 yrs. old mare was presented with the history of foaling injury along with the retention of placenta. Manually placenta was expelled out. Antibiotics and anti-inflammatory drugs was injected for 5 days. Perineal wound was dressed with betadine ointment. Third degree perineal lacerated wound was allowed to cicatrize for 30 days. After cicatrization of wound, mare was maintained on liquid and laxative diet for 3 days. Third degree perineal laceration was operated in standing position under epidural anaesthesia using 2 % lignocaine hydrochloride. The transverse vaginal wall was separated into dorsal and ventral shelves, and the dissection was continued along the ventrolateral margin of the vestibule. Now dorsal and ventral fold of both sides was sutured by six bite technique in simple spiral form using 2no. braided silk thread. After perineal reconstruction, mare was maintained on fluid therapy, antibiotics and anti-inflammatory drugs for 5 days. Suture was removed on 10<sup>th</sup> post-operative day. Perineal reconstruction was successful.

### 4. Surgical management of complete open fracture of metatarsal bone in foal

**J. K. Kasundra, J. R. Ukani and M. Y. Mankad**

V4Vets Clinic, Rajkot, Gujarat

A 3 month old foal was presented with the history of accident with autoriksha. Clinical examination revealed limping of left hind limb with complete oblique open fracture of left metatarsal bone at little lower to mid shaft. After fasting of 24 hours, bone plating was performed under general anaesthesia using intravenous injection of xylazine and ketamine hydrochloride @ 1.1 and 2.2 mg/kg body weight. Complete immobilization of limb was created by applying gutter plaster along with bamboo sticks. Post-operatively antibiotics, anti-inflammatory drugs, calcium supplement and local dressing of suture was carried out for 7 days. After 21 days, plaster was removed. Uneventful callus formation was seen. After 6 months of operation foal can run and completely bearing a weight on operated limb.

### 5. Caesarean section in a mare under local infiltration anaesthesia

**Ninu, A. R.<sup>1</sup>, Binsila B Krishnan<sup>2</sup>, Arundeeep, P. S.<sup>1</sup>, Remya, V<sup>1</sup>, John, R.<sup>1</sup>, Saxena, A. C.<sup>1</sup>, Maiti, S. K.<sup>1</sup> and Zama<sup>1</sup>, M. M. S.**

Division of Surgery<sup>1</sup> and Division of Animal Reproduction<sup>2</sup> Indian Veterinary Research Institute, Izatnagar -243122.

A nulliparous cross bred mare was referred to the surgery division of IVRI with a complaint of dystocia due to lateral deviation of the neck of the foetus. The clinical examination revealed congested mucous membranes, rectal temperature of 98<sup>o</sup> F and a pulse rate of 43/ minute which was weak and of low amplitude. Both the forelimbs of the foetus were visible outside the vulva. There was no straining. The foetus was dead as there was no pedal reflex. Pre-operatively, Tetanus toxoid, was given intramuscularly and Dexamethasone was administered along with DNS as intravenous infusion. As pelvic space was inadequate for manual correction or foetotomy, caesarean was done under local infiltration anaesthesia. Post-operatively, Normal Saline and antibiotics were given. Aseptic daily dressing of wound, feeding of food and water in small quantities at frequent intervals and suture removal on 12<sup>th</sup> post-operative day was advised. The owner reported an uneventful recovery.





## 6. Treatment of radial nerve paralysis in a stallion by physiotherapy

*A. K. Singh, B. Om Preethi, N. K. Katiyar, G. Patel, S. S. Kale, Nishant Yadav, H. N. Singh, kh. Sangeeta Devi and A. K. Gangwar*

College of Veterinary Sciences and Animal Husbandry, NDUAT, Kumarganj, Faizabad (UP)-224 229

A stallion of age 2 years was presented to the polyclinic with the complaint of no weight bearing on the left forelimb since last one week. Detailed enquiry revealed that the animal was on daily exercise and fallen down on the uneven surface. On clinical examination, there was dropped elbow and dorsal aspect of the toe was touching the ground. The animal was dragging the affected limb during movement. Rectal temperature, heart rate and respiration rate were within normal limits. The case was diagnosed as radial nerve paralysis. Treatment includes infrared therapy by I.R. lamp for 15 minutes each in morning and evening. After one hour of infrared therapy, the whole affected limb was massaged with ammonia liniment. Supportive therapy includes injection vitamin B-complex. This treatment was continued for six weeks. The animal recovered day by day and completely recovered after six weeks of the treatment. The case will be discussed in detail.

## 7. A clinical study on musculo-skeletal affections of equines

*M. Nagar and T.K. Gahlot*

Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Science, Bikaner, Rajasthan University of Veterinary and Animal Sciences, Bikaner-334001

In present study surgical affections of musculo-skeletal system of equines were recorded in 58 cases out of which 20.69% were male and 79.31% were female. A group wise analysis of surgical affections revealed that highest affections were related to forelimb region (43.10%) followed by hind limb region (29.31%), head and neck region (13.79%) and thorax, abdominal and pelvic region (13.79%). In all the regions highest incidence was of laceration of skin and muscles. The values of vitamin A and vitamin E in all the cases of diverse groups of present study were found to be less than the control values.

## 8. Surgical management of eye worms in horses

*V. S. Dabas, C. F. Chaudhari, J. M. Patel, S. K. Jhala, S. K. Tyagi and R. H. Bhatt*

Department of Teaching Veterinary Clinical Complex, Vanbandhu College of Veterinary Science & A. H., NAU, Navsari, Gujarat

Fifteen horses were presented to college clinic with varying degrees of corneal opacity, epiphora, ocular discomfort and partial loss of vision of either side eye from one to two weeks. Ocular examination of the affected eye revealed presence of eye worm moving in the anterior chamber. Fluorescein staining was negative in all the cases. The eye worm was removed from the anterior chamber under xylazine sedation and retrobulbar nerve block in standing position through a stab incision at limbus anywhere between 3 to 9 O'clock positions. Post-operatively mefloxacine and flurbiprofen eye drops were administered for 15 days. All animals showed uneventful recovery.



## 9. Management of urogenital affections under pudendal nerve block in stallions

*V. S. Dabas, J. N. Mistry, S. K. Tyagi, D. N. Suthar and C. F. Chaudhari*

Department of Teaching Veterinary Clinical Complex, Vanbandhu College of Veterinary Science & A. H., NAU, Navsari, Gujarat

Three stallions with different urogenital affections were presented at college clinics. In first case, an 18 years old Marwari stallion was presented with the growth on left side of the prepuce. Clinically, it was hard to touch with eroded surface. Surgical excision of the growth was performed under pudendal nerve block in standing position and surgical wound was closed in routine manner. In another two cases with severe cystitis, the stallions were not able to pass out the urine even after repeated efforts. Catheterization to evacuate the urinary bladder was done under pudendal nerve block. Antibiotic, anti-inflammatory and antihistaminic were given in prescribed doses for 5 days besides daily antiseptic dressing in operated case. All the animals showed uneventful recovery.

## 10. Equine colic due to unusual faecolith caused by plastics - report of 4 cases

*S. Senthilkumar, S. Kathirvel, K. Jayakumar, A. Kumaresan, S. Dharmaceelan and N. Rajendran*

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Colic is defined as an acute abdominal pain. Four Kathiwari horses presented to VC & RI hospital, Namakkal during 2011-12 with the history of colic signs were selected for the study. In case 1, colic signs, persistence of intermittent inappetance and achezia were reported for 48 hours and rectal examination revealed empty rectum with palpable rough surfaced faecolith. Liquid paraffin enema was given to facilitate lubrication and faecolith was removed with mild traction and was found to contain highly coiled plastic threads, used for making cement bags. In case 2, colic signs were reported and administration of liquid paraffin through nasogastric tubing resulted in spontaneous expulsion of thin household plastic carry bags with routine pain management. In case 3, pieces of polyester cloth and nylon threads results in formation of faecolith causing obstruction and achezia was removed after lubrication with paraffin. In case 4, a recurrent intermittent colic sign with achezia was managed medically but the animal succumbed. Necropsy revealed a presence of an unusually large caecolith causing obstruction. It is concluded that the incidence of equine colic caused by faecolith containing various types of plastics is increasing and the access to plastics ingestion should be avoided.

## 11. Squamous cell carcinoma of penile sheath in a stallion

*A. M. Gahlod, S. B. Akhare, S. V. Upadhye, M. G. Thorat, M. S. Dhakate, M. V. Kamble and Vijay Tailor*

Department of Surgery and Radiology, Nagpur Veterinary College, Nagpur (M.S.)

A ten year old stallion was reported to the Teaching Veterinary Clinical Complex, Nagpur Veterinary College, Nagpur with a small ulcerative mass on the penile sheath and it was gradually increasing in size since 2 months. On clinical examination, the large sized growth was attached firmly to the sheath extending caudally, pressing on the glans of the penis and preventing the erection of glans penis. The growth bleeds occasionally.

The growth was excised under dissociative anaesthesia, however the blunt dissection was done and bleeding points were cauterised with the help of electrocautery. Histopathology of the tumour revealed a squamous cell carcinoma of penile sheath.



## 12. Accidental injury in a horse by train

*Jaiswal, S., Jadon, N. S. and Das, A. K.*

*Department of Surgery and Radiology, COVASc, GBPUA&T Pantnagar, Udham Singh Nagar, Uttarakhand*

A horse was presented with severe thoracic injury and a large wound in gluteal region. The horse was hit by a train. On clinical examination, a thoracic wound was found connected to pleural cavity along with rib fracture along with tearing of skin and muscle in the gluteal region. The thoracic wound was repaired immediately after cleaning and pouring antibiotic powder. The wound of gluteal region was also repaired. Regular antiseptic dressing was done and antibiotics were administered for 10 days. The horse survived and cured.

## 13. Surgical management of colon dilatation and torsion in a donkey - a case report

*Ramesh Rathod, V. Mahesh, B. N. Nagaraja. L. Ranganath, A. S. Patil, H. C. Shivaiah and D. N. Srinath*

*Department of Veterinary Surgery and Radiology, Veterinary College, Bangalore*

A two year old donkey was presented to the Veterinary College Hospital, Bangalore with a history of anorexia, passing scanty mucous coated dung for 5 days. Animal was showing colicky signs. Per rectal examination revealed mucus coated scanty dung. Distention was noticed in the right paralumbar fossa and tympanic resonance could be heard, upon percussion and auscultation. Ultrasonography examination revealed gas filled engorged intestinal loops tentatively suggesting intestinal obstipation, so exploratory laparotomy was opted for. Colon was exteriorised through right flank laparotomy. On exploration, it was found that colon and Caecum were dilated with torsion at caeco colic junction. Enterotomy at antimesenteric border was done, gas and ingesta (plastics) were evacuated and the torsion was corrected. Enterotomy wound was closed by double layer of inversion sutures and laparotomy wound was closed in routine manner. Animal resumed normal defecation and colic signs disappeared with regaining of normal feeding habits and total recovery by 10 days.

## 14. Squamous cell carcinoma in the third eye lid of a horse- a case report

*B. Bharti, R. Bijiyal, Satyaveer Singh, P. Singh, R.K. Chittora and M. Katare*

*Mahatma Gandhi Veterinary College Bharatpur, Rajasthan*

A 9 Years old, Skewbald, Mare Horse was presented to Teaching Veterinary Clinical Complex, Mahatma Gandhi Veterinary College, Bharatpur (Rajasthan), with the history of a tumorous growth in right eye which has been covered whole area of the right eye and it was protruding from the third eye lid. The animal was anaesthetised using Xylazine (1mg/kg bwt, I/V), Butorphanol (0.02mg/kg bwt, I/V) and ketamine (2mg/kg bwt, I/V), eye growth mass was excised surgically; all the aseptic procedures were taken during surgery. The Eye growth mass was preserved in 10% formalin and sent for Histopathological analysis and it was diagnosed as Squamous Cell Carcinoma.



## 15. Surgical removal of ocular setariosis in a horse: a case report

*J. V. Vadalia*

Assistant Professor, Dept. of Veterinary Surgery and Radiology College of Veterinary Science & A.H. J.A.U., Junagadh - 322 001

A six year old Marwari horse reported with clinical signs of lacrimation, corneal opacity, blephorospasm and presence of white thread like worm in an anterior chamber of the right eye. The horse was anaesthetized using Xylazine @ 1.1 mg/kg body weight IV & Ketamine @ 2.2 mg/kg body weight IV. Auriculo-palpebral nerve block was performed by infiltration of 2 % Xylocaine solution. A small stab incision with 11 no Bard Parker blade was given 4 'O' clock position at limbus. The worm was expelled out with aqueous humour. The aqueous humour was replaced with Hydroxypropyl Methylcellulose 2 % w/v for maintaining intraocular pressure with aim to maintain position of the lens as well as the shape and size of the eyeball. The postoperative antibiotic eye drops were applied for two weeks. The complete clearance of the corneal opacity took the four weeks time.

## 16. Surgical repair of third degree perineal laceration in the mares under field condition.

*R. A. Vala*

Deputy Director of Animal Husbandry, Government Veterinary Polyclinics, Amreli (Gujarat)

The present clinical case of third degree perineal laceration in three mares (one kathyawadi and two kathyawadi-marwadi cross), age ranging from 3-7 years each with a history of perineal laceration 2 to 15 months back at the time foaling. Clinical examination revealed a common opening of rectum and vagina with a line of scar tissue at the junction of rectum and vaginal mucosa. The anal sphincter had a communication on ventral aspect with a tear in rectal wall, perineal shelf and dorsal vaginal wall. All three mares were given epidural anesthesia with 2% lignocaine HCl and Xylazine HCl at the 1<sup>st</sup> intercoccygeal space in standing position. After aseptic preparation of surgical site, the vaginal and rectal mucosa were reconstructed with the help of Vicryl no. 1 in a six bite interrupted suture pattern with 7-8 sutures. The rectal and vulval borders and perineum was closed with interrupted vertical mattress suture with non-absorbable nylon thread. Post-operative care was carried out with higher antibiotics and NSAID's and owners were advised to feed mare with lush green grass, wheat bran and liquid paraffin at least for 15 days of post-operative. The mares recovered uneventfully with regular antiseptic dressing and post-operative follow-up.

## 17. Clinical management of equine sarcoid in a sindhi filly

*R. K. Gosai, J. V. Vadalia, H. D. Thakker, B. N. Parmar, H. L. Makwana and Menguzeno Sale*

Department of Veterinary Surgery and Radiology College of veterinary Sciences and Animal Husbandry, A.A.U, Anand- 388001, Gujarat, India.

A 15 month old Sindhi filly was admitted to the Department of Veterinary Surgery and Radiology, College of Veterinary Science and Animal Husbandry, Anand Agricultural University, Anand with a history of chronic cauliflower like mass on wither was discharging serosanguineous exudate and was showing tendency to proliferative enlargement. Looking to the over granulating feature of the growth, liquid nitrogen cryotherapy was instituted following double freezing - thawing cycle at an interval of 4-5 days for three times. Need based antibiotics, analgesics and antiseptic dressing supports were given. The mass showed progressive reduction with almost skin covering leaving a small sinus opening with sanguineous discharge. Over a period an enlargement underneath the sinus could be noticed which was then surgically excised en block including the sinus tract. Appropriate antibiotics and analgesic support was given for a 4 days post-operatively. The skin sutures line was dressed daily and the sutures were removed after 10 days. Histopathological examination revealed it to be equine Sarcoid.



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LEAD PAPER

## Management of perineal affections in dogs

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The most common diseases affecting the perineal region in the dogs are the anal furunculosis, perineal hernia, affections of the anal glands and neoplasms. This paper describes a few important points related to the etiology, diagnosis and surgical management of these diseases.

### **Anal furunculosis:**

Anal furunculosis, broadly referred as the perianal disease is characterized by chronic, purulent, ulcerating, sinus tracts in the perianal tissues. Dogs with broad tail base, deep anal folds are more prone for the disease. The disease is more commonly encountered in German shepherd dogs and is a frustrating disease to treat. Contamination of the hair follicles and glands of the anal area by fecal material and anal sac secretions may result in necrosis, ulceration, and chronic inflammation of the perianal skin and tissues. The draining tracts are lined with chronic inflammatory tissue and often extend to the lumen of the rectum and anus. Infection may spread to deeper tissues.

### **Clinical Findings:**

In dogs, signs include attitude change, tenesmus, dyschezia (constipation), anorexia, lethargy, diarrhea, and attempts to bite and lick the anal area. Signs in cats are similar to those in dogs but may include matting of fur and sitting in the litter box.

### **Treatment:**

Surgical therapy traditionally includes excision, fulguration and cryo surgery. Anal sacculotomy is also routinely performed along with excision of the fistulous tracts. In extreme cases amputation of the tail at its base has also been advocated. Sequelae of surgery include fecal incontinence, rectal stricture, and recurrence.

A study conducted at Madras Veterinary College comparing three methods of management of anal furunculosis, namely, Electro fulguration, Cryo surgery and surgical excision. It was found that surgical excision was found to be superior to the other two. Most of the dogs will have suture dehiscence after initial surgical excision. In these cases, a secondary debridement and suturing was found useful. In addition low level laser exposure was very effective in cases of wound dehiscence.

Much to the relief of the practitioners, most cases of perianal disease can now be treated medically. The following schedule is routinely used for the medical treatment of anal furunculosis

Tab.Cephalexin orally 250 to 500mg bid

Tab.Metranidazole orally 500mg once daily

Tab.Prednisolone 5 to 10mg orally once daily

Onit. Tacrolimus on the fistula

The above treatment is given for atleast 4-6 weeks for successful outcome.



## Perineal Hernia

Perineal hernia occurs due to weakening of the pelvic diaphragm which is constituted mainly by the muscles and fascia of the pelvis. The anatomical landmarks essential for correction of the perineal hernia are the *external anal sphincter, levator ani, medial coccygeus, internal obturator and sacrosciatic ligament*.

This is a disease of uncastrated male dogs occurs due to

- i. Hormonal imbalance
- ii. Rectal diseases
- iii. Prostatic diseases
- iv. Anatomical deviation

Basically perineal hernia is divided into i. Sciatic hernia. ii. Dorsal hernia iii. Caudal hernia and iv. Ventral hernia

Sciatic hernia occurs dorsal to the ischial bone. Dorsal hernia occurs between the sacrosciatic ligament, and the medial coccygeus. The caudal hernia which is the most common form of perineal hernia occurs between medial coccygeus and the levator ani muscle and the ventral hernia occurs on the ventral aspect of the pelvic diaphragm.

There is an unexplained predominance on the right side and >80% of these are on the right side. The hernial contents are most commonly the rectum and perineal fat. An enlarged prostate may also be found along with a retroflexed bladder.

Common signs include constipation and obstipation, tenesmus, and dyschezia. Stranguria and urinary obstruction may develop secondary to retroflexion of the bladder and prostate. A perineal swelling ventrolateral to the anus is evident. Herniation may be bilateral, but two-thirds are unilateral.

### Surgical treatment:

Different surgical procedures are available for the correction of perineal hernia in dogs, namely i. the conventional method ii. Internal obturator flap method iii. Reinforcement with fascia lata iv. Reinforcement with semitendinosus muscle.

*The conventional method* involves external anal sphincter as the anchor and reconstruction of the pelvic diaphragm with medial coccygeus, sacrosciatic ligament and internal obturator muscle.

Alternatively the *internal obturator* muscle is elevated from the ischial bed and used to cover the defect in the pelvic diaphragm

For chronic cases and those with weak muscle either *fascia lata* or *semitendinosus muscle* may be used as a reinforcement.

### Affections of Anal Gland:

#### Anal Sac diseases:

Anal sac disease is the most common disease entity of the anal region in dogs and the affections include impaction, infection, abscessation and neoplasia. The disease occurs commonly in small breeds of dogs; large or giant breeds are rarely affected. In cats, the most common form of anal sac disease is impaction.

Poor expression of anal glands during defecation results in accumulation of gland secretion and impaction. Poor muscle tone and generalized seborrhea may also predispose the disease.



## Clinical Findings

Signs are related to pain and discomfort associated with sitting. Scooting, licking, biting at the anal area, and painful defecation with tenesmus may be noted. Induration, abscesses, and fistulous tracts are common. Severe pain is present on palpation. Fistulous tracts may be formed when the sacs rupture. This must be differentiated from anal furunculosis.

When the sacs are infected or abscessed, severe pain and often discoloration of the area are present. Fistulous tracts lead from abscessed sacs and rupture through the skin; these must be differentiated from perianal fistulas.

Anal sac neoplasms are usually nonpainful and are associated with perineal edema, erythema, induration, or fistula formation. Apocrine gland adenocarcinomas of the anal sac are typically seen in older female dogs. These dogs are presented for signs secondary to hypercalcemia, such as polyuria and polydipsia, or for problems related to the perineal mass.

Diagnosis of impaction, infection, or abscessation is confirmed by digital rectal examination. A tumor should be suspected (anal sac apocrine adenocarcinoma) in anal sacs that are firm, enlarged, and nonexpressible even with irrigation. In these cases, the diagnosis should be confirmed by biopsy. Regional and systemic metastasis should be evaluated, and serum calcium measured.

Impacted anal sacs should be gently manually expressed. A softening or ceruminolytic agent or saline can be infused into the sac if the contents are too dry to express effectively. Infected sacs should be cleaned with antiseptic, followed by local and systemic antibiotic therapy. Hot compresses, applied every 8-12 hr for 15-20 min each, are beneficial for abscesses. Repeated weekly flushings combined with infusion of a steroid-antibiotic ointment may be needed. Adding supplemental fiber to the diet may increase fecal bulk, facilitating anal sac compression and emptying. If medical treatment is ineffective or if neoplasia is present, surgical excision of the sac is indicated. The closed technique for excision is preferred and has the lowest complication rate. However, fecal incontinence, which is a common complication of anal sac surgery, may result from damage to the caudal rectal branch of the pudendal nerve and may be complete if damage is bilateral. Chronic fistula formation may be seen when sac removal is incomplete or when the sac ruptures. Scar formation in the external anal sphincter may result from surgical trauma and result in tenesmus.

## Surgical treatment (anal saccullectomy):

Closed anal saccullectomy is better since the chances of infection could be reduced. The anal sacs are approached through vertical incision lateral to the anal opening. The glands lie at the 4 o'clock and 8 o'clock position. The glands may be pre distended with Anal sac gel, Self-hardening resin, Dental acrylic, Plaster of paris, Melted paraffin, Curved hemostat, Grooved director, Foley catheter etc. I often use saline to fill the gland intermittently. Fine scissors are used to dissect between the external sphincter muscles. The ducts are ligated with 3/0 or 4/0 monofilament suture material.



## Current trends in veterinary ophthalmology- indian perspective

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Ophthalmic surgery in India has made tremendous strides in the last decade and is marching towards excellence. Basically the surgical diseases of the eye can be classified as extra ocular and intraocular affections, and the principles of surgery for extraocular and intraocular procedures usually resemble that of microsurgery. Hence magnification and use of ophthalmic operating microscope is inevitable.

### Extraocular surgery

#### Catheterization of the canine naso lacrimal Duct

Catheterization of the canine nasolacrimal system utilizes either a monofilament nylon suture or very small diameter silicone tubing. Both ends are sutured to adjacent skin. The system may remain in position for several weeks to ensure patency of the nasolacrimal system.

- After deep sedation or short-acting general anesthesia, a 2-0 to 3-0 nylon suture is passed through the nasolacrimal system, starting at the dorsal lacrimal punctum.
- Once the nylon suture has traversed the nasolacrimal system, 50 to 90 size polyethylene tubing is threaded down the suture.
- Once completed, both ends of the tubing are transfixed to the adjacent skin by one or two simple interrupted non-absorbable sutures. An E-collar is recommended when the nasolacrimal catheterization is in place to prevent its dislodgement.

#### Lateral permanent tarsorrhaphy.

- The apposing upper and lower eyelid margins are trimmed by Metzenbaum or Mayo scissors at a depth of 4–5 mm.
- The lids are apposed by two layers of sutures: the tarsoconjunctival layer with 4-0 to 6-0 simple continuous absorbable sutures placed submucosally, and the orbicularis oculi muscle and skin layer with 4-0 to 6-0 simple interrupted non-absorbable sutures.

#### Complete temporary tarsorrhaphy.

- Three to six 4-0 to 6-0 interrupted mattress non-absorbable sutures are pre-placed in the lids.
- Stents are used to distribute the tension on the sutures and prevent lid necrosis.
- The sutures are placed through the 'gray line' (or the orifices of the tarsal glands) and outer one-half thickness of the eyelids to avoid touching the cornea and still maintain excellent holding capacity. The sutures are left long to permit occasional adjustments postoperatively.

#### Modified Hotz–Celsus technique

Used to correct for central lower lid entropion.

- The skin and orbicularis oculi muscle layers are incised by scalpel. The incision along the eyelid margin should be 1–2 mm from the margin. The lower incision is determined by the length and shape of the entropion.





- The strip of eyelid skin and orbicularis oculi muscle are carefully dissected and excised by small tenotomy scissors.
- The surgical wound is apposed by 4-0 to 6-0 simple interrupted non-absorbable sutures. The sutures should be angled somewhat to accommodate the two different lengths of the wound edges.
- At the conclusion of surgery because of the eyelid swelling, slight overcorrection may be present.
- Preoperative appearance of a cat with bilateral lower lid medial entropion.
- Same cat immediately after bilateral Hotz–Celsus procedure..
- The corneal ulcer is carefully debrided to remove all suspect necrotic and/or infected tissues.
- The dorsolateral bulbar conjunctiva is most accessible and the graft's base is usually lateral or at the 12 o'clock position. The dotted line indicates the outline for the pedicle graft.
- A pedicle strip of thin bulbar conjunctiva is prepared primarily by small tenotomy scissors.
- After preparation of the bulbar conjunctival pedicle graft, its end is trimmed by scissors to conform to the ventral edge of the corneal ulcer. The pedicle graft should lie flat on the corneal surface, and be neither stretched nor excessive in length.
- The entire tip of the pedicle is apposed to the corneal ulcer by 5-0 to 7-0 simple interrupted absorbable sutures. At least one suture is carefully positioned between the dorsal edge of the corneal ulcer and the pedicle; this suture is positioned along the long axis of the graft to minimize its effect on the graft's blood supply.

#### Posterior nictitans anchoring method

For the treatment of gland protrusion.

- The bulbar surface of the nictitans is exposed to reveal the extent of the gland prolapse.
- The mucosa is incised by a Beaver microsurgical blade from posterior of the gland to the medioventral conjunctival fornix and then to the limbus. Unfortunately, this may damage the majority of the nictitans gland's ducts.
- The basal portion of the gland and the nictitans cartilage are carefully separated from their fascial attachments by scissor dissection. By blunt dissection with tenotomy scissors, the anchor site (the ventral sclera, ventral oblique muscle or periorbital fascia) is isolated.
- A 4-0 green monofilament nylon suture with a reverse-cutting needle is passed through the prolapsed portion of the gland and the anchor site.
- As the suture is tightened and tied, the gland should return to its original position.
- The conjunctival mucosa is apposed with a 5-0 to 6-0 simple continuous suture. The knots are buried to prevent corneal contact.
- Cross-section of the completed surgery: (A) eyelid; (B) nictitans cartilage; (C) nictitans' tear gland; (D) orbital bony rim; (E) deep anchor of the green non-absorbable suture.

#### Used to treat nictitans gland protrusion.

- The nictitans is protracted by thumb forceps to reveal its bulbar (deep) surface and the affected gland.
- Two semicircular mucosal incisions are performed with the Bard–Parker blade.



- After separation from the submucosa, the two edges of the mucosa are pulled over the gland and apposed with a 5-0 to 6-0 simple continuous absorbable suture.
- With both ends of the conjunctival mucosa open, secretions from the nictitans glands can exit.
- Immediate postoperative view of a patient with conjunctival mucosal pocket procedure.

Note the central continuous suture and that both ends of the 'pocket' are open.

### 3<sup>rd</sup> eyelid flap technique

Securing the nictitating membrane temporarily to the dorsolateral conjunctival fornix.

- One tip of the thumb forceps is placed above and the other tip below the eyelid margin. The forceps tips, inserted as far as possible, indicate the position of the conjunctival fornix (arrowed) and where the sutures should traverse the eyelid.
- The first 2-0 to 3-0 non-absorbable suture is placed through the eyelid stent (a rubber band is illustrated), through the eyelid, and into the conjunctival fornix. The needle and suture are then extended to the dorsal surface of the leading edge of the nictitating membrane to penetrate its full thickness.
- At least two horizontal mattress sutures are pre-placed, and the part of both sutures that penetrates the leading edge of the nictitating membrane should incorporate the upper stem of the nictitans cartilage.
- After placement of both sutures, they are tightened to secure the nictitans in the dorsolateral conjunctival fornix. Leaving the suture ends long permits occasional adjustments and lowering of the flap for inspection and medication of the eye.

### Superficial grid keratotomy

In this procedure, the corneal epithelia and anterior stroma are incised in a grid or cross-hatching manner within the corneal erosion and adjacent area.

- The initial corneal incisions, about 0.1–0.25 mm deep, may be performed with the Beaver microsurgical blade, diamond knife or a disposable 20 g hypodermic needle.
- A second set of crosshatching incisions are placed at 90° to the initial incisions. The grids should be 1.0–1.5 mm apart
- Using a trephine the depth of the cornea to be incised (0.2-0.3 mm) is determined and with the help of the no .15/no.11 BP blade ,keratectomy is performed under magnification with an operating microscope .

The Cryo probe is used to cause tissue destruction of the squamous cell carcinoma of the conjunctiva in a rabbit.

In this procedure the globe is removed from Tenon's capsule through a bulbar conjunctival incision at the limbus. After removal of the nictitating membrane, the eyelid margins are removed and permanently apposed.

- The palpebral fissure is temporarily enlarged by a lateral canthotomy. The lateral canthus is incised by small tenotomy scissors for 5–10 mm.
- The bulbar conjunctiva and Tenon's capsule are incised by curved Steven's tenotomy or strabismus scissors a few millimeters behind the limbus. About 2–4 mm of bulbar conjunctiva are left attached at the limbus, to permit manipulation of the globe with forceps during the enucleation procedure.
- By blunt-sharp dissection with curved tenotomy scissors, the extraocular muscle insertions to the globe are excised. The globe is rotated in different directions to provide the optimal exposure during the dissection process.



- The optic nerve is clamped by curved hemostat and transected by curved enucleation or Metzenbaum scissors. Special care is required to prevent touching the posterior globe with the tips of the scissors during optic nerve incision. Once the optic nerve has been cut, the globe can be rotated forward for incision of any remaining fascial attachments.
- The nictitating membrane is protracted by thumb forceps and its base clamped with two curved hemostats. The structure is excised by Mayo scissors. The lacrimal gland may be removed at this time from beneath the lateral orbital ligament.
- The two layers of closure include apposition of the rostral portion of Tenon's capsule by simple interrupted absorbable sutures. The skin-orbicularis muscle layer is apposed with simple interrupted non-absorbable sutures.
- Two weeks following enucleation in a young Labrador Retriever and suture removal.

#### **Enucleation – transpalpebral approach:**

In this technique the globe is removed with the eyelids sutured or clamped together.

- The palpebral fissure is closed by suturing the eyelids together with a continuous non-absorbable suture. Alternatively, the eyelids can be clamped together by Allis or towel forceps.
- The eyelid skin and orbicularis oculi muscle layers are incised to the level of the tarsoconjunctiva. The incision is usually about 6–8 mm from the eyelid margins to avoid the bases of the meibomian glands.
- With the sutured eyelids clamped by Allis forceps, the dissection is continued by small curved Metzenbaum scissors around the conjunctival fornices and onto the globe.
- Once the sub-Tenon's space is entered about the globe, the different extraocular muscle insertions are isolated and transected. Hemorrhage is usually minimal as long as the surgical plane remains in the sub-Tenon's space.
- Once the posterior orbit is entered, the optic nerve is carefully isolated, clamped by a curved hemostat, and incised by curved scissors posterior to the clamp.
- The first of two layers of closure consists of apposition of the orbital septum with simple interrupted or simple mattress absorbable sutures.
- The second and last closure is apposition of the eyelid and orbicularis oculi muscle layer with simple interrupted non-absorbable sutures.

#### **Intra-capsular cataract extraction**

- An 8mm incision is made on the cornea at the limbus, by an initial stab incision with a keratome or bard – parker blade no.11 and then extending the incision using a corneal scissors.
- The luxated lens is removed using a lens loop.
- Any attachments of the posterior capsule to the vitreous are carefully dissected. The lens and capsule may also form attachments with other structures such as the iris or be buried in the vitreous.
- The corneal incision is sutured using 8-0 or 10-0 ophthalmic silk suture material in a simple interrupted pattern.

1. Extracapsular cataract extraction
2. Phacoemulsification

Over the years from Susruta's couching to Charles D. Kelman's phacoemulsification cataract surgery has witnessed a



phenomenal progress. The successful cataract surgery is determined by the best and earliest possible visual rehabilitation.

### 1. Extra Capsular Cataract Extraction

This was the standard and the most popular method of lens removal in the dog for many years.

#### Corneal Incision

The clear corneal incision is made 1 to 2 mm anterior to the limbal margin. This incision has become the most popular in the dogs. It is relatively quick and easy to perform, resulting in excellent exposure and visualization of the anterior chamber. The fornix based flap may be used to cover wound following suture placement. Here the disadvantage is that of increased incidence of corneal optical opacification along the incision line. Eye is instilled with viscoelastic solution to maintain the corneal contour and prevent corneal endothelial damage.

#### Removal of anterior lens capsule

The pupil should be well dilated. To grasp the anterior lens capsule the surgeon has to position the extra capsular forceps on the anterior lens capsule and open them widely. The teeth are then pressed against the anterior lens capsule and compressed slowly. This procedure can tear the capsule in the weaker equatorial region of the lens.

Nucleus delivery can be performed by manual technique using extra capsular forceps. The cortex material can be removed with a simcoe combined manual irrigation and aspiration system, using balanced salt solution, attached to a 10 ml syringe. The chamber will be formed again with hydroxyl propyl methylcellulose.

#### Closure of anterior chamber

Absorbable or non absorbable suture material swaged on spatula or reverse cutting needles may be used. Absorbable suture materials like polyglatin 910 and polyglycolic acid are commonly used. The sizes commonly used are 6-0 and 7-0. Non absorbable sutures are nylon and prolene (10-0).

### 2. Phaco emulsification

The techniques of cataract surgery have changed enormously in the last few years and will undoubtedly continue to evolve at an ever increasing pace. Presently, technologies with the use of small self sealing incisions have taken a major lead in cataract surgery. During the past few years phacoemulsification or phacofragmentation (phaco) has largely replaced the extracapsular cataract extraction (ECCE) with posterior chamber IOL implantation. Phacoemulsification surgery provides a higher success rates with immature cataract when compared to mature and hypermature cataracts.

In this method high frequency ultrasonic vibrations are used to fragment the lens into fine particles, which can be aspirated from the anterior chamber. The major limiting factor for this method is the cost of the equipment. The advantages over extra capsular extractions are that the incision needs to be smaller, the surgery time is less, and there is less of postoperative uveitis and improved overall surgical result when done properly.

The anterior lens capsule is then lacerated near the equator and the ultrasonic tip placed into the lens cortex. The nucleus and the opacified cortical material are fragmented as aspirated. Care must be taken to maintain the anterior chamber depth with the irrigating fluid and to keep the ultrasound tip within the capsule throughout the procedure. The anterior lens capsule and the remaining lens epithelium are removed with intraocular scissors. After phacoemulsification and aspiration of the cataract, if an intraocular lens has to be implanted, the limbal incision has to be enlarged using corneal scissors according to the width of the IOL.



### Intraocular lens implantation

A canine eye without lens has a reduction in visual acuity of less than 20/800 compared to the normal value of 20/80. This makes visually challenging tasks difficult. To correct this, intraocular lens implantation is necessary. A lens of +40 diopters is needed to approach emmetropia in majority of dogs. Currently PMMA (poly methyl methacrylate) intraocular lens is most favored.

The prosthetic lens has two parts- an optic and two haptics. The optical portion is made of polymethylmethacrylate and measures about 7.5 mm in diameter, the haptics measure about 16 mm from tip to tip. There are different types of intraocular lenses available. Silicone lenses are also available, which require only a small part of entry into the anterior chamber for introduction. Although there is some individual variability in refractive need, an implant of about 40 diopters brings the majority of canine patients acceptably close to emmetropia. IOL power can be calculated by use of keratometer and A-Scan ultrasonography

Needle or scissor capsulotomy is preferred if an intraocular lens is to be inserted because of the desirability of having a controlled capsular tear with large anterior flaps. After cataract extraction the incision is closed, except for an 8 mm superior wound (or extended to 8 mm if phacoemulsification is used). The anterior chamber and capsular bag are reformed with viscoelastic solution (hyaluronic acid, methyl cellulose, chondroitin sulphate alone or in combination), and the implant is inserted into the capsular bag. The lower haptic is inserted directly and the superior haptic either dialed with a hooked 30 gauge needle or otherwise manipulated into place. Dialing however ensures capsular placement of both haptics with minimal capsular stress. Viscoelastics are important to prevent corneal endothelial damage during insertion of IOL; this material is then flushed

from anterior chamber before closure of the corneal wound completely. Intracameral viscoelastics can increase IOP in the dog and hence should be flushed before closure of corneal wound.

### Phacoemulsification

The extraction technique in which the cataractous material is removed by ultrasonic fragmentation and aspiration through a small corneal incision.

- A 2.8-3.2 mm corneal incision is performed with a keratome, sufficient to permit insertion of the phacoemulsification needle but small enough to prevent excessive loss of the irrigation fluids. Depending on the diameter of the optic of the intraocular lens, the corneal incision may be enlarged later in the surgery.
- During the corneal incision, the anterior lens capsule may also be incised with the keratome - capsulorrhexis
- Adrenaline is instilled into the anterior chamber in order to dilate the pupil.
- The anterior chamber is filled with viscoelastic agent to maintain the anterior chamber during phacoemulsification.
- The Utrata capsule forceps are used to tear a continuous anterior capsulectomy (about 6–8 mm diameter). If an intraocular lens (IOL) is implanted, the diameter of the anterior capsulectomy should be 1 mm less than the diameter of the IOL optic.
- The phaco ultrasonic tip is carefully inserted (bevel up) through the corneal incision, then through the anterior capsulectomy (bevel up) into the anterior lens cortex.
- Phacoemulsification is started in the anterior lens cortex and nucleus.
- If a chopper is used to divide the lens nucleus into halves, it is inserted through a separate corneal incision. It is carefully manipulated across the pupil and beneath the anterior capsule. Using the phaco tip and aspiration to stabilize the nucleus, the tip of the chopper is advanced to divide the nucleus into halves. The tip of the instrument should not extend below



the posterior lens nucleus.

- The sculpting is initially limited to the nucleus, fragmenting it into four pieces, and then removing it.
- The remaining nucleus and cortices are fragmented by parallel sculpting.
- Any remaining cataractous material is carefully removed, avoiding tearing of the posterior lens capsule. An irrigation-aspirating handpiece is useful during this final phase for removing any remaining cataractous material from the equator and surface of the posterior lens capsule the technique known as polishing.
- The short corneal incision is apposed with one or two 8-0 to 10-0 simple interrupted non-absorbable sutures, and the anterior chamber is reformed with lactated Ringer's solution if required.

### Extra-capsular cataract extraction

The extraction technique in which the cataractous lens material is removed without removal of the anterior and posterior capsule

- A 3mm limbal incision is performed with a keratome.
- Adrenaline is infused into the anterior chamber in order to dilate the pupil.
- The incision is extended along the limbus, to form a 8mm long incision using a corneal scissors.
- An continuous anterior capsulectomy is performed using a capsulotomy needle the diameter of which is about 6–8 mm.
- The lens material is removed using a lens loop.
- The anterior chamber is irrigated to remove remnants of cortical lens material
- The cornea is sutured using 8-0 or 10-0 ophthalmic silk suture material in a simple interrupted pattern. Sutures are placed 2mm apart.

### Management of cataract associated with hypertension

#### 1. Phacoemulsification followed by trabeculectomy

- The surgery is performed under magnification using an operating microscope
- The eyeball is fixed with stay sutures, placed on the bulbar conjunctiva near the limbus in a radial pattern
- An stab incision is made on the cornea close to the limbus, at the four'O'clock position for the left eye and 10'O'clock position for the right eye in order to enter the anterior chamber. The incision may be extended with the use of corneal scissors to 3mm
- intracamerally injected Adrenaline (1:1000) is used to dilate the pupil
- The collapsed anterior chamber is reformed using HPMC 2%
- Anterior capsulotomy is performed using a bent (45°) 23G hypodermic needle introduced through the corneal stab incision
- Phacoemulsification was done using a one handed phacoemulsification technique, divided into 3 phases
- The corneal incision was closed using 8-0 or 10-0 ophthalmic silk suture material

#### Trabeculectomy

- A fornix based conjunctival flap is taken 1mm away from the limbus extending from 10'O'clock to 2'O'clock position
- The conjunctiva is elevated from the underlying sclera





- Vannus scissors is used to deepen the flap 10mm into the dorsal fornix
- The conjunctival flap thus created is reflected posteriorly
- Tentons capsule is excised followed by episclera to expose the sclera
- A small limbal based triangular partial thickness incision is made at the 12'O'clock position in such a way as to create a flap which is then reflected anteriorly
- An area of 1mm by 2mm is then marked out on the underlying sclera as near to the linbus as possible along the area marked out a greyish trabecular meshwork is excised to create a window, which is followed by aqueous leakage.
- The scleral flap is then apposed to the underlying sclera at the apex alone, with a single interrupted suture using monofilament prolene 5-0.
- The conjunctival flap margin is apposed back in position to the strip of limbal conjunctiva

## 2. Phacoemulsification With Implantation Of Gonioshunt

- The surgery is performed under magnification using an operating microscope
- The eyeball is fixed with stay sutures, placed on the bulbar conjunctiva near the limbus in a radial pattern
- An stab incision is made on the cornea close to the limbus, at the four'O'clock position for the left eye and 10'O'clock position for the right eye in order to enter the anterior chamber. The incision may be extended with the use of corneal scissors to 3mm intracamerally injected Adrenaline (1:1000) is used to dilate the pupil
- The collapsed anterior chamber is reformed using HPMC 2%
- Anterior capsulotomy is performed using a bent (45<sup>0</sup>) 23G hypodermic needle introduced throught the corneal stab incision
- Phacoemulsification was done using a one handed phacoemulsification technique, divided into 3 phases
- The corneal incision was closed using 8-0 or 10-0 ophthalmic silk suture material

### Implantation of the gonioshunt

- An incision is made on the upper outer or upper inner quadrant of the limbus
- Conjunctiva is then cut and opened
- A pocket is created under the conjunctiva and the tentons capsule with curved corneal scissors
- A curved blunt spatula is further used to clear the pocket
- The glaucoma shunt is then flushed with normal saline using a 27G cannula to check the patency of the system prior to implantation
- The implant is inserted into the pocket, and is positioned 10mm behind the limbus
- The valve is sutured in place using 5-0 non absorbable suture material by passing the needle through the eyelets present in the shunt
- Bleeding points are controlled by light cautery
- A tunnel is then created on the sclera for the insertion of the shunt tube into the anterior chamber
- Length of the tube is cut in an oblique fashion, so that the length is just sufficient to enter into the anterior chamber making the end of the tube visible inside
- The conjunctiva is closed using absorbable suture material



## 1. Surgical management of incisional hernia in pigs

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Incisional hernia may develop following abdominal surgery in all species with an incidence reported in the horse of 8% within 4 months of surgery. The incidence depends on a number of factors including incisional drainage, repeat laparotomy, excessive incisional oedema, chest infection; abdominal distension and old age. There are a number of different methods for surgical repair of ventral midline incisional hernia including reconstruction and primary closure. This paper reports only primary closure technique in 30 pigs having ventral midline incisional hernia. In the state of Mizoram ventral midline hernia mostly encountered as a post-operative complication of spaying by conventional method, performed by the farmer. Primary closure technique with proper post-operative care for incisional herniorrhaphy in pigs has been found to be a satisfactory treatment with low post-operative complication and minimum recurrence

## 2. Prevalence of skin and subcutaneous tissue neoplasms in canines

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The present research work was conducted on 25 dogs presented during the period from October 2010 to September 2011 at the department with the complaint of neoplastic growths at various locations. Particulars of animals like age, sex, breed, location, diet, housing pattern and breeding history of tumours were recorded. The higher prevalence of skin and subcutaneous tumours were found in age group of 8 to 12 years (32%) followed least in the age group of 0 to 4 years (16%). The sex wise prevalence revealed that a majority of the cases were in male accounting for (56%) cases as compared to females (44%). The breed wise distribution shows that a majority of the cases were in Spitz/Pomeranian breed accounting for fifteen (60%) cases followed by other breeds were recorded. Genital region was found to be most affected site for skin and subcutaneous tumours comprising 9 (36%) of total skin and subcutaneous tumours whereas prevalence of mammary region tumours were 6 (36%), oral 3 (12%), ear 2 (8%), neck 2 (8%), tail 2 (8%) and limbs comprised of 1 (4%) of total skin and subcutaneous tumours. Dogs with non-vegetarian diet were found to be the most affected with tumours comprising 11 (44%) followed by mixed diet 8 (32%) and vegetarian diet 6 (24%). The majority of the cases were in between 0 to 10 kg accounting for fifteen (60%). This study revealed that confined dogs thirteen (52%) were mostly affected as compared to dogs with limited exercise eleven (44%). Out of 25 dogs, seventeen females (68%) and eight male (32%) were with earlier breeding history.

## 3. Clinico-physiological studies of skin and subcutaneous tissue neoplasms in canines

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In the present study conducted on twenty five dogs, out of total twenty five dogs positive for skin and subcutaneous tumours, twenty (80%) were in good body condition, five (20%) cases were in poor health condition. Majority of tumours 18 (72%),



non-pedunculated (broad based) only 7 (28%) were pedunculated whereas the tumour mass were hard in consistency fifteen (60%) followed by soft ten (40%). The weight of tumour mass was found to be in the range of 0 to 300 grams. The higher prevalence of tumours were found in 11 (44%) dogs which were in the weight group of 0 to 50 grams and minimum of 2 (8%) dogs were in the weight group of 200 to 300 years. Out of three groups, rectal temperature in all the groups of animals showed a non-significant decreased value. The mean decreased values of rectal temperature ranged from  $100.96 \pm 0.28$  OF to  $101.89 \pm 0.12$  OF. Heart rate in all the groups of animals showed a significant ( $P < 0.05$ ) increase upto 60 mins. followed by decrease between 60-120 mins. after lumpectomy in group II and lumpectomy plus antineoplastic therapy in group III. The mean increased values of heart rate ranged from  $72.50 \pm 2.30$  beats/min to  $82.96 \pm 0.85$  beats/min. Respiration rate in all the groups of animals showed a non-significant increase between 30 to 60 mins after lumpectomy in all the groups. The mean increased values of respiration rate ranged from  $27.83 \pm 1.95$  per min. to  $36.0 \pm 2.30$  per min. in different groups of animals at various intervals. However, the value compensated and returned to normal limits within 24 hours.

#### 4. Haemato-biological effects of skin and subcutaneous tissue neoplasms in canines

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The study was conducted on twenty five dogs to assess the alterations due to skin and subcutaneous tumours by estimating the various haemato-biochemical parameters. In this study haemoglobin showed a non-significant decrease after lumpectomy alone in group I and II at various intervals. In animals of group III, there was a non-significant increase in the haemoglobin value. The packed cell volume showed a non-significant changes whereas TLC decreased significantly. A non-significant change in neutrophils, lymphocytes, monocyte, eosinophil and basophils values in all the groups of animals. Blood glucose, serum urea nitrogen, and serum aspartate aminotransferase showed a significant increase in the group I and II (post lumpectomy) and also in group III post lumpectomy and following antineoplastic therapy whereas the total serum proteins and creatinine showed a non-significant decrease in post lumpectomy (group I and II) and lumpectomy plus antineoplastic therapy in animals of group III. However, the increase was transient and all the values returned to normal limits within 24 hours. Thus, skin and subcutaneous tumours caused no any alterations, which returned to normalcy within 24 hours.

#### 5. Surgico-histopathological evaluation of skin and subcutaneous tissue neoplasms in canines

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The study was conducted in twenty five cases and divided in to three groups. All the dogs of Group I, II and III the animal was premedicated with atropine sulphate @ 0.65 mg (total dose) i/m followed by xylazine sedation @ 1mg/kg. b. wt. or medetomidine @ 20µg/kg, i/m and general anaesthesia was achieved by using ketamine @ 5 mg/ kg. b. wt. or propofol @ 5 mg/kg i/m the tumour mass were removed aseptically along with healthy portion following standard surgical techniques. Postoperatively, Intramuscular injection of Ceftriaxone 500 mg, Meloxicam 2 ml was administered intramuscularly for 3 days post-operatively. The surgical wound was cleaned with Povidone Iodine liquid and dressed daily with Silversulphadiazine cream. Histopathology of the representative tissue samples in 10% neutral buffered formalin and sent for the histopathological



examination in respective department. The tumours were examined histopathologically and classified accordingly as per their characteristic features as carcinoma, sarcoma or benign tumours. Among these tumours 40 percent were malignant and 60 percent were benign tumours. Histopathologically, out of twenty five skin and subcutaneous tumours, 10 were of malignant in nature which included fibromatous epulis, squamous cell carcinoma, rhabdosarcoma, tubulo papillary adenocarcinoma, venereal granuloma and fibrosarcoma. Fifteen cases were confirmed to be of benign tumour which included fibroma, histiocytoma, fibroadenoma and leiomyoma. All the dogs recovered uneventfully except in one case.

## 6. Surgico-chemotherapeutic evaluation of skin and subcutaneous tissue neoplasms in canines

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The study was conducted on 25 clinical cases of dogs affected with skin and subcutaneous tumours which were divided into three groups for comparing the three different treatments. All the dogs of Group I, II and III the animal was premedicated with atropine sulphate @ 0.65 mg (total dose) i/m followed by xylazine sedation @ 1mg/kg. b. wt. or medetomidine @ 20µg/kg, i/m and general anaesthesia was achieved by using ketamine @ 5 mg/ kg. b.wt. or propofol @ 5 mg/kg i/m. In group I, fifteen dogs which were affected with benign tumours were treated surgically. In group II, five dogs which were affected with malignant tumours were treated surgically while remaining five dogs of group III which were affected with malignant tumours were treated by lumpectomy plus antineoplastic therapy (Vincristine Sulphate @ 0.025mg/kg body weight I/V followed one week later by Methotrexate @ 0.3mg/kg body weight) intravenously at weekly interval. The dogs were followed up at least for 2 months after surgery. Four dogs from group II and five dogs from group III did not show any recurrences. One dog (no. 23) of group II showed recurrence in the 4 months post-surgery and the dog died one month after the recurrence of tumour. Side effects like alopecia, anaemia, vomiting and anorexia were commonly seen in the dogs subjected to lumpectomy plus vincristine sulphate and methotrexate treatment. In the present study, it was concluded that Surgery with antineoplastic therapy still remained the main stay for the treatment of skin and subcutaneous tumours.

## 7. Intestine obstruction with fecoliths in a cat

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One cat aged 1 year was brought to the TVCC RAJUVAS, Bikaner with a history of being off feed and constipation since last four days. Laparotomy was performed under general anaesthesia using Xylazine, Ketamine and Atropine Sulphate. Fecoliths were found in intestine. Liquid paraffin was injected to soften the fecoliths and these were squeezed out towards rectum to move out of anus. Laparotomy wound was closed in usual manner. Post operatively, inj. Amoxicirum forte 300mg i/m for 5 days, inj. Meloxicam 2.5mg i/m 3 days, inj. 5% DNS 150 ml i/v 5 days, inj. Ringer's lactate 150 ml i/v 5 days were given. Recovery was uneventful in the case.



## 8. Use of pharyngostomy gastric tube in management of jaw fractures in dogs

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Jaw fractures are common occurrence, accounting for 1.5% to 3% of all fractures in dogs with vehicular trauma being the most common cause. Most jaw fractures are open with varying degrees of contamination and infection. The complication rate of treatment for jaw fractures, however, is high at 34%. Nearly 2/3 of those complications involved dental malocclusion or osteomyelitis. Treatment of jaw fractures has the sole goal of reestablishing dental occlusion and jaw function. Four cases presented at Shri Mata Prasad Veterinary Hospital affected with jaw fractures were repaired using wiring (2 cases) and external skeletal fixation (ESF; 2 cases) maintaining proper dental occlusion. All cases were fed through pharyngostomy gastric tube till wound healing to avoid contamination and infection caused by food particles. Patients were advised for betadine® mouth wash 5-6 times daily for 10 days. Post operatively antibiotics were given for 7 days, vitamin C for 15 days and calcium for 1 month. Three cases showed uneventful recovery and one case (age 12.5 years) died on fifth day of surgery.

## 9. Surgical management of extensive case of intraluminal leiomyoma in a pomeranian bitch

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Leiomyomas are usually single, firm, round resembling like abscess and are benign tumors. An six year old, intact female Pomeranian bitch was presented with the complaint of vulvar swelling along with mixed foetid discharge from the last one month. The animal was previously treated by local veterinarian with Vincristine sulphate but bitch had not responded to this treatment. Per vaginal examination revealed the presence of multiple, round and pedunculated masses attached to the vaginal floor. Operation was performed under general anaesthesia using Xylazine @ 0.5 mg/kg i/m and Ketamine @ 5 mg/kg i/v. Routine episiotomy was done and all the growth was carefully separated from the vaginal wall by blunt dissection. The growths were round, smooth, pedunculated, variable in size and twenty four in number at different places which were removed. Episiotomy incision was closed in two layers using simple continuous sutures of 1/0 chromic catgut. Post operatively, injection of ceftriaxone (500mg) daily i/v for 5 days and injection meloxicam 0.2mg/kg bw i/m daily for 3 days were given. The antiseptic dressing of surgical wound was done by silver sulfadiazine ointment till removal of skin sutures. The animal was recovered uneventfully in a period of ten days. Histopathological examination of the tumour mass revealed leiomyoma.

## 10. Acellular dermal matrix of rabbit origin for the repair of hernias in dogs

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The aim of this study was to investigate the outcome of the surgical repair of hernias in dogs using acellular dermal matrix (ADM) of rabbit origin. The ADM was prepared using patentable technology (Patent application filed vide application No #2148DEL/2009). Nine dogs having abdominal (n=3), inguinal (n=2), and perineal (n=4) hernias were used in this study. Under general anaesthesia, the hernias were repaired with ADM using the inlay and the onlay graft technique. All the animals had an uneventful recovery without clinical signs of wound dehiscence, infection, or recurrence of hernias. The types of repair





techniques and the types of hernias had no effect on the outcome of the surgical treatment. Integrity of the ADM graft was neither lost nor rejected up to 6 months after hernioplasty. Evidence from treated animals suggests that ADM of rabbit origin may be useful for the repair of hernias in dogs with adequate strength.

## 11. Clinical evaluation of perineal hernioplasty with prosthetic mesh implantation in dogs- four case studies

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The study was conducted to evaluate clinically perineal henioplasty using prosthetic mesh in four different breeds of dogs of 7-10 years age group referred to Department of Surgery and Radiology, College of Veterinary Science with a history of painless perineal swelling in varying degrees, tenesmus, faecal impaction, force full scanty urination and change in appetite.

Purgative and enema was used applied prior to 24 hours of surgery. The dogs were pre-medicated with diazepam induction of general anesthesia using Ketamine hydrochloride. The surgical correction of the hernia done and synthetic surgical mesh (Prolene Mesh) was placed using interrupted technique with braided coated Polyglactin 910 violet followed by skin suture in usual manner. The dogs were returned to normalcy in its appetite, defecation and urination from first week onward except one showing wound dehiscence. Perineal hernioplasty using prosthetic mesh provided early clinical cure with reduced pain and inflammation. There was minimal post-operative complication with no recurrence was recorded upto maximum of fourteen months.

## 12. p53 and Cox-2 tumour markers expression in canine mammary tumours

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A clinical study was carried out on the 22 clinical cases of dogs of different breeds and ages were presented to the referral veterinary polyclinics of Indian Veterinary Research Institute (IVRI), Izatnagar with the history of spontaneous mammary tumours and twelve normal mammary tissue samples were used for the study. There were higher expression levels for genes p53 and Cox- 2 in tumours tissues than normal mammary tissues. The expression profile of p53 and Cox 2 genes were analyzed by using quantitative Real-Time PCR (RT-qPCR). Higher expressions of these genes were related to their poor prognosis. It was concluded that gene expression profile of p53 and Cox-2 can be used for early diagnosis and prognosis of canine mammary tumours.

## 13. A comparative study of surgical and chemotherapeutic management in canine mammary tumours

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A clinical study was carried out on the 30 clinical cases of dogs of different breeds and ages were presented to the referral





veterinary polyclinics of Indian Veterinary Research Institute (IVRI), Izatnagar with the history of spontaneous mammary tumours used for this study. Different therapeutic modalities like anti-angiogenic therapy; chemotherapy; chemotherapy + Cox-2 inhibitor; chemotherapy + Cox-2 inhibitor + Immunomodulator drugs and surgical therapy were evaluated in different types of mammary tumours. Spitz was the mostly affected breed and 7-9 yrs of age group and 4th and 5th mammary gland were mostly involved in canine mammary tumours. Histopathologically, 16.67 % were benign and 83.33 % were malignant. Anticancer drugs 5-FU and anti-angiogenic drug Tamoxifen induced apoptosis in canine mammary tumours. Immunomodulator drugs (Levamisole) along with Cox-2 inhibitor (Etoricoxib) and chemotherapeutic drug (5-Fluorouracil) induced more % of apoptosis in canine mammary tumours and can be used as a supportive therapy in canine mammary tumours and was an effective and promising strategy for the treatment of canine mammary tumours. The effects of chemotherapy with immunomodulator drug and Cox-2 inhibitors were clinically proved better than mono-chemotherapy.

## 14. Management of corneal lipidosis by superficial keratectomy in three dogs-A case report and literature review

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To evaluate superficial keratectomy for management of unilateral corneal lipidosis refractory to conservative therapy Three dogs of different breeds' Chihuahua, spitz, and a mixed breed were presented with unilateral and bilateral corneal haze in the central cornea, detailed ophthalmic examinations were performed and the condition was diagnosed as corneal lipidosis. Blood was collected from all dogs for evaluation of lipid profile and cholesterol. Conservative treatment was instituted with topical anti-inflammatory drops and subsequently it was decided to perform superficial keratectomy in all cases. Florescein dye test was done regularly to monitor the corneal healing post surgery and the patients were monitored by slit lamp biomicroscope at regular intervals. After the clearing of the cornea, patient follow up was done for 6 months post surgery. The patients were advised to change to low fat and moderate protein diet. All tests gave normal results ie pupillary light reflex, schirmer tear test, florescein dye test, and intraocular pressure. No other associated pathology was observed other than corneal haze and lipid deposits of various densities, which was evident in the anterior stromal layer on observation through slit lamp biomicroscope. Although the blood report indicated normal lipid profile in all cases, the condition was interpreted as corneal lipidosis based on clinical features. Conservative treatment topical anti-inflammatory drops failed to clear the opacity, following superficial keratectomy there was significant amelioration of the corneal haze and by four weeks post surgery the lesion had cleared in all the three patients. None of the owners reported of recurrence for 6 months following treatment. The results of this study indicate it is encouraging to perform superficial keratectomy for treatment of corneal lipidosis when conservative treatment fails.

## 15. Management of peroneal nerve paralysis in dogs

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Peroneal nerve paralysis was recorded in 6 animals following various causes like, faulty intra muscular injection (n=4), prolonged exertion during whelping (n=1) and erroneous traction n=1). All the animals had similar signs like knuckled fetlock with normal function of hip and stifle joints. There was damage to the skin over the flexed joints, as the limb was dragged on the ground. In some cases there was open joint. The animals were treated for a period of 1-2 months with neurotonics.



Stimulation of nerve was attempted by depositing B1, B6 and B12 injection at different sites of the course of the nerve. The treatment was repeated at weekly intervals for 3 occasions. The open joint was dressed with routine antiseptics and a half limb cast was applied to immobilize the part. All the animals were given serratio peptidase tablets @ 5-10 mg, orally. All the animals recovered completely after 3rd injection.

## 16. Evaluation of silver nanoparticles for post surgical wound healing

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To evaluate topical use of 40nm silver nanoparticles for surgical wound sepsis, healing and its local as well as systemic side effects. Laparotomy surgery was performed in 12 New Zealand White rabbits and the incision site was treated either with silver nanoparticles one time or once daily for 14 days or vehicle. After one week bacterial load on the incision site was estimated. The wound healing was evaluated clinically and by histopathology. Local area toxicity was evaluated by histopathology and scanning electron microscopy. Systemic side effects were assessed by hematology, clinical biochemistry and histopathology. A significant reduction on the bacterial load as well as improved healing was observed following daily treatment with silver nanoparticles. However the bacterial load as well as healing, following single treatment was not significantly different from the vehicle treated animals. Daily topical application of 40 nm silver NPs for two weeks did not cause any systemic side effect. Silver nanoparticles of 40 nm size may be used for short term management of surgical wound. However, for long term use further studies are warranted.

## 17. Surgical management of urinary calculi in dogs- review of 5 cases

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Five dogs of different breeds were presented with the history of urinary incontinence, haematuria and one dog with anuria. Blood examination revealed high BUN. Radiography and ultrasonography revealed cystoliths in all cases. All the cases were operated under general anaesthesia using atropine sulphate @ 0.02 mg/kg as pre anaesthetic, Diazepam and ketamine hydrochloride @ 0.5 and 10 mg/kg body weight intravenously. Calculi of different sizes were retrieved from bladder and urethra by cystotomy and urethrotomy. Hydropropulsion technique was used to propel the calculi from urethra to bladder. Bladder, urethra and laparotomy wound were sutured as general rule. Indwelling catheter was kept for 15 days. Post operative antibiotic, anti inflammatory drugs were injected for 5 days. Urinary alkalizer and cystone tablets were given for 2 months. Out of 5 dogs, 4 dogs were recovered uneventfully but in one dog, catheter was drawn out by dog and died due to bladder rupture.

## 18. Surgical management of recurred benign vaginal tumors alongwith chemotherapeutic trials for their malignant types in bitches.

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Bitches (n-14) of different breeds with recurred vaginal tumour were undergone both tumor resection alongwith midventral complete bilateral ovariectomy (OHE). Serum estradiol level estimated and analysed statistically in all animals were



(138.71±20.26 pg/ml) in pre-ovariohysterectomy as well as (63.71±16.88 pg/ml) and (29±12.29 pg/ml) at two and four months post-ovariohysterectomy period, respectively. The level of higher serum estradiol was found in twelve animals than that of normal level in preovariohysterectomy period which decreased gradually due to removal of polycystic ovaries. In all the cases no report of recurrence till one year post- operation was noticed. Histopathological study by staining with Haematoxylin and Eosin stain of all vaginal tumors confirmed the diagnosis of leiomyoma in six cases, fibroleiomyoma in four cases, leiomyosarcoma in two case and leiomyosarcoma alongwith adenocarcinoma in two cases. No evidence of local or distant metastasis was observed by exploratory laparotomy during OHE and by chest x-ray post-operatively in four cancer cases. Scanning electron microscopy (SEM) of the tumor tissue was done in four malignant cases. Anti-estrogenic aromatase inhibitor exemestane was tried post-operatively in all the cancer cases to control further growth. This result reports again the need of ovariohysterectomy in vaginal tumor and the anti-estrogenic trals for the malignant birth canal tumours

## 19. Incidence of neoplasms of canine in WBUAFS clinics, kolkata

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A total nos. of 257 referred cases of neoplasam in dogs during 2006-2010 presented in University Clinics were analysed during treatment in majorly four ways namely organ frequency of occurrence, breedwise, agewise and sexwise occurrences. This survey work reveals that the female dogs facing more physiological changes in period of time are more prone to different tumors in organs of reproductive system. More percentage of dogs suffer from tumors after crossing the higher activity phase of life i.e. 7-9 years of age. In context of the organs involvement mammary gland is on the top of the list of occurrence(44.35%) followed by genitalia(19.45%). Breed wise occurrence of neoplasia(Spitz 34.25%) is related to the population of that particular breed in this area.

## 20. Effect of fibrin-gelatin and fibrin-gelatin impregnated with silver/goldnanoparticles on wound healing in dogs

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A clinical study the etiology, incidence and epidemiological pattern of cutaneous wound in dogs. To study the wound healing properties of fibrin-gelatin and fibrin-gelatin impregnated with silver and gold nanoparticles composite and to evaluate the best suitable of the three biomaterials (fibrin-gelatin and fibrin-gelatin impregnated with silver and gold nanoparticles composite). Thirty two dogs of different breeds, sex, and age and body weight were selected and randomly divided into four groups. In Group I, eight dogs were treated with fibrin-gelatin sheet, in Group II eight dogs were treated with fibrin-gelatin impregnated with silver nanoparticles sheet, in Group III eight dogs were treated with Fibrin-gelatin impregnated with gold nanoparticles sheet, in Group IV eight dogs were treated with vetbacin ointment. In the present study, wound healing properties of fibrin-gelatin impregnated with silver nanoparticles composite was found to be the best suitable biomaterial when compared to fibrin-gelatin, fibrin-gelatin impregnated with gold nanoparticles composite and vetbacin ointment.

## 21. Pig as a model for studying neuroembolisation agent

*Lekshmi V, Harikrishnan V. S., Sachin J Shenony and P.R. Umashankar*

Neuroembolisation is a minimally invasive treatment procedure for tumours, aneurysms and blood vessel malformations that occur in brain. It is an neuro-interventional procedure in which the abnormal brain vessels are catheterized and



selectively occluded by injection of embolising agents through this catheter. Several agents such as liquid embolic agents, sclerosing agents, particulate embolic agents and mechanical occlusion devices are used to achieve this purpose. The present work highlights the suitability of pig model for the preclinical trials of neuroembolisation agents. The typical brain anatomy of the pig with carotid rete mirabile makes it an apt model for testing neuroembolisation agent. The rete is a thin arterial netting, which in swine replaces the intracavernous segment of the internal carotid artery and is well suited for the study of embolisation materials. Moreover the size of the rete vessels (50 to 250  $\mu\text{m}$ ) is similar to brain arteriovenous malformation nidi and the rete mirabile is readily accessible to catheterization and pathological studies. The present paper details the angiographic evaluation of pig rete mirabile for subsequent use as a model for evaluation of a neuroembolising agent. The procedure for neuro-catheterization and its peri-operative management standardized using Ankamali pig is presented in this work.

## 22. A two year survey of some peculiar surgical conditions in canine patients

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A variety of surgical affections are routinely encountered in companion animals which includes both emergency as well as selective procedures. The present communication deals with some peculiar surgical conditions carried out in the Division of Surgery, IVRI, Izatnagar. All of these cases were referred ones and had already undergone either minor surgical or therapeutic intervention but failed to relieve the pathological condition. Some of the unusual cases recorded during the observation period include perianal gland tumor, unusual foreign body in stomach, scrotal affections, recurrent urolithiasis, enteric trichobezoar, recurrent rectal prolapse management, large intestinal caecolith removal, bizarre sized urolith, dermoid cyst excision, face tumour of large size, eyelid laceration, tumorous testis, very large cutaneous wound, excessively enlarged pyometra, shoulder tumorous mass, seroma formation, rope snooze injury, reconstructive vulvoplasty, esophageal obstruction, oral and penile myiasis, uterine rupture, bullet injury, penile injury during mating, enterotomy and unusual dystocia cases. All of these cases will be presented and discussed at par length in the presentation.

## 23. Surgical affections in rescued pets: an analysis

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Pets like dogs and cats are left to shelters when they demand attention involving physical service or when they stop being useful to the owners. At Visakha Shelter for care and protection of animals, orthopedic problems (n=42) like, multiple fractures requiring amputation of limbs, severe hypocalcaemia and osteopenia, pelvic fractures, paralysis etc occupied the prime position. Eye problems (n=28) including opacity of cornea, hyphema, hypopyon, senile cataract, deep corneal ulcerations etc stand in second position. Soft tissue problems (n=12) like ascites, splenomegaly, Hepatomegaly, abdominal tumors etc were also recorded. In the miscellaneous category (n=18), burns, necrosis, gangrene, lip fold pyoderma, scaly dermatitis, chronic otorrhoea, mammary tumors etc were documented. Many pets recovered fully with rational therapy and timely attention. The animals which lost a limb could live normally with its fellow animals. Recovery from paralysis was seen only in limited number of cases. Many of the eye problems could be treated with promising results. Cases with changes in parenchymatous organs were found to have even systemic problems like leptospirosis, diabetes mellitus etc. All most all the cases of integumentary system were neglected cases of dermatological problems which responded promptly with appropriate chemotherapy. A common and pinching factor observed in the failed cases was their agony for separation from the owners.



## 24. Canine urolithiasis- retrospective and comparative evaluation of urethrotomy with or without cystotomy in clinical cases

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A retrospective study on incidence of urolithiasis and comparative evaluation of urethrotomy with or without cystotomy was carried out between 1<sup>st</sup> April, 2001 to 31<sup>st</sup> March, 2002. Total number of urolithiasis cases reported was 224. Out of the total positive cases 58.82 % of uroliths occur in males and 41.18 % in females. Twelve urolithiasis cases were randomly grouped into two equal groups where urethrotomy was performed in Group I and urethrotomy along with cystotomy was performed in Group II. Anaesthesia was maintained with Diazepam-Ketamine and the patients were monitored for a period of one year post surgery. In Group I, three cases out of six undergoing urethrotomy were reported for reoccurrence within a period of six to eight months whereas in Group II, all the cases recovered without any reoccurrence of urolithiasis during the period of study. Chemical analysis of uroliths revealed calcium oxalate crystals and dietary restriction were advised. Urethrotomy gives a quick relief in condition of anuria however, there is every possibility of reoccurrence. Urethrotomy along with cystotomy helps to reduce the chance of reoccurrence of canine urolithiasis in clinical practice.

## 25. Allogenic mesenchymal stem cells with and without platelet derived growth factor for wound healing in rabbits

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Wound healing potential of allogenic mesenchymal stem cells alone (Group ST) and along with platelet derived growth factor (Group SP) was evaluated on full-thickness skin wounds on adult New Zealand white rabbits. Bone marrow collection as well as wound creation was carried out under xylazine and ketamine anaesthesia. Collection, isolation and culture of MSCs were done in a routine manner under strict aseptic conditions. The experimental study consisted of three treatments viz. sub-cutaneous injection of stem cells around wound margins (ST), sub-cutaneous injection of stem cells along with topical application of PDGF hydrogel (SP) and topical application of PBS which served as control (Group C). Different clinicophysiological and hematobiochemical parameters along with gross, photographic as well as microscopic (histopathological and histochemical) evaluation were recorded for each wound. Statistical analysis was done using Analysis of Variance (ANOVA), paired t-test and Kruskal-Wallis test. Amongst all 3 groups, application of SP and ST treatments augmented healing of excisional wounds, but SP resulted in early and faster wound contraction, granulation tissue appearance and shorter duration of complete healing of excisional wounds than ST and C group. Histopathological and histochemical studies revealed that SP augmented wound healing activity significantly by increasing cellular proliferation, early control of inflammatory reaction, increasing the formation of granulation tissue, neovascularization, synthesis of collagen and better epithelialization and early histological maturation. The overall assessment of the parameters showed faster and scar less wound healing in SP group, which was followed by ST and control group.





## 26. Diagnosis and surgical management of thoracic trauma in dogs

*J. Mohindroo, P. Verma, S. S. Singh, M. Raghunath and Tarunbir Singh*

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The study included five cases of thoracic trauma presented to the Veterinary Hospital at GADVASU, Ludhiana. Routine physical examination was done in all the animals. Based on the condition suspected, radiography and ultrasonography was done to establish the pathology. The cases included diaphragmatic hernia with herniation of liver (n=1), traumatic pneumothorax (n=3) and unilateral open thorax (n=1). Surgery was done under positive pressure ventilation and inhalation anesthesia using isoflurane. Four animals survived the treatment while one animal died. The paper describes the diagnosis and surgical protocols for thoracic trauma in dogs.

## 27. Segmental horizontal body mandibulectomy for management of mandibular osteosarcoma in a dog

*Saini N. S, Mahajan S. K, Sangwan V. and Kumar A.*

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The present case report discuss about the diagnosis and treatment of clinically affected dog suffering from osteosarcoma of mandible. Case was presented with a soft tissue growth on the medial side involving mandible. Segmental horizontal body mandibulectomy was performed under general anesthesia. On histopathological examination, osteosarcoma was confirmed. Animal did not face any problem in drinking and feeding. However, the tongue was always hanging to one side. Animal remained disease free for three months and again developed soft tissue growth which was again operated and removed. Animal developed malignancy and was euthanised six months after the first operation.

## 28. Unusual non metallic intestinal foreign bodies in dogs and their surgical management – report of six cases

*S. Kathirvel, S. Dharmaceelan, S. Senthilkumar, K. Jayakumar, R. Thangadurai, K. S. Ramakrishnan and N. Rajendran*

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Intestinal obstructions are common in dogs due to their playful habits and swallowing without chewing. In the present study the dogs of various breeds reported for gastrointestinal foreign bodies to the Veterinary College and Research Institute Hospital, Namakkal, Tamil Nadu were operated. The unusual foreign bodies like shuttle cork bottom, radium fancy ball and wood materials were diagnosed by radiography. In all the cases the non metallic foreign bodies were retrieved through enterotomy as per standard surgical procedure. All the animals made an uneventful recovery.





## 29. Surgical management of eviscerated fetus in a queen cat

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Department of Veterinary Surgery and Radiology, Veterinary College and Research Institute, Namakkal, Tamil Nadu - 637002.

A two year old non-descriptive pregnant queen cat was presented with the history of cat bite wound in the lower abdomen with a leg of a fetus protruded outside the skin through the wound. Clinical examination revealed animal was active and alert without any abnormality. Anaesthesia was induced with xylazine and ketamine hydrochloride and an incision was given over the bite wound to extend it. The dead fetus was found protruding through rupture of the left uterine horn created by the bite and recovered. Further exploration of the abdominal cavity revealed one more dead fetus which already escaped into the abdominal cavity through the rupture. On examination the right horn was healthy and had two live fetuses within it. By *enbloc* resection the two live kittens were recovered and saved. The abdominal muscle and skin were closed as per the standard surgical procedure after debridement. Post operatively the cat was maintained with antibiotic and analgesic. The cat was recovered uneventfully.

## 30. A study on use of n-butyl-2-cyanoacrylate in the treatment of corneal ulcers in dogs

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The present study was undertaken in six dogs presented with corneal ulcers. The affected eyes were examined grossly and under magnification. STT1 and Fluorescein dye tests were conducted on the affected eyes. Culture and Sensitivity tests were performed prior to instillation of any drug. Under general anaesthesia, the affected cornea was irrigated with normal saline prior to surgery to remove any debris and necrotic tissue. The eyelids were held open using a suitable eye speculum wherever necessary and the globe was fixed using a pair of Colibri forceps. The edges of the ulcer were debrided and the ulcer bed was cleaned and dried with sterile cotton tipped swabs. A single drop of the cyanoacrylate adhesive was applied through a 30-gauge needle on the corneal ulcer. It was concluded that N-Butyl-2-Cyanoacrylate tissue adhesives helped corneal healing by providing tectonic support and bacteriostatic action.

## 31. Surgical management of aural hematoma in dogs using corrugated drain sheet- a clinical study.

*B. Ramesh Kumar; R. M. D. Alphonse, T. P. Balagopalan, N. Arul Jothi and Samantha R. J.*

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A clinical study using corrugated drainage sheet for surgical management of aural hematoma in dogs was conducted at the Dept. Of Veterinary Surgery and Radiology, teaching veterinary clinical complex, RAGACOVAS, Puducherry between April 2011- August 2012. A total of 22 dogs reported with aural hematoma were taken for the study. All the animals were prepared for aseptic surgery and anaesthetized with Xylazine (@1 mg/kg body wt) and Ketamine (@ 10mg/kg body wt) by intravenous route. The affected ear flap was opened at two places and drained the contents. The cavity was flushed with 0.5% Povidone Iodine- Normal saline solution and postoperative drainage was provided with a corrugated drainage sheet (Romsons) fixed by two stay sutures. Regular wound dressing and drainage of the contents were carried out. All the animals were administered



with post operative antibiotics for five days and the drain sheet was removed on the seventh post operative day. All the animals made an uneventful recovery.

### 32. Surgical management of unusual foreign bodies from gastrointestinal tract in dogs

*Samantha R. J ; B. Ramesh Kumar; R. M. D. Alphonse., T. P. Balagopalan and N. Arul Jothi.*

Department of Veterinary Surgery and Radiology, Rajiv Gandhi College of Veterinary and Animal Sciences, Pondicherry-9

Seven clinical cases with the history of anorexia, pyrexia and congested mucous membranereported at the Teaching hospital, Rajiv Gandhi College of Veterinary and Animal Sciences, Pondicherry during 2011-2012. Physical examination, ultra Sonography, and radiological procedures were carried out to confirm the presence of the foreign body in all the cases. Radiolucent foreign bodies were identified in five cases by sonography and radio- opaque foreign bodies in 2 cases in radiography. Exploratory coeliotomy was performed under tranquilization Diazepam (@ 1 mg/kg body wt) with and induction with Xylazine (@1mg/kg body wt) and Ketamine (@10mg/kg body wt) and maintenance with gaseous anaesthesia using 1-2% Isoflurane and oxygen mixture using Bayle's anesthetic apparatus. In two cases foreign bodies were removed from the stomach and in others from jejunum and ileum. Post operatively the animals were administered with antibiotics for 7 days and fluid therapy for 3 days and sutures removed on tenth post operative day. All the animals made an uneventful recovery.

### 33. A clinical study on paralysis in dog

*Priya Nagare, Gahlod B. M., Thorat M. G., Akhare S. B., Dhakate M. S. and Kamble M. V.*

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The study was carried out to record the prevalence of paralysis of limb, to study the efficacy of actinotherapy, electrotherapy and conservative therapy in the treatment of paraplegic dogs. The 18 clinical cases of paralysis of limb in dogs were divided in three groups comprising of 10 cases of paraplegia, four cases of hemiplegia and four cases of quadriplegia in group I, II and III, respectively. The clinical, neurological, haematological and biochemical observations were recorded at scheduled intervals. On the basis of results recorded in the present study, it is concluded that the highest incidence of paralysis in age group of 0-6 months (45.40%), more in male (61.11%) and highest prevalence in non descript dogs (61.11%) followed by German Shepherd, Labrador, Pomeranian and Terrier. The cause of paralysis in dogs was mostly due to automobile accident (44.44%), while onset of paralysis was sudden in 33.33% cases. The radiographic examinations revealed vertebral compression and intervertebral disc protrusion (11.11%), fracture of vertebral column (11.11%), fracture of pelvic girdle (11.11%), spondylosis and spur formation (5.55%) and no lesion (61.11%) cases. The conservative therapy with methyl prednisolone, actinotherapy and electrotherapy were effective in majority of cases. Haematological and biochemical parameters viz. TLC, DLC, BUN, total protein, blood glucose did not show significant changes during study. Physiotherapy, maintenance of hygiene, provision of soft, clean bedding and regular grooming/bath to the paraplegic patient plays an important role in recovery.

### 34. Surgico-therapeutic management of oral affections in canine

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The study on surgico-therapeutic management of oral affections in canine was conducted on 65 clinical cases presented to the TVCC, Nagpur Veterinary College, Nagpur. The diagnosis was made on the basis of history, clinical observations, cultural



examination and histopathology of oral tumours. The incidence of oral affections in clinical cases in canine was reported as under 41.53% (27) dental tartar, 6.15% (4) epulis, 6.15% (4) oral papilloma, 4.61% (3) foreign body in mouth, 1.53 (1) tongue tumour, 4.61% (3) magotted wound of palate, 1.53% (1) oral tumpur, 9.23% (6) gingivitis, 4.61% (3) gingival hyperplasia, 3.08% (2) stomatitis, 13.84% (9) teeth shedding, 1.53% (1) oronasal fistula and 1.53% (1) dental fistula. It is concluded that the incidence of oral affections was more in age group 9-12 years (52.03%), higher in male (66.15%) as compared to female (33.84%) and higher prevalence in Pomeranian (43.07%) followed by non-descript, German Shepherd and others. Vegetarian dogs (33.84%) are more prone for oral affections than dogs maintained on non vegetarian or commercial food (13.84%). *Staphylococcus aureus* was found predominant among the isolates from dental tartar samples. Periodical dental scaling is effective method for maintaining oral hygiene and to prevent periodontal disorders. The use of liquid sensofom for a period of week reduces the sensitivity of teeth and was found to be very effective for sulcular lavage after dental sealing. Surgical excision of epulis and oral tumour is the best method to treat the affections. Haematobiochemical parameters like TEC, TLC, DLC, TPC, Hb and PCV did not showed significant changes during the study. Histomorphological study of oral tumour tissue reveals squamous cell carcinoma (20%), odontogenic tumour (60%) and gum tumour (20%). Awareness about the importance of oral and dental hygiene should be made a part of the continuous veterinary education for pet practioners to reduce the incidence of periodontal disease.

### **35. Repair of corneal defects in chinese pugs using collagen sheet from small intestine submucosa**

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Collagen sheet of bovine small intestinal originis ready available and cost effective. Eight Chinese pug dogs presented to the Veterinary College Hospital, Mannuthy, Thrissur, Kerala with various thickness defects of cornea were subjected to collagen sheet placement. The collagen sheet was placed over the newly prepared recipient bed on the cornea after soaking in Gentamicin eye drop and was sutured on to the bulbar conjunctiva using 4/0 silk at 12, 3, 6 and 9'O clock position with simple interrupted sutures followed by placement of temporary tarsorrhaphy sutures. The sutures were removed on the seventh post-operative day. Collagen sheet placement along with proper management helped to attain optimum results and preserved vision as it maintained corneal transparency and cornel integrity.

### **36. Experimental production of diabetes in rabbits**

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Experimental induction of diabetes, have been reported to cause significant mortalities in earlier studies. In the present study, diabetes was induced in 27 New Zealand White rabbits by intraperitoneal administration of alloxan monohydrate. Sterile solution of alloxan monohydrate in NSS was administered intraperitoneally @ 60 mg per kg body wt. in well fed rabbits. The diabetic blood sugar level was achieved within 20-25 days in almost all animals. It was concluded that diabetes can be produced experimentally by intraperitoneal administration of alloxan monohydrate at the dose rate of 60 mg/ kg body weight in rabbits and to avoid mortality it should be administered in well fed rabbits.



### **37. Laparoscopic versus conventional ovariectomy in female dogs- A comparison of hematological, biochemical changes and post-operative wound scores**

***Ketki Raje, Narinder Singh Saini, Jitender Mohindroo, Shashikant Mahajan, Tarunbir Singh, Anuj Pratap Singh***

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A total of eight healthy, non-pregnant female dogs were ovariectomized laparoscopically (n=4) and conventionally (n=4). Hematological examination included complete blood count while biochemical examination included liver and kidney function tests along with blood glucose and serum cortisol as stress-markers. The laparoscopic group showed significantly higher values of Hb and PCV on day 12, TEC on days 2 and 12 and TP on day 12 than the conventional group. Significantly lower values of serum AST on day 12 and those of ALT on days 0 and 2 were observed in the laparoscopic group as compared to the conventional group. On day 12, serum cortisol and on day 4, total wound score of the laparoscopic group were significantly lesser than those of the conventional group. Thus laparoscopic procedure was found to be a better and less stressful alternative over the conventional method of ovariectomy in female dogs.

### **38. Adnexial tumour in dogs: report of five cases**

***Ramesh Rathod, L. Ranganath, A. S. Patil, V. Mahesh, B. N. Nagaraja, H. C. Shivaiah, and H. S. Rajendraprasad.***

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Adnexial tumors are common tumors often noticed in various forms on the animal body. Such tumors are commonly found on ears, chest, loin region and forehead region. Five dogs were presented to the Veterinary College Hospital, Bangalore over period of one year (2010-2011), with a history of swelling over the left thorax, lumbar, upper side of left eye, dorsal surface of neck and on the ear pinna. Duration of lesion growth ranged from two months to one year, which was refractory to medical treatment. Upon physical palpation movable hard mass was felt, not adhering to bony tissue. In all the cases surgical excision was performed. In one dog where the mass was on the ear, it was subjected by electrosurgery. Excised masses were hard, weighing between 200 gms to 700 gms which were sent for histopathology. Histopathological examination confirmed it as adnexial sebaceous gland tumor. Animals recovered uneventfully by tenth post-operative day. There were no reoccurrences noticed in one year follow up period.

### **39. Gastro-intestinal tract obstruction in dogs: five year review**

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Gastro-intestinal obstructions are common in dogs and it can occur in any part of the gastro-intestinal tract, but most often in small intestine due to its narrow lumen. A total of 107 cases of GIT foreign bodies in dogs causing obstruction were diagnosed and treated at the department of Veterinary Surgery and Radiology, Veterinary College Hospital Bangalore over a five year period (2006-11). The data collected was analyzed for breed, age, sex and season wise incidence of GIT obstruction due to foreign bodies. The causes were divided based on anatomical occurrence of obstruction i.e oesophageal-06, stomach-15, intestines-86, the clinical symptoms, treatment undertaken and outcome are discussed. Survey radiograph was useful in detecting radioopaque materials and contrast radiography in radiolucent foreign bodies. Clinical symptoms included anorexia,



Vomition and dyschesia and not responding to the medical treatment. The foreign bodies included stone, marble stone, wire mesh, corn cobb, cotton rope, tennis ball, bone piece, jack fruit seed, remote rubber cover, mango kernal and intramural mass (Adenocarcinoma). The intestinal lumen was closed with 2-0 chromic catgut by simple interrupted pattern with knots inside. Linea alba was closed with polyglactin 910 in simple interrupted pattern. Subcutaneous and skin were opposed in routine manner. Animals made uneventful recovery by 10<sup>th</sup> post-operative day.

#### **40. Use of VDM combination for the treatment of connective tissue neoplasm in dogs.**

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A tumor is any sort of lump, bump, growth or swelling. Tumor invades neighboring tissue and continues to grow in unrestricted way, Malignant tumors are actually life threatening can be cured by combination of surgery and chemotherapy. Objective of the present study was to study the efficacy of chemotherapeutic combination in treatment of connective tissue tumors. A total of 30 cases were suspected for tumors and 15 cases were confirmed to be connective tissue tumors after histopathology. Out of these 15 cases only 5 cases were diagnosed as malignant connective tissue tumors and 10 were benign connective tissue tumor. The tumor of each animal was excised surgically and tissue samples were sent for histo pathological examination. Based on histo pathological findings tumor was categorized as benign/malignant. Animals having benign tumor were given routine post-operative treatment and chemotherapeutic treatment for animals having malignant tumors were started 10<sup>th</sup> day after surgery with the use of VDM (vincristine ,doxorubicin, methotrexate) combination. Out of five cases of malignant connective tissue tumors, who after surgery received the chemotherapy, one dog died during first cycle of chemotherapy and also showed very fast recurrence of tumor. Another dog died after completion of first cycle of chemotherapy without apparently showing signs of recurrence of tumor. One more dog showed recurrence after six months, received second cycle of chemotherapy and still alive. Two more dogs showed no sign of recurrence even after six months of surgery and still alive. Conclusion of the study was that VDM combination was safe, economic and easy to administer and effective in prolonging the disease free survival time in dogs.

#### **41. Comparative gross studies on combination of collagen particles, metronidazole and mupirocin with povidone iodine on open wound healing in dogs**

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The objective of present study was to evaluate combination of drug collagen particles, metronidazole and mupirocin on wound healing. The study was conducted on 12 dogs randomly divided in 2 groups irrespective of age, sex, breed, and location of wound. Each group was consisting of 6 animals each. The group I animals were treated with combination drug Collagen Particles, Metronidazole and Mupirocin (CMM) + parenteral antibiotic and the second group animals treated with povidone – iodine solution + parenteral antibiotic. Wound surface studies (Using the Planimetric method) were done on day's 0<sup>th</sup> , 3<sup>rd</sup> , 7<sup>th</sup> , 10<sup>th</sup> and 14<sup>th</sup>. A highly significant increase in the percentage of wound contraction and percentage of wound re-epithelialization was noted in the combination (CMM) treated group. The percentage of wound contraction and percentage of wound re-epithelialization was higher in group I and lesser in group II. There was a highly significant decrease in the percentage of unhealed wound area in the combination (CMM) treated group. The maximum decrease in the size of wound was observed in group I, than group II. The percentage of wound contraction on day 7<sup>th</sup> was significantly higher than those





on day 10<sup>th</sup> and 14<sup>th</sup>. A highly significant decrease in the percentage of unhealed wound area was noted in group I on days 7<sup>th</sup>, 10<sup>th</sup> as compared to day 14<sup>th</sup> within the group and between the group. Thus the present study reveals that group I animals healed better and faster as compared to group II animals.

## 42. Hematobiochemical and histopathological evaluation of combination of collagen particles, metronidazole and mupirocin with povidone iodine on open wound healing in dogs

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The objective of present study was to evaluate combination of drug collagen particles, metronidazole and mupirocin on wound healing. The study was conducted on 12 dogs randomly divided in 2 groups irrespective of age, sex, breed, and location of wound. Each group was consisting of 6 animals each. The group I animals were treated with combination drug Collagen Particles, Metronidazole and Mupirocin (CMM) + parenteral antibiotic and the second group animals treated with povidone – iodine solution + parenteral antibiotic. Haematological and Biochemical studies was done on days 0, 7<sup>th</sup> and 14<sup>th</sup>. The total erythrocyte counts, haemoglobin, total leukocyte count and packed cell volume values did not have any significant difference between the groups or within groups. A non significant decrease in total leucocyte count was observed in both groups as the wound healing progressed and the total protein, blood glucose and alanine aminotransferase values did not show any significant differences between the groups or within the groups. Skin biopsies of 3mm were obtained on 0<sup>th</sup>, 7<sup>th</sup> and 14<sup>th</sup> day of the study for histopathological studies. After treatment, 3 mm biopsies were collected from the healed area to study the changes. There was no highly significant differences noticed in the cell pattern between the combination (CMM) treated group and the povidone – iodine group. The difference of thickness of epidermis and large amount of collagen formation was observed, in combination (CMM) treated group, epidermis was thicker and large amount of collagen was present as compared to povidone – iodine group. Thus the present study reveals that group I animals healed better and faster as compared to group II animals.

## 43. Clinical use of Multifactorial Numerical Rating Scale (NRS) for assessment of pain and response to analgesics in elective abdominal surgery of dogs

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Twelve dogs underwent for elective abdominal surgery for study. These animals were randomly divided into two groups each having six dogs and were administered with Inj. buprenorphine (0.01 mg/kg b.wt. IM for 2 days, b.i.d) and Tab. carprofen (4 mg/kg b.wt. orally for 2 days, t.i.d) respectively for postoperative analgesia for 2 days. Pain evaluated preoperative (1 hour before surgery), immediate post recovery, 8, 24 and 48 hours postoperatively using Multifactorial Numerical Rating Scale (NRS). Evaluation of analgesia by NRS showed no significant difference in the analgesia provided by buprenorphine and carprofen. However, carprofen provided comparatively longer duration of analgesia than buprenorphine and thus increased pain score was present at after recovery and 8 hours. However, at 48 hours pain score comes near the base value in both groups. Total pain score in carprofen group decreased from 3.83 to 0.16 and in buprenorphine group the scores decreased from 4.83 to 0.33.





#### **44. Evaluation of clinical and biochemical parameters following electroacupuncture and interferential therapy for healing of experimental bone defect in rabbits**

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The present study was conducted to evaluate and compare the efficacy of different physiotherapeutic modalities such as electroacupuncture and interferential therapy on bone healing and also to investigate their effect on stress response on experimental rabbits with bone defect. Eighteen adult New Zealand White rabbits of either sex were randomly divided into 3 groups (group A, B and C) of 6 animals each. The animals were treated with antibiotics (cefotaxim @ 50mg/kg by IM, OD X 5 days) and analgesic (meloxicam @ 0.5 mg/kg by IM, OD X 3 days) and were not offered any additional therapy. The animals in group B weretreated with electroacupuncture given at acupoints LI-4, LI- 11, GB-39 and ST-36 using 50Hz and 3-10mA DD current for 10 min, animals in group C were given interferential therapy (100 KHz) with bipolar method for 10min respectively on alternate days up to 2 wks while the animals in group A which were not given any treatment served as control. A 2 mm bone defect was created in the mid shaft of radius of right limb in each animal under xylazine and ketamine anesthesia. The rate of bone healing was evaluated on the basis of different clinical parameter viz. appearance of incision site, swelling, pain perception, weight wearing score and biochemical parameters viz. Ca, P, ALP, Cortisol and Lipid peroxidation. There was early resolution of swelling, pain and weight bearing in group B followed by groups C and A. Decreased level of calcium and increased levels of serum ALP and phosphorus with low Cortisol and Lipid peroxidation were recorded in group B followed by groups C and A. On the basis of present study it was concluded that healing of bone defect was faster with electroacupuncture therapy, followed by interferential therapy and control. Physiological stress induced due to creation of bone defect was effectively ameliorated by electroacupuncture therapy followed by interferential therapy as compared to untreated animals.

#### **45. Early neutering in dogs (end) and rehabilitation - permanent solution for stray dog menace in a long term perspective**

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Barking dogs chasing two- wheeler-riders, pedestrians, joggers and hawkers will be a thing of past when Early Neutering in Dogs (END) and rehabilitation project is scaled up and implemented. The pilot study was carried at Kerala Veterinary and Animal Sciences University Veterinary Hospital, Kokkalai, Thrissur with financial aid from the Department of Animal Husbandry, Kerala. and project completed on 31-03-2012. The study was conducted in 50 puppies of 2-3 months age collected from various parts of Thrissur. All the puppies were sheltered and observed for one month. The surgical sterilization was performed in all animals .The females were sterilized by hysterectomy and males by vasectomy under general anaesthesia. Standard surgical and post operative procedures were followed in all the cases. The skin sutures were removed on the eighth post operative day and vaccinated all puppies against rabies. These vaccinated puppies were given for adoption by animal lovers. Now these puppies are maintained in various houses of Thrissur as guard dogs. Even though the project has completed with that but the surgery and adoption programme is going on with public support and so far 150 puppies were given for adoption. The project team has visited selected houses after six months and documented the feedback from the persons who adopted the pups. The dogs in the new houses as guard dogs are as that of any pet animals. The result of the study was quite encouraging to adopt it for the permanent solution for the stabilization and control of stray dogs in a phased manner so that the abandoned puppies are removed from the street; they get a better shelter and can avoid an unwanted litter. In contrast to the present ABC programme, catching and maintenance of puppies were easy at 2-3 months age. Handling of



puppies during pre surgical, surgical and post surgical period was not a problem. Surgical procedure adopted in the study was found simple to perform by a veterinarian under any field veterinary hospital situation after receiving a short training in surgery. Healing of laparotomy wound in female puppies were faster with no complications and no need for suture removal in males after vasectomy as a small incision can close with a single simple interrupted suture using catgut. The sterilized puppies were well accepted by the public and rehabilitation by adoption is the biggest advantage of this project. The cost for capture, maintenances and surgery could be reduced considerably. The number of stray dogs can be stabilized by adopting this method all over India as a permanent solution for stray dog menace in a long perspective along with the ABC programmes for the immediate result. For Technical Support-contact Kerala Veterinary and Animal Sciences University, Kerala.(Author can be contacted by e- mail- drmknarayanan@gmail.com ; Mob 9447019009)

#### **46. Ultrasonographic and radiographic diagnosis of foreign bodies and its successful retrieval in dogs**

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Ten cases of dogs (aged 5 months to 6 years) with symptoms of vomition, retching, uneasiness, diarrhea/constipation were diagnosed for presence of foreign bodies with the help of radiography and ultrasonography. The major sites of foreign body lodgments were buccal cavity, cervical esophagus, stomach and intestine. Sewing needle, rubber material, plastic wares, coins, metallic materials (shaving blades, key rings, bottle tap etc.), leather piece, cloths and phytocoliths were retrieved from these dogs. The operative procedure was performed under xylazine and ketamine anesthesia. Dogs those undergone gastrotomy and enterotomy were maintained on fluid therapy for 5 to 6 days along with antimicrobial, analgesic, antiemetic and antacid as per necessity. All the dogs showed uneventful recovery.

#### **47. Successful corrections of unusual congenital anomalies in canine**

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Eight dogs within 10 days to 1.5 years of age were reported having different congenital anomalies like atresia ani, rectovaginal fistulae, nostril defect, pseudo tail and anus, chrypchortic testis, limb defect, dual penis, urethral orifice defect. The corrective surgery was performed under xylazine and ketamin anesthesia in all dogs. Post-operative care was given with antibiotic, analgesic and B – complex as per necessity. All the dogs showed effective recovery.

#### **48. Chronic case of intestinal obstruction in a dog.**

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A German shepherd male dog aged about 3 years was presented with history of chronic vomiting from 3 months, not responding to symptomatic treatment. History revealed that the animal was fond of playing with balls. On clinical examination, sub normal body temperature, weight loss was found and the animal was in state of negative energy balance. The animal was subjected to survey radiography in lateral and dorso-ventral position. The radiograph revealed radiolucent image in left side of mid-adnominal cavity. USG examination revealed a hypoechoic circular image in caudal abdomen. The foreign body



was also palpated in this region. These findings conclusively supported the presence of a ball like substance at ileo-caecocolic junction. After confirmation of diagnosis of foreign body the laparotomy was performed under general anaesthesia with atropine@0.02mg/kg i.m, Xylazine Hcl @ 1.0 mg/ kg i.m and Ketamine Hcl @ 6mg/ kg i.m. The abdominal cavity was explored for the foreign body and the affected part of intestine was exteriorized. The enterotomy was performed for retrieval of the crazy ball. Enterotomy incision was closed with two layers of inversion suture pattern using catgut No 2-0. The incision was lavaged with Normal Saline 0.9% to remove any contamination. The laparotomy wound was closed in routine manner. Skin was closed with simple interrupted sutures using braided silk No1. Fluid therapy with DNS or Ringer's lactate was also administered during post operative period. Antibiotic and analgesic were also injected to animal. Animal was maintained on fluid therapy and oral glucose solution for five days and was gradually shifted to normal diet. Animal recovered uneventfully after surgery.

#### **49. Gross, haematological and biochemical studies of canine mammary gland tumors treated with NS1 gene of Canine Parvo virus**

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The present investigation was carried on 10 dogs affected with mammary gland tumours. In this studies gross, haematological and biochemical studies of mammary gland tumors were made following administration of NS1 gene of Canine Parvo virus. All the animals were subjected to the intratumoural administration of NS1 gene @ 200µg at weekly intervals upto 4 weeks. The efficacy of gene therapy was evaluated by determining gross appearance of the tumour mass (surface area and volume of the tumour mass), and the haematobiochemical parameters (Hb, ESR, PCV, TLC, TEC, DLC, BUN, Creatinine, ALT and AST) at weekly interval. On the basis of above mentioned parameters it was revealed that NS1 gene may be a promising agent for the treatment of mammary gland tumours in dogs.

#### **50. Studies on the effect of stem cells and gold nano particles for hepatic regeneration in dogs**

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Twenty four dogs of either sex naturally suffering with hepatic dysfunction were used in this study with the objective to investigate the potential of hepatocytic stem cells and gold nanoparticles for augmenting the healing of hepatic damage in canines. The animals were randomly divided into four groups administered with different drugs viz. neohepatex @ 1ml/10kg body weight, IM alternatively for fifteen days (Group A), gold nanoparticles @ 5ppm, intraperitoneally only once + neohepatex @1ml/10kg body weight alternatively for fifteen days IM (Group B), Hepatocytic stem cells @ 5X10<sup>7</sup> cells, intraperitoneally only once(Group C) and hepatocytic stem cells @ 5x10<sup>7</sup> intraperitoneally + gold nano particles @5ppm, intraperitoneally once (Group D). The clinical signs, haematological, biochemical, histological and ultrastructural studies were made at 0, 3, 6, 10, 15, 20th day using standard protocols. On the basis of parameters observed it was concluded that combination of hepatocytic stem cells and gold nanoparticles have the potential for liver regeneration as compared to other treatment used in this study.



## 51. Gross, haematobiochemical and histopathological studies of canine venereal tumour treated with ns-1 gene of canine parvo virus and vincristine.

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The present study was conducted to evaluate the oncolytic effect of NS1 gene of Canine Parvo Virus and vincristine in canine transmissible venereal tumour (CTVT). Sixteen dogs of either sex with naturally occurring CTVT used in this study were randomly divided into four groups. The animals were administered with different drugs combination viz. Plasmid without NS1 gene @ 100µg, intratumoural (Group A); NS1 gene @ 100µg, intratumoural (Group B); NS1 gene @100µg + Vincristine @ 0.025mg/kg body weight, I.V (Group C); and Vincristine alone intravenously @ 0.025mg/kg body weight (Group D), at weekly interval for four consecutive weeks. The effect of the gene therapy with or without chemotherapy was evaluated using physical, haematobiochemical and histopathological TUNEL assays and Fluorescent activated cell sorting parameters. The changes were recorded at 0 week, first, second, third and fourth week using standard protocol. The result revealed regression in CTVT cell at first and second week interval was more in the animals treated with NS1 + vincristine as compare to vincristine and NS1 gene alone. Combination of vincristine and NS1 gene is more effective as it shows early regression of tumour as compare to vincristine alone due the synergistic effect of both the component.

## 52. Clinical and ultrasonographic evaluation of bitches affected with pyometra

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Among the common major reproductive disorders in bitches, canine pyometra is a major one. Total nine bitches having gynaeco-clinical signs suspected of pyometra were evaluated by abdominal palpation and ultrasonography using 2.5-7.5 MHz sector probe through ventral midline approach. Ultrasonographic images of anechoic to hypoechoic fluid filled uterus with thick uterine wall confirmed all the nine bitches to be pyometric. The general condition of bitches with closed pyometra was poor, whereas it was fair in cases of open pyometra. The distension of abdomen was apparent in 33.33% cases and on palpation also the uterus was found distended. Inappetance, fever and vomition was observed in 88.89, 77.78 and 55.56 % of pyometric bitches, while toxemia, polyuria and polydipsia were present in 77.78, 66.67 and 77.78 % of bitches, respectively. Vaginal discharge sticking to the hair of tail and perineum was present in all 6 cases of open pyometra and it's colour varied from gray to chocolate with foul odour. Abdominal palpation was clear in 3 cases and unclear in 6 cases. It is thus concluded that ultrasonography is an effective diagnostic tool for the qualitative and quantitative evaluation and diagnosis of canine pyometra.

## 53. Study on gross, histopathological and microbiological changes in the uterii of bitches affected with pyometra

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Uterine pathology was evaluated in nine bitches affected with pyometra in relation to that in eight healthy bitches under pan-hysterectomy. Uterine horns of bitches affected with pyometra (n=9) ranged from 12 to 50 cm, with a mean length of right and



left horns  $21.17 \pm 3.88$  and  $23.67 \pm 4.52$  cm as against  $14.65 \pm 1.28$  and  $14.35 \pm 1.11$  cm in healthy spayed bitches ( $n=8$ ). The mean weight of intact organs of pyometric bitches was  $800.00 \pm 340.98$  (160 to 3000) g and in normal healthy bitches it was  $88.40 \pm 26.78$  g. The quantity of uterine content averaged  $432.78 \pm 252.58$  (15 to 2000) ml in pyometric bitches, being greater in closed pyometra (35-2000 ml). It's colour was blood mixed reddish brown (chocolate) to grayish white with watery to thick creamy consistency. Uterine content of all 9 cases of pyometra was found positive for bacterial isolates, viz., gram-negative bacilli in 6, gram-positive cocci in 2, and mixed isolates in 1 cases, whereas uterine swabs of all 8 healthy bitches were found sterile. Ciprofloxacin was the most effective antibiotic against isolates. Endometrium of pyometric bitches was found to be smooth in most cases and thickened in 3 cases. In cases of open pyometra, uterine walls were found thickened as compared to closed pyometra. In few cases oedema, thickening, corrugation or velvety appearance with roughened endometrium were observed. In majority of the cases endometrial surface was necrosed, ulcerated, eroded with focal to diffuse thickened cystic areas due to endometrial hyperplasia. Ovaries revealed corpora lutea, cysts and follicles in majority of pyometric bitches. Histopathological examination of uterine tissues from pyometric bitches revealed CEH and inflammatory reaction classical of cystic endometrial hyperplasia pyometra complex—a life threatening metestrus disease of bitches. Judiciously performed ovario-hysterectomy was found uneventful to grace life to the pyometric bitches.

## 54. Incidence and management of tumors in domestic animals

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Tumors of integuments are common in all domesticated and wild animals including birds, and are responsible for morbidity and mortality in sizable population depending upon the organ involved, the type and nature of growth and the treatment availed. This study was aimed to know the incidence and timely management of different type tumors in domesticated animals. A total of 33 cases of tumors were attended and managed surgically in different species of domestic animals over a period of six months. These included 25 in canine, 3 each in bovine and equine and 2 in camel. Canine tumours mainly included the mammary gland tumors of benign or malignant nature and of single or multiple types. Maximum cases were of fibroma (10), followed by squamous cell carcinoma and histiocytoma (4 each), basal cell carcinoma, hamangiopericytoma and fibrosarcoma (3 each), fibroadenoma (2), and liomyoma, seminoma, osteoma and myoepithelioma (1 each). The clinical diagnosis based on gross physical appearance of tumorous growths was made followed by their surgical resection using standard anesthetic and operative techniques. No any untoward sequelae was noted in any of the cases attended. The histopathological findings of these tumors were classical and true to the nature. Surgical removal of the entire mass was the treatment of choice for tumors. Benign tumors only affected the site but most malignant cancers had already spread before being diagnosed and treated. It was inferred that canines are more prone to tumors of varying nature and mammary tumors in particular, which can be successfully managed surgically.

## 55. Adjuvant combination chemotherapy for malignant cutaneous tumour in dogs

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The present study was conducted to study occurrence of different type of cutaneous tumors in dogs and to evaluate the comparative efficacy of Doxorubicin and Cyclophosphamide as one combination and 5-Fluoro-uracil and Cyclophosphamide in other combination. The tumors were classified on the basis of histopathological examination and 20 malignant tumor cases were selected for the study. Group-I consisted of 10 dogs of either sex and the chemotherapeutic protocol was a combination





of 5-fluorouracil (150 mg/m<sup>2</sup> BSA) and Cyclophosphamide (100 mg/m<sup>2</sup> BSA) which was given on 10th day postoperatively, intravenously and repeated for four consecutive weeks. Group II consisted of 10 dogs of both sex and one week after the operation, adjuvant chemotherapy of Doxorubicin and Cyclophosphamide was administered using the schedule: Doxorubicin, intravenously at 30mg/m<sup>2</sup> once weekly, for 3 consecutive weeks. Cyclophosphamide, intravenously at 100 mg/m<sup>2</sup>, 3 days after the Doxorubicin administration, for 3 consecutive weeks. Cutaneous tumor was observed in young animals aged 2 years, maximum occurrence was noticed between 5-10 years. There was no breed predilection, however more cases were observed in Pomeranian followed by Nondescript and GSD dogs. The size of tumor were approximately tennis ball like in most cases but in one case of Haemangiosarcoma the size of tumor was nearly football like present on elbow of animal. In four cases of malignant tumors there were metastasis in lungs and small nodules were clearly observed in lateral thoracic radiograph. In group-I the disease free survival life was less but this protocol does not affect haematobiochemical parameters significantly. On the other hand, in group-II the disease free survival life was more but it affected the haematobiochemical parameters significantly. Both the protocols decreased most of the haematological parameters and increases BUN, Creatinine. There was transient decrease in haematological parameters but in normal range in both groups. Mean value of serum creatinine were higher since beginning of therapy and marked increase during chemotherapy. There were various complication developed during chemotherapy like anorexia, vomition, diarrhea, hypersensitivity decrease in haematological parameters, increase in BUN and creatinine but these complication were managed symptomatically. All the parameters returned to normal limits within 21-30 days. On the basis of haematobiochemical and clinical observations group-II (Cyclophosphamide+Doxorubicin) was found better than group-I combination (Cyclophosphamide+5-fluro uracil).

## 56. Management of true epiphora in canine

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ND Pashu ChikitsaVigyan Vishwavidyalya Jabalpur (M.P.)

The study was carried out in 6 healthy clinical cases of dogs presented at T.V.C.S.C. with signs of epiphora. All the 6 animals, were found to have nasolacrimal system defects included blockage of nasolacrimal duct, imperforate puncta and dacryocystitis, leading to faulty tear drainage which was confirmed via Jones Fluorescein Dye Test, Dacryocystorhinography, Ophthalmoscopy and Schirmer Tear Test (STT). These dogs were subjected to probing of nasolacrimal duct system followed by flushing with normal Saline and exit of fluid from external nares confirmed its patency. Post-operative observation revealed lacrimation was moderate on 3<sup>rd</sup> and 7<sup>th</sup> day in all cases while it was mild on 14<sup>th</sup> day. None of the cases showed lacrimal discharge on 21<sup>st</sup> day.

## 57. Comparative studies on open orchidectomy techniques in cats

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The present clinical study was conducted on comparative evaluation of two surgical techniques of spermatic cord ligation viz., square knot technique (Group-I, n=6) and suture technique (Group-II, n=6) in cats of different age group. All toms underwent twelve hour fasting with liquid diet on previous day before anaesthesia. Group-I toms were anaesthetized with combination mixture of Ketamine (22 mg/kg body weight), Midazolam (0.15 mg/kg body weight) and Atropine (0.04 mg/kg body weight) administered intramuscularly. Similarly Group-II toms were anaesthetized with mixture of Ketamine (22 mg/kg body weight), Diazepam (0.44 mg/kg body weight) and Atropine (0.04 mg/kg body weight). Different anaesthetic parameters remained within physiological limits and vomition or salivation was not observed during anesthesia. In Group-I





bilateral orchidectomy with square knotting of ductus deferens as one strand and remaining testicular vessels as another was found at ease in handling with less tissue edema and no complications. While in Group-II bilateral orchidectomy by ligation of spermatic cord with sutures was also free from complications except for slight postoperative edema. The time required for surgical intervention in both the groups was 11-13 minutes. Daily dressing with Povidone iodine- Metronidazole spray and Ceftriaxone with Tazobactam @ 25 mg/kg body weight intra muscular was followed for three days in both the groups. For pain management ketoprofen @ 2 mg/kg body weight (Group-I) and meloxicam @ 0.3 mg/kg body weight (Group-II) was administered for three consecutive days. Behavior evaluation of toms at two months after orchidectomy following owner counseling revealed reduction in territory range with mild increase in body weight. Thus the two open orchidectomy techniques involving spermatic cord ligation using square knot without suture and with suture were efficient for castration in cats.

## 58. Studies on implantation of intraocular lens in the eyes and ocular lens material in the muscles of rabbit

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The Poly (methyl methacrylate), Acrylic hydrophobic and Acrylic hydrophilic test implants were compared with the control implants in six healthy New Zealand White (NZW) rabbits. The ocular lens materials were implanted surgically into the body of paravertebral muscle. The animals were sacrificed after one month and implant together with sufficient unaffected tissue was excised and subjected to histopathological evaluation. The Poly (methyl methacrylate) IOLs (+21 Dioptre, 12.50 Haptic, 6 Optic Diameter) were implanted in the eyes of the rabbit by extracapsular cataract extraction (ECCE) technique and the contra lateral 6 right eyes were implanted with Acrylic hydrophilic foldable by Phacoemulsification technique. The rabbits were observed for a period of one month and the operated eyes were examined grossly and by slit lamp biomicroscopy. Grossly, tissue reactions like hematoma, edema, and encapsulation were not recorded at the paravertebral muscle implant sites. Histopathological examination of the implanted muscle sites and the implant material revealed no vascularization, fatty infiltration, granuloma formation or inflammatory cells. All the PMMA and Acrylic hydrophilic foldable IOLs were successfully implanted in the bag in the twelve eyes of six rabbits. Intraoperative complications observed were miosis and iris damage (1 eye). Post-operatively, all rabbits were subjected to slit lamp examination which revealed anteriorly dislocated lens, neovascularization with corneal edema, generalized corneal edema with AC flare and posterior synechiae and posterior capsular opacification. Ophthalmic reflexes were present in 11 eyes and absent in 1 eye. Intraocular pressure (IOP) of the operated eyes was within the normal range of 18 to 22 mm Hg for all the 11 eyes and buphthalmia with IOP 32 mmHg for 1 eye.

## 59. Surgical removal of anal gland tumors in four dogs with different histopathology

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Two adult Labrador retriever breed, one mongrel and one German shepherd dog with history of hard tumor like growth seen near perianal region. Difficulty in defecation, bleeding occurs in feces, continuous licking to anal region with normal appetite. Clinical study reveals with normal heart rate, respiration rate and temperature. Haematological examination reveals neutrophilia, lymphocytosis. Liver and kidney function tests are normal. All four Dogs were operated under Ketamine



diazepam mixture anesthesia. Removed anal gland tumors with different size. All four dogs show uneventful recovery after surgery. In two dogs recurrence seen after six month operated twice. Details of surgical procedures and histopathological findings were discussed.

## 60. Cell based therapy and rehabilitation of accidentally injured legs in himalayan long haired dog

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One 4 years old male dog of Himalayan Long haired breed was presented in TVCC, CVSc. and AH, Bhubaneswar with complain of chronic wound on both the hind legs and the animal was in poor health condition. From history it was known that during transportation from Srinagar to Bhubaneswar by train one serious accident occurred with loss both the hind legs. On the way they took some first-aid and then treated locally for many days, but the wound did not responded to treatment. On the day of presentation there was massive and necrosed wound on both the leg. Thereafter under direct supervision it was dressed for 15 days, but did not responded to treatment for healing. With the consent of the owner the cell based therapy was done by collecting bone marrow from same animal from antero-medial aspect of tibia. After BM-MSCs application it took 24 days for complete healing. Afterwards the animal was recovered and able to walk with the cut stump. From aesthetic point of view and with the request of the owner it was applied with artificial leg and wheel to move. After some days of training the animal was able to walk simulating normal walking posture. By adoption of stem cell therapy and adopting rehabilitation procedure even the animal can able to walk normally.

## 61. Congenital agenesis of prepuccial opening along with malformation of penis and its surgical repair in a pup

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Congenital agenesis of prepuccial opening is rarely seen in canine species. One such case of micro pore prepuccial opening along with malformation of penis was seen in a 5 days old GSD pup presented with complain of swelling of abdomen with anorexia and stoppage of urine since 2 days. From history it was known that the proposed prepuccial opening area was swollen and then urination occurs drop by drop. On palpation very small sized penis was felt. So it was prepared for surgery. The proposed site of opening was anaesthetized by xylocaine 2% diluted with distil water 1:1 and 1.5 cm long incision was made. The penis was felt but it was closely adherent to the surrounding area. Very carefully small nick was made and by blunt discussion the penis was cleared and slight urination has done. Keeping the prepuccial opening for free passage of urine the site was sutured. Post-operatively antibiotics and analgesics were administered for 7 days. After 10 days the suture were removed and it was seen that the pup is urinating freely and overcome from the difficulty of urination.



## 62. Intestinal obstruction in canine- study of twelve cases

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Twelve cases of intestinal obstruction in dogs presented at TVCC, Nagpur Veterinary College, during November 2009 to June 2010 were studied which included 9 cases of intussusception and one case each of foreign body, volvulus and trichobezoar. Young dogs below 12 months suffer mostly (10/12). Common symptoms included persistent vomiting, loose faeces sometimes with blood or dark brown mucoid, constipation was observed in two. Anorexia, dehydration, dullness, spasms, arched back, intermittent straining, tender abdomen were the other signs noted. A typical sausage shaped mass could be palpated. Most common site of intussusception was ileo-colic junction (06/09). Radiography and ultrasound coupled with clinical and laboratory investigation helped in diagnosing the cases.

The dogs were operated under dissociative anaesthesia. In fresh cases of intussusception, the adhesions were negligible and the intussusception could be relieved by simple end traction. In two cases, where there was hyperemia and extravasation of blood locally, the viability of the intestine was ascertained by using intravenous fluorescein sodium dye. Postoperatively parental fluid therapy with DNS and Ringer's Lactate along with antibiotic, analgesic, antacid and antiadhesive drugs were instituted for 5 days. The haemato-biochemical parameters revealed leucocytosis, neutrophilia, lymphopenia, eosinopenia, increased TEC, TPC, Haemoglobin and PCV values, Hyponatremia, hypokalemia and hypochloremia, preoperatively. All values returned to normalcy during postoperative period. One dog each suffering from intussusception and volvulus died during postoperative period.

## 63. Successful surgico-medical management of gastric dilatation & volvulus by minimal invasive & key hole approach – study of 15 cases

*A. A. Pawar, G. S. Khandekar, D. P. Raibole, S. S. Raut, D. U. Lokhande, S. D. Tripathi and L. B. Sarkate*

Department of Veterinary Surgery & Radiology, Bombay Veterinary College, Parel, Mumbai-400 012

Gastric Dilatation And volvulus (GDV) is an extremely serious condition and the increasing frequency of GDV together with an overall case-fatality rate of approximately 15% to 30% explains why GDV is the second leading cause of death in large breed dogs. Fifteen cases of Gastric dilation were reported. The condition was majority reported in male animals with age ranging from 2-8 years with max. between 2-4 years. All the dogs on arrival were subjected to survey radiograph after clinical examination & anamnesis. Attempt was made to pass stomach tube & Upon stabilization of patient were subjected for surgical intervention. Celiotomy was performed under Diazepam + 2.5% Thiopentone sodium anaesthesia. Gastric dilatation was decompressed by using sterile I/V infusion set tip and through the same opening, on passing the tube of suction machine, the gastric contents were removed by suction & manual method & lavaging of stomach performed. In no case gastropexy was performed and all the cases recovered without any eventuality with average post-operative recovery time of 12 days and till date no recurrence has been observed. The method proves much easier, less invasive with high success rate, hence recommended in field use.



## 64. Comparative study of conventional and laparoscopic assisted cryptorchidectomy in dogs.

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In this study six Cryptorchid dogs were operated by conventional method and remaining six were operated by laparoscopic assisted method of cryptorchidectomy under Xylazine, ketamine and 2% Isoflurane anaesthesia. In conventional method of cryptorchidectomy, Dogs were restrained on Trendelenberg or dorsoventral position and incision was made on the ventral abdomen and abdomen exposed. Vas deferens was followed cranially to locate the testis. Vas deferens, testicular artery and vein were triple ligated. Then abdomen layer and skin were sutured. In laparoscopic cryptorchidectomy, Dogs were placed in Trendelenburg position and insufflation was achieved with carbon dioxide. Three ports technique were used in this group, one for scope and two for forceps and cautery. During this the spermatic vessels and ductus deference was grasped with grasping forceps and cauterized with cautery forceps and scissors were used to cut the vessels and ductus deference. Less surgical time was recorded in laparoscopic assisted cryptorchidectomy than conventional cryptorchidectomy. There was a no significant difference in rectal temperature, respiratory rate, heart rate and pulse rate. In conventional method more time was required for maintenance of anaesthesia than laparoscopic cryptorchidectomy. However, in both the method it produces long duration. Result suggested that laparoscopic assisted method of cryptorchidectomy was found to be quick, effective and minimally invasive technique. Thus, could be used as an alternative to conventional cryptorchidectomy as also provides good visibility and exposure of the abdominal cavity and could be used as a day care surgery, allowing faster recovery to reduce the cost of postoperative management.

## 65. Comparative study on insufflation during laparoscopy with CO<sub>2</sub> and filtered room air in dogs and pigs.

*Khandekar G. S, L. B. Sarkate, D. U. Lokhande, K. R. Bendale, Mehraj Dar D. P. Raibole and A.A.Pawar*

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The clinical study was conducted on 24 dogs and 16 pigs. Further all the dogs were randomly divided into two groups viz. I and II each consisting of 12 dogs, while the pigs were divided into two groups namely III and IV each consisting 8 pigs. Induction of anaesthesia in the dogs of group I and II was done with Acepromazine (0.04 mg/kg IV) and Propofol (5 mg/kg). however maintainance of anaesthesia was done with incremental doses of Propofol in group I and 2.5 % Halothane in group II. Induction of anaesthesia in the pigs of group III and IV with Xylazine (1 mg/kg IM), ketamine (15 mg/kg IM) diazepam (0.5 mg/kg) and maintenance of anaesthesia was done with incremental doses of combination of ketamine (10 mg/kg) and diazepam (0.25 mg/ kg) in group III and IV. Insufflation of abdomen with filtered room air was performed in group I and III whereas carbon di-oxide (CO<sub>2</sub>) insuffulation was used in group II and IV and in all the groups different laparoscopic surgical procedures were carried out. Physiological parameters, haematological and biochemical parameters were observed during insufflation, anesthesia and surgical procedure. No major alterations in physiological and haemato-biochemical parameters were observed during insufflation either with filtered room air or CO<sub>2</sub>. Overall insufflation was adequate in all the four groups either with CO<sub>2</sub> or filtered room air. However insufflation of abdominal cavity with CO<sub>2</sub> gave better visualization of the abdominal viscera as compared to filtered room air throughout the laparoscopic procedure. The complications like air embolism following air insufflations was not recorded in any animals during laparoscopic examination of abdomen



in any animal of all the four groups. The CO<sub>2</sub> is superior to filtered room air in respect of the safety and non combustion property, especially during cauterization and haemostasis. However, considering its cost and availability, the room air could be substituted for creating pneumoperitoneum in dogs and pigs without any serious complications under field conditions.

## 66. Laparoscopic ovariectomy in dogs: a comparison between single portal and two portal access.

*Kulkarni M. V., Khandekar G. S., Sarkate L. B., Pawar A. A., Tatelu S., Moru Nisha and Thakur Durga*

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Twelve apparently healthy female mongrel dogs were divided into two groups, each comprising of six animals, with an objective of comparing the single portal access (Group I) with the two portal access (Group II) to perform laparoscopic ovariectomy. All the animals were anaesthetized using the same anaesthetic protocol using Acepromazine-Propofol-Isoflurane combination anaesthesia and its quality was evaluated for performing laparoscopic ovariectomy in dogs. Various anaesthetic, surgical and haemato-biochemical parameters were assessed at various time intervals so as to compare Group I and Group II and to analyse the feasibility of the anaesthetic combination for laparoscopic ovariectomy in dogs. No significant differences were found for any of the assessed anaesthetic, surgical (except time taken from first trocar insertion to left ovary grasping was significantly lesser in single portal access) or haemato-biochemical parameters at the proposed time intervals. A higher amount of fat in the ovarian ligament and bleeding, which were correlated to the body condition score significantly increased the operative time. The anaesthetic combination of Acepromazine-Propofol-Isoflurane induced good to excellent quality of anaesthesia. The recovery was smooth and fast, without altering the haemato-biochemical parameters significantly at various time intervals. Both the methods are feasible for performing laparoscopic ovariectomy in dogs. The anaesthetic combination of Acepromazine-Propofol-Isoflurane is a suitable anaesthetic combination for performing laparoscopic ovariectomy in dogs. A learning curve exists for performing laparoscopic procedures.

## 67. Canine transmissible venereal tumour in a male dog and its surgical management

*Das, Jayakrushna., Nayak S., Behera S S., Sika P., Behera M., Hembram A.*

Department of Veterinary Surgery and Radiology, College of Veterinary Science and Animal Husbandry, OUAT, Bhubaneswar-751003.

A 3yr old castrated male mixed breed dog was presented at TVCC of C.V.Sc. and AH, OUAT, Bhubaneswar with the complain of dribbling of urine with serosanguineous discharge and swelling of the prepuce. On clinical examination to the prepuce it was observed that a hard swollen mass was there and even after trials it was unable to protrude the penis from sheath. Suspecting the case of CTVT one curved haemostatic forceps was introduced through the prepuce orifice and some nodular mass was exposed around the glans area. It showed a large cauliflower like mass at the tip of the penis fully encircling the glans region, shaft and base of penis. Under GA a nasogastric feeding tube was introduced into the urethral orifice and the multi lobulated cauliflower like masses were excised. Tissue sample was sent for histopathological study. Then the incised edges were sutured with chromic catgut no 2-0 with needle. Terramycine topical was instilled at the site and inj. Adrenaline was sprayed to control capillary bleeding and penis was released into the sheath after fixing a nasogastric feeding tube to the wall of the prepuce. After 30 days the animal recovered well from the condition.





## 68. Incidence of corneal affections in dogs: A review of five years

*P. V. Parikh, D. B. Patil, M. J. Sheth, S. K. Jhala, Nisha Joy, K. R. Mistry, D. D. Rishi and Menguzeno Sale*

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During the last five years a total of 425 dogs of different breeds presented to the Department of Veterinary Surgery & Radiology, College of Veterinary Science & Animal Husbandry, Anand for ophthalmic examination were evaluated for corneal affections. The corneal affections constituted 35% (147 out of 425 cases) of total ophthalmic affections. Categorization of the corneal affections revealed maximum case load of corneal ulcers (81, 55%), corneal melanosis (29, 20%), corneal edema (15, 10%), corneal opacity (15, 10%) and traumatic injury (7, 5%) to the cornea.

## 69. Canine transmissible venereal tumour in a male dog and its surgical management

*Das Jayakrushna., Nayak S., Behera S S., Sika P., Behera M., Hembram, A.*

Department of Veterinary Surgery and Radiology, College of Veterinary Science and Animal Husbandry, OUAT, Bhubaneswar-751003.

A 3yr old castrated male mixed breed dog was presented at TVCC of C.V.Sc. and AH, OUAT, Bhubaneswar with the complain of dribbling of urine with serosanguineous discharge and swelling of the prepuce. On clinical examination to the prepuce it was observed that a hard swollen mass was there and even after trials it was unable to protrude the penis from sheath. Suspecting the case of CTVT one curved haemostatic forceps was introduced through the prepuce orifice and some nodular mass was exposed around the glans area. It showed a large cauliflower like mass at the tip of the penis fully encircling the glans region, shaft and base of penis. Under GA a nasogastric feeding tube was introduced into the urethral orifice and the multi lobulated cauliflower like masses were excised. Tissue sample was sent for histopathological study. Then the incised edges were sutured with chromic catgut no 2-0 with needle. Terramycine topical was instilled at the site and inj. Adrenaline was sprayed to control capillary bleeding and penis was released into the sheath after fixing a nasogastric feeding tube to the wall of the prepuce. After 30 days the animal recovered well from the condition.

## 70. Intussusception in dogs – a review of 15 cases

*L. Nagarajan, Ravi Sundar George, Mohamed Shafiuzama, R. Sivashankar, V. Bhuvaneshwari and Mala Shammi*

15 dogs affected with intussusceptions were reviewed. Dogs presented to the Madras Veterinary College teaching hospital over a period of one year were included in this study. History and clinical symptoms included sudden anorexia, vomiting, diarrhea, dehydration and depressed behavior. On clinical examination signs of bowel obstruction and palpable abdominal mass were noticed. Sausage shape or bull's eye appearances of the intestines were confirmed through diagnostic ultrasound. Enteropexy and enteroanastomosis were the surgical procedures followed. The common sites of intussusception were found to be ileo - cecum, ceco - colic, jejunum - ilial and in some ilio - ilial junction. The anesthetic, surgical protocol and post operative care will be discussed.





## 71. Splenectomy in dogs - a review of 7 cases

*Mala Shammi, L. Nagarajan, Ravi Sundar George, Mohamed Shafiuzama, R. Sivashankar and V. Bhuvaneshwari*

A review of 7 cases of splenic affections in dogs was carried out. The cases were presented to Madras Veterinary College teaching hospital during the year 2011-12. The dogs were presented with symptoms of anemia, anorexia and abdominal distension. On abdominal palpation the dogs were suspected to have splenomegaly. Diagnostic radiography and ultrasound confirmed splenic involvement. Exploratory laparotomy revealed the presence of splenic tumor. Splenectomy was performed in all cases except two cases that had partial splenectomy. The anesthetic protocol, surgical management and post operative care will be discussed.

## 72. Neo-adjuvant Chemotherapy and surgical oncology protocols for management of cutaneous tumors in 20 dogs

*Sivashankar R, Mohammed Shafiuzama, Jayaprakash R, Ravisundar George, Nagarajan L, Vairamuthu S, Sridhar R and B Justin William*

The objectives of the study included firstly to demonstrate the effect of neo-adjuvant chemotherapy with proper surgical oncology protocols for excision of cutaneous tumors in dogs and secondly to see the post operative survival. 20 dogs brought to the small animal outpatient clinic at Madras Veterinary College teaching hospital for cutaneous tumors were included in this study. The dogs were subjected to routine hemato-biochemical tests, radiography, ultrasonography for detection of metastasis and FNAC/ FNAB was for initial diagnosis of these tumors. Neoadjuvant chemotherapy was initiated for these tumors. The surgery was performed after 3 cm regression of the tumor size and an adequate margin of 2 to 3cm around the tumor in three dimensional plane. Margins were subjected to histopathological analysis. The dogs were followed over a period of 12 months for remission and prognosis following surgery. The results indicate that dogs that had significant reduction in tumor size and tumor free margins following surgery had a 12 months remission. It is concluded that dogs that undergo neoadjuvant chemotherapy with surgical oncology protocols carried a better prognosis with tumor free survival for a period of 12 months.

## 73. Aphakic visual outcome and biometric changes following phacoemulsification in a kitten

*C. Ramani, L. Nagarajan, N. J. D'Souza M. K. Ahirwar and B. J. William*

Department of Veterinary Surgery and Radiology, Madras Veterinary College, Chennai - 07

A seven month old kitten was presented with a history of blindness in the left eye. Examination revealed the presence of a unilateral (OS) congenital cataract the surgical correction of which is discussed in the present paper. Detailed ophthalmoscopic and neurological examinations, A – scan and keratometry were carried out pre – operatively following which surgical correction was found to be the most appropriate. The kitten was placed under general anaesthesia using isoflurane. The phacoemulsification procedure was carried out using a one – handed technique by placing the corneal incision at the 3'O'clock position. Linear phacoemulsification power was placed at 70% during the procedure and a fixed aspiration pressure of 40mmHg. The time elapsed for phacoemulsification was 4 minutes and 4 seconds. The cornea was sutured with 8-0 ophthalmic silk suture material. The anterior chamber depth (ACD), axial length (AL), corneal curvature and refractive state of the eye were assessed pre – operatively as well as on days 3, 15 and 30 post–operatively. Mild fibrin deposition was noticed in the anterior chamber post – operatively for two weeks, after which the kitten showed an uneventful recovery.



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LEAD PAPER

## Ruminant surgery in animal shelters – Shri Surat Panjarapole experience

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The panjarapoles are the shelters formed with laudable object of keeping, nurturing and caring the old, disabled, unproductive and stray cattle of all types big or small. In 17<sup>th</sup> century, the philanthropist from 'Parasi' community were the first to initiate the concept of care and compassionate attitude towards the stray animals by erecting shelters in many parts of our country. Further, the socialist, animal lovers and activists from different communities united to form such shelters on large scales and named it as Panjarapoles. Being a non government organizations, it specifically confined to run by public donations. India being a religious country, peoples extended their arms whole heartedly to support for care and management of old, crippled, abandoned and rescued animals of bovine community.

The people, who assiduously dedicate themselves in trying to give the space that mute beings believing firmly in the ideology that it is only through the mutual and harmonious synchronization of humans and animals, the world would be better place to live in. Hence, the people working for the betterment of the animals are carving a harmonious path for better natural existence.

### Principles of panjarapole - past and present

At present thousands of panjarapole are located in different states of India. Among these, 218 (highest) are functioning successfully even today in state of Gujarat performing the animal welfare activities with strong concept of ahimsa and jivdaya.

The main motto is to take care of the disabled, old and discarded animals. Their pain and anxiety has to be reduced to prolong their life span until the natural death. Before two decades the functional activity of panjarapoles was mainly concern with shelters and food. Health concern true veterinary practices were neglected. But with passing of time, the scenario has changed completely. In this era of advancement the panjarapoles have also started providing the superior health care services to reduce the animal sufferings by erecting the veterinary hospitals and employing skilled veterinary practitioners. Hence with vision of sophisticated veterinary services, concept of better health care and rehabilitation has been initiated in panjarapoles in addition to shelter and food.

Live example of this is the Surat Panjarapole Trust, one of the biggest panjarapole in south Gujarat. It was established in 17<sup>th</sup> century by two philanthropist of Surat. The activities of the trust expanded with passing of time and today the trust has four branches in Surat district rendering services to 10,000 stray cattle. The trust with its desire of providing better health care service to animals established Nandini Veterinary Hospital in year 2000, equipped with all the modern facilities like diagnostic laboratory, imaging techniques like computer radiography, ultrasound with colour Doppler, well balanced operation theaters for large and small animals.

### Sources from where the panjarapole receives animals.

1. **Municipal corporation** : Majority of the animals rendered at panjarapoles shelters are sent by the municipal corporation from in and around the city area.
2. **Animal owners** : When the animal is old, unproductive and suffering from any chronic affection, the owner prefers to keep the concerned animal at panjarapole.
3. **People with jivdaya concept** : The animals rescued from the slaughter houses are brought to panjarapole.





4. **Animal lovers/ activists** : Individual member, groups or societies working for the wellbeing of the animals brings the recumbent animals on road side or after an accidents.

#### **Transport modalities used in Panjarapoles**

Transport of large animals is one of the most important activity during routine management practice within the panjarapoles for lifting and shifting the recumbent and injured animals. At present different modalities of transport like tractors with short trolleys, ambulances with ramps, low ground based wheels trolleys pulled by tractors, automated hydraulics lifting machines/ dozers having 360 degree rotational movement can help to make transport of affected animals easy and comfortable without causing any additional stress and pain to them.

#### **Common surgical affections in Panjarapole animals.**

Generally, the health performance score for the panjarapole animals is much more compromised as majority of animals are from street and are debilitated, suffering from malnutrition and immune deficit. It takes longer time to make them stable for survival. The chronicity of the affections always restricts the expected outcome. Most of the surgical affections are very complicated at the highest degree to work out. A tumor will not only be a small growth but it will appear as wide bulky mass weighing up to 10 to 15 kgs. A hernia will not only limit to a small ring but will be extensive bulging with multiple organ involvements. Most of the animals with chronic phage of surgical affections are initially treated by the field practitioners and after long period the owner will prefer to keep the animal in panjarapole with no hope of its survival.

Some of the most common surgical affections are horn injuries/fractures, horn cancers, extensive tumors, oesophageal obstructions, non penetrating foreign body syndromes, lateral and ventral hernias, TRP, pericarditis, tympany, acidosis, reticulo omasal obstructions, omasal impaction, bladder ruptures, urethral ruptures, urolithiasis, preputial injuries and fibrous growths, chronic uterine and rectal prolapses etc.

Hence, the veterinary surgeons employed in panjarapoles has to play a challenging role for correction of the chronic surgical affections with due respect to proper knowledge of advance diagnostic method and surgical techniques.

#### **Conclusion.**

To accomplish great things we must not only act, but also dream; not only plan but also believe' so we strongly believe that perspective 2020 will be very bright for the panjarapole animals with a hope that the advance surgical techniques and diagnostic methodologies will cross the threshold of research institutes and will successfully be employed in the field to reduce the sufferings of the mute animals.



## 1. Surgical Disorders of Ruminant Stomach: An Overview

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Ruminant stomach comprises four compartments and every compartment manifests few surgical disorders which needs attention of clinicians. This paper overviews surgical disorders of ruminant stomach. Bloat (ruminal tympany) is the overdistention of rumen and reticulum by gases produced during fermentation. Primary tympany (legume bloat, frothy bloat) occurs following diet change, rumen pH decreases to 5-6, foam forms which blocks cardia and causes rumen to distend (seen clinically as distended left paralumbar fossa). Secondary tympany occurs following physical or functional obstruction/stenosis of esophagus leading to eructation failure and gases accumulate in rumen. Esophageal foreign body, vagal nerve dysfunction, lymphosarcoma, etc also cause bloat. Other causes of bloat are foreign bodies (potential and nonpotential ones), trichobezoars, phytobezoars and lead poisoning. Rumenitis may occur due to lactic acidosis (Grain overload), bacterial – secondary to acidosis or mechanical injury and mycotic – secondary to acidosis or antibiotic administration. Vagus Indigestion (chronic indigestion) is seen in cattle and sheep. It causes gradual development of rumenoreticular and abdominal distention. Four types are recognized based on site of functional obstruction. Type I is failure of eructation resulting in free-gas bloat, usually due to inflammatory lesions that involve vagus nerve (hardware disease, pneumonia, etc). Type II is failure of transport from omasum to abomasum via omasal canal, usually due to abscess in wall of reticulum near vagus (hardware disease), or lymphoma or papilloma blockage. Type III is abomasal impaction due to feeding of dry coarse roughage with restricted access to water, especially in winter. Type IV is poorly characterized partial forestomach obstruction that usually occurs during gestation, may be due to enlarging uterus shifting abomasum to more cranial position. Definitive treatment requires exploratory left paralumbar fossa laparotomy and rumenotomy. In hardware disease there is ingestion of baling wire, nails perforates through wall of reticulum (traumatic reticulitis) and enters peritoneal cavity (traumatic reticulo-peritonitis) or pericardial sac (traumatic pericarditis). Reticular abscesses are also encountered in ruminants and need proper diagnosis and treatment. Abomasal disorders include abomasal displacement (LDA, RDA), volvulus, ulcers, impaction, inflammation (abomasitis), bovine viral diarrhea and mucosal disease, abomasal parasites, lymphosarcoma etc. Dietary omasal or abomasal Impaction is seen in cattle and sheep being fed poor quality, indigestible roughage during cold weather, can also be sand if on poor quality pasture with sandy soil. Displaced Abomasums (Das) could be LDA's, RDA's or RTA's in adult lactating dairy and is considered as a production or herd problem. Majority of DA's have concurrent diseases. It can be treated by non-surgical techniques wherein the cow is rolled with ropes into right lateral recumbency. Roll onto back & extend the rear legs. Roll in a 90-degree arc for 3 minutes, ending in left lateral recumbency. Bring the cow to sternal position & allow to stand. Ascult the left thorax to ensure that LDA is relieved. The surgical techniques involve abomasopexy or omentopexy from left or right flanks or paramedian approaches. These techniques have several merits and demerits which are discussed.

## 2. Ultrasonographic findings and management of perineal pathology in buffaloes

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The Perineal pathology is not so frequent in buffaloes. The perineal pathology can be due to hernia, accumulation of pus or fluid in the perineal area. Various types of the perineal pathology need differential diagnosis for a suitable line of treatment. The ultrasonography appears to be useful technique to differentiate these conditions and looks to be helpful in guiding proper line of treatment. The study was conducted on eight adult buffaloes having perineal swelling divided into three groups. The swelling appeared following constant straining over a month in four buffaloes. The straining was due to *enteritis* in



three buffaloes and *vaginitis* in four. In second group of two buffaloes, the swelling appeared after an accident, which occurred about fifteen days back. In third group of two buffaloes, there was gradual increase in size of the perineal swelling without any history of trauma or straining. Ultrasonographic findings in *first group* of perineal hernia showed large size of the hernial ring. The hernial content observed were *intestine* in three buffaloes and *urinary bladder* in one buffalo. In *2<sup>nd</sup>* group, there was no hernial ring and there was only fluid accumulation. In *3<sup>rd</sup>* group also there was no hernial ring and the contents of the swelling were purulent material. The buffaloes were controlled in standing position in Travis following sedation with xylazine. The caudal block was achieved between sacro-coccygeal joint after injection of 2% lignocaine HCl. In *1<sup>st</sup>* group of perineal hernia, the rectal contents were evacuated by hand and a gauze plug was placed in the anal opening. A slightly curved incision about six inches long was given toward lateral side of the anus to expose the hernial contents. Blunt dissection was carried out to separate herniated mass from the surrounding tissue. The intestinal loops were lying free in *two* buffaloes and were replaced. The urinary bladder was pressed to evacuate the urine and pushed back to its normal position. The defect in pelvic diaphragm was repaired by placing sutures in two layers. In *2<sup>nd</sup>* group, the dead space was obliterated by suturing muscles with surrounding tissue using *catgut* no. three as suture material. In *3<sup>rd</sup>* group, the purulent material was drained off. Postoperatively, the buffaloes were maintained on full course of antibiotics, analgesics & anti-inflammatory drugs, B-complex and fluids. The buffaloes were given liquid paraffin for four days and maintained on green fodder only for two weeks thereafter routine diet was given. The surgical wounds were dressed daily till removal of skin sutures after 14 days. The buffaloes recovered after one month of treatment.

### 3. Surgical management of obstructive urolithiasis in male buffalo calves – report of five cases

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The present study was conducted to evaluate the efficacy of the post scrotal urethrotomy operation for the management of obstructive urolithiasis in five male buffalo calves. Preoperatively, fluid and supportive therapy were given to counteract severe dehydration and uraemia as per requirement. The animals were allowed to stabilize and were prepared for surgery at the earliest possible time. Diagnosis of the disease was made on the basis of a history of anuria and clinical signs. The cases of obstructive urolithiasis were managed by post scrotal urethrotomy followed by catheterization using simple polyvinyl chloride tube. In all the animals litholytic agents, anti-inflammatory drugs, antibiotics along with urine acidifiers were given. The suitability of surgical technique, duration of surgery and overall success rate were recorded in all the cases. From this study, it is concluded that post scrotal urethrotomy with polyvinyl chloride tube catheterization is the most successful and easily applicable method for the management of obstructive urolithiasis under field conditions.

### 4. Management of congenital surgical affections in calves

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Congenital surgical affections were recorded in 27 calves over a period of last one year in calves. These included atresia ani (10 cases), umbilical hernia (5 cases), contracted flexor tendons (3 cases), urachus pervious (5 cases), dermoids (2 cases), evisceration of abdominal viscera (1 case), and hermaphrodite (1 case) at TVCC, RAJUVAS, Bikaner. Surgical management of these affections was done under local anaesthesia. All animals made good recovery. Atresia ani was managed by a criss



cross incision, umbilical hernia by herniorrhaphy, contracted flexors by coaptation splinting, evisceration by closing the vent, dermoids were excised and hermaphrodite case was not treated.

## 5. Congenital and acquired surgical affections of head region of calves- clinical study

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The study was conducted on 18 clinical cases of congenital and acquired affections of head region in cow calves and buffalo calves of either sex of less than 1 year of age. The congenital affections were recorded in 6 (33.33%) calves and acquired affections were recorded in 12 (66.67%) calves. These cases were treated on the general principle of management. Congenital surgical affections were agenesis of oral commissure and ocular dermoids. The calf having agenesis of oral commissure did not survive and succumbed during supportive therapy. The ocular dermoids were successfully removed surgically. The acquired surgical affections were mandibular fracture, abscesses, corneal lacerations and evisceration of iris. In the case of mandibular fracture, application of device made up of PVC bottle with help of bandage was applied around the jaw for supporting the lower jaw. The cases of abscess, bilateral corneal laceration and evisceration of iris were successfully managed surgically.

## 6. Comparative evaluation of Topicure spray and Scavon Vet spray in the post-operative wound management in ruminants

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The study was conducted in twenty animals brought for various surgeries in ruminants viz, rumenotomy, urethrotomy, caesarean section, horn cancer, herniorrhaphy etc. The post-operative wound dressing was done using Topicure Spray (Natural Remedies Pvt. LTD. ) in ten animals whereas in rest of the ten animals, Scavon Vet Spray ( Himalaya Drug Company) was used with routine antibiotic therapy for post-operative care. The results indicated that the tissue irritation was less with Scavon Vet Spray in comparison to Topicure Spray. The maggoticidal and fly repellent property was more in Topicure Spray in comparison to Scavon Vet Spray. The Scavon Vet Spray was more aerosol in nature. The wound healing was faster with Topicure Spray in comparison to Scavon Vet Spray. Therefore, from this study, it is concluded that Topicure Spray has an edge and is better than Scavon Vet Spray in the management of wounds in ruminants.

## 7. Surgical management of evisceration of rumen in a cow calf - case report

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Evisceration of whole rumen after accident is very rare. A two years old male cow calf was brought with the complaint of an automobile accident that resulted in evisceration of rumen completely from left paralumbar fossa. On clinical examination, red, painful, and echymotic skin around the eviscerated organ with perforation of rumen, oozing of ruminal contents around wound of skin, discharging of ruminal content from both the nostrils and apparent bleeding from ear were observed. Animal was showed difficult respiration. Immediate stabilization and surgical interventions were carried out to save the life of patient.



No pre-anaesthetic drug was given as the animal was comatosed, only local infiltration of 2% lignocaine around site of skin wound was done to minimize the risk of anaesthetic shock. Post operatively; the animal was given Ampicillin cloxacillin (2g) i/m once daily for 5 days, meloxicam @ 0.3mg/kg body weight i/m for 4 days. The antiseptic dressing of surgical wound was done by Povidone iodine ointment till removal of skin sutures. There was an uneventful recovery in a period of ten days.

## 8. Extensive bovine ocular squamous cell carcinoma (oscc) in a working bullock: case report

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A working Khillar Bullock of 15 yrs age was presented with disfigured left eye resulted from a growth partially extending to the eye from medial canthus. There was profuse lachrymation and the animal evinced severe pain on palpation. Upon detailed examination, complete loss of architecture of eye with cancerous growth partially adhered to lower eyelid and extending to the medial canthus with extensive corneal edema and ulceration were observed. Considering the irreparable state of restoration of vision, extirpation of eye was performed with general anaesthesia induced by combination of Xylazine, Butorphanol and Ketamine and regional anaesthesia by retrobulbar nerve block. Histopathological study of the tumor revealed confirmatory lesions of Bovine Ocular Squamous Cell Carcinoma (OSCC). Various aspects of Bovine Ocular Squamous Cell Carcinoma in working bullocks, the efficacy of the anesthetic combination for standing stunned eye extirpation and the surgical techniques of eye extirpation are discussed.

## 9. Vulval reconstruction in a cow calf after burn injury

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A cow calf of 7 months of age was presented to the Veterinary Polyclinic, IVRI, Izatnagar, with a history of burn injury 2 months back and difficulty of urinating. On physical examination, the vulval opening was observed to be small due to cicatricial contraction after burn injury. The animal was prepared aseptically for surgery and under epidural analgesia using 2% lignocaine, the vulval reconstruction was performed by a modified episiotomy technique. The animal was administered inj. Cefotaxime at a dose of 13 mg/kg for 8 days and analgesic for 3 days. The sutures were removed on 8<sup>th</sup> post-operative day. The animal had an uneventful recovery.

## 10. Castration in camels (*Camelus dromedarius*)

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Present report is based on castration of three young camels aged three years. The operation was performed under xylazine sedation and epidural anaesthesia using 60 ml of 2% lignocaine hydrochloride. The site at scrotal sac was prepared thoroughly by soap and water after shaving. Two longitudinal incisions were given cranio-caudally on each scrotal sac. The tunica vaginalis was incised to exteriorise the testicles. The epididymal attachment of mesorchium was severed. A three clamp tie





method of ligation together with application of emasculator on spermatic cord was done. The castration was accomplished. The scrotal skin was apposed by simple interrupted sutures. These animals were given broad spectrum antibiotics for 7 days and NSAIDs for 3 days and skin sutures were removed after 12 days.

## 11. Retrieval and resection of impacted soft palate in camels

**Anita Meena, Kapil Kachwaha, M. C. Parashar, Mahesh Agarwal, Mukesh Gahlot, Alok Palei and T. K. Gahlot**

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Present report is based on 5 cases of impacted soft palate which were retained *in situ*. These animals were off feed and held the neck stretched. A clinical examination was performed under xylazine sedation and the impacted soft palate was retrieved out by making a long hook, indigenously prepared by using a 6 mm aluminium rod. The soft palate was then resected by a long handle straight mayo scissors. The oral cavity was irrigated with light potassium permanganate solution after resection. The resected soft palate showed inflammation, infection, wounds and abscess of varying order. Post operatively, animal were administered broad spectrum antibiotics, NSAIDs and multivitamins. All animals recovered uneventfully and had a restored appetite.

## 12. Complications encountered in emergency Caesarian section in Indigenous and Semi-Indigenous cows

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A clinical case of 8 full term pregnant cows having dystocia was referred. The cows had conceived through both Artificial Insemination and natural service. Most of the cases had history of accidental fall in the hilly terrain or blunt force trauma. Most of the cases were referred later than 12 hours. The cows had severe tympany requiring immediate rumen puncture to alleviate distressful breathing. In those cases suspected of falling; uterine torsion seen and few had breech position coupled with torsion. In case of AI aided pregnancy the cause was large foetus in small indigenous heifer. Due to extreme manual handling severe uterine rupture particularly on the innerline of the gravid horn and in one particular case the tissue tear ran both horns through the bifurcation. The caesarian section was followed by uterine washing with mild antiseptic uterine solution, pessaries and strong dose of parenteral injections prescribed along with intravenous rehydration solutions as per the standards prescribed and available. Successful recovery seen on those cows which could be attended to within eighteen hours, with indigenous cows showing good recovery.

## 13. A case of vulval and vaginal tear in a cow after per-vaginal extraction of fetus and its correction

**Dayamon D. Mathew, A. M. Pawde, Kiranjeet Singh, Remya V., AswathyGopinathan, Naveen Kumar, Sivanarayanan T. B., Raja Aijaz Ahmad, Mohsina A., Vineet Kumar and A. K. Sharma**

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A primipara cow was presented to the Veterinary Polyclinic, IVRI, with a history of vulval and vaginal tear following per-vaginal extraction of fetus. The vulval and vaginal tear was so extensive that the external genitalia were not recognizable. The





vulval and vaginal tear was carefully reconstructed using no. 1/0 catgut after catheterizing the external urethral orifice under epidural analgesia using 2% lignocaine. The skin was closed using silk no. 1 in a simple interrupted fashion. The animal was administered 3 grams of inj. Ceftriaxone twice daily for 5 days along with an anti-inflammatory drug (Inj. Melonex) for 3 days. The wound was cleaned and dressed daily with povidone iodine solution and sprayed an anti-maggotidal agent. The sutures were removed after 14 days.

#### 14. A new strategy to treat intestinal obstruction in Ongole bulls

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Ongole is considered to be the king of south Indian cattle breeds. In the early 21st century, cattle breeders became over enthusiastic to feed their bulls with high energy and protein rations in order to put on weight so as to enable them pull more weights during competitions. Over a period of two years (2010-2012), a total of 14 cases of intestinal Intussusception were treated out of which 12 belonged to ongole breed. The animals received large doses of diuretics and were found severely dehydrated. The main symptoms were initial colic for a couple of days followed by anuria and constipation. The haematocrit values were high. These animals were given orally purgative doses of magnesium sulphate, liquid paraffin, tonic powder and probiotics. Intravenously balancing crystalloid solutions containing sodium, potassium, calcium etc were administered in huge volumes @ 40 ml/Kg/day. The fluids selected were 10 liters of DNS, 1 liter of rintose, and 450 ml of calcium borogluconate for an animal weighing 30 kg body weight. The latter was also given subcutaneously. After the treatment, the animals were made to exercise. The restoration of intestinal motility was checked by rectal examination. 10 out of 14 the animals (71%) passed dung with necrosed portions of intestines after 2-3 days. However in rest of the animals, laparotomy was performed. It was recommended that, before proceeding to intestinal resection and anastomosis, one could try for conservative therapy to avoid complicated surgeries at field level.

#### 15. Suture less cystotomy to treat Urolithiasis in large ruminants: an alternative approach

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Urolithiasis is one among a few disorders in bullocks which when not treated properly, can lead to grief consequences. This disease was reported from upland areas. The animals were brought to the hospital from various parts of the adjoining districts as referral cases, only 5 to 7 days after the recognition of the problem. All the animals were observed to have been treated with diuretics. Symptoms varied from moderate to severe degree of dehydration, rupture of bladder, water belly, signs of uremia etc. A total of 12 animals were operated under local analgesia. Surgical correction by performing cystotomy and urethrotomy demands two different incisions requiring much time, which was more undesirable especially under field conditions. Hence, an incision, cranial to the rudimentary teat was placed on the lower left flank, through which both the procedures could be done with reasonable amount of ease. This incision also facilitated the exteriorization of the penis with straightening of the sigmoid flexure. However, in some large animals with voluminous abdomen, the bladder was very deeper in location and it was difficult to impossible to suture. When the bladder with intact catheter was kept closer in the palm for 10 minutes, free flow of urine was seen through the penile urethra. All the animals urinated through the catheter throughout the observation period and there were limited post operative complications proving the superiority of this technique.



## 16. Surgical management of eye affections in bovine

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Eye affections constitute a significant portion of cases reported for surgical treatment. During June 2012 to Aug 2012 fourteen cases of eye affections were reported at TVCC Hisar. Three cases were of corneal ulcer of varying degree, six cases had tumor of eye ball and adenexa, two animals had ruptured eye ball due to traumatic injury and three cases had foreign bodies adhered / penetrated in the cornea. During treatment, all the animals were sedated with Xylazine hydrochloride @0.05mg/kg b.wt. IV and local analgesia was achieved by Peterson's and A.P. nerve blocks. Kerato-conjunctivoplasty was done in one case, however, two cases of corneal ulcer were treated with silver nitrate scarification followed by neosporin ointment topically. It was advised to keep animals in dark. Small size tumours to corneal surface were surgically excised in four cases, however, in two cases the eyeball was extirpated. In case of eviscerated eye ball the lid margins were freshened and sutured. Foreign bodies adhered / penetrated to cornea were removed with the help of mosquito forceps after proper nerve blocks (Peterson's and A.P.) and restraining. The desired outcome was achieved in all cases except one case of corneal ulcer which took very long time to heal.

## 17. Management of preputial prolapse in three cow bulls

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Preputial prolapse is a condition of mainly exotic and cross breed cattle. Other predisposing factors are old age, pendulous prepuce and any trauma inflicted on it. Three cross-bred cattle bulls of 7-9 years of age were reported at TVCC Hisar with injured prepuce almost touching the ground. There was hardness and swelling around the preputial orifice and in one case a tumorous mass was present at one side of the preputial orifice leading to stenosis. Bulls were sedated with xylazine hydrochloride @ 0.05mg/kg b.wt. IV and pudendal nerve of both sides were blocked through ischio-rectal fossa by transcutaneous approach. The animals were restrained in lateral recumbency and local infiltration of 2% lignocaine hydrochloride was done at the site of incision. First, the incision was made in half circle reaching upto the lumen of prepuce. After inverting the incised edges of skin and preputial sheath with chromic catgut, the preputial sheath and skin were apposed with silk. Then, the incision was extended on another half circle and repaired similarly. The excised portion of distal prepuce was around 9-12 inches in length and hard on palpation. Post-operatively anodyne antiseptic ointment and fly-repellent spray was applied topically and enrofloxacin 10% 30 ml IM twice a day for five days and a combination of phenyl butazone and salicylic acid 20 ml IM once a day for five days were given. All the bulls recovered uneventfully.

## 18. Successful surgical treatment of various surgical conditions in ruminants

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Eight clinical cases of ruminants presented to TVCC, Bidar constituted the material for study. The different surgical caese were caecal dilatation and volvulus in a calf and cow(2 cases), severe theilitis in a goat(1), sertoli cell tumour in a bullock(1 case), mandibular fracture in a buffalo(1 case), choke in a buffalo(1 case), cleft palate in a kid(1case), and acute contracted tendon with anterior deviation in a calf(1 case). These cases were treated successfully using different surgical techniques



## 19. Management of exuberant granulation of popliteal lymph node in a camel

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A camel was brought to the surgery clinics with a history of development of an exuberant growth over the popliteal lymph node. Owner reported occurrence of an abscess involving popliteal lymph node of right hind limb, about 3 months back. The abscess even though ruptured but never healed and turned into an exuberant granulation. The growth was excised under epidural anesthesia and xylazine sedation. The topical application of antiseptic ointment and parenteral administration of antibiotic (for 5 days) and non-steroidal anti-inflammatory drug (for 3 days) led to a satisfactory healing in four weeks.

## 20. Comparative evaluation of midline and post-xiphoid approaches for the diaphragmatic hernia repair in bovine

*Tarunbir Singh, S. S. Singh, M. Raghunath, J. Mohindroo, Pallavi Verma and N. S. Saini*

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The study involved comparative evaluation of post-xiphoid and midline approaches for the surgical management of diaphragmatic hernia in bovine. The diagnosis was made on the basis of radiography, ultrasonography and laparotomy. In 34 animals of group I, diaphragmatic herniorrhaphy was performed by routine post-xiphoid approach. Nearly 15-20 inch paracostal post-xiphoid incision was given traversing abdominal muscle layers. In 22 animals of group II, the repair was made by midline approach. About 15 inches skin incision was given along midline through the linea alba. Diaphragmatic defect was closed by standard lock stitch pattern using silk thread in both techniques. The muscle layer in group I was closed by no. 2 silk thread using preplaced horizontal mattress suture patterns. The linea alba defect in group II, was closed by simple continuous suture pattern using vicryl no. 2. The first suture layer was reinforced with few simple interrupted sutures placed at one inch interval using vicryl no. 2. Skin incision was closed routinely. Both the groups were compared on the basis of ease to approach the hernia ring, ease of suturing, time taken for completion of surgical procedure and postoperative complications. The time taken for completion of surgery was comparable in both the techniques. However, the approach to diaphragm and suturing of defect were easy in post-xiphoid approach. When comparing the long term postoperative complications the suture abscess reported in some cases of post-xiphoid approach were not noticed in midline approach. The midline approach could therefore be recommended as a routine method of diaphragmatic herniorrhaphy in bovine.

## 21. Surgical retrieval of *Setaria digitata* (eye worm) in a cross-bred cow

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A 4 year old crossbred cow was presented to the university hospital with the history of ocular opacity. At first instance corneal edema was suspected and steroid and antibiotics were injected subcutaneously. After four days the corneal opacity was significantly reduced and an actively motile eye worm was visible in the anterior chamber of eye. The surgery for the removal of eye worm was performed under midazolam sedation and local nerve blocks. A stab incision on dorsal aspect of cornea of eye was given using no. 12 BP blade. The active worm was recovered along with fluid from the anterior chamber. Post-operatively animal was given ciprofloxacin eye drops. The light microscopic examination of the worm revealed male *Setaria digitata*.



## 22. Studies on incidence and management of various neoplasms in cattle: review of 107 cases in 5 years

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The objective of the present paper was to study the incidence of various neoplasm's in cattle presented to hospital for treatment and to analyze with regard to biological behavior (i.e. malignant or benign), species, breed, age, sex, anatomical location and tumor type and also the possible therapeutic measures. A total of 107 cattle suffering with different neoplasm's presented to the hospital for treatment during the period 2008-2012 were taken for study. Depending upon type of neoplasm treatment was taken up- surgical excision; surgical excision and chemotherapy. Histopathology was performed and is discussed. A total of 12 different types of tumors were broadly identified. Of these highest incidence was that of scc of eye followed by scc of horn, skin tumors etc. of these 64% were benign. Highest incidence was observed in males that to in khillari breed followed by non descript ones. As per treatment results Surgery was performed in 92 cases ( 85.98%), of which recurrence was seen in 14 cases (15.21% ). Death occurred during the course of either of the treatment in four cases (3.74%). Peculiar and rare tumors recorded during the course of the study were lymph node tumors, renal tumors, lipomas, pharyngeal tumors and parotid gland tumors.

## 23. Management of teat injuries using collagen and silver sulphadiazine cream dressing in cattle - report of 6 cases

*T. P. Balagopalan, N. Aruljothi., R. M. D. Alphonse and B. Ramesh Kumar*

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Management of six cases of injuries of teat in cross bred cows using conventional surgical technique and application of collagen with silver sulphadiazine cream is presented. History regarding age, calving history, stage of lactation, Daily milk yield, the period of illness, affected teat and extent of injury were recorded. Three animals were presented with incised wounds on teat involving the skin and the muscular layer and in other three teat canal was found exposed. Under sedation with Xylazine and ring block analgesia using 2% Lignocaine hydrochloride, the animals were controlled on lateral recumbency. The wounds were cleaned, debrided, mopped dry and sutured following standard surgical technique. In the animals with exposed teat canal, a sterile prosthetic tube made up of modified polyvinyl chloride was introduced into the lumen for draining the milk, infusing the medicine and to maintain the patency of the lumen preventing postoperative contamination. The tube was fixed using adhesive tape and protected the teat by applying a sterile condom over the entire teat. Collagen with silver sulphadiazine cream was applied on the day of surgery and once in 3 days for 10 days postoperatively in all the animals. The sutures were removed on 10<sup>th</sup> day and the dressing was continued for 10 more days. All the animals showed uneventful healing.

## 24. Incidence of congenital anomalies in calves- retrospective study

*N. Aruljothi., T. P. Balagopalan., R. M. D. Alphonse and B. Ramesh Kumar*

Department of Veterinary Surgery and Radiology, Rajiv Gandhi College of Veterinary and Animal Sciences, Pondicherry-9

A retrospective study was conducted in calves reported with congenital deformity at the Teaching Hospital, Rajiv Gandhi college of Veterinary and Animal Sciences, Puducherry, for a period of 10 years from 2010-2012. Among all congenital



deformities is recorded, highest percentage of incidence in musculoskeletal system was (59.8%) followed by digestive system (32.2.7%), sensory organs (4.7%), urinary system (1.8%) and congenital monsters (1.7 %). Salient clinical symptoms and surgical management employed if any for correction is presented

## 25. Septic poly arthritis in heifer calves

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Ongole calves of aged about 3-8months (n=6) were treated for septic poly arthritis. History revealed limping on one or more limbs for one month and were said to have been treated locally, without any success. Up on clinical examination, swelling of shoulder, elbow, carpal, hip, stifle, hock, fetlock, pastern and coffin joints were found involved. The affected joints were very hard in some cases, while soft in the others. The body temperature had wide variations ranging from 101-105°F. It was diagnosed as septic polyarthritis. After hot water fomentation, the matured abscesses were opened at dependent portions and drained after sedation with xylazine hydro chloride @ 0.05 mg/kg under local analgesia. The contents were sero-sanguinous to purulent in nature. At the time of drainage, extensive pain and discomfort were noticed even after sedation and local analgesia. Then the joint cavity was irrigated with 1 in 10,000 potassium permanganate solution and followed by placement of a seton dipped in tincture iodine at first followed by acriflavin. The discharges were sent for antibiotic sensitivity test. Following streptopencillin, satisfactory improvement was noticed at hock joint but the animal showed only minor improvement at the hip joint. The radiograph obtained at this stage did not reveal any obvious radiological sign. The remaining post operative treatment was carried out with ceftriaxone based on results of ABST. Weight bearing restored to normalcy in 5 animals while one developed secondary neuralgia.

## 26. Therapeutic evaluation of vitamin-C as antioxidant in diaphragmatic herniorrhaphy in buffaloes

*K. N. Joshi , P. B. Patel, H. A. Avasthi, J. B. Patel, S. S. Chikodi and M. S. Gami*

Department of Veterinary Surgery and Radiology, Dr. V. M. Jhala Clinical Complex, S.D.A.U, Sardarkrushinagar-385506

Six clinical cases of diaphragmatic hernia in buffaloes were presented at Department of Veterinary Surgery and Radiology, Deesa. For correction of diaphragmatic hernia two stage surgery was performed including rumenotomy by standard technique and post xiphoid abdomen approach for diaphragmatic herniorrhaphy. Xylazine hydrochloride @ 0.1 mg/kg body weight intramuscularly and local infiltration anaesthesia were used in all animals for herniorrhaphy without intermittent positive pressure ventilation. Vitamin-C @ 5 g total dose in 1 L of NSS intravenously given before rumenotomy (0 hour) then at 24, 48, 72 and 96 hours after rumenotomy in all six animals. Different parameters were observed before rumenotomy and after rumenotomy. MDA were significantly decreased whereas the mean values of SOD were significantly increased post-operatively. Out of six, five animals successfully survived and also no any post operative complications found. It could be recommended that the injection of Vitamin C @ 5 g intravenously before and after rumenotomy can be injected to reduce the oxidative stress in the buffaloes suffering with diaphragmatic hernia.





## 27. Therapeutic evaluation of manganese chloride as antioxidant in diaphragmatic herniorrhaphy in buffaloes

*K. N. Joshi, P. B. Patel, H. A. Avasthi, J. B. Patel, S. S. Chikodi and M. S. Gami*

Department of Veterinary Surgery and Radiology, Dr. V. M. Jhala Clinical Complex, S.D.A.U, Sardarkrushinagar-385506

Six clinical cases of diaphragmatic hernia in buffaloes were presented at Department of Veterinary Surgery and Radiology, Deesa. For correction of diaphragmatic hernia two stage surgery was performed including rumenotomy by standard technique and post xiphoid abdomen approach for diaphragmatic herniorrhaphy. Xylazine hydrochloride @ 0.1 mg/kg body weight intramuscularly and local infiltration anaesthesia were used in all animals for herniorrhaphy without intermittent positive pressure ventilation.  $MnCl_2$  @ 5 mg/kg in 1 L of NSS intravenously given before rumenotomy (0 hour) then at 24, 48, 72 and 96 hours after rumenotomy in all six animals. Different parameters were observed before rumenotomy and after rumenotomy. MDA values were significantly increased and SOD values non significantly decreased post-operatively. Out of six, three animals survived and post operative complications like tachycardia, restlessness, salivation, increase temperature and respiration rate up to 96 hours post-operative. It concluded that repeated dose of  $MnCl_2$  not advisable for antioxidant therapy during diaphragmatic herniorrhaphy.

## 28. Treatment of hygroma by *en bloc* resection in bovine

*Nawnit Kumar; P. B. Patel, S. S. Chikodi; K. N. Joshi and P. T. Sutaria*

Department of Veterinary Surgery and Radiology, Dr. V. M. Jhala Clinical Complex, S.D.A.U, Sardarkrushinagar-385506

The present study was conducted in 5 animals having knee joint swelling presented at the Department of Surgery and Radiology. These swelling were tentatively diagnosed as hygroma on the basis of history, clinical signs, site, location, consistency and exploratory puncture of the swollen part. For confirmatory diagnosis radiography and Ultrasonography were used. All these 5 animals were treated surgically with *en bloc* resection method. The animals recovered completely between 15-30 days post-operatively with minor complication. Non significant differences were found when rectal temperature, heart rate, respiration rate and haematological parameters were recorded on 0 day pre-operative and 15 day post-operatively, except that TLC, neutrophil, lymphocyte and monocyte were found having significant differences when compared to 0 day and 15 day post-operatively. It could be concluded that surgical removal of bursitis is an effective method of treating hygroma in bovine and radiography and Ultrasonography is helpful in diagnosing the condition.

## 29. Conservative treatment of hygroma in bovine

*Nawnit Kumar; P. B. Patel; S. S. Chikodi; M. S. Gami and P. T. Sutaria*

Department of Veterinary Surgery and Radiology, Dr. V. M. Jhala Clinical Complex, S.D.A.U, Sardarkrushinagar-385506

The present study was conducted in 5 animals having knee joint swelling presented at the Department of Surgery and Radiology. These swelling were tentatively diagnosed as hygroma on the basis of history, clinical signs, site, location, consistency and exploratory puncture of the swollen part. For confirmatory diagnosis radiography and Ultrasonography were used. The animals were given conservative treatment under which the fluid was evacuated from the dependent part and irritant chemical (1 per cent  $CuSO_4$  solution) was injected into the bursal cavity and pressure bandage was applied. After treatment all the animals developed fibrosis of the bursal mass along with some extent of inflammation and pain in three of them. Non significant differences were found when rectal temperature, heart rate, respiration rate and haematological parameters were recorded on 0 day pre-operative and 15 day post-operatively. It could be concluded that the conservative





treatment in the present study is not up to the advisable mark but it is found satisfactory for preventing hygroma from increasing its size constantly throughout life and so it is a very good cosmetic treatment if it is adopted in very early stage of hygroma.

### **30. Cytological, histological examination and antibody detection in hygroma in bovine**

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Department of Veterinary Surgery and Radiology, Dr. V. M. Jhala Clinical Complex, S.D.A.U, Sardarkrushinagar - 385506

The present study was conducted in 10 animals having knee joint swelling presented at the Department of Surgery and Radiology. These swelling were tentatively diagnosed as hygroma on the basis of history, clinical signs, site, location, consistency and exploratory puncture of the swollen part. For confirmatory diagnosis radiography and Ultrasonography were used. Serum samples of these 10 animals were collected and processed for antibody detection by RBPT and STAT. Of these 4 animals were found positive by RBPT and 2 animals by STAT. Cytological study of hygroma fluid have found considerable similarities with synovial fluid, although notable differences did exist. Histologically, the cystic form of bursitis was lined with 2-3 cellular layers of connective tissue like cells and the fibrous form of bursitis having underlying connective tissue, while the proliferation form of bursitis was characterized by loss of cellular lining in the presence of only mature connective tissue.

### **31. Clinical management of caesarean section for prevention of peritonitis in cow**

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The study on clinical management of caesarean section for prevention of peritonitis was conducted on twelve clinical cases of dystocia in cow divided in two equal groups and the results were compared on the basis of clinical, haematological and biochemical observations. The caesarean section was carried out by using left ventro-lateral oblique incision. The peritoneal and uterine fluid was drained with the help of suction pump in group II animals. The average age of dystocia affected cow ranged from 4 to 7.5 years. One (8.33%) cow was primiparous and 11 (91.66%) cows were pleuriparous. Duration of dystocia ranged from 8 hours to 32 hours. Maternal cause of dystocia was observed in 4 (33.33%) cows; where as in 8 (66.67%) cows, foetal cause of dystocia was recorded. Anterior presentation of foetus was recorded in all cows. Ventrosacral position of foetus in 4 (33.33%) cows; whereas, dorsosacral position in 8 (66.67%) cows was recorded. Abnormal posture of foetus was observed in 6 (50%) cows. Ten (83.33%) cows were able to raise head and move ears. Similarly, the observation on ability to stand prior to caesarean was also recorded. Eight (67.67%) cows were able to stand and 4 (33.33%) cows were found unable to stand. In 10 (83.33%) cows cervix was fully dilated. In 8 (66.66%) cows, uterus was tonic; whereas, it was observed atonic in 4 (33.33%) cows. Colour of the uterus ranged from light pink to cyanotic black. In 8 (66.67%) cows uterus was rigid, whereas; in 4 (33.33%) cows, it was fragile. Significant changes were observed in rectal temperature in group II animals. Haemato-biochemical parameters revealed significant changes in the haemoglobin, packed cell volume and platelet count in group I and eosinophil count in group II, blood glucose and potassium in group II and SGPT in group I when compared within the group. The left ventrolateral oblique approach for caesarean section was observed suitable during study with advantages and few disadvantages. The suction pump used in the present study for drainage of peritoneal and uterine fluid was found satisfactory and helpful in controlling the complications like peritonitis.



## 32. Surgical management of pervious urachus and umbilical hernia in a male buffalo calf

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A 5 month old male calf was presented with the history of swelling at umbilicus since by birth but it was progressively increasing. The calf also had dribbling of urine from umbilicus. On examination, the swelling was reduced after pressing the swelled area in dorsal recumbency. The case was diagnosed as umbilical hernia with pervious urachus. The calf was operated under local infiltration of lignocaine 2%. The pervious urachus was ligated and severed. The hernia content (Intestine and omentum) was reduced and hernia ring was sutured with overlapping suturing technique by Silk thread. Animal was administered with broad spectrum antibiotic and anti-inflammatory for 7 days. The suture was removed 12<sup>th</sup> day post-operatively. The calf made an uneventful recovery.

## 33. Evaluation of surgical techniques for castration in rams

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The present study was conducted on 12 rams to evaluate different methods of castration at the Department of Veterinary Surgery and Radiology. The rams were divided into two groups viz. group 'A' and group 'B'. Rams of group 'A' were castrated by complete ablation of scrotum while, rams of group 'B' were castrated by conventional surgical method. Physiological parameters like rectal temperature, respiration rate and heart rate ranged within normal limits in animals of group 'A' and 'B'. Values of haematological parameters viz. haemoglobin concentration, PCV, TEC, ranged within normal limits in animals of group 'A' and 'B'. Values of TLC and DLC ranged within normal limits in animals of group 'A'. However, DLC revealed Neutrophilia with lymphopenia in group 'B' as compared to animals of group 'A' suggesting infection in group 'B' animals. Estimations of biochemical parameters like increased concentration of MDA and decreased concentration of SOD in animals of group 'A' and 'B' suggested oxidative stress up to 10<sup>th</sup> post-operative days. It could be concluded that the complete ablation of scrotum for castration was found easy and efficient as compared to conventional method.

## 34. Oesophageal obstructions in bovines: five year review

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Oesophageal obstruction, or choke, is a common occurrence in cattle, and is attributable to their indiscriminate feeding habits. Twenty two cases of oesophageal obstruction were referred to Dept. of Veterinary Surgery and Radiology, Veterinary College, Hebbal, Bangalore over a period of five years (2006-2011) for treatment. The age group was between six months to eight years. Breed wise 12 cases of cross bred Holstein-Friesian, five cases of ongole, two cases of halliker, two cases of khillari and one case of non-descriptive breed. Obstructed foreign bodies included raw mango, beet root, potato, plastic, trichobezoars etc. Clinical signs include ptyalism, swelling at the obstructed site and ruminal tympany. A 2 cm diameter stomach tube/probang was passed to confirm the seat of obstruction. In Three cases foreign bodies were removed per orally and in rest of 17 cases foreign bodies were removed surgically. The mucosal layer was sutured with simple interrupted sutures utilizing



chromic catgut No. 1-0 as intraluminal sutures. The submucosa was opposed with catgut-0 in simple interrupted pattern with buried knots with rest of the layers in simple interrupted pattern. The muscles and skin were closed in routine manner. All the Animal recovered uneventfully by 10<sup>th</sup> Post operative day without any further complications.

### **35. Surgical management of caecal dilatation and torsion by typhlectomy and typhlotomy in bovines – three case reports.**

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Department of Veterinary Surgery and Radiology, Veterinary College, Bangalore

Three Holstein – Friesian cows were presented to the Veterinary College Hospital, Bangalore with a history of anorexia since 15 days, reduced milk yield, passing scanty blood and mucous coated dung. Animals were showing signs of colic with distention of right flank. Percussion and auscultation revealed dull tympanic sounds. Per rectal examination revealed distended, fluid filled Ceacum. It was decided for exploratory laparotomy. Animals was prepared for aseptic surgery at right flank and restrained on left lateral recumbency. On exploration, Ceacum was dilated with torsion at caeco colic junction. In one animal, Ceacum was dilated with gas and ingesta with major area of necrosis with severe adhesions. Typhlectomy was done after evacuating the contents. End to end anastomosis was done using no. 1 chromic catgut in 'simple interrupted pattern' with buried knots. Typhlotomy was done for other two cows to evacuate the contents. Muscles, subcutaneous tissue and skin were opposed as per the standard procedure. The cows started passing dung immediately and regained the normal feeding habits next day and made a complete recovery by 10 days.

### **36. Critical care and management of traumatized cattle calf**

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A calf aged about 1.5 year was presented to Teaching Veterinary Clinical Complex, DUVASU, Mathura with the severe trauma by the truck. The rumen and other abdominal organ were eviscerated. The rib was also fractured. On arrival at Hospital the animal was unable to stand and was also in shock condition. The adequate fluid therapy and life saving drugs were administered to revive the animal. The abdominal organs were washed with normal saline solution with povidone iodine solution. The reposition of the rumen was not possible. The emergency rumenotomy was performed and the contents of the rumen were evacuated. The rumen and other abdominal organ were reposed into abdominal cavity. The fractured rib was repaired using SS wire suture and the abdominal wound was closed routinely. Under the umbrella of antibiotic and analgesic the eventless recovery was noticed.

### **37. Ultrasound guided pericardiocentesis for the management of serous form of traumatic pericarditis in eight cattle**

***S. Kathirvel, N. Rajendran, S. Dharmaceelan, M. Subramanian, G. A. Balasubramaniam and G. Vijayakumar***

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In eight cattle confirmed for serous form of traumatic pericarditis by ultrasonography were subjected to pericardiocentesis. In three animals which had radiographic evidence of foreign body in the reticulum, rumenotomy was performed and foreign



bodies were retrieved 24 hour prior to pericardiocentesis. Ultrasound guided pericardiocentesis was performed in standing animals under local anaesthesia. A two cm long vertical nick was made on the skin at the fifth intercostal space on the left side at the level of point of elbow. Trocar catheter 28 FG was passed through this nick and slowly advanced till the pericardial exudates were evident the trocar was withdrawn. The catheter was fixed to the skin using Chinese finger trap suture and the pericardial fluid was allowed to drain. The catheter was maintained for five to seven days till cessation of pericardial exudation. Pericardial lavage with temperate normal saline two litre followed by infusion of metronidazole 1500 mg using suction apparatus at a vacuum pressure of 380 mmHg was performed till removal of catheter. One animal collapsed after 48 h and one animal collapsed on 10<sup>th</sup> day. The pericardial lavage with two litres of temperate normal saline followed by infusion of 1500 mg metronidazole was found suitable and contained the pericardial exudation within seven days.

### **38. Pericardiectomy for the management of constrictive form of traumatic pericarditis in nine cattle**

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Department of Veterinary Surgery and Radiology, Veterinary College and Research Institute, Namakkal-637 002. Tamil Nadu.

Nine animals with radiopaque foreign body diagnosed in the thoracic cavity through radiograph and ultrasonographic signs of thickening of pericardium or constrictive pericarditis were subjected to pericardiectomy. Fifth rib resection thoracotomy was performed. The pericardium was incised and a piece of 7 x 3 cm was removed below the left phrenic nerve. The pericardial sac was explored by digital manipulation from all sides of the heart to retrieve foreign body and adhesions were removed carefully and pericardial fluid drained with suction apparatus. Chest drainage catheter of size 24 FG was placed away from the incision site in the ventral aspect after making subcutaneous tunneling in the intercostal region and fixed to the skin using Chinese finger trap suture. Thoracotomy incision was closed and the chest drainage catheter was removed after 3 to 5 days on assessment of the fluid drained from the catheter and wound care was advocated.

### **39. Ultrasonographic study and surgical management of patent urachus in calves**

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Study was carried out on six calves which were brought to the veterinary clinic with the complain of dribbling of urine from the navel area. Out of six, in four cases the urine was coming from both places i.e. urachus and urinary tract while in two cases urine was voided through navel only. Out of six calves, three were buffalo calves and three were cow calves. In two cow calves of 2 months age, the navel area was swollen and elongated and drop wise urine mixed with purulent material was oozing. The navel area was painful. The calf was showing sign of pain while getting and down. The intake of food and water was normal in these cow calves. In buffalo calves also the intake of milk was normal. The passing of faeces was normal in all calves. The rectal temperature, pulse rate and respiratory rate was slightly elevated in these calves. The blood pictures of the cow calves showed normal value of the haemoglobin and increased value of total leucocytic count and neutrophil count. Ultrasonographic study of the elongated navel cord of two cow calves showed presence of lumen in the center filled with anechoic fluid surrounded by hyperechoic muscular structure. The lumen was observed to be obstructed toward the tip of the navel cord in these cow calves. The patent urachus can be seen as anechoic tubular structure starting from the U.B. and terminating at the umbilicus. The umbilical area can be seen as diffuse anechoic area. In one new born buffalo calf, the image of the urachus can be seen in the process of fibrosis. At the time of birth, there was drop wise oozing of urine from the umbilicus but after 5 days of



birth the dribbling get stopped completely. The calves were sedated with xylazine (0.2 mg/kg) and controlled in right lateral recumbency. Umbilical ring block was achieved by infiltrating 2% lignocaine hydrochloride. The umbilical area was prepared for aseptic surgery. The infected umbilical cord was resected out in two calves. Healthy portion of the urachus was separated, ligated and transfixed using silk as suture material ensuring complete occlusion of the patency of the urachus in four calves. In two buffalo calves, the abdomen was also opened to ligate the urachus at two places, one below the U.B. and second at the umbilicus. The overlying muscles and skin were sutured. The post-operative management involves full course of antibiotics, analgesics, B-complex, fluids and daily anti-septic dressing of surgical wound. After 3-4 weeks of the surgery, there was no drop wise urination from the umbilicus and urine start coming from the normal urinary passage. Five calves (2 B.calves and 3 C. calves) showed uneventful recovery but one B.calf died due to peritonitis.

#### 40. Retrospective study of gastro intestinal surgery in bovine – a review of 98 cases

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A Three years retrospective study was conducted from May 2009 to May 2012 on the surgeries performed in gastro intestinal tract affections in Bovine at Teaching Veterinary Clinical Complex, Namakkal, Tamilnadu. A total number of 98 gastrointestinal surgeries were performed during this period. Among this 38 rumenotomies were performed for various ruminal disorders like rumen impaction (11), indigestion not responding to medical treatment (3), foreign body reticulitis (21) and phytobezoar (3). Cervical oesophagostomy was performed in four animals. Abomasotomy was performed in one animal for severe abomasal impaction. A total of 30 herniorrhaphy was performed for hernias like umbilical hernia (16), ventral hernia (7) and diaphragmatic hernia (7). Lancing of reticular abscess in two cases was performed through left post xyphoid incision. A total number of 23 Intestinal surgeries were performed for various intestinal surgical disorders like intussusceptions (14), intestinal phytobezoar (4), Intestinal volvulus (2) and ceecal dilatation (3). Cystorrhaphy was performed in a heifer. The details of the surgical procedures with anaesthetic techniques and the outcome will be discussed.

#### 41. Diagnosis and management of dilatation / impaction of cecum and colon in cows and buffaloes

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The present study was included 10 bovine animals (7 buffaloes and 4 cows) diagnosed and treated for dilatation / impaction of cecum and colon. Mean age of affected animals was  $6.2 \pm 0.6$  years which included 8 adult females (5 buffaloes and 3 cows) and 2 buffalo heifers. Clinical signs included complete anorexia, loss of defecation, abdominal pain and right flank distension from 3 to 13 days. Majority of the animals (90%, n=9) were in periparturient stage i.e. 7 animals (4 buffaloes and 3 cows) were in advanced stage of pregnancy and two buffaloes were recently calved. All the animals were passing mucus per rectally. Per rectal examination diagnosed ceecal dilatation in all the animals. However, per-cutaneous ultrasonography from right side was helpful to confirm clinical and per rectal findings and also to ascertain the extent of the ceecal / colon dilatation. Right flank cecotomy was done in standing position under local anesthesia and cecum was emptied. Out of ten animals, 8 started passing watery feces within 12-48 hours of cecotomy. The present paper discusses the surgical procedure for cecotomy, intra-operative findings and follows up.





## 42. Ultrasonographic study of testicular tuberculosis in cow bull

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Swelling of testicular area is not so common in cow bulls. It may be due to orchitis, hydrocele and testicular hernia. Swelling of testicular area due to tuberculosis is a rare observation in cow bulls. The tuberculosis usually affects the lung area in cattle but sometimes it can affect other organs also. This report describes such a condition where it metastasizes into the testicular area. There was swelling of the one testicle for the last six months. The swelling led to variable size of the testis. The Cow bull was reluctant to cover the cows. The bull was showing gradual sign of weakness and emaciation. The cow bull was partly off feed & water. The bull was sedated with xylazine and controlled in lateral recumbency for examination of the testicles and there after surgical intervention. The left testicle along with spermatic cord was hard to touch and the affected testicle was enlarged also. The right testicle was comparatively soft in texture and small in size. Both testicles were subjected for ultrasonographic examination. The hard portion of the left testicle along with spermatic cord was also put under ultrasonographic scan. Ultrasonographic examination of left testicles showed increase in echogenicity throughout the testicular area with total disruption of normal architecture. The middle portion of the testicle was hyper-echoic while outer portion of the testes was hypoechoic. Multiple echogenic granules in the middle portion of the testicular area were indicative of tuberculosis granules. The testicular area was prepared for surgical intervention. Local analgesia was achieved by infiltrating lignocaine-HCl over both testicles in longitudinal linear fashion. Longitudinal incision was given over the scrotum to expose the testicles. The left testicle was enlarged and hard on palpation with adhesions of tunica vaginalis with the testicles, while the right testicle was smaller in size with complete separation of its covering i.e, tunica vaginalis. The post-operative management included a long course of antibiotics, with anti-histaminics and anti-inflammatory drugs. Vitamin C and B-complex were given as supportive therapy. Daily antiseptic dressing of the surgical wounds was followed till complete healing. The cow bull made an eventful recovery after three months. The ultrasonography is observed to be useful technique in diagnosing and differentiating the cases of testicular tuberculosis from other conditions of the testicle. After castration the bull showed good response in recovery from tuberculosis.

## 43. Shearing of overgrown tooth by using Mistry's tooth cutter

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Projection of tooth due to lack of wear is commonly called a dental hook which may cause injury to cheek, tongue or opposite gum. Dental hook can be removed by using tooth shears or may be rasped. This is common condition observed in herbivores. A bullock ageing twelve years and eight years old stallion were presented with chewing problems and diagnosed for overgrown teeth which required shearing. The animals were restrained in lateral recumbency after required anaesthesia. By using mouth gag and specially designed Mistry's tooth cutter the teeth were cut at desired level. Post operative care improved the condition in due course of time. The advantages and application of Mistry's tooth cutter will be discussed at the time of presentation.

## 44. Emergency rumenostomy: salvage procedure for recumbent cows and buffaloes

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The study included 8 cows and 4 buffaloes presented with fore-stomach impaction, lactic acidosis, peritonitis and vagal



indigestion. The animals had become recumbent making rumenotomy impossible. An easy and simple method of rumenostomy was performed in the recumbent patients where a small opening sufficient to evacuate the contents of rumen was made on the middle of the left flank. This helped in decreasing the bulk of the abdominal contents and was helpful in salvaging 75% (9/12) animals. Two animals died during the procedure and one animal did not stand up after the rumenostomy. Out of the total of 12 animals, eight (66.6%) were able to stand up within 1 hour of surgery. No post operative complication like peritonitis was observed in any of these animals. The rumenostomy wound was closed within a couple of days in 7 animals and in one animal the rumenostomy opening was closed after 1 month. It was concluded that emergency rumenostomy may be a viable option for salvaging recumbent bovine patients suffering from impaction or lactic acidosis.

## 45. Cryotherapy for bovine ocular squamous cell carcinoma

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Present study demonstrated the prevalence of bovine ocular squamous cell carcinoma (BOSCC) and cryotherapy for the same in Satara and Kolhapur region. To evaluate cryotherapy in the treatment of eye cancer the clinical cases reported during the period of study were categorized into two groups on the basis of clinical signs, size and dimension of tumour. In Group A, 14 animals particularly those, which had small tumours measuring less than 2 cm in diameter, were operated for tumour excision followed by cryocauterization and recurrence was observed. While, Group B consist of 4 cases from group A which showed recurrence even after tumour excision and cryocautery and two animals which had extensive tumours more than 2 cm with impaired vision and invasion of underlying structures were subjected for enucleation of eyeball. From this study an inference could be drawn that, surgical excision followed by cryocautery of small size ocular tumour is the easiest and effective way of treatment, while in recurrent cases and advanced lesions confined to the globe, enucleation of eyeball is the treatment of choice.

## 46. Hoof associated lameness in organized dairy farms in western maharashtra

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The study was undertaken to determine hoof associated lameness in organized dairy farms in some part of Western Maharashtra. Total seven hundred animals were screened, out of which 63 (8.91%) animal showed hoof disorders associated lameness. The main lesions were overgrown hoof, interdigital hyperplasia and white line disease. The other lesions include sole ulcer, white line abscess, interdigital dermatitis, heel horn erosion, footrot and vertical and horizontal fissure. The incidence of overgrown hoof was very high because of hard flooring pattern and lack of regular hoof trimming practice. Most of the animals become less productive due to hoof disorders, that requires extensive work on hoof health. It was concluded from this study that lesions of hooves were them a in causes of lameness in cows and lack of hoof trimming practice lead to overgrown hoof and other associated lesions.



## **47. A field based study on the suitability and outcome of standing animal approach for caesarian section in acute obstetrical emergencies in cattle**

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Department of Animal Husbandry, Government of H.P

Caesarian Section in cattle is commonly performed by restraining the patients in lateral recumbency both at teaching institutes and in the field. Most veterinarians prefer this approach as they are trained in this approach only. The present study was conducted on 14 cattle cases presented for caesarian Section following acute obstetrical emergencies in the field in the sub- temperate Himalayan region. All the surgeries were conducted at the owners' doorsteps during late hours'. Paucity of manpower for restraint of the patient, discomfort to the patient in lateral recumbency leading to haemodynamic disturbances, limitations of casting an animal suffering with lameness due to old femoral or coxo-femoral malunion during fracture healing encouraged me to perform caesarian section in standing position in these patients. The suitability and outcome of the surgery by this approach will be discussed.

## **48. Urethrostomy as a salvage procedure for penile adhesion induced urethral rupture-cum-necrosis of penis: A report of two cases**

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An adult bull and a 6 years old bullock brought to the clinics with the history of ventral swelling in penile region and dribbling of urine from preputial opening. The bull and bullock had the history of an attempt of mating 15 days back and injury-cum-abscess over penis 6 months back, respectively. Clinical signs were similar to signs of urethral rupture. The urinary bladder was normal and palpable in both cases. The penis was exteriorized from post scrotal incision. Calculus was not found in any case in urethra or its surrounding; however, adhesion of penis was seen distal to ruptured site. The penis was transected and urethral lumen was incised from the transected end to make an inverted 'V' shaped urethral flap; the each arm of flap sutured with respective skin edge. Both cases recovered from the condition and had normal urine flow from urethrostomy site.

## **49. Incidence of septic arthritis in cattle: review of 36 cases**

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Septic arthritis in sixty three joints of thirty six cattle were analysed to find out their incidence with respect to breed, sex, age and joints involved. Crossbreds (83.3%) were more commonly affected than native animals (16.7%). Majority of the cases were females (83.3%). Age of the affected cattle varied from five days to seven years and most of them were less than one month old (69.5%). Carpal joints were most commonly affected (71.4%) followed by tarsal (19.0%), elbow (4.8%) and fetlock (4.8%) joints. Of the of 45 carpal joints, radio-carpal compartment alone was affected in 19 joints (42.2%), both middle carpal and carpo-metacarpal compartments in 18 joints (40.0%) and all the three compartments in eight joints (17.8%). Of the 12 tarsal joints, both tibio-tarsal and proximal intertarsal compartments were involved in 11 joints (91.7%) while the involvement of distal inter tarsal and tarso-metatarsal compartments was observed in only one joint (8.3%). The mean



age of cattle with monoarthritis (17.5 months) was significantly higher ( $p < 0.01$ ) than that with polyarthritis (4.04 months). Omphalophlebitis was the source of infection in 18 cases, post partum metritis, respiratory tract infection and enteritis in one case each. Source of infection could not be ascertained in the remaining 12 cases. Three cases with primary septic arthritis were the sequel to penetrating wound.

## 50. The successful use of artificial limb following amputation of forelimb in a cow

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A 5 year old cow suffered a left metacarpal fracture following a fall. It's limb was stabilized by application of external bamboo splints locally by a lay person in a faulty manner resulting in excessive compression of the limb leading to gangrene. It was decided to amputate the affected limb in such a manner that limb prosthesis may be applied later on. Therefore, following stabilization of the animal with appropriate therapy for 3 days, its left metacarpal was disarticulated from the carpo-metacarpal joint aseptically under local analgesia and surrounding tissue was mobilized and attached to provide a soft tissue cover over the stump. The limb was temporarily supported in a specially designed padded sturdy frame. The wound was treated routinely which healed in a normal course of time. After a gap of about 5 months, the animal was retrofitted with a customised artificial limb constructed from high density polyethylene (HDPE). The cow adapted with the artificial limb gradually and a 4 month follow-up revealed proper weight-bearing of the animal on the prosthesis. The paper describes the case management, surgical technique and the design of artificial limb and frame.

## 51. Bone marrow derived mesenchymal stem cells for augmentation of tendon repair in goats

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Eighteen clinically healthy adult goats used in this study were divided equally into two groups (A and B). The superficial digital flexor tendon was transected and repaired immediately using locking loop suture technique in both the groups of animals. Dulbecco's modified eagle media-low glucose and bone marrow derived mesenchymal stem cells were implanted at the site of injury in the animals of group A and B respectively. A full limb PVC pipe splint was applied to immobilize the operated limb for 10 days. The efficiency of treatment was assessed by observing various clinical parameters (swelling, exudation, warmth, pain at the operated site, tendon gliding movement and weight bearing capacity) on day 3, 7, 10, 15, 30, 45 and 60 postoperatively. The air-tendograms and histopathological examination were performed on day 15, 45 and 60. There was early reduction in swelling, exudation, warmth and pain at the repaired site in group B as compared to group A. The early restoration of tendon gliding movement and weight bearing capacity were also observed in the test group. Air-tendograms revealed comparatively more adhesions in control group than the test group. Histopathological observations revealed well organized collagen fibres in group B as compared to group A. Results reveal that autologous bone marrow derived mesenchymal stem cells enhance the regeneration of tendon.



## 52. Abdominal hernioplasty in a cow

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A sahiwal cow weighing 400kg suffering from lateral abdominal hernia since one year was operated by hernioplasty. The surgical correction was attempted before eight months by using nylon mesh but due to pregnancy and subsequent parturition recurrence of hernia was noticed. The cow was re-operated to close a defect of about 8 x 4 inch by using a prosthetic mesh of glass fiber. Glass fiber mesh was selected because of its strength and biocompatibility to correct the hernia ring defect. The muscles on the caudal abdomen were very weak thus to the possible extent mesh was used. A cotton mesh of niwar was used for external support to the operated area for 15 to 20 post-operative days. The defect heals uneventfully with a slight bulging on the caudal side due weakened muscle.

## 53 Efficacy of low level laser therapy on healing of clinical open wounds in calves: clinical studies

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The present work was undertaken to study the efficacy of low level laser therapy (LLLT) on healing of clinical open wounds in 16 calves. The calves were divided randomly into four groups. In control Group I-antiseptic dressing was done till complete healing along with parenteral antibiotic for 7 days and analgesic for 3 days. The animals of Group II and III received same treatment as in Group I, in addition to this low level laser therapy (LLLT) of 10 Hz :4min :2.4 J and 30 Hz:4min :2.4 J respectively was used, whereas in calves of Group IV LLLT of 30 Hz: 4min :2,4 J along with normal saline dressing was done.. In Groups II, III and IV treatment with laser therapy was carried out continuously for 5 days. These animals were subjected to various gross examinations for assessing the rate of wound healing on day 0, 3, 7, 10 and 14 post treatment. Decreased inflammation and exudation with clinically no scab during healing was observed in the laser treated wounds of Group II, III and IV as compared to Group I calves wounds. Maximum decrease in the size of the wound was observed in Group II, followed by Group III, with a maximum rate of healing 93.39% and 90 .30% respectively , with maximum efficiency at 10 Hz:4 min:2.4 J for deeper wounds and by 30 Hz:4min :2.4J for superficial wounds.

## 54. Surgical management of hoof disorders using tip chute in organised dairy farms

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The present investigations were aimed at recording the incidence of different hoof lesions, undertake standardized treatment protocols for management of various foot disorders, perform functional hoof trimming of affected animals at farmers door step using tip chute, collect the hoof shavings and blood sample of certain affected animals for certain laboratory estimations and suggest preventive measures to reduce occurrence of hoof disorders in and around Anand. The information derived by surveillance was analyzed in relation to species, breed, age, sex, housing system and floor conditions. Successful functional





trimming of the hooves was performed in 40 animals using tip chute facilitated early detection of subclinical laminitic lesions and thus reduced the incidence of hoof lesions. Use of tip chute facilitated proper restraint and comfortable functional hoof trimming with less manpower and time.

## **55. Prevalence of surgical conditions in dairy bovine practices under veterinary services of mehsana district cooperative milk producers' union limited, popularly known as dudhsagar dairy, mehsana**

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During the time span of last 11 years veterinarians in AH department of Mehsana District Cooperative Milk Producers' Union Limited Mehsana attended a sum of 48,28,974 visits call out of this a sum of 37,86,200 visits were for various illnesses. Out of these illness visits 91,373 visits were for surgical cases, it comes to the tune of 2.41%. In all 24 types of various surgical interventions carried out by dairy veterinarians in field. Relative prevalence of surgical intervention in cooperative dairy bovine practices are Dehorning (78.39%), Patellar Desmotomy (7.145%), Horn Cancer (5.155%), Castration (Open Method) (2.743%), Amputation of tail (2.376%), Abscess (1.816%), Tumor (0.392%), Caesarean (0.383%), Interdigital Fibroma (0.343%), Rumenotomy (0.275%), Artesia ani (0.126%), Spastic paresis (0.073%), Knuckling (Planter Tenotomy) (0.068%), Amputation of ear (0.063%), Extirpation of eye ball (0.053%), Entero-Enterectomy (0.047%), Cystic catheterization (0.047%), Yolk Gall (0.043%), Urethrotomy (0.036%), D.H. (0.023%), Paratidectomy (0.022%), Evisceration of eye ball (0.016%), Esophagotomy (0.014%), Other minor surgical conditions like Brisket ulcer, warts etc (0.353%).

## **56. Unusual case report of eye worm and its surgical treatment in sheep**

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One year old sheep presented in OPD, TVCC with history of corneal opacity, epipora, redness and itching of left eye. Slight anorexia and continuous shaking of head towards left side. Clinical study reveals with normal heart rate, respiration rate and temperature. On eye examination slight movement noticed in anterior chamber. Confirmed eye worm movement. Sheep was operated under diazepam sedation and retro bulbar nerve block with 2% lignocaine HCl. Removed eye worm from left eye and sample given to parasitological confirmation. Post operative antibiotic given for five days with pain killer eye drop (Flur) and plain antibiotic (Toba) eye drops. Corneal opacity clear after three days and sheep shows uneventful recovery. The details of findings and operative procedure will be discussed.

## **57. Successful surgical management of pendulous penile urethra with prepuce sheath in a massive bull.**

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One 8 years old massive indigenous bull was presented with the complain of pendulous prepuce with penile urethra confusing



as fifth leg. Since it was remaining similar height as that of leg, but one inch above the ground, so there was great possibility of rubbing on the ground. From history it was known that the bull was thoroughly used for breeding purposes and thereafter it developed inflammatory swelling of prepuceal sheath. Day by day due to heavy swelling and weight of the mass it was dragged downwardly. Due to rubbing on the ground it developed infection and wound infested with maggots. The mass was washed and cleaned thoroughly and applied povidone iodine and sprayed with anti-maggot preparation along with parenteral antibiotics. After 3 days of proper dressing it was prepared for surgery by keeping 24 hours fasting. Under sedation with xylazine the heavy swollen mass was excised and closure was made. Then second attempt was made for surgical excision on other day. Tissue samples were sent for histopathological study. Post-operative measures with proper hygienic management were taken. The bull recovered well and able to move with normal urination afterwards.

## 58. Precautions during intestinal strangulation/ intussusception/obstruction operation

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The author has performed 523 surgeries in large animals during the period 2000-2012. During this, many cases of intestinal obstruction in large animals were resolved successfully. With experience, the author recognized some important dark spots which can spoil the successful outcome. To overcome these measures are listed below.

1. Most obstructions (intussusception/volvulus) occur at the jejunum and ileum.
2. While incising the right paralumbar region, great care must be taken to protect greatly distended intestinal loops that may lie very close to abdominal wall and are likely to be perforated.
3. The obstructed loops often adhere to mesentery, omentum etc. Exteriorising may be difficult especially in few days standing cases. Careful release of these adhesions is essential to avoid rupture.
4. In old chronic cases, the loops may be grossly distended and require firm hold of palm and bringing out by slow swinging movements.
5. Once the obstructed loops are exteriorized, other loops are wrapped in a sterile towel and released back into abdomen to prevent them interfering with further procedure.
6. A continuous flush with normal saline helps identifying the bleed at surgical site, wash out contamination and prevent soiling.
7. It is desirable to close the laparotomy from ventral end (in standing animal) to prevent trapping of loops of intestines in the sutures.

## 59. Incidence of horn affections in bovines at kaira and anand districts (Amul Milk Shed Area) of Gujarat.

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Horn is one of the important organ of bullock which is focusing the farmers for its beautiful look. One of the serious problems of bullock is the horn affections include cancer, evulsions dehorning and fractures of horn. The study was conducted to know the affections of horn out of total surgical interventions in bovine population of Amul milk shed area. During the period of 2006 to 2012, AH Division of Amul Dairy, Anand have received 129294 calls from the milk producer members of the milk union for surgical intervention. The veterinarians at different centers of AH department have attended these call and the diseases



recorded by them have been classified over the aforesaid period. Out of total 129294 surgical cases recorded the cases of horn affections were 9585(7.41%) which comprises cancer 1201(0.93%), fracture 2827(2.19%), evulsions 3027(2.34%) and dehorning cases 2530(1.96%).

## 60. Incidence of surgical interventions in cattle and buffaloes in amul milk shed area

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During the period of 2006 to 2012, AH Division of Amul Dairy, Anand have received 2225432 calls from the milk producer members of the milk union. The veterinarians at different centers of AH department have attended these call and the diseases recorded by them have been classified over the period of 6 years. The total surgical cases recorded out of total attended cases were 129294. Thus total percentage of surgical cases was 5.81%. In all 35 types of various surgical interventions carried out by dairy veterinarians in field. Relative prevalence of surgical cases in our milk shed area is- Wound- 40.33%, Sprain- 11.08%, Trauma-6.88%, Teat Affections-5.43%, Choke- 5.35%, Fracture- 4.55%, Tail Surgery- 2.60%, Amputation of Horn- 2.49%, Evulsion of Horn-2.34%, Abscess- 2.26%, Teat Papillae- 2.05%, Dehorning 1.96%, Hygroma- 1.61%, Tumor- 1.54%, Patellar Desmotomy- 1.37%, TRP- 1.30%, Intestinal Obstruction- 0.94%, Horn Cancer-0.93%, Inter Digital Fibroma- 0.88%, Hernia- 0.69%, Eye Cancer- 0.64%, Urethrotomy- 0.48%, Castration- 0.42%, Knuckling- 0.30%, Spastic Paresis- 0.28%, Caesarean Operation- 0.26%, Amputation of Ear- 0.14%, Evisceration of Eye ball- 0.1%, Diaphragmatic Hernia - 0.07%, Parotidectomy- 0.04%, Cystorrhaphy- 0.04%, Extirpation of Eye ball- 0.03%, Atresia Ani- 0.03%, Rumenotomy- 0.02% and other minor surgical conditions like warts brisket ulcers etc.- 0.58%.

## 61. Incidence of teat affections in bovines at kaira and anand districts (Amul Milk Shed Area) of Gujarat.

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The affections involving teats were recorded with an incidence of 5.43. Among the teat lesions highest incidence of intraluminal obstructions and Teat Sphincter Inadequacy ("Leakers") was observed. The incidence was 6.00%. Obstruction of teat was the major etiology. An examination of the point of time of the diagnosis revealed that 46.2% of all cases fell during the first month after calving. Of all cases of stenosis, 52.8% were found in the rear teats and, correspondingly, 47.2% in the fore teats. The location of the stenosis in the teat was known in 850 cases: 60.00% in the streak canal and tip of the teat, 11.2% in the mid-section of the cistern, 19.8% in its upper section and 9.0% affecting the entire cistern. Of the 570 cases treated surgically, 27.0% required repeat treatment. Of the 280 cases treated without surgery, 35.00% had to be treated several times. On the basis of the observations made, conclusions were drawn with regard to etiological factors and the results examined in the light of some other studies.



## 62. Incidence of surgical interventions in cattle and buffaloes in sabar milk shed area

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During the period of April 2011 to September 2012, AH Division of Sabar Dairy, Himatnagar have received 5,22,330 calls from the milk producer members of the milk union. The veterinarians at different centers of AH department have attended these call and the diseases recorded by them have been classified over the period of 1.5 years. The total surgical cases recorded out of total attended cases were 23992. Thus total percentage of surgical cases was 4.59%.

In all types of various surgical interventions carried out by dairy veterinarians in field. Relative prevalence of surgical cases in our milk shed area is as per following table.

| Surgical case Name           | Total Case (April 11-Sep 12) | Among Surgical Case (%) | Surgical case Name              | Total Case (April 11-Sep 12) | Among Surgical Case (%) |
|------------------------------|------------------------------|-------------------------|---------------------------------|------------------------------|-------------------------|
| Abscess                      | 912                          | 3.80                    | Obstruction of intestine (opr.) | 5                            | 0.02                    |
| Abscess opening              | 276                          | 1.15                    | Other surgical operation        | 29                           | 0.12                    |
| Amputation of horn           | 224                          | 0.93                    | Ottorrhoea                      | 161                          | 0.67                    |
| Amputation of tail           | 109                          | 0.45                    | Patellar desmotomy (mpd)        | 354                          | 1.48                    |
| Atresia ani (opr.)           | 5                            | 0.02                    | Penile injury / penile wound    | 5                            | 0.02                    |
| Caesarian section            | 40                           | 0.17                    | Rumenotomy                      | 11                           | 0.05                    |
| Castration                   | 68                           | 0.28                    | Spastic paresis                 | 28                           | 0.12                    |
| Dehorning                    | 412                          | 1.72                    | Sprain                          | 718                          | 2.99                    |
| Diphragmatic hernia          | 7                            | 0.03                    | Surgical wound                  | 192                          | 0.80                    |
| Esophagotomy                 | 1                            | 0.00                    | Teat canal obstruction          | 743                          | 3.10                    |
| Evisceration of eye ball     | 15                           | 0.06                    | Teat papillae                   | 66                           | 0.28                    |
| Evulsion of horn             | 114                          | 0.48                    | Trauma                          | 780                          | 3.25                    |
| Extirpation of eye ball      | 12                           | 0.05                    | Traumatic reticulo peritonitis  | 829                          | 3.46                    |
| Eye cancer                   | 11                           | 0.05                    | Tumour                          | 180                          | 0.75                    |
| Eye injury                   | 138                          | 0.58                    | Ulcer                           | 14                           | 0.06                    |
| Fracture of bone             | 317                          | 1.32                    | Urethrotomy                     | 28                           | 0.12                    |
| Fracture of horn             | 481                          | 2.00                    | Urolithiasis                    | 117                          | 0.49                    |
| Haematoma                    | 5                            | 0.02                    | Wart                            | 170                          | 0.71                    |
| Hernia                       | 66                           | 0.28                    | Wound                           | 15032                        | 62.65                   |
| Hernia operation             | 20                           | 0.08                    | Yoke gall                       | 35                           | 0.15                    |
| Horn cancer                  | 430                          | 1.79                    |                                 |                              |                         |
| Hygroma                      | 196                          | 0.82                    |                                 |                              |                         |
| Inter digital fibroma (opr.) | 24                           | 0.10                    | <b>Total surgical case</b>      | <b>23992</b>                 | <b>100.00</b>           |
| Intestinal obstruction       | 612                          | 2.55                    | <b>% of all treatment calls</b> | <b>4.59</b>                  |                         |



### 63. Case report-surgical management of tumors growth at limb in buffalo heifer

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During the time span April 11-Sep 12 we at Sabar dairy have attended 23992 (4.59%) surgical cases of the total call 522330 among this Surgical cases prevalence of cases related to tumors were 180 (0.75% of total surgical cases) Here we have presented one of the interesting one: A buffalo aged about 8 years in its 3<sup>rd</sup> lactation was suffering with tumors growth at coronet to hoof region on right hind limb .It was difficulty bearing body wt on it and having difficulty in locomotion .By negligence of owner it was progressed too much in size. Mass was removed under local analgesia by blunt dissection after skin incision Tumor mass measured about 7-8 inches in length and 5 inches in diameter. Sample was send for histopathological examination. Results are awaited.





## Ruminant Surgery Session

### XXXVI Annual Congress of ISVS and International Symposium





## Ruminant Surgery Session

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LEAD PAPER

## Current Trends in Large Animal Fracture Treatment

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Fracture of long bones is one of the common surgical conditions encountered in large animal practice. In large animals, fractures are more difficult to treat and healing of fracture takes more time than in small animals or human beings. Till recently, most cattle and horses with severe fractures were euthanized, largely because it was difficult to restrict the animal's movement or keep its weight off the fractured leg during healing. Today fracture fixation in large animals has changed significantly. Internal fixation, using nails and plates, or external skeletal fixation permits an adult cattle or horse to stand on a broken leg while it heals, often making previously life-threatening fractures treatable. New devices, mainly adapted from the human field, have been successfully introduced into large animal practice. Further, new devices such as intramedullary interlocking nail (ILN) and external skeletal fixation (ESF) have also been developed exclusively for large animal fracture management. Some other advances in equine orthopedic surgery include the more frequent use of arthroscopy in repair of articular fractures, development of locking compression plate, and advances in management of laminitis and arthrodesis techniques. Magnetic resonance imaging, computed tomography and computerized surgical guidance systems are being integrated into surgery to allow less invasive surgical treatments of difficult fractures. Additionally, new anaesthetic protocols and methods of anaesthetic recovery have greatly reduced the complications like development of re-fractures during recovery in large animals. Nevertheless, many problems related to fracture fixation and healing are yet to be resolved and need concerted efforts to improve.

### Types of Fracture

Fractures involving the limbs are common in cattle and buffaloes. The cause of fracture is mostly an automobile accident; in young calves, they often occur due to trauma during dystocia or handling. The fractures are most commonly seen in metacarpus and metatarsus (about 50%), tibia (10-15%), radius and ulna (7-10%), femur, humerus, pelvis and phalanges, and fractures of axial skeleton are less frequently seen. Incomplete fractures, caused by long-term repeated stress, are fairly common in performance horses, whereas complete fractures commonly occur during intense exercise or result from a kick or severe accident. In large animals, fractures of lower limb are most likely to get open, where the end of a broken bone generally penetrates the skin. Equine skin is thin and easily penetrated by sharp bone fragments.

### Diagnosis of Fracture

Most complete fractures are easily diagnosed. The first sign of a fracture is generally a non-weight bearing lameness. The fracture site generally has swelling and the animal shows distress with carrying of affected leg. An animal with a complete fracture often attempts to move on three legs. Incomplete fractures, though infrequent, can be difficult to detect, as they usually cause only mild lameness. Early diagnosis is critical to prevent an incomplete fracture leading to a complete fracture. Confirmative diagnosis of a fracture can be done by radiographic examination. Generally both medio-lateral and cranio-caudal or dorso-plantar/dorso-palmar views are indicated. In recent years digital X-ray has increased the accuracy of diagnosing a fracture. Modern diagnostic methods like digital X-ray, CT scan, nuclear scintigraphy and MRI are particularly useful, where sometimes a survey radiograph fails to diagnose a fracture, especially an occult fracture or fracture/luxation of axial skeleton. However, they are generally beyond the reach of a common veterinary surgeon.

### First Aid

The chance of a successful repair often depends largely on how the animal is handled before it gets on to the operating table.



If the animal is forced to walk on the broken bone or if it is transported to the hospital without a proper splint, a relatively simple fracture might become a comminuted or compound fracture, which may be irreparable. The animal may attempt to use its broken leg to regain balance, which can cause severe damage to surrounding soft tissues, vessels and nerves. Arteries can stretch and get damaged leading to bleeding and impaired blood flow to the fracture site. Fortunately, severe bleeding is unusual in large animals even with compound fractures.

First step should be stabilization of the fractured limb by applying splint to the fractured leg to reduce the animal's anxiety and further damage. It allows the animal to regain control of the leg even though it can not put complete weight on it. Once the limb is stabilized, most animals will rest the leg rather than try to use it for support. In excited animals it might be necessary to sedate the animal to reduce the anxiety and for splinting. A rigid splint (any lightweight, relatively strong, rigid material, such as wood or PVC pipe split lengthwise) should never be used directly against the animal's skin. Instead, a layer of cotton roll is applied over the skin, and gauze is tightly wrapped over the cotton, then the splint is placed over the bandage and wrapped with a cotton/elastic bandage. A splint requires at least two pieces of wood/PVC tubing that must be placed 90° apart, never 180°; one along the outer surface and the other along the front or the back of the leg. Placing the splint along the inner and outer surface of the leg is ineffective, as it does not prevent the leg from bending.

#### **Factors to be considered before fracture fixation**

The outcome of a fracture and fracture fixation depends on many factors that vary from case to case. Many animals with simple fractures recover with rest and proper care. Others with much more serious injuries have to undergo surgical fixation at the earliest. The timing of surgical fixation of fracture is often dictated by multiple factors, particularly in the presence of other injuries. Nevertheless, early care and fracture fixation to stabilize the bone fragments is essential to minimize fracture complications. Several factors that should be considered while selecting the technique of fracture management, like, species of the animal, location and type of fracture, presence or absence of soft tissue and neuromuscular trauma, closed or open fracture environment, body weight and behavioural nature of the animal, the facilities available and above all the experience of the surgeon with a particular technique.

**Ability of the animal to stand and walk:** Large animals, cattle, buffaloes and horses, can walk on three legs easily, even after severe fracture in one leg; such animals have good prognosis after fracture fixation. Prognosis is generally poor in cases which remain recumbent for prolonged period. An animal lying down for few days without being able to get up, may or may not be able to get up on its own even after bone fixation. Hence every attempt should be made to make the animal stand at the earliest after splinting the fractured leg. Nevertheless, undue movement of the animal should be restricted.

**Type, severity and location of fracture:** Generally simple (closed) diaphyseal fractures of long bones below the stifle or elbow joint are amenable to treatment. A cast or any other external fixation technique is easily applied and may provide stable fixation of such fractures, especially in fore limbs. Animals with open comminuted and infected fractures with severe soft tissue injury are generally difficult to treat and recover slowly; external skeletal fixation (ESF) is generally advised to treat such cases. A fractured scapula can often be healed with 3-6 months of stall rest. However, a broken femur or humerus is difficult or nearly impossible to treat in large animals, especially in horses. Fortunately femoral or humeral fractures are more frequently seen in relatively young calves and foals, which can be managed with an internal fixation technique. The fractures at one end of the bone and those involving the joint generally lead to permanent arthritis and lameness. Treatment of such fractures should be done by providing stable and rigid fixation, and in most cases a trans-articular fixation is preferred.

**The possible outcome of fracture fixation, and the purpose and quality of life after recovery:** Generally cattle are excellent patients for treatment of fractures as they spend most of the time lying down, have a tremendous potential for bone healing and are most resistant to contralateral limb breakdown and stress laminitis, and usually well tolerate the fixation devices. Further, they are temperamentally less agile and powerful, and relatively less susceptible to infection than horses. Postoperative care and management is also relatively easy in cattle than horses. Infection and pain management are significant problems



that the surgeon must address with equine patients. In horses, laminitis of the 'good leg' (support limb) is one of the most serious complications. Generally younger animals recover better and faster after a fracture than adults, more often because of lesser weight. One should also consider the purpose and quality of life after recovery from fracture. Broken bones can often mean the end of a horse's athletic career. Further, possible arthritis problems, laminitis, recurring infections, and recurring injuries are more common in horses after a fracture. However, persistence of slight lameness or deformity is 'acceptable' in a cow or a buffalo. Amputation of a severely traumatized limb can be an option in cattle (due to socio-economic and religious concerns), but is never acceptable in a horse. These factors should be weighed before attempting and deciding on the surgical fixation of fractures in large animals.

**Economics:** The cost of fracture treatment and economics is a major concern in veterinary practice, more so in large animals. The cattle and buffaloes are reared mostly for production purpose and generally reared by poor farmers, exuberant cost of fracture treatment will jeopardize the poor farmer. Even in horses, treatment of a simple fracture may sometimes cost thousands of rupees. The cost of implants and the drug is also very high because of animals' heavy weight. When dealing with such a situation one must discuss with the animal owner about the severity of fracture, the realistic outcome and cost, and treatment should be attempted only with the owner's willingness and consent. Nevertheless, veterinarian should keep in mind the cost of treatment before deciding on the treatment. In bovines particularly, more often the choice of fracture treatment is dictated by the cost of treatment rather than the optimum level of fixation.

#### **Challenges in large animal fracture management:**

**Need for immediate weight bearing:** One of the biggest challenges veterinary surgeons facing today with regards to fracture repair is that the animals need to be able to put weight on the fractured limb immediately after surgery. This is further compounded by the fact that many large animal patients have heavy body weight and the challenges become obvious. Even if the fracture could be repaired, the opposite (good) leg needs to be able to bear weight. If the corresponding leg supports too much of the body weight for long time, the support structures of that leg may break down leading to laminitis, especially in horses.

**Non-availability of implants:** It is another biggest challenge confronting the veterinary orthopaedic surgeon. There are very few implants used in fracture repair in cattle and horses that are designed specifically for them, most are adapted from human practice. Though large animals would need much bigger plates, the laws of physics and the amount of skin present limit the size of the plates that may be used. Plates and screws, or IM nails are most often not sufficient to allow a large animal to bear weight after surgery. Hence it is always advisable to use some type of cast/external fixation technique along with internal fixation to provide additional support to the limb.

**Open fractures:** The occurrence of open fractures is relatively more in large animals than in small animals. This is mainly attributed to heavy body weight, less soft tissue covering of lower limbs and also more possibilities of post-injury complications (inadequate first aid and delayed treatment etc.). Open fractures have a much lower prognosis and a higher cost associated with treatment, mainly due to higher incidence of infection of implants and soft tissues. Some of the biggest recent advances in fracture repair in large animals have been in the treatment and prevention of infections. In such cases effective antibiotic therapy along with early bone stabilization is recommended, which can be accomplished by ESF that allows drainage of open wounds. Whenever possible, early closure of open wounds is done to decrease the rate of infection.

**Recovery from surgical fixation:** Another major problem confronting large animal fracture management is the recovery from anaesthesia after surgical bone fixation. It is always the most anxious and stressful moment for the surgeon when a large animal gets from the operating table till it is back on its feet. Some of the methods used for smooth recovery include pool recovery systems, recovering in a sling, or using a system of ropes to assist in standing. First 24-48 hours of bone fixation is critical in large animal fracture fixation, and most of the implant failures occur during the period. During the early post-fixation period, the animal feels discomfort, and tries to adapt to the fixation device and learn to sit, lay, stand and walk with



the device. Hence careful monitoring and assistance should be provided to the animal to get it accustomed to the fracture fixation/device.

### Methods of fracture fixation:

The first step in treating a complete fracture is to reduce the bone fragments into proper alignment. The animal is usually placed under deep sedation or general anesthesia to perform the open reduction, and specialized equipments might be required to pull large bones into position. Closed bone reduction is generally not possible in large animals due to heavy muscular pull and severe overriding of bone fragments. Once the bone fragments are properly aligned, they are fixed in position either with an external or an internal fixation device.

**External fixation techniques:** *Plaster cast* is the most widely used both in bovines and equines. Indicated in immobilization of fractures below the mid-diaphysis of radius or tibia. Under sedation/anaesthesia, cast is applied with the help of an assistant to maintain alignment of the limb. In large ruminants, the bone reduction can be achieved and the limb held in tension during casting by placing wires through the holes drilled in the hoof wall and applying tension. The thickness of the cast is usually based on clinical judgement. Casts 6-8 layers thick may be adequate for calves  $\leq$  150 kg body weight, but adult cattle may require casts 12-16 layers thick. Casts used on the hind limbs must be thicker because of stress concentration by the angulation of the hock. Incorporation of splints (wooden/metal) within the cast (2 rods placed 90° to each other) can increase the strength of the cast. Complete drying/hardening of the cast (attaining full strength) may require 24-72 hrs. Use of a walking bar ('U' shaped bar placed under the hoof and incorporated into the cast) will increase the distribution of loading forces into the cast and away from the distal limb. Fractures in adult cattle may heal within 8-10 weeks, but often require 12-16 weeks for clinical union to occur. Plaster is removed after radiographic fracture union takes place.

*A fiberglass cast* is a lighter, synthetic alternative to the more traditional plaster cast. It is done by padding the extremity with cotton or waterproof padding material, followed by wrapping several layers of knitted fiberglass bandages impregnated with a water-soluble, quick-setting resin. It is lighter and more durable than plaster, so fiberglass has quickly become the preferred type of casting with many large animal practitioners. It offers greater strength, less time for setting, and requires less maintenance than a plaster cast. However, the synthetic materials leave less room for swelling. Plaster is more moldable than the knitted fiberglass and resin bandages, so a more comfortable fit can sometimes be achieved with plaster.

**Internal fixation:** Internal fixation offers several advantages. A fracture repaired under compression heals more quickly and does not form a bony callus, which could interfere with tendons sliding over the bone. An animal with an internally fixed fracture can bear weight on the injured leg and return to work more quickly than an animal whose fracture is repaired with a cast or external fixation. In addition, internal fixation avoids the complications of cast application, such as pressure sores. Unlike in humans and small animals, in large animals, however, bone density rarely reduces (no stress protection), because no bone plate available is strong enough to take more than a fraction of an adult cattle's or horse's weight off the bone. Large animal surgeons constantly look for stronger, more rigid implant.

*Intramedullary nails*, though are the most widely and commonly used fixation devices in small animal practice since long time, it has gained acceptance in large animal practice only quite recently. Kuntscher nails, hollow IM nails, were earlier used in large animal fracture fixation due to the advantage of light weight and three point fixation. They have been used in transverse or short oblique fractures of long bones, especially femur, humerus and tibia, where the cortex is good with no longitudinal cracks. In recent years, intramedullary interlocking nails (ILN) have replaced the K-nails due their better mechanical advantage of prevention of collapse of the fracture site by the locking effect. An ILN is basically an intramedullary pin secured in position by proximal and distal transfixing screws, which engage the bone to the nail to provide axial bending and torsional stability. The ILN is best suited for diaphyseal fractures of femur and humerus in calves and foals, and is especially useful in fractures with extensive comminution of the diaphysis. Angled tibial ILN for bovine tibia has also been developed and is under investigation. Because screws are placed at either end of the nail, fractures of the metaphyseal or epiphyseal regions may not





be amenable to repair with ILN if there is not sufficient bone for screw placement. Nevertheless, in distal femoral fractures, ILN introduced by normograde technique through the intercondylar fossa could provide greater purchase of the nail in the small distal fragment. ILN permits early return to limb function with the added advantage of minimal soft tissue morbidity. The outcome after surgical repair of mid diaphyseal humeral and femoral fractures can be improved by the use of ILN and ILN-plate combinations; overall results are up to 75% with animal as large as 300 kg being successfully treated. Unfortunately these systems are not commercially available and evaluated extensively; hence their utility is limited at the moment. Non-availability of nails with proper size and shape, and the heavy cost of the instruments, however, limit their use in large animal practice.

*Dynamic compression plate (DCP)* having oval screw holes of special geometry has been used for rigid internal fixation of long bone fractures in large animals. Use of single plate, however, may not provide stable fixation in heavy animals. Hence, double plates have been used sporadically for fixation of tibial, radial, metatarsal and metacarpal fractures, both in bovines and equines. Plate luting, a technique that uses polymethylmethacrylate (PMMA) interposed between the plate and bone as well as between the screw head and the plate hole, to improve contact, stability and fatigue resistance to cyclic loading has been used to improve the outcome of plate fixation in equine long bone fractures. This method of increasing the contact area of the screw head with the plate hole, and increasing the contact surface between the plate and bone, provides a mechanism that prevents micro-motion at the screw head as well as movement of the plate on the bone. Plate luting could increase the fatigue life of the implants by 300–1200 % without additional negative biological effects that would influence bone healing. Presently, the use of plate luting is a standard technique in treating long bone fractures with plates. Incorporation of antibiotics into the PMMA has the added benefit of continuous local antibiotic coverage within the wound of potentially infected fractures postoperatively.

The use of *Locking Compression Plate* system has perhaps been the most important advancement in the past decade. Locking compression plates have threaded screw holes, which allow screws to thread to the plate and function as a fixed-angle device. These plates may have a mixture of holes that allow placement of both locking and traditional nonlocking screws (combi plates). Fixed angle screw plate constructs do not rely on the screw thread bone interface or plate bone friction to provide stability in fracture repair. The significant result of this is improved holding strength of constructs with a much lower risk of implant loosening or constructs failure even in the face of sepsis. The fixed angle screw-plate constructs have been used in the repair on most long bone fractures in foals, arthrodesis techniques, as well as revision surgeries for failed orthopedic repairs. While locking plates have been used for years in specialized research trials, they have been available for general orthopaedic applications only in the last 5 to 10 years. This system has not yet been used in large animals as a clinical entity but may have promise. The concept of mechanically locked screws should provide stronger and more certain stability than plate luting. This locking compression plate concept might even allow the use of biological fixation. Locking plates can be considered as external fixators placed underneath the skin, further they are more stable as a result of the shorter distance between the plate and the bone. Continued efforts to develop locking plate specifically for large animals may improve the outcome of fracture fixation.

**External skeletal fixation:** It refers to the stabilization of musculoskeletal injury using percutaneous fixation pins that are connected outside the body to form a rigid frame or scaffold, spanning the region of instability, e.g. transfixation pinning and casting, bilateral linear fixators and circular fixators. This type of fixation is indicated for the management of long bone fractures especially of tibia and radius, where cast immobilization is not appropriate or does not provide optimal level of fixation (fractures proximal to the distal radial or tibial physis, with soft tissue injuries and open fractures).

External skeletal fixation is another area of exploration for use in large animals, though it has not been widely embraced in large animal orthopedics. The use of human and small animal fixators adapted for use in adult large animals did not succeed in the hands of different surgeons and have gone unreported in the literature. However, more recently ESF devices are exclusively being developed for use in large animals. A resurgence of interest in ESF occurs every time a clinician is faced with an unstable, severely comminuted open or closed fracture of a weight supporting bone where reconstruction using internal



fixation is technically impossible. 'Pins in plaster' method has been used in large animals, including horses, as a treatment modality. It is the use of a walking bar incorporated into a cast using transfixation pins above the fracture. Transfixation pinning and casting (TPC) may be applied either as a 'hanging limb pin cast' or as external skeletal fixator. Hanging limb pin cast refers to placement of transfixation pins through the bone proximal to the injury, followed by application of a full limb cast. The advantage of using pin-casts compared with hanging limb casts is that the fracture is more stable and the fracture fragments are not able to move within the pin-cast, and the pin-cast may not need to span adjacent joints. For management of open fractures, daily dressing of the wound may be carried out by leaving a hole in the cast (window cast) at the site of injury. However, this gives unsatisfactory access to the wound and is uncomfortable to the patient because the swelling in the limb becomes concentrated at the defect in the cast. An ESF device specifically designed for equine use in distal limb fractures has also been reported. This device incorporated transfixation pins in the intact bone above the fracture, with sidebars and a base plate that allowed the transfer of weight-bearing forces around the fracture to the ground. This allowed the animal to bear weight immediately after fixation via the pins and sidebars without loading the fracture. Modified ESF design was also developed using the concept of loading the ESF pin in shear instead of bending, which involved using large diameter sleeves over the transfixation pins.

At Indian Veterinary Research Institute, concerted efforts were made to develop different designs of linear, circular and hybrid external fixators specifically for use in large ruminants. The results with the use of these devices were encouraging, especially in those open infected long bone fractures where no other fixation technique could be effective. Advantages of ESF include: early return to function of the affected limb with excellent mechanical properties; ability to adjust the frame after bone fixation, allowing correction of rotational or angular deformities; avoidance of surgical trauma to the injured tissue; avoidance of infection associated with buried implants; ease of implant removal after fracture union; provision for transarticular fixation in the presence of severe soft tissue trauma or severe comminution of the proximal or distal end of the affected bone; preservation of joint motion and multiple applications with reusability of components.

**Epoxy-Pin fixation systems:** Standard ESF devices with stainless steel components provide rigid fixation but are heavy. Aluminum and carbon fiber components are lighter; however there is higher cost with carbon fiber. Regardless, the size and shape of the connecting bars/rings are similar and fixation of transosseous pins is dictated by the size and location of clamps or rings. To overcome these limitations, other materials like acrylic (eg, polymethylmethacrylate) and epoxy putty have been used for use in light weight animals like calves and foals. Advantages of free form fixation include contouring the connecting bars to match any fracture configuration, pin direction not influenced by connecting bar location, and pin diameter not influenced by clamp size. Free form fixators have been generally used for mandible and maxilla fractures in dogs and for fractures of small bones in birds. But in recent years, they have been found effective for management of open, infected long bone fractures in calves and foals.

Epoxy-pin fixators (bilateral multiplanar and circular designs) can be used for repair of open fractures/dislocations distal to the stifle and elbow joints. Fractures and dislocations are reduced and immobilized using 2.0-3.0 mm K-wires (depending on the animal's weight) fixed at different levels (at least at 2 points in each fragment). Fixation wires in the same plane are bent and joined; and using additional wires, connecting bars/rings are constructed to make a temporary scaffold. Thoroughly mixed epoxy putty is then applied using the scaffold as guide and by incorporating the wires within the epoxy mold. The fixation of epoxy-pin ESF is easy, less cumbersome, needs minimal instrumentation, economical and also provides stable fixation of fractures in animals weighing at least up to 100 kg, hence can be practiced by a veterinary surgeon at any remote corner in the field.

### Conclusions

Even though fracture repair has made tremendous advances in recent years, it remains a great challenge to treat fractures in large animals, and the risks and benefits should be thoroughly analyzed before choosing repair. It is a tough task to repair fractures especially those associated with upper part of limbs, including that of tibia. It seems strange that although much of





the technological advancement has taken place in the field of veterinary and medical fields, there is not much development in the field of large animal orthopaedics. Efforts are being made to develop fracture fixation techniques and devices/implants custom made for large animals, nevertheless still there is a long way to go. There is also need to impart training and develop specialists in large animal fracture repair. It is expected that next few years will be exciting for large animal orthopaedics in terms of technology development. Until then treatment of fractures in large animals will remain a huge challenge for veterinary surgeons.



## 1. Effects of growth factors autologous uncultured bone marrow cells induced repair of peripheral nerve in rabbits

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The present study was conducted to evaluate the effect of uncultured autologous marrow cells derived mononuclear cells (BMNCs) or its combination with TGF- $\beta$ 1 or IGF-1 on healing of crushed sciatic nerve injury in rabbits. Forty eight clinically healthy New Zealand White adult (10-12 months old) rabbits of either sex weighing one to two kg were used in the study. The animals were randomly divided into four groups, A, B, C and D of 12 animals each. Sciatic nerve injury was created at intermediate region in its course down the thigh before bifurcation into the tibial and common peroneal nerve by crushing at second lock position with a hemostat forceps for 60 seconds. Uncultured autologous bone marrow derived mononuclear cells (BMNCs) ( $2.96 \pm 0.18 \times 10^6$ ) (group B), BMNCs and growth factors TGF-  $\beta$ 1, 30 ng/30  $\mu$ l (group C) and BMNCs and IGF-1 30 ng/30  $\mu$ l (group D) were implanted at crushed site immediately after creation of nerve injury. The animals of group A were kept as control. Evaluation of nerve repair was done on the basis of changes in rheobase value (mA), pain perception, proprioception, neurological recovery scores at 15 days intervals and histological, histochemical and Scanning electron microscopystudies . The score for pain perception increased gradually in all the groups. But recovery of the pain perception and related score was faster in group C followed by groups D, B and A. All the treatment groups have shown better pain score than the control group A at different intervals. The recovery in proprioception was faster in group C as compared to other groups but difference between groups C and D was minimal. The neurological recovery data showed early response in neurological recovery in group C followed by groups D, B and A. On histopathological evaluation vacuolation of the degenerated myelin was more prominent and characterized by extensive Wallerian degeneration and degradation of myelin by foamy macrophages (gitter cells) and Schwann cells, causing formation of vacuolar spaces (digestion chambers) in control group A. In the treatment groups especially in groups C and D, more compact staining was observed suggesting faster temporal myelinoclastic activity. The overall histological grading also suggested best healing in group C followed by group D and then group B. It is concluded from this study that implantation of uncultured autologous BMNCs at the injury site can augment the healing of crushed sciatic nerve. The combination of BMNCs and transforming growth factor beta-1 is found better than BMNCs and insulin like growth factor-1 for the repair of injured sciatic nerves in rabbits.

## 2. Studies on articular cartilage repair using growth factors and autologous uncultured bone marrow mono-nuclear cells (BM-MNCs) in rabbits

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The objective of this study was to investigate the effect of autologous bone marrow derived mononuclear cells and growth factors on healing of full thickness articular cartilage in rabbits. Forty eight clinically healthy New Zealand White adult (10-12 months old) rabbits of either sex weighing one to two kg were used in the study. The animals were randomly divided into four groups, A, B, C and D of 12 animals each. Osteochondral defects, 5mm in depth and 3mm in diameter was created on trochlear groove of left femur with the help of a trephine in each animal. Uncultured autologous bone marrow derived mononuclear cells (BMNCs) ( $2.96 \pm 0.18 \times 10^6$ ) (group B), BMNCs and growth factors TGF- $\beta$ 1, 30 ng/30  $\mu$ l (group C) and BMNCs and IGF-1 30 ng/30  $\mu$ l (group D) were implanted in the defect. The animals of group A were kept as control. The repair of cartilage defects was assessed on the basis of radiographic, gross appearance of healing site, histological, histochemical grading scale and surface electron microscopic observations. Radiographically the defects in groups A and B were distinct from the surrounding area even up to 90 days. In groups C and D the defects were not distinct radiographically from the



surrounding area but radiodense pattern of trabecular appearance was more prominent in group D as compared to group C. The overall mean gross healing scores increased up to day 90 in all the groups. The mean gross score was highest in group D followed by groups C, B and A. Histologically the healing of osteochondral defect was the best in group D followed by groups C, B and A at all the intervals. In group C cells were mainly distributed in clustered form and patchy deposition of proteoglycans was observed. In group D repaired tissue was hyaline in nature having intense staining with safranin-O and toluidine blue and cells were mostly arranged in column. It was concluded that implantation of uncultured autologous BMNCs at the injury site can augment the healing of articular cartilage, which can be enhanced further by addition of growth factors. The combination of BMNCs and insulin like growth factor-1 is better than BMNCs and transforming growth factor beta-1 for the repair articular cartilage defect in rabbits.

### 3. Evaluation of autogenic and allogenic bone marrow-derived mesenchymal stem cells for acceleration of segmental bone defect healing in rabbits

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Comminuted fractures of long bones involving varying amount of bone loss are frequently encountered in veterinary practice. Management of such fractures with considerable bone loss may take long healing time and poses a considerable challenge for orthopedic surgeons. The present study was designed to compare autogenic and allogenic bone marrow derived mesenchymal stem cells (BM-MSCs) with hydroxyapatite for repair of bone gap defect in rabbits. Fifty four New Zealand White rabbits, 6-7 months old, and 1.4-2.2 kg of weight, randomly divided in three equal groups A, B and C, were used for the study. BM-MSCs were isolated from bone marrow aspirate of rabbits of group B and culture expanded for allogenic and autogenic transplantation. Under xylazine-ketamine anaesthesia a 5 mm segmental defect was created in mid-diaphysis of radius in each animal. The defect was filled with hydroxyapatite alone in group A, hydroxyapatite with autogeneic BM-MSCs in group B and hydroxyapatite with allogenic BM-MSCs in group C. On an average  $3.45 \times 10^6$  cells were implanted at the defect site in each animal. The healing at the defect site was evaluated by radiographic, angiographic and histological examinations made on days 30, 60 and 90 postoperatively. Radiographically a more rapid reduction in the size of bone defect was evident in groups B and C treated by BM-MSCs as compared to control group A. Radiographs of treatment groups showed increased radiographic density and early filling of the defect with new bone. Complete bridging of bone gap with newly formed bone was evident in the animals of groups B and C by day 60. However, in the animals of control group, the bridging was not complete even on day 90. Histological examination suggested increased osteogenesis, early and better reorganization of cancellous bone, more new bone marrow formation and early remodeling in treatment groups as compared to the animals of control group. Healing of the defect in the rabbits treated with allogenic and autogenic mesenchymal stem cells was parallel to each other in terms of quantitative (radiological) and qualitative (histological) evidences of healing. It was concluded that *in vitro* culture expanded BM-MSCs induce faster and better healing as compared to control. Allogenic and autogenic BM-MSCs are equally effective for the repair of radial bone defect in rabbits.



#### 4. Repair of segmental bone defects using bone marrow nucleated cells with or without TGF- $\beta_1$ and IGF-1 in rabbits

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The objective of present study was to compare the efficacy of the freshly collected bone marrow nucleated cells with or without growth factors in the repair of bone gap defect in rabbits. Fifty four New Zealand White rabbits, 6-7 months old, and 1.4-2.2 kg of weight, randomly divided in three equal groups A, B and C, were used for the study. Bone marrow aspirate were collected from the rabbits of groups B, and C. Bone marrow nucleated cells (BMNCs) were isolated from bone marrow by buffy coat method and this isolate was used for autogenic transplantation. A 5 mm bone gap defect was created in the central diaphysis of radius bone in each rabbit. The defect was filled with hydroxyapatite (HA) alone in group A, HA with autogenic BMNCs in group B and HA with BMNCs plus TGF- $\beta_1$  and IGF-1 in group C. The healing response was evaluated by clinical, radiographical, angiographical, gross morphological, histological, histochemical and scanning electron microscopic studies on days 30, 60 and 90 postoperatively. The radiological observations depicted more reduction in the size of bone gap, increase radiographic density and remodeling in the animals of groups B and C as compared to group A. Angiograms revealed hyper-vascularity in early stages in treatment groups B and C as compared to the control groups A. Gross observations revealed that filling of the defect and degradation of HA was relatively better in groups B and C when compared to group A. Histological examination suggested increased osteogenesis, early and better organization of newly formed bone in group C as compared to groups B and A. Group B also showed better bone formation than the group A. Signs of more bone marrow formation were evident in treatment group C as compared to the animals of group. Masson's trichrome stain indicated more newly formed collagen tissue in group C as compared to the animals of group B, which had more collagen than that in group A. Scanning electron microscopy supported the results of radiological, gross morphological and histological observations. It was concluded that the freshly collected bone marrow nucleated cells can potentially enhance the rate of osteogenesis which can be augmented further by addition of growth factors TGF- $\beta_1$  and IGF-1.

#### 5. Isolation and characterization of rabbit fetal osteoblast from long bones and Calvaria: base for bone tissue engineering

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To establish an experimental model for rabbit fetal osteoblast culture in vitro for bone tissue engineering. We attempted to isolate, culture, ex-vivo expansion and characterization of rabbit fetal osteoblast. Full term pregnant females were taken. Caesarean section was performed and the fetal osteoblasts were isolated from the calvarial bone, cervical vertebra and all the limbs. The bone pieces were digested in trypsin (0.25 %) and cultured in a medium. The cells were characterized based on the morphology, biological behavior, alkaline phosphatase activity and production of a mineralized matrix detected by Von-kossa staining. The results were indicative of the cells having the morphologic characteristics and biological behavior of osteoblasts. Based on the primary isolation of fetal osteoblasts from bone and combining the digestion with explants a new model for culturing the rabbit fetal osteoblasts in vitro was established, which was very feasible and convenient. The present study demonstrates that, considering the isolation, proliferation capacity and the osteogenic potential, the rabbit fetal osteoblast cells might be useful not only to augment in vivo bone formation but also to study the osteogenesis mechanisms and cell-biomaterial interactions for bone tissue engineering.



## 6. Evaluation of three decellularization methods in the design of a xenogeneic scaffold for tissue engineering the bone

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To evaluate three decellularization methods for creating a xenogeneic scaffold for bone tissue engineering. The effects of decellularizing agents on the bone morphology were assessed using three decellularizing agents: 1% Sodium dodecylsulphate, 25% Acetone and 75% Ethanol (vol %) and rapid freeze-drying process and was evaluated through external morphology, histopathology and scanning electron microscopy (SEM). Cancellous bone appeared as network of homogenous red stained osteoid material of trabeculae with no cells in the intercommunicating spaces in histological sections for all the treatment methods adopted. SEM results indicate that not much significant disturbances in extracellular matrix morphology in all the decellularizing protocols and the scaffolds were having an average pore size of 83.402  $\mu\text{m}$  to 297.437  $\mu\text{m}$  which is an ideal for osteoblast seeding or migration of blood vessels. So ultimately we conclude that all the above decellularization protocols were equally effective to prepare acellular scaffold for bone tissue engineering. The pore size was satisfactory. The treatment using SDS caused the resultant tissue to become relatively softer while using acetone- ethanol led to a significantly stiffer and dehydrated material. Rapid freeze and drying caused the scaffold to be more brittle.

## 7. *In vitro* biomechanical evaluation of canine femur bones with different degrees of osteopenia

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The objective of the study was to evaluate the biomechanical characteristics of canine femur bone under different degrees of osteopenia. Firstly the time required for creation of 25%, 50% and 75% demineralization was standardized using the solution containing equal parts of 8% HCl stock solution and 8% formic acid solution. The demineralization was confirmed at different intervals using digital radiography and mineral estimation from bone ash. It required about 12 hr, 24 hr and 48 hr for producing 25%, 50% and 75% demineralization, respectively. Subsequently 48 femur bones of 24 dogs collected from euthanized animals were subjected to *in vitro* biomechanical tests. All the bones were randomly divided into 4 groups of 12 each. Three groups of bones were subjected to chemical treatment to produce 25%, 50% and 75% osteopenia, respectively, and one group of bones (normal) did not receive any treatment (control). Six bones each from different groups were subjected to compression and cranio-caudal 3-point bending tests (@ speed of 10 mm/min) using a Universal Testing Machine at Spectro Analytical Labs Limited, New Delhi. The load-deflection graphs were plotted and different mechanical parameters were recorded and compared. The results indicated that as demineralization level increased from 25% to 75% level, there was progressive decrease in the stiffness and failure load values under bending stress. Under compression it was interesting to note that though the stiffness and failure loads reduced up to 50% demineralization of bone, at 75% demineralization the stiffness and failure load increased as compared to 50% demineralized bones.





## 8. Ostectomized osteopenic canine femur bones

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The objective of the study was to determine the biomechanical properties of different fracture fixation techniques in osteopenic bones using canine femur as a model. Forty eight femur bones of 24 dogs were collected from euthanized animals and were chemically treated to produce 50% demineralization. Subsequently, all the bones were randomly divided into 4 equal groups. In group 1, bone-interlocking nail (ILN) construct was prepared using 6.0 mm dia. 14 cm long nails fixed with 20 mm long 3.5 mm locking screws (3-in the proximal part and 2-in the distal part of the nail). In group 2, bone-ILN-ESF construct was prepared using 14 cm long, 3.5 mm dia. ILN and 10 cm long 3.5 mm fixation bolts, which were connected outside the skin using an epoxy (M-seal). In group 3, bone-contoured tubular plate constructs were prepared using 6 cerclage wires (3 each in the proximal and distal parts). In group 4, bone-locking compression plate (11.8 cm long, 8 holes) constructs were made using 6 locking screws (3.5 mm). In all the bone-implant constructs, a gap of 5.0 mm was created at the centre of the bone to simulate unstable fracture condition, and were subjected to compression and cranio-caudal 3-point bending tests (@ speed of 10 mm/min) using a Universal Testing Machine at Spectro Analytical Labs Limited, New Delhi. The load-deflection graphs were plotted and different mechanical parameters were recorded and compared. The results indicated that the ILN was more resistant against bending, whereas locking compression plate was more resistant against compression load. ILN with ESF did not show any mechanical advantage over ILN alone. Contoured tubular plates were relatively more resistant under compression than bending; but were inferior to locking compression plates.

## 9. Epoxy-pin external skeletal fixation for correction of antebrachial deformities in dogs

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The purpose of this study was to describe the epoxy-pin external skeletal fixation technique to obtain accurate alignment and stabilization of a distal radial closing wedge osteotomy for the definitive correction of distal radial and ulnar angular limb deformities and to report the clinical results of this technique in 4 dogs. After the initial clinical examination, mediolateral and craniocaudal radiographic views of the limb were made to measure the angular and translation deformities; in unilateral cases, the affected limb was also compared with the contra lateral normal limb. Subsequently a standard wedge osteotomy was performed and the bone fragments were reduced, aligned and checked for the correction of the defect. Once it was ascertained that the deformity was corrected satisfactorily, two sets of cross wires were passed in the proximal bone fragment (from anteromedial to posterolateral direction and posteromedial to anterolateral direction), approximately with a crossing angle of  $> 60^\circ$ . Similarly, at the distal fragment, additional two wires were crossed. Subsequently cross wires were also passed in the metacarpal bones, mediolaterally in crossed manner. Fixation wires in the same plane were then bent and joined; and using additional wires, connecting bars/rings were constructed to make a temporary scaffold. The limb was again checked for any defect, if required minimal correction was accomplished. Subsequently, thoroughly mixed epoxy putty was applied by taking the scaffold as guide and by incorporating the wires within the mold. The wound was closed routinely. The epoxy-pin construct was then allowed to set for 30-45 minutes. Postoperatively the animals were observed clinically for the weight bearing and correction of the angular defect. The surgical incision and skin-wire interfaces were regularly observed for the discharge and healing. Radiographs were made at regular intervals to observe for the healing at the osteotomy site and also for the correction of the deformity. In general, good stability at the osteotomy site was observed in all the animals, they





could tolerate the fixator well and use the limb freely. Bone healing was achieved in 30-45 days. Good to excellent functional recovery was achieved in all the cases. Only minor complication observed was wire tract sepsis. The epoxy-pin fixation is a simple, less expensive and effective technique with minimal complications, which can be used to stabilize the distal radial osteotomy for the definitive correction of angular limb deformities in dogs.

## 10. *In vitro* biomechanical evaluation of different designs of epoxy-pin external skeletal fixation systems

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The study was done to evaluate and compare the *in vitro* biomechanical properties of four different designs of epoxy-pin ESF constructs, i.e. uniplanar (EU), multiplanar-I (EM-I), multiplanar-II (EM-II) and circular (EC). 12 constructs of each ESF design were developed using 1.5 mm K-wires and epoxy resin mounted in an ultra high density polyethylene rod (20 mm dia.). Three-point fixation was done in each fragment, and the distance between the fixation wires, and between the rod and the side bars was kept constant in all the designs. A gap of 5 mm was created at the centre of the fixation rod to simulate a comminuted fracture. The fixator constructs were then subjected to compression (n=4), bending (n=4) or torsion (n=4) tests using a Universal Mechanical Testing Machine. The load-deflection graphs were plotted and different mechanical parameters were recorded and compared between the fixator constructs. Results indicated that EU design was the weakest. Designs EM-I, EM-II and EC exhibited similar strength under compression. Under bending, designs EM-I and EM-II were similar, whereas EC was the strongest. Under torsion, EC was the strongest, followed by EM-II, EM-I and EU; EM-II provided double the rotational stability than EM-I. Overall, EC and EM-II ESF designs showed better resistance against different loads, and hence may be useful to treat a variety of bone fractures in small animals.

## 11. An *in vitro* biomechanical investigation of an intramedullary interlocking nail system developed for tibia in large ruminants

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The objective of the study was to determine and compare the mechanical properties of bovine interlocking nail (BIN), ostectomized adult bovine tibia stabilized with BIN in different configurations, and intact bovine tibia; and to assess the convenience of interlocking nailing in bovine tibia. 52 tibiae were collected from slaughtered adult buffaloes (weighing 300–350 kg). BIN (12 mm diameter, 250 mm long, 9 hole solid nails with 10° proximal bend, made of 316L stainless steel) alone was loaded in compression (n=4) and 3-point bending (n=4); intact tibiae and ostectomized tibiae stabilized with BIN using 4.9 mm diameter standard or modified locking bolts (2 or 4 in each bone fragment) in different configurations were subjected to axial compression, cranio-caudal 3-point bending and torsion (n=4 each) using a Mechanical Testing Machine. Mechanical parameters were determined from load-displacement curves and compared between different specimen groups. Results showed that intact tibia was stronger than BIN as well as bone-nail constructs in all testing modes. Strength of fixation was significantly more in constructs fixed with 8 locking bolts (4 in each fragment) than the constructs with 4 bolts (2 in each fragment). Overall strength of fixation increased by using modified locking bolts as compared to standard bolts. By increasing the number of bolts and quality of locking mechanism in the BIN, the strength of fixation against forces of bending, compression and torsion is increased. The cranio-caudal insertion of fixation bolts in bovine tibia is mechanically and technically superior to medio-lateral insertion.



## 12. Development of an animal model of diet induced osteopenia in growing rabbits

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The objective of the study was to develop an animal model of diet induced osteopenia in growing rabbits. 72 New Zealand white rabbits of either sex weaned at 42 days were divided into 9 equal groups. Seven types of diet containing different proportions of calcium (Ca) and phosphorus (P) were formulated (excessive Ca, excessive P, low Ca, low P, high Ca and high P, low Ca and low P, and low Ca and high P) and were fed to seven different groups of rabbits from the age of 60 days. One group of normal rabbits and another group of female ovariohysterectomized rabbits were kept as control, which were maintained under standard diet contained Ca and P at 0.42% and 0.31% level. All the groups of rabbits were evaluated based on blood biochemical parameters like plasma Ca, inorganic P and alkaline phosphatase, and radiographic and quantitative ultrasound assessment made on 0, 15, 30, 45 and 60 days. Mineral estimation of the femur bones was done in 4 animals of each group euthanized on days 30 and 60. The overall results indicated that the highest degree of osteopenia was observed in rabbits fed with low Ca and high P diet.

## 13. Effect of vitamin d (1, 25 di-hydroxy cholecalciferol) on *in-vitro* cultured adult rabbit osteoblast

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Bone formation requires differentiation and active osteoblasts to synthesize the extracellular matrix that will support the mineralization process. The aim of present study was to evaluate the effect of vitamin D and dexamethasone on osteoblastic activity of *in-vitro* cultured adult rabbit osteoblasts. The long bone was collected and cultured in Dulbecco's modified Eagle's medium (DMEM) containing 10% fetal calf serum and antibiotics. The cells were passaged after attaining 80% confluency and induced for mineralization through media containing  $\beta$ -glycerophosphate ( $\beta$ -GP), dexamethasone with ascorbic acid and vitamin D. Cells harvested after 0, 3, 7, 14, 21 and 28 days for observation of osteoblastic differentiation and mineralization. The levels of alkaline phosphatase and osteocalcin were measured to assess the osteoblastic activity (by RT-qPCR method) and the amount of mineral accumulation was assessed by Von-Kossa staining. Based on this study we successfully evaluated the osteogenic differentiation potential and the mineralization effect of dexamethasone and vitamin D on *in-vitro* cultured adult rabbit osteoblast from the long bone.

## 14. Development and evaluation of acellular matrix of swim bladder for oesophagoplasty in rabbits

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Acellular matrices of fish swim bladder grafts were prepared using 1% Triton X-100 and confirmed decellularisation by H&E staining. Cervical oesophagoplasty was done under triflupromazine sedation and 5% thiopental sodium anesthesia in 24 rabbits. Oesophagorrhaphy (G-I), Oesophagoplasty with fresh and acellular swim bladder graft were performed in G-II and G-III respectively. Rabbits were inactive up to 10-14 days of postoperative period. Oesophagogram revealed mild stenosis



in acellular swim bladder grafted group by 28<sup>th</sup> day. Macroscopic findings showed no apparent changes in graft both in the luminal and extra luminal surface of the oesophagus in the acellular swim bladder grafted group by 28<sup>th</sup> day. Microscopically initiation of epithelialization and angiogenesis was observed on 21<sup>st</sup> postoperative day in acellular swim bladder grafted group. The acellular swim bladder showed superiority in terms of stenosis, initiation of epithelialization and angiogenesis when compared to fresh swim bladder. Acellular matrix of swim bladder was given satisfactory results for the repair of oesophageal defects.

## 15. *In vitro* osteogenesis of bone marrow derived rabbit mesenchymal stem cell (r-MSC)

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To characterize unique differentiating property of rMSC and mineral deposition, osteogenic differentiation was performed in monolayer culture for 3 weeks. Rabbit MSC (rMSC) of 4<sup>th</sup> passage were induced towards osteogenesis after reaching 60-70% confluence. For osteogenic differentiation, cells were cultured in an osteogenic induction medium, which consisted of 10<sup>-8</sup> M Dexamethazone, 1M  $\beta$ -glyserophosphate, and 50 $\mu$ g/ml L-ascorbic acid. Cells cultured in a base medium of DMEM supplemented with 10%FBS were used as a negative control. The cells changed from a fibroblastic appearance to a more polygonal appearance and formed nodules. After 3 weeks of culture time, the induced cells were stained positive (orange red) with Alizarin red S stain for mineral (calcium) deposition in their newly formed matrix. Control cultures, although becoming over-confluent after 3 weeks, retained their fibroblast like appearance, did not form cell aggregates and were stained negative for mineral deposition. Osteogenic induced cell cultures changed morphology from adherent monolayer of swirling spindle shaped cells, which was still apparent in the control cultures, to layered cell clusters surrounded by a matrix-like substance positive upon Alizarin Red S. The osteogenic differentiation status of BM-rMSC was also determined by alkaline phosphatase staining after 21 days of osteogenic induction to analyze the osteogenic differentiation of MSCs and the intracellular ALP activity. ALP activity or expression was higher in osteogenic differentiated cells compare to control. In positive cases, the nucleus of MSCs took bluish-purple color. Statistically significant ( $p < 0.001$ ) higher quantities of calcium deposition and alkaline phosphatase activity at the 90% level were also demonstrated in these osteogenic induced culture wells.

## 16. Characterization of bone marrow derived rabbit mesenchymal stem cell (r-MSC) by Flow Cytometry and PCR analysis

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Flow cytometry was performed in FACS Caliber equipment from the second and fourth passage using the anti-mouse CD-105, CD-29, CD 44 and CD-34 and CD-45 monoclonal antibody to evaluate cell expression which were marked with goat anti mouse IgG-FITC. For determination of surface markers of BM-rMSC, first three generation of MSC were cultured, trypsinize, centrifuged, washed with DPBS two times, determination of cell concentration and then they were mixed with anti-rabbit CD-105, CD-29, CD 44 and CD-34 monoclonal antibody ( in PBS instead of primary antibody as negative control) . After 30 min reaction in room temperature, cells were washed with PBS two times, and mixed with FITC labeled goat anti-mouse IGg (secondary antibody), dark reaction for 15 min was followed and then flow cytometry was performed for expression of cell surface markers. Flow cytometry analysis revealed: CD-105, CD-29 and CD 44 as positive cell expression. However, this expression percentage varied in different passages tested. Greater expression was observed as the number of passages



increased. In relation to analysis of the surface marker CD 34 and CD-45, no reaction was obtained with MSC derived from rabbit bone marrow. A specific monoclonal antibody to identify rabbit mesenchymal stem cells is not yet available; thus it is important to conduct such characterization using the largest number of markers that present a reaction (CD 44, CD 29 and CD105) and that present no reaction (CD 34 and CD 45). Expression of different CD markers for rMSC using PCR was also studied. For this, extraction of total RNA from rMSC, cDNA synthesis, PCR from CD105, CD44, CD73, CD34, CD45 and Beta Actin (house keeping gene) specific primers, Agarose Gel Electrophoresis (1% Agarose) were performed. Different primers (forward and reverse) were used for CD105, CD44, CD73, CD34 and CD45. Rabbit MSC (rMSC) showed negative expression for CD34 & CD 45, whereas, rMSC was positive for CD105, CD 44 and CD 73.

## 17. Comparative efficacy of different physiotherapeutic modalities and conventional drug in treating induced arthritis

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12 New Zealand White adult rabbits were taken for the present study and were divided into 4 groups each consisting of 3 rabbits. The study was done to compare the effect of different physiotherapeutic modalities and conventional drug therapy on arthritis induced in left stifle joint by injecting 0.1 ml of turpentine oil under aseptic conditions. Physiotherapeutic modalities viz., interferential, therapeutic ultrasound and magnetic therapy were given to the 3 different groups and fourth group was given conventional drug (meloxicam at the dose rate of 0.3 mg/kg, IM). These therapeutic modalities were applied immediately after appearance of signs of arthritis (24 hrs after injection). Interferential and ultrasound therapies were given on alternate days up to 14<sup>th</sup> day where as magnetic therapy was applied for 7 consecutive days and drug was given OD for 7 days. Effect of different therapies were evaluated on the basis of clinical parameters like joint swelling, joint warmth, pain on palpation, flexion response and lameness each of which was divided into four grades. The parameters were taken on 0, 1, 3, 9, 12 and 19 days. Results suggested that ultrasound therapy was most effective in reducing the symptoms of induced arthritis followed by interferential, magnetic and conventional drug therapy.

## 18. Diagnosis and management of fracture in camels (*Camelus dromedarius*)

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Present study was done in the Clinics of department of Veterinary Surgery and Radiology and 21 cases, including 19 male and 2 female, of different fractures were diagnosed on the basis of history and clinical examination. These were treated on the general principle of management which included application of plaster of Paris cast using iron or wooden splint, interdental wiring using copper wire, wherever, required and medicinal or surgicotherapeutic treatment. The Ca, P, Vitamin A and Vitamin E values in all cases were found lower than the reference values for their parameters in camels. However, the values of CPK and ALP were found higher than the reference values for their parameters in camels.



## 19. Long bone fracture in dogs - retrospective study of five years

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A retrospective study on incidence of long bone fractures was carried out between 1<sup>st</sup> April, 2007 to 31<sup>st</sup> March, 2012. Total number of fracture cases reported were 531. Out of 531 fracture cases 47.48% were of femur, tibia-fibula 19.20%, radius-ulna 16.38%, humerus 8.47%, metacarpal 6.21% and metatarsal 2.26%. The incidence of femur fracture followed by tibia-fibula and radius-ulna were more in comparison to humerus, metacarpal and metatarsal fractures probably due to more frequency of exposure of these bones in an accident. Further, the predisposition of fracture was more in males (68 %) than in females (32%) and between 2 to 5 years of age. Most of the cases were due to automobile accidents and fall from a height. All the fractures were interpreted radiographically and were surgically restored with successfully recovery except in 9 cases.

## 20. Modified segmental fixation for lumbosacral luxation in a Neopolitan Mastiff pup

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A four month old paraplegic Neopolitan mastiff was presented to Veterinary College Hospital, Bangalore with a history of a fall from a height. On physical and radiographic examination it was diagnosed to be a case of lumbo-sacral luxation. Surgical correction was taken up under Diazepam sedation, Propofol induction and Isoflurane maintenance. The lumbosacral stabilization was done with modified segmental fixation by transilial support using Steinmann pins and orthopedic stainless steel wire. The Steinmann pins were anchored parallel to the spinous processes of lumbar vertebrae and posterior ends of the pins were bent at right angles to involve ilial wings on either side. Post operatively, a course of antibiotics, neuroprotectants, neurotonics and antioxidants were administered for seven days to the animal along with regular wound dressing. Animal was confined to restrict its movement for three weeks. By third day animal regained pannicular reflex, deep pain reflex and control over bladder. By 10 days animal started to bear weight partially on hind limbs. By 30 days the pup made uneventful recovery with normal gait.

## 21. Studies on stabilization of vertebral fractures using locking compression plate technique in dogs

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Spinal cord disorders involving the lumbar spine are frequently encountered in veterinary practice. Further, management of lumbar spinal disorders has remained problematic and overall success is low. The present study was conducted in six clinical cases of Lumbar vertebral fracture in dogs, which were presented for treatment at the Veterinary College Hospital, Bangalore. Lateral vertebral body plating was done using Locking compression plates to stabilize the fractures of lumbar vertebrae by dorsal approach. There was no significant variation in physiological, haematological and biochemical parameters during the period of study. Four out of six cases chosen for the study programme recovered to near normal functioning which were active and weight bearing from seventh day onwards. One dog which recovered showed screw loosening and plate loosening. Two cases which died showed postoperative complications like seroma and decubital ulcer formation. This technique is excellent in stabilisation of the lumbar vertebrae for the treatment of traumatic posterior paralysis in dogs especially with vertebral body fractures and luxations.





## 22. Use of modified type-II external fixation (PMMA/wooden planks as connecting bars) for long bone fracture repair in various domestic animals

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A total of eighteen domestic animals of different age groups belonging to various species (adult cows-5, cow calf-4, Goat-4, Sheep-3, horse-1 and donkey-1) presented to the department of Veterinary Surgery and Radiology, Veterinary College Hebbal, KVAFSU Bangalore, from Sept-2011 to Aug-2012 with history automobile accidents and trapping of legs in holes, leading to long bone diaphyseal fractures were taken for the present study. Here two to three Denhamm cortical pins (centrally threaded) were transfixed on either side of fracture line across the proximal and distal fracture fragments. These pins were incorporated into rectangular wooden planks or cylindrical methyl methacrylate bars as connecting bars on either side of the leg. Different long bones repaired using the present technique was Metatarsus - 7, Metacarpus - 5, Tibia - 4 and Radius and Ulna - 2. A thick cotton padding was given between the leg surface and the connecting bar. Daily povidone iodine was used to soak the exit point of the pins. A course of streptopencillin and meloxicam were given parenterally for seven days. In cases of compound fracture a window was left at the wound site for regular wound dressing. All the animals started to bear weight on the affected limb immediately following surgery. The fracture fragment alignment, callus formation and bone healing was observed radiographically. All the animals bore complete weight and had normal gait by 45 days. All the animals recovered completely without any complications by 60 days.

## 23. Surgical management of thoracic vertebral fracture in a dog by laminectomy, external skeletal fixation and wheel cart

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A ten year old non-descript dog was presented to the department of Veterinary Surgery and Radiology, Veterinary College Hebbal, KVAFSU Bangalore, with the history of vehicle accident and exhibiting signs of posterior paralysis was examined clinically, neurologically and radiographically and diagnosed to be having T<sub>10-11</sub> thoracic vertebral fracture causing compression over the spinal cord. Surgery was taken up under Diazepam sedation, Propofol induction and Isoflurane maintenance. Dorsal Laminectomy was performed at T<sub>10-11</sub> thoracic vertebrae by mid dorsal approach to relieve compression over spinal cord. External fixation was performed for vertebral stabilization using steinmann pins placed in to the vertebral bodies and using PMMA as connecting bars. Injection Amoxycillin and clavulanate, Injection Methylcobalamine and Injection Pentozocine were given for seven days along with oral vit E supplementation. Animal showed marked improvement in deep pain reflex, pannicular reflex and regained complete control over urinary bladder by third day. The animal was placed over the locally designed wheel cart after 10 days post operatively. animal started to bear weight on hindlimbs partially by 15 days. However animal succumbed to acute ehrlichiosis on 22<sup>nd</sup> day post operatively.





## 24. Comparative evaluation of mid dorsal vs dorsolateral epiaxial muscle splitting approach for lateral vertebral body plating for stabilization of lumbar fractures in dogs

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A total of 12 clinical cases that were presented to the department of Veterinary Surgery and Radiology, Veterinary College Hebbal, KVAFSU Bangalore from Sept-2011 to Aug-2012 with history of traumatic posterior paralysis following automobile accidents were taken for the present study. These animals were clinically and radiographically examined and diagnosed to be suffering from lumbar vertebral fractures resulting in compression of the spinal cord. They were divided into two groups of six each. A mid dorsal approach in one group and dorsolateralepaxial muscle splitting approach for the other were used for stabilization of vertebral body fracture site using LCP. Among these, dorsolateral technique provided an easy approach to fracture site with minimal soft tissue dissection and hemorrhage. With this technique, trauma to the dorsal spinous ligament was totally avoided; there was minimal seroma formation because of total obliteration of dead space and minimal damage to the dorsal roots of spinal nerve. The only disadvantage was if at all laminectomy is desired then, we have to restrict ourselves to hemilaminectomy.

## 25. A clinical study of long bone fractures in sheep and goats

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The present study was carried out on 45 clinical cases of long bone fractures in sheep (7) and goats (38). Fifteen fractures were treated by application of Plaster of Paris cast. Thirteen cases were treated by application of Polyvinyl Chloride (PVC) splints and bandage. Modified Thomas splints were used to treat 5 animals. Free-form External Skeletal Fixation (ESF) was used in 10 cases (2 sheep and 8 goats) with open fractures. The two cases with fracture of the femur were treated with intramedullary pinning in one case and intramedullary pinning combined with full Cerclage wiring in the other.

Post treatment healing was assessed by radiography and physical examination. The complications encountered in the animals of the present study were considered minimal and transient to be of any significance.

## 26. Closed method of interlocking nailing in repair of femoral fracture in dogs under c-arm guidance.

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In this study six dogs of different breeds between age groups of 1 to 7yrs and body weight ranging between 14 to 23 kg with diaphyseal femur fractured cases presented to Department of Veterinary Surgery and Radiology Veterinary College Bangalore were subjected to closed method of static interlocking nailing. In this method in interlocking nails of various lengths 160 mm, 180 mm, 220 mm and diameters 5 mm or 6mm and locking bolts were of self tapping type with a diameter of 3.5 mm and length ranging from 16 mm to 26 mm in 2 mm increments were used in this study. Postoperative dogs started bearing weight completely at the end of third day, radiographic studies showed that a better femoral fracture healing with minimal periosteal callus was attained on 42<sup>nd</sup> day. C-arm guided interlocking nailing technique took less surgical time, minimal tissue injury and



relatively non invasive and dogs of this group exhibited early weight bearing with less pain score. However during learning period this procedure had taken more time and more exposure to fluoroscopy, with the availability of C-arm image intensifier, C-arm guided interlocking nailing technique is advised.

## 27. Studies on the effects of bone marrow derived mesenchymal stem cells in augmenting the healing of bone defects in diabetic rabbits

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Thirty six New Zealand white rabbits of either sex were randomly divided into four equal groups (A, B, C and D) and diabetes was induced experimentally in animals of all the groups except group A. A bone gap defect of 5 mm was created surgically in the mid-shaft of radius in animals of all the groups, which were treated with different treatment combinations viz. grafting of hydroxyapatite (HA) granules only (groups A and B), grafting of HA granules along with local insulin therapy (group C) and transplantation of cultured allogenic BMMSCs in HA scaffold along with local insulin therapy (group D). On the basis of clinical signs observed during wound healing, radiographic observations at day 0, 30, 60 and 90, gross morphology, histological and histochemical evaluation at day 30, 60 and 90, scanning electron microscopy at day 60 and tetracycline labelling study at day 90, it was concluded local insulin therapy along with grafting of hydroxyapatite at the bone defect site induces faster and better healing in alloxan induced diabetic rabbits but, it was not sufficient. However, transplantation of allogenic, culture expanded bone marrow derived mesenchymal stem cells in hydroxyapatite scaffold along with local insulin therapy at the bone defect site in alloxan-induced diabetic rabbit models, induced a faster and better healing of bone defects in compared to animals treated with local insulin alone, untreated diabetic animals and normal healthy control animals.

## 28. Surgical management of femoral head fracture and hip dislocation by femoral head ostectomy in dogs

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Two dogs with severe hindlimb lameness following accident were presented to the Department of Veterinary Surgery and Radiology, Veterinary College Hospital, Bangalore. On clinical examination one dog had femoral neck fracture and other had cranio-dorsal hip dislocation which was confirmed by radiography. It was decided to perform femoral head excision arthroplasty. In both the cases Curvi-linear skin incision was made at the lateral aspect of the hip joint. In first dog, femoral head was excised with the help of periosteal elevator and in second dog, femoral head was transected using wire saw. Proximal part of femur was placed in the acetabulum with gentle traction. Muscle and tensor fascia lata were opposed with chromic catgut size-1 in simple interrupted pattern. Subcutaneous tissue and skin were sutured in routine manner. After the surgery, fibrous tissue formed in the area of the hip joint which prevented friction between the bones. The muscles held the hip in place and Animals started weight bearing after three weeks of post surgery without any evidence of pain.



## 29. Interlocking nails for the long bone fractures repair by open reduction in dogs –clinical and biochemical evaluation

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In the last two decades there have been major changes in the management of lower limb long bone fractures. Wherever resources permit, surgical management of open and closed femoral and tibialdiaphyseal fractures have become routine. Although the use of interlocking nails was once limited to larger dogs, the development of smaller diameter nail system allowed its application in smaller dogs and cats. A total of 8 clinical cases were treated with interlocking nailing by open reduction and use of guiding device. The interlocking nailing was performed in normograde manner in all the cases.

All the dogs showed excellent weight bearing on affected limb from next day after surgery to 5th post-operative day. Good weight bearing with slight lameness after exercise was noted in all the cases by 4th week. Excellent weight bearing was achieved in all the cases (except case nos. 2, 3 and 5) by the end of 6th week. The quick return of limb function in majority of the cases was attributed to the stability provided by the interlocking nail. There was a significant increase in the serum alkaline phosphatase activity in all cases between day 0 to day 15 indicative of increased osteoblastic activity at fracture site. The serum cortisol (mcg/dl) which was elevated on day 0, decreased on day 15 & 45th post-operative day indicating reduction in stress during fracture healing process treated with interlocking nails.

## 30. Epidemiological study of orthopaedic maladies in dogs

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The objective of the study was to record the incidence of fractures and their management in dogs. The data were analyzed with respect to the age, sex, breed, nature of pathology and cause of fracture, limb and bone involved, type of fracture and the technique of fixation. The results showed higher occurrence of fractures in non-descript, young male dogs. Femur was the most common fractured bone and intramedullary pinning was found satisfactory for fixation of long bone fractures in most of the dogs. External coaptation also found satisfactory but in small numbers. In context to above, last three years (2009-2011)' retrospective information as mentioned above was retrieved by scrutinizing the data bank of the College Hospital. A total of 20,420 new cases were registered out of which 9,630 (47.16%) cases were of dogs. Among the canine cases registered, 2,381 (24.72%) were referred to Department of Surgery and Radiology and 550 (5.71%) cases showed orthopaedic maladies.

## 31. Clinical studies on immobilization of tibial fractures using bilateral external fixator-type II apparatus in dogs

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A clinical study on Bilateral External Fixator-Type II Apparatus technique and intra medullary pinning for immobilization of tibial fractures in dogs was carried out in 12 clinical cases of tibial fractures. The cases were randomly divided into two



groups based upon the fracture stabilization technique used, viz., Bilateral External Fixator-Type II Apparatus technique (Group I, n=6) and intramedullary pinning (Group II, n=6). Serosanguinous type exudation at pin tract site was seen in group I whereas mild exudation was observed in few cases of group II. Partial weight bearing was seen as early as 2nd postoperative day in group I as against 7th postoperative day in group II. Complete weight bearing was observed from the 8th postoperative day in majority cases of group I as compared to 24th postoperative day in group II. The earlier restoration of the functional usage of the limb could be attributed to the closed reduction, no external infection and axial stability of the Bilateral External Fixator-Type II Apparatus except in one case. In majority cases of group I joint mobility was earlier, seen from the 2nd post operative day whereas limited joint mobility was seen in the first week which gradually improved in all the cases of group II. Radiological examination was done at weekly intervals. Removal of the Bilateral External Fixator-Type II Apparatus or pin was carried out at 7-8 weeks in group I and 8-9 weeks in group II. This was done when clinical healing was observed in the form of functional limb use and endosteal and/or periosteal bridging was evident on radiographs.

### 32. A unique case of maxillary fracture in a cat

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A male cat was brought to the department with history of having fallen from the 3rd floor of the building. Clinical examination revealed fracture of the maxilla with extensive bleeding. The bleeding was managed medically and the cat was operated for the correction of maxillary fracture by means of wiring of the alveolar bone. The hard palate was sutured by means of simple interrupted prolene sutures. The cat made an uneventful recovery.

### 33. Application of mesenchymal stem cells for treatment of spinal cord injuries in dogs

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Mesenchymal stem cells have capacity to differentiate and transdifferentiate into tissues of different germ layer origin including components of nervous tissues. The present study was conducted on isolation, in vitro expansion and characterization of bone marrow derived mesenchymal stem cells and their application for the therapy of spinal cord injuries in dogs. Bone marrow aspirates were collected from iliac crests of healthy dogs under ketamine-xylazine anaesthesia. From the bone marrow aspirate mesenchymal stem cells were isolated by density gradient method and expanded ex-vivo following the protocol of our laboratory (Gade et. al, 2012). These cells were further characterized through cell surface markers, they were also differentiated to osteogenic lineages. These cells showed enormous capability for the plastic adherence and grew in clusters, confirming the clonogenic properties. These cells were found positive for various mesenchymal stem cell surface markers, viz. CD-105, CD-90 and showed mineral deposition after 21 days of osteogenic induction. Cells were routinely passaged and used for the therapy only after third passage onwards. Canine bone marrow derived mesenchymal stem cells were used for the treatment of 18 clinical cases of spinal cord injuries in dogs. Dogs of different breeds, age and sex were presented with the spinal cord injuries, the duration of illness varied from one and a half months to 2 years. All the animals were subjected to routine clinical examination, radiological examination and neurological examination to establish the type and location of the spinal lesion. All the dogs suffered from paraplegia except one that had quadriplegia. The history of the injury varied from clearly discernible spinal fractures to sudden onset of symptoms with out signs of any other appreciable disease/ abnormality. On the basis of radiological and neurological examination of the animals, the site of the lesion was localized in each case, an injection of the mesenchymal stem cells in the vehicle was prepared 30 minutes before treatment and it was aseptically applied at the site of the lesion directly. Depending upon the condition and response of the animal 2-4 doses of



the stem cells were given to the dogs. Follow up neurological examination showed a variable response and about 70% cases showed complete recovery. All the cases showed very encouraging improvements, however, in few cases the response was mild, though they showed some initial improvement in neurological function but could not be cured completely. All the details of the treated clinical cases shall be discussed in details.

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### **34. Comparison of internal fixation techniques for management of long bone fracture in bovine**

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Eighteen cow calves weighing about 50- 150 kg body weight, brought to TVCSC, Jabalpur for the treatment of fracture of long bones. History of each case was recorded and the radiographic examination was done to determine the type of procedure. All the animals were fasted for 24 hours before the surgery and the fractured site was prepared for aseptic surgery. Sedation was done by using Xylazine hydrochloride @0.03 mg/ kg bwt, intramuscularly 10 minutes prior to surgery followed by Intravenous regional anesthesia (IVRA) for fracture of fore limb and anterior epidural for fracture of hind limb by using 2% lignocaine hydrochloride. Amongst the eighteen fractures the two metacarpal and eleven metatarsal fractures were immobilized by dynamic compression plating, while fractures of tibia bone were immobilized with interlocking nailing in three cases and intramedullary pinning in two cases. The present study indicate that internal fixation with intramedullary pinning was found good for transverse fracture of tibia of young animals weighing 50-70 kg. Dynamic compression plating provides rigid fixation in transverse and comminuted diaphyseal fracture of metacarpal and metatarsal bone and the interlocking nailing was easy and effective method of internal fixation resulting in to early ambulation of limb with progressive fracture healing.

### **35. Diagnostic and therapeutic management of canine osteoarthritis**

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Osteoarthritis is the most common orthopedic disease and a cause of lameness in dogs. The present study was conducted in 18 clinical cases divided equally into 3 groups. Group I animals treated with meloxicam (0.2 mg/kg) orally for 10 days. In group II meloxicam was given as above along with therapeutic ultrasound while in IIIrd group intra articular injection of hyaluronidase was given. Animals of all three groups were supplemented with glucosamine 250mg and chondroitin sulphate 200mg orally for 30 days. The assessment was made by clinical, haematobiochemical, radiography, synovial fluid analysis and arthrography. During the period of study out of total OPD cases of 12600 recorded at TVCC, prevalence of joint disorders was 5.71% and the prevalence of osteoarthritis from total joint disorders cases was 30.55%. Radiographic findings at day 0 showed mild periosteitis, subchondral sclerosis, irregular joint space and osteophytosis which subsequently reduced on day 21, 40 and 70. Synovial fluid examination revealed significant changes in turbidity, viscosity and cell count in group III followed by II and I. Arthrography findings included roughening of articular cartilage and narrowing of joint space with irregular joint surface. These were absent in 8 animals, doubtful in 6 and characteristic in 4 arthrograms. Clinically, animals of group II responded better than group I and III. The haematobiochemical parameter was transient. Chondroprotective properties of glucosamine and chondroitin sulphate were found positive in relevance to improved radiographic findings at different intervals in all the groups.





## 36. Bone peg allografting in a 6 month old kid

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N. D Pashu Chikitsa Vigyan Vishwavidyalaya

A 6 month old kid was presented at TVCSC Jabalpur with a history of fresh compound metacarpal fracture. Clinical examination revealed inappetance, with a rectal temperature of 103°F and complete disability to bear the weight on affected limb. Radiographic examination suggested a 5mm gap between two fracture segments. After stabilizing the animal for 2 days with Inj. Dextrose Normal Saline 200 ml i/v, injBistrepren 1.0 gmi/m and injMelonex 0.7 ml i/m, bone peg allografting of the affected limb was undertaken, followed by stabilizing the allograft with 3.5mm DCP bone plate with 8 holes. External immobilization was provided with metal aluminium splints for 21 days with alternate day dressing till removal of skin interrupted suture. On 45<sup>th</sup> post operative day animal showed 85% weight bearing and excessive callus formation at the fracture site along with area of resorption of bone peg.

## 37. Open reduction and internal fixation of distal radius and ulna fractures in dogs – review of ten cases

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Fractures of the radius and ulna are commonly encountered in dogs. The most common fracture seen in the ante-brachium are transverse or short oblique fractures of the distal third of the radius and ulna. Ten cases of distal radius and ulna fractures were stabilized using locking T-plate (n=4), dynamic compression plate (n=4), linear locking compression plate (n=1) and limited contact dynamic compression plate (n=1). AO/ ASIF principles of open reduction and internal fixation were followed. Out of ten cases, primary healing was observed in 8 cases, secondary healing was observed in one case and stress protection was observed in one case by 4th month postoperatively. The indications, technique, radiographic findings and complications are discussed.

## 38. Minimally invasive stabilization of tibial fractures in dogs

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Tibial fractures account for third most common type of fracture after femur and radius and ulna in dogs. Majority are caused by road traffic accidents. Although, open reduction and internal fixation produces rigid internal fixation, it may disturb fracture hematoma leading to delayed or non union. The benefits of preserving fracture hematoma have led to the concept of biological osteosynthesis. Eight cases of tibial fractures were managed by Minimally Invasive Plate Osteosynthesis (n=6) and two cases were managed by linear external skeletal fixation. Six dogs showed weight bearing on immediate postoperative day and two dogs showed weight bearing during the first postoperative week. The indications, technique and radiographic findings are discussed.



## 39. Femur and tibial fracture in a Labrador pup and its surgical management

*Jayakrushna Das, Sidhartha S. Behera, Prasanta K. Sika, Anjan Sahu, Harish Mathor*

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One Labrador pup of four months old weighing six kg body weight was presented with the history of falling from a height and unable to bear weight on its hind limb. On C-arm examination, there was bilateral fracture i.e. simple complete oblique fracture of proximal 1/3 of left femur and simple complete transverse fracture of distal extremity of right tibia. So it was planned to go for C-arm guided intramedullary pinning with modified Thomas splintage as surgical management practice. The animal was anaesthetised and aseptically prepared for orthopedic surgery as per routine basis. The femoral fracture was reduced and the pin was advanced and seated inside femur by retrograde pinning. Likewise for right side tibial fracture, the pin was placed in the proximal fragment and fracture was reduced and the extra portion of pin was placed. Then bilateral modified Thomas splints were applied to the animal. Initially the pup was kept inside the sling. After 22 days Thomas splint was removed and some sorts of physiotherapy was needed for bringing the animal into normal gait.

## 40. A radiographic study of fracture repair by interlocking nail in dogs

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Long bone fractures in dogs occur most commonly due to automobile accidents, especially in metropolitan cities. Most of the time the fractures are of severely comminuted type. Interlocking nails are effective tools to immobilize fractures of long bones. In the present study, total eight cases of long bone fractures were treated by interlocking nails and their radiographs were evaluated for the progress of fracture healing on 15th and 45th post-operative days. Interlocking nails are an attractive alternative to bone plates as they counteract all forces present at the fracture site. Radiographs (mediolateral and anteroposterior view) were taken on 0 day showed proper alignment of fracture fragments with proper placement of nail in medullary cavity. The transcortical screws were also in proper position in both the fragments. Radiographs on 15th post-operative day showed good periosteal callus but fracture line was still visible in all cases. The 45th post-operative radiographs revealed good callus formation with bridging and obliteration of fracture line in all cases. One case showed healing with angulations. Radiographs proved to be a reliable indicator of bone healing as was also evaluated by weight bearing and mobility of the affected limb.

## 41. Evaluation of fibre glass, plaster, PVC cast with or without transfixation or Thomas splint for open or closed fractures in large ruminants: 130 cases

*B. V. Shivaprakash and S. M. Usturge*

Veterinary College, Bidar

Different techniques of external immobilization and external skeletal fixation such as fibre glass, plaster cast, PVC cast with or without transfixation or Thomas splint were evaluated in 130 clinical cases of large ruminants for treatment of simple or compound fractures of long bones. In group I, 70 animals suffering from either simple or compound fractures were treated with plaster cast alone. This group consisted of 40 calves and 30 adult cattle and buffaloes weighing up to 300 kg for tibial fractures and upto 500 kg for radial or distal limb fractures. In group II, 20 adult cattle and buffaloes were treated for simple fractures of tibia or radius and ulna with combination of plaster cast and Thomas splint. In group III, 30 adult cows suffering



from compound tibial fractures were treated with combination of plaster cast and transfixation pinning. Transfixation pinning was reinforced with external iron bar in 25 animals and polymethylmethacrylate in 5 animals. In group IV, 5 calves suffering from open fractures of metatarsus or metacarpus were treated using combination of full circumference PVC pipe and transfixation. In group V, 5 cows suffering from compound metatarsus or metacarpus fractures were treated using fibre glass cast. Windows were created for all compound fractures with all above techniques for prolonged dressing of wound. Animals were evaluated clinically and radiologically for three months. Treatment of simple fractures of metatarsus, metacarpus, radius and ulna using plaster cast alone yielded 100 % success both in calves and adult cattle and buffaloes. Comparatively fresh cases of compound fractures also showed improvement in all the treated animals. Plaster cast alone for simple tibial fractures in cows of lesser body weight and thinner legs also showed improvement in all the cases. However, immobilization using plaster cast alone for tibial fractures in cows and bulls exceeding 300kg could not be achieved as the plaster cast slipped within a day or two even though it was applied far above the stifle. Combination of plaster cast and Thomas splint in group II for simple fractures of radius for heavier buffaloes or for fractures of tibia in smaller sized cows was successful. However it failed within hours in heavier bullocks treated for tibial fractures. It also failed in calves treated for metaphyseal fractures with severe skin and soft tissue loss. Combination of plaster cast and transfixation reinforced with external iron bar in group III for compound tibial fracture yielded success in 20 % of the cases of heavier cows. Transfixation reinforced with methylmethacrylate side bars failed in cases of adult cows with open tibial fractures, whereas, it was successful in calves. Combination of PVC cast and transfixation in calves of group IV with compound fractures of metatarsus yielded success in 50 % of the cases as the soft tissue damage and infection were extensive. Results were excellent in group V cows treated with fibre glass for compound fractures of metatarsus. The results were very good even for fracture located very near to the distal fetlock joints. Fibre glass was found to be stronger than plaster cast and did not become wet and allowed for post operative irrigation for several weeks in case of open infected fractures. It is concluded that tibial fractures are most difficult to treat with any of the external fixation methods in heavier animals. All other fractures can be satisfactorily treated in ruminants if the techniques are implemented skillfully.

## 42. Surgical affections of joints and its surgical management in dogs- review of 97 cases

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Joint affections are most common in dogs of which most of the cases necessitates surgical interventions to maintain joint congruity and pain free mobility. 97 cases of various joint affections in dogs which underwent surgical procedures during the period 2008 -2012 includes patellar luxation 55 cases where in the patella is fixed by trochlear wedge resection with or without tibial tuberosity transposition depending on the grade of patellar luxation of which 95 percent of the cases showed near normal mobility and in five percent of the case had shown signs of joint stiffness, 10 cases of tibiotarsal luxation which underwent surgical intervention includes screw fixation with extracapsular stabilisation, type II linear skeletal fixator for tarsal arthrodesis, cross pinning, pinning with tension band wiring of which 60 percent of cases recovered uneventfully, 20 percent had screw loosening and 20 percent had joint stiffness, 20 cases of coxofemoral joint affections where in surgical intervention carried out includes THR 6 cases, FHO 12 cases and pinning two cases, the percentage of joint free mobility was seen in 90 percent and 10 percent had joint stiffness, 4 cases of elbow luxation that underwent surgery by extra capsular stabilization with wires and screw and 3 cases of olecranon which was stabilized by tension band wiring and screws, one case of montiggia's fracture stabilized with pinning and tension band wiring, 5 cases of carpal luxation stabilized by two cases with plating, cross pinning and one case with linear skeletal fixator to induce pan carpal arthrodesis, all the cases recovered uneventfully with minor completion like pin migration and wound dehiscence. The incidence, various surgical techniques for different joint stabilization and its outcome is discussed.



### **43. Management of mid shaft transverse tibial fracture with intramedullary interlocking nailing after failure of earlier fixation with bone plating in a bullock.**

***Ashwani Kumar, M. Raghunath, Tarunbir Singh, S. K.Mahajan, J. Mohindroo, Pallavi Verma and S. S. Singh***

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A one and a half year, male bullock weighing 176 kg. was presented in the clinics with a history of accident with a vehicle, and severe injury to the right hind limb. Animal was standing on rest of three limbs and radiographic examination revealed mid shaft comminuted fracture of right tibia with 2 small chips. The fracture was initially repaired by 4.5mm broad, 12 hole DCP with 5 screws in the proximal fragment and 6 screws in the distal fragment with satisfactory intra-operative stability. Four days later, the bullock had a history of fall, leading to complete bending of plate with exposed tibial fracture ends. Radiographic examination revealed bending of plate at the fracture site. The animal was re-operated, and the fracture was stabilised with Intramedullary interlocking nailing with 10mm × 22cm nail with 3 screws in proximal and 3 screws in the distal fragments. The animal started partial weight bearing on the 2<sup>nd</sup> day post-operative. Padded bandaging with straight splint was advised regularly. On 15 day post-operative, radiographic examination revealed excessive periosteal reaction extending throughout the length of the bone. The implant and the fracture were in satisfactory position and the animal was bearing full weight on the operated limb. After two and half months, radiographic examination revealed fracture fragments were well aligned, fracture line was not visible and implant was intact with no breakage of screw and loosening of nail, but excessive swelling was seen around the medial aspect of tibia. Aspiration from the swelling revealed pus and the culture sensitivity of the pus showed sample was sensitive to enrofloxacin. Animal was treated with enrofloxacin @5mg/kg b.wt for 7 days, resulting in healing of wound within 6 days. The fracture healed within 3 months after nailing and animal showed no signs of lameness.



Avian Surgery Session

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LEAD PAPER

## Recent Trends In Avian Surgery

**Dr. R. V. Suresh Kumar**

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Avian surgery is a branch of veterinary surgery gaining importance and interest among veterinary practitioners. Though basic surgical principles are same, avian species have certain anatomical and physiological differences compared to animals which should be considered for administering anesthetic drugs and performing surgery. Advancements in the field of imaging sciences, use of lasers, ultrasonic equipment, Semi/ non invasive diagnostic facilities, minimally invasive surgical procedures, safe anaesthetic protocols extrapolation of information from human and veterinary sciences made to emerge avian surgery as a separate specialty. The Avian surgeon should have adequate knowledge about Anatomy and physiology of birds. Bird rearing has become a fashion among people and this attitude is growing on par with pet companionship. Avian veterinary medicine and surgery has become highly advanced in recent years.

### Anatomical & physiological considerations for avian surgery

- ✓ Do not have teeth.
- ✓ Proventriculus is considered as glandular stomach and Gizzard is considered as mechanical stomach.
- ✓ Large intestines are shorter than smaller intestines.
- ✓ Cloacal chamber receives wastes from digestive as well as urinary system.
- ✓ Birds have developed left ovary and oviduct.
- ✓ No diaphragm.
- ✓ Distension and compression seen on air sacs not on lungs.
- ✓ Small head, long neck and small tail.
- ✓ Bones are of two types –pneumatic and medullary bones.
- ✓ Have high metabolic rate.
- ✓ Air sacs act as reservoirs of inspired gases.

### Routine and special diagnostic procedures.

#### ✓ Clinical examination

For injuries, wounds, swellings, obstructions, painful lesions, fractures, dislocations etc

#### ✓ Radiography

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

#### ✓ 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 and abdomen like ascites and intra abdominal masses.

#### ✓ Endoscopy

Paediatric scopes of smaller diameter can be used for endoscopic diagnosis of different disease conditions related to gastro intestinal tract



✓ **Laparoscopy**

Commonly used 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, intestines etc.

✓ **CT Scan & MRI**

Expensive but accurate diagnostic modalities regarding evaluation of skeletal as well as soft tissue lesions which are otherwise refractory and inconclusive to other diagnostic methods. Anesthesia is mandatory to get more accurate results.

✓ **Anaesthetic considerations**

- Anesthetic selection is as critical as that of surgical procedure since body reaction differ from bird to bird.
- Few avian surgeons prefer local anaesthetics where as majority prefer general anaesthesia since even simple struggle and excitement leads to shock/ death.
- Anesthetic gases and vapors will be rapidly absorbed in to the blood stream.
- Maintenance of body temperature during after surgery and Post anesthetic oxygen administration is important.
- Ketamine, xylazine, diazepam, midazolam, and medetomidine are commonly used inject able drugs where as isoflurane and sevoflurane with oxygen are commonly used volatile anaesthetics for various surgical procedures.
- Avoid fasting for longer periods.
- Though many drugs are available, use the available and safe drugs for surgery.

**Routine & special surgical procedures related to avian species**

✓ **Debeaking**

Procedure where 1/3rd length of upper beak at its tip is cut and removed and repeated once in 40-45 days to prevent cannibalism and for effective feed consumption. It is also advised to correct Scissors beak and Mandibular prognathism or injuries.

✓ **Eye surgery**

Various conditions like abscess, cysts, and tumours are to be treated by incision and drainage or surgical excision. In extreme cases where extensive damage is noticed evisceration/enucleation of eye is also indicated.

✓ **Pinioning**

Procedure to prevent bird flying height by tenotomy operation on muscles of wings.

✓ **Wing amputation**

Removal of wing at the end of proximal 3rd of humerus as a part of treatment of impact injury, crushing and brachial paralysis.

✓ **Trimming of spurs**

Procedure to prevent injury to other birds by sharp edges of spurs where sharp spurs are trimmed / rasped.

✓ **Dubbing of combs&cropping of wattles.]**

Procedures indicated in conditions like edema extensive injury, necrosis, and gangrene conditions and also to prevent interference during feeding.



- ✓ **Ingluviotomy**  
Performed to remove foreign bodies, excess feed accumulation and also help to pass rigid endoscope in to the stomach. Crop biopsy can also be taken to diagnose proventricular dilation syndrome.
- ✓ **Cropectomy**  
Procedure where portion of crop is removed in conditions like extensive damage, neoplasia, foreign bodies and diseases.
- ✓ **Proventriculotomy/ventriculectomy**  
Usually performed for foreign body removal and extensive damage under general anaesthesia.
- ✓ **Enterotomy**  
Not routinely performed procedure. obstruction due to foreign bodies, feed necessitates this procedure with poor prognosis and complications.
- ✓ **Cloacotomy**  
Procedure indicated for excision of papillomatous growths, and masses and also for evacuation of wastes.
- ✓ **Cloacopexy**  
Surgical procedure indicated to prevent chronic cloacal prolapse. Circumcostal cloacopexy involves fixing of cloaca to last rib. Ventropexy is indicated conditions like atony of vent sphincter.
- ✓ **Hysterotomy/ hysterectomy**  
Procedure to remove obstructing egg or any egg related problem.
- ✓ **Bumble foot**  
Routinely observed clinical condition in birds where abscess is noticed on foot due to injuries, infection vitamin A deficiency results in pain lameness local swelling and reduced appetite. Incision and drainage along with local medical treatment provides satisfactory results.
- ✓ **Experimental surgery**
  - a. GIZZARDECTOMY(surgical excision of gizzard for nutritional studies)
  - b. DEUTECTOMY (surgical excision of yolk sac for nutritional studies)
  - c. RESECTION OF OVIDUCT(for nutritional studies)
  - d. RECTOSTOMY( connecting rectum to artificial anus)
  - e. LIGATION OF CAECUM
- ✓ **Caponization**  
Castration of male fowl is called as caponization. Indicated for fattening of broilers, decreasing the aggressive behavior and also decrease the chance of cloacal prolapse and starining.
- ✓ **Cancer surgery**  
Benign / malignant tumours do occur in birds and observed externally and unnoticedly in internal organs. Papillomas, lipomas, liposarcomas, squamous cell carcinoma, fibro sarcoma, adenocarcinoma, hemangiosarcoma, malignant melanoma, mesothelioma lympho sarcoma leucemia and osteosarcoma are some of the tumors reported in avian species. Aggressive surgery(excision/ amputation) or chemotherapy after confirmatory diagnosis l either cure the



condition or as a palliative measure prolong the life of the bird.

✓ **Fracture repair**

Like other animals and humans fractures/ dislocations are common in birds also. Since the bones differ anatomically and physiologically special attention is required regarding procedure, selection of implant etc. Intra medullary pins, rush pins, cerclage wires 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. In extreme cases amputation is indicated as a life saving measure.

✓ **Coeliotomy**

This surgical procedure exposes most of the abdominal organs like duodenum, intestines, spleen, gonads, proventriculus, kidneys, pancreas for examination purpose. Recently other surgical conditions were also reported and gaining attention of the avian surgeons like Toe necrosis ( constricted toe syndrome,) feather cysts, conjunctival masses, corneal ulcers, impaction of uropygeal glands, xanthomas of wing tip, Rhinoliths, infra orbital sinusitis, tracheal obstruction, oro pharyngeal abscess, and oropharyngeal papillomas, crop fissures, and abdominal hernias in different types of birds. Correspondingly use of modern gadgets/ technology like pulseoximetry, copnography, operating microscope, endoscopes, laparoscopes, minimally/ non invasive techniques, ultra sound scanning, radiography, chemotherapy for cancer etc. is giving promising results.

**CONCLUSION**

As with growing advances in science, and medicine , there is steep growing interest , awareness on avian species health care obviously veterinarian has to transform himself into a specialized professional i.e. Avian surgeon performing multifaceted activities on birds.. In India also there is increasing demand for avian surgery not only for domestic birds but also for wild and endangering species of birds.



## 1. Management of chronic abscess in peacock

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A peacock was brought to the TVCC RAJUVAS, Bikaner with a history of inflammatory swelling below to lower eyelid and being off feed from last one week. The eye of the effected side was closed due to pressure of inflammatory swelling. An exploratory puncture was made over the swelling confirmed abscess. The site was cleaned with spirit. A criss-cross incision was given over the swelling and caseated pus was removed. Wound was irrigated with normal saline and dressed with betadine solution and ointment lorexane. Recovery was uneventful in the case.

## 2. Oesophagotomy in baby Ostrich- clinical case

*Eldora Ch. Momin*

Tura Veterinary Hospital, Bamunpara, West Garo Hills, Meghalaya. Tura-794001

A four and half month old baby ostrich was brought to the Tura Veterinary Hospital with swelling in the lateral side of the neck. On examination and careful palpation the sharp shape and the middle tapered tine of a mosquito coil stand could be clearly distinguished. Ostrich has a tendency to swallow shiny objects like stones, glass beads etc. The bird was anaesthetized with intravenous injection of Diazepam and ketamine at 0.22mg and 4.4mg/kg body weight respectively. Oesophagotomy performed on the right lateral side of the neck. The edges of the sharp object was crushed folded-up before being carefully removed. The oesophageal incision was closed with Cushing suture using 2/0 chromic catgut and skin closed with nylon. The bird maintained on intravenous DNS 5% (wing vein), electrical solution and parenteral injections. No oral feeding for two days, followed by restricted feeding of fortified starch liquids and vitamins. The bird recovered uneventfully on the eight day. Oesophagotomy can be successfully performed in ostrich to remove foreign objects.

## 3. Successful surgical treatment of crop injury in two pigeons under field condition

*Manjunatha, D. R., Santhosh, K. M. and Nagappa K Banuvalli*

Department of Animal husbandry and Veterinary services, Veterinary Dispensary Anathi, Channarayapatnataluk, Hassan district.

Two pigeons weighing around 250 gm about one years of age were presented to Veterinary Dispensary Anathi, Channarayapatnataluk, Hassan district, with the history of cat bite near neck and thoracic region. On examination laceration of skin near neck and thoracic region and rupture of crop leading to spillage of food grains in both the cases. The pigeons were anaesthetized using inj Ketamine hydrochloride 30mg/ kg body weight i/m into the pectoral muscle, the surgical site was prepared aseptically for surgery in both the cases, the surgical area was washed using normal saline to prevent infection, upon debriding the wound edges of crop were sutured with double layer of Lambert suture using No 3-0 catgut and skin with No 3-0 Linex by simple interrupted pattern. Post operatively fluid therapy for two days, inj Melonex 0.5mg/kg body weight I/m for two days, inj Ceftriaxone 20mg/kg body weight i/m twice daily for five days and food was restricted for one day followed by two days semisolid food and then regular food was given, the wound dressing was done on alternative days and both the pigeons were made an recovered completely on 10<sup>th</sup> day of operation.





#### 4. Surgical repair of wing web injury in Indian white backed vultures (*Gyps bengalensis*).

**Prajwalita Sutaria, T. V Sutaria and P. B. Patel**

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Six white backed vultures (*Gyps bengalensis*) were operated under isoflurane anaesthesia for surgical repair of different degrees of wing web injuries during Uttarayan (Kite flying festival of Gujarat). The vultures were unable to fly due to severed propatagial tendon and deep muscle injuries. The birds were anaesthetized with isoflurane (1.5-2%), propatagial tendon was sutured with vicryl 3-0, muscle using vicryl 2-0 and patagium with vicryl 3-0. Fluid therapy with D5 and RL @ 5% of body weight, Enrofloxacin @ 5mg/kg body wt. b.i.d and meloxicam @ 0.1 mg/kg body weight o.i.d was given for 5 days along with daily dressing with povidone iodine. The injured wings were immobilized with figure of eight bandage using wet wrap and birds were kept in captivity till complete recovery and released in natural habitat.

#### 5. Management of surgical affections in avian patients

**Madhu, D. N., J. Singh, Rohit Kumar, Sivanarayanan, T. B., A. M. Pawde., P. Kinjavdekar, Amarpal, H. P. Aithal, A. C. Saxena and M. M. S. Zama**

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A number of clinical cases of avian patients are being presented to different veterinary hospitals affected with various ailments which need prompt surgical intervention. The present communication deals with the management of surgical affections in avian patients presented to the Division of Surgery, IVRI, Izatnagar for their expert opinion and treatment. The different clinical cases included amputation of wing in eagle, electrocution injury in kite, external skeletal fixation in sarus crane, corneal opacity in parrot, crop swelling in pigeon, eye tumour in pigeon, wound over dorsum in vulture, barbed wire injury in wing of eagle, pinning in owl, amputated limb injury in parrot. The details of these clinical cases will be discussed in the paper.

#### 6. Wing amputation of white-backed vulture (*Gyps bengalensis*) at Vulture Conservation Breeding Centre, Pinjore, Haryana : case report

**Parag Deori<sup>1,3</sup>, Andrew Routh<sup>2</sup>, Devojit Das<sup>1</sup>, Mellisa Nollet<sup>2</sup> and Vibhu Prakash<sup>1</sup>**

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3. Department of Veterinary Surgery and Radiology, College of Veterinary Science, Khanapara, Guwahati.

The white-backed vulture (*Gyps bengalensis*) had a history of left wing kite string injury in Ahmedabad during kite flying festival in 2007 and transferred to Vulture Conservation Breeding Centre (VCBC), Pinjore. The wing of the vulture had dropped down due to injuries with restricted movement of the elbow joint. The vulture was reported as flightless. There were several previous episodes of myiasis and trauma. So, wing amputation was done at VCBC, Pinjore on 15<sup>th</sup> September, 2010 to prevent further complications. Isoflurane at 2.5%-5% in oxygen was used for maintenance of anaesthesia. Various anaesthetic and physiological parameters were recorded before and during surgery at every five minutes interval. Biceps brachii, deltoideus major, brachialis and triceps brachii muscles were severed and humerus was sawed off at proximal site. The surgery was completed in 2 hours and 30 minutes without any complications and smooth recovery from anaesthesia.



## 7. Surgical management of esophageal laceration in emu birds – report of 4 cases

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Four Emu birds were presented to the Teaching Veterinary Clinical Complex, Veterinary College and Research Institute, Namakkal with the history of varying degree of esophageal laceration inflicted by chain link fencing. All the birds were premedicated with intramuscular injection of xylazine hydrochloride at the dose rate of 5 mg/Kg b.wt. and the anaesthetic induction was carried out with intramuscular injection of ketamine hydrochloride at the dose rate of 20 mg/Kg b.wt. The maintenance of anaesthesia was done in all the birds with isoflurane in the small animal gaseous anaesthetic machine. The esophageal reconstruction was performed in all the cases with polyglactin 910 and skin was apposed with cotton thread. Post operatively the birds were isolated until the skin suture removal to avoid pecking. Post operatively broad spectrum antibiotic therapy and daily cutaneous wound care were given. The birds recovered uneventfully. It is inferred that xylazine, ketamine and isoflurane anaesthesia was found ideal for esophageal reconstruction in emu birds with varying degree of esophageal laceration.

## 8. Management of closed complete fracture of humerus in a crow with figure of eight knot bandage - case study

*Kavechiya V. P., Patel P. B., Chaudhary, D. A., Barvalia D. R., Raval J. D. and Raval N. J.*

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An adult crow was rescued and presented to the Bird Hospital, Jivdaya Charitable Trust, Ahmedabad, Gujarat with a history of trauma at the left wing. Clinical and radiological examination revealed closed, undisplaced, complete, transverse fracture of upper one third of the left humerus. Figure of eight knot bandage was applied for ten days and ceftriaxone - tazobactam 150 mg, bid and meloxicam 0.5 mg/kg was given for 5 days. Crow was adapted well to eight knot bandage. A callus could be palpated clinically after 8 days. Bandage was removed after 10 days and during rehabilitation period various form of exercises were given. Uneventful recovery was achieved and the crow was released to nature.

## 9. Management of open fracture of humerus in a Shikra (*Accipiter badius*) with intramedullary pinning - case study

*Patel P. B., Kavechiya V. P., Chaudhary, D. A., Barvalia D. R., Raval J. D. and Raval N. J.*

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An adult Shikra was rescued and presented to the Bird Hospital, Jivdaya Charitable Trust, Ahmedabad, Gujarat with a history of trauma at the left wing. Clinical and radiological examination revealed open, displaced, complete, oblique fracture of upper one third of the left humerus. Bird was in stress. For three days, open wound dressing with povidone iodine followed by eight knot bandage applied and Ceftriaxone - tazobactam 150 mg, bid and meloxicam 0.5 mg/kg was given. On fourth day, fracture fragments were reduced and intramedullary pinning (1.8 mm K- wire) was done under isoflurane anaesthesia. Supportive eight knot bandage was kept for 10 days. Post-operative antibiotics were continued for 15 days. Shikra was adaptation well with "figure of eight" bandage. Wound condition was assessed clinically and radiographically. Normal soft callus was found at fracture site. After one month K-wire was removed under isoflurane anaesthesia. During rehabilitation period light exercise was given. The recovery was uneventful and the bird was released successfully in nature.



## 10. Incidence of emergencies and their management in Indian peafowls (*Pavocristatus*) - study on 62 clinical cases

*Patel P. B., Kavechiya V. P., Chaudhary, D. A., Barvalia D. R., Raval J. D. and Raval N. J.*

Bird Hospital, Jivdaya Charitable Trust, Ambawadi, Ahmedabad, Gujarat.

A total of 62 Indian peafowl (*Pavocristatus*) were rescued and presented for the treatment for various surgical and medicinal affections to Bird Hospital, Jivdaya Charitable Hospital, Ahmedabad, Gujarat over a period of July 2009 to September 2012. The major affections encountered were dog bite wound (14), dehydration and weakness (29), fracture of wings and legs (03), kite string injuries (12), head trauma (3) and paralysis (1). The peafowl were anaesthetized using isoflurane for surgical management whereas medicinal cases were treated as per suitable treatment. Stress was considered a main cause of death in this species. The clinical signs, diagnosis and therapeutic management for various conditions as well as outcomes were discussed. Recovered birds were released in their habitat.

## 11. Incidence of emergencies and their management in White-rumped Vulture (*Gyps bengalensis*) - study on 107 cases

*Kavechiya V. P., Patel P. B., Shashtri K. B., Chaudhary, D. A., Barvalia D. R., Raval J. D. and Raval N. J.*

Bird Hospital, Jivdaya Charitable Trust, Ambawadi, Ahmedabad, Gujarat.

A total of 107 White-rumped Vultures were rescued and presented for treatment to the Bird Hospital, Jivdaya Charitable Trust, Ahmedabad, Gujarat during the period from 1st January, 2009 to 5th August, 2012. Affections to this critically endangered species included various surgical and medicinal affections comprised of 49 kite string injuries and rest 58 with various non-surgical affections i.e. dehydration, visceral gout etc. Among 49 kite string injuries, 15 had injuries over right wing, 24 over left wing 7 over bilaterally and 3 over other body part. Among 58 various non-surgical affections, 35 had dehydration and 23 visceral gout. For surgical management vultures were anaesthetized with isoflurane and medicinal cases were treated as per suitable treatment. The clinical manifestations, diagnosis and treatment protocol for various surgical and medicinal cases as well as outcome was discussed. Recovered birds were released or sent to captivity in various nominated breeding centers across India.

## 12. Surgical management of crop fistula in pigeons.

*Chaudhary P. S., Varshney J. P. and Deshmukh V. V.*

Nandini Veterinary Hospital, GhodDod Road, Surat(Gujarat)

Seven adult pigeons were reported with complaint of food grains draining through the open wound on lower cervical esophageal and chest region. All the cases were operated for correction of crop fistula under ketamine @ 50mg/kg and diazepam @5mg/kg anesthesia. The fistulous crops were sutured with 3-0 chromic catgut in simple continuous pattern and skin was opposed using 3-0 nylon. Post operatively the birds were treated with iv saline, InjClavlanic acid potentiated amoxycilin @ 150mg/kg im repeated every 24 hrs, Inj.Carprofen @ 5mg/kg once daily for 3 days and daily dressings with povidone ointment. The hard paper collar was applied to prevent self mutilation of suture line with beak. All the birds were discharged from hospital on 15<sup>th</sup> day.



### 13. Surgical management of egg binding and dystocia conditions in emu birds - a clinical report on three cases

*G. Vani*

Veterinary Assistant Surgeon, Veterinary Dispensary, Seetharamapuram, VadamalapetMandal, Chittoor (Dt), A.P.

Hysterotomy is a surgical condition performed in Emu birds in the conditions of dystocia in which a developing egg is in the caudal oviduct and is either obstructing the cloaca or has caused oviductal tissue to prolapse through the oviduct-cloacal opening. Egg binding and Dystocia conditions were observed in three different Emu birds of three different farms of age group of 4-7 years. All the three birds were anaesthetized with intra muscular injection of Xylazine – Ketamine @ 5mg & 10mg/ Kg b wt respectively along with local infiltration of Lignocaine. Post operatively, the anti infectives, analgesics and laxative diet were advised for 5 days. All the birds recovered well and started laying eggs as usually in the next breeding season. The possible causes studied were hypocalcemia, oviductal infection and ruptured oviduct, weak musculature of oviduct, hormonal imbalance, malformed eggs and concurrent stress such as environmental temperature changes or systemic diseases.



Wild and Zoo Animal Surgery Session

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LEAD PAPER

## Recent advances in wildlife anaesthesia

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Deforestation has severely affected the habitat of wild animals, for which they are migrating towards the human habitat and alarmingly increased man-animal conflict. Moreover, improper protection of the forest also providing ample scope to the poachers to kill the invaluable wildlives. Thus a sizeable number of wild animals are losing their lives in every year and some of them are in the verge of extinction. Therefore, ministry of environment has stressed on the protection and conservation of such valuable animals and declared them as the Schedule-I animals. In this context treatment of the injured wild animals, rescue of the distressed and translocation of wild animals to a new habitat get momentum. The main tool use for welfare of the wildlife is anaesthetic management. Recent advances in wildlife anaesthesia pull the conservation of wildlife to a new height, and responsibility of this work is mainly bestowed on the veterinarians. Thus it become an everlasting challenge for the veterinarian to establish an efficient chemical restraint for the wide variety of wild animals. The untiring effort of researchers made tremendous progress in developing immobilizing and reversal agents and in the techniques of drug delivery system. Beyond this, animal protection laws prevented the use of painful physical restraint and become totally dependent on chemical immobilization.

A brief description of the wildlife anaesthetics, their reversals and techniques of drug delivery system will be discussed hereunder:

### Anaesthetic used in recent years :

The goal of anaesthesia is to reduce physiological stress that occur during the procedure and to ensure optimal tissue oxygenation. Invention of potent injectable anaesthetic has replaced the use of inhalation anaesthetic in wild animals. The anaesthetics presently used for immobilizing wildlives are very potent and concentrated enough to enable the use of low dart volume even in large species like elephant and rhino. Because of the low volume, it could be darted from sufficient distance, without causing fear to the wild animals. The groups of the drugs are as follows:

#### 1. Alpha-2 adrenoceptor agonist :

The members of the group exerts their action by modulating the release of noradrenaline on adrenergic nerve terminals. They induce sedation in dose dependant way. After attaining the optimal level of sedation and analgesia, the additional dose prolong the duration of sedation. The members of the group are:

i) **Medetomidine ( Zalopine ,Domitor) :** It is imidazole derivative, a novel and very potent sedative and analgesic synthesized in 1987 by Farnos, Finland. It is available as 1,10, and 30 mg/ml of solution. It is a highly selective and specific  $\alpha$ -2 adrenoceptor agonist with rapid onset of action. Medetomidine is 30 times more potent the xylazine. Because of the higher potency and concentration, it can be used in small volume of dart to reach a long distance. The agent is stable and with wide margin of safety. The induction and recovery under this anaesthesia is smooth. It can be safely use in pregnant animals without any adverse effect. Dosages of medetomidine for some species of wild animals are as follows:

- a) Elephant 5 mg/kg body wt.
- b) Rhino 20 mg/kg
- c) Tiger 60mg/kg



- d) Bear 50 mg/kg
- e) Deer 50 mg/kg

It has been extensively used for sedation of variety of non-domestic species. Medetomidine in combination with ketamine exerts synergistic action. Based on the clinical, haematological, serum biochemical and acid base status parameters, the resulting immobilization appear to be of good quality. This combination has been used on several occasions with good safety in animals with severely compromised health. No fatalities were recorded in 1240 immobilizations under medetomidine-ketamine combination in Helsinki zoo Finland ( Jalanka,1991). Extreme higher dose (426mg/kg) did not alter any vital functions in Barbary sheep, when monitored by clinically, haematologically and by ECG. Because of these character of medetomidine alone or in combination with ketamine is considered as an attractive alternative to other immobilizing agents, specially to narcotics. Medetomidine-ketamine combination was used for standing sedation of Asian elephant (Sarma et.al,2002) and also for one horned Asian rhino ( Sarma et.al.,2011).

ii) **Detomidine** : ( Domosedan): Detomidine was synthesized in late 1970 and was the next major development after xylazine. It is available as 10mg/ml solution in 5 ml vial. Chemically closely related to medetomidine, is a selective analgesic, sedative  $\alpha$ -2 adrenoceptor agonist developed for horses. One of the unique feature of detomidine is that it provides sedation and analgesia while the animal remain standing (Vainio,1985). It is 20 times potent than xylazine. Clinical dose of detomidine in horse is 20-40 mg/kg. Detomidine has been used to sedate very nervous ungulate during transport (Kasmiri,1984). Detomidine in combination with other drugs like ketamine or butorphanol has been used for sedation in elephant, rhinoceros etc. Detomidine- butorphanol combination was used for standing sedation in zebra and combination with azaperone was used for standing sedation in giraffe.

iii) **Romifidine** (Sedivet) : Romifidine is a potent  $\alpha$ -2 adrenoceptor agonist bearing the similar characters of other members of this group. It is available as 10mg/ml solution in 20ml vial. It was specially develop for large animals like horse. Use of Romifidine in wild animal is still limited. Romifidine @10 mg/kg in combination with ketamine could be used for sedation of elephant calf (Sarma and Choudhury,2011).It produces longest duration of sedative effect amongst the  $\alpha$ -2 adrenoceptors. Romifidine-Zoletil-Ketamine (50mg/kg +1.25mg/kg + 0.6 mg/kg) produced immobilization in Tapir.

iv) **Xylazine** (Rompum) : It is a sedative and analgesic developed in Germany in 1960 and its activity on  $\alpha$ -2 agonist was recognized in late 1970.It is widely used as alone or in combination with ketamine or opiod for sedation of wild as well as domestic animals( Hsu and Shulaw, 1984). Figueiredo et.al(2005) have ranked xylazine as the least potent amongst the members of the  $\alpha$ -2 adrenoceptor agonists. Therefore, recent development of potent and selective  $\alpha$ -2 adrenoceptor agonist have replaced use of xylazine in wild animals sedation. It is contraindicated in pregnant animal as it induces abortion. Induction time of xylazine in wild animals is slower than medetomidine and muscle relaxation produced by this drug is moderate. Duration of useful immobilization is shorter than medetomidine. Xylazine 100-175 mg may produce sedation in elephant.

## 2. Dissociative Anaesthesia:

This type of anaesthesia causes dissociation of thalamo-cortical tract from the limbic system. As this group of drug does not produce CNS depression, it can be used for anaesthesia of animals with seriously compromised health. The members of the group are Ketamine, tiletamine and phencyclidine. The later is not used in clinical practice.

i) **Ketamine** (ketaset) : Ketamine a cyclohexanone hydrochloride, induces dissociative or cataleptoid anaesthesia. It is available as 50 and 100 mg/ml solution in 10,50 and 100 ml vial. Ketamine stimulate heart in clinically normal animals causing increased heart rate. Pharyngeal and laryngeal reflexes are retained during ketamine induced anaesthesia. It has wide margin of safety. It is specific for feline and primates. Ketamine is producing analgesia only, but not unconsciousness and muscle relaxation, therefore, it is often mixed with  $\alpha$ -2 adrenoceptor to produce balanced anaesthesia. The dose rate required for different species are as follows :



|         |                        |
|---------|------------------------|
| Cat     | 11 – 33 mg/kg body wt. |
| Primate | 10-15 mg/kg            |
| Bird    | 15-25 mg/kg            |
| Snake   | 40-60 mg/kg            |
| Deer    | 10-20 mg/kg            |
| Bear    | 4.5-9mg/kg             |

ii) **Tilatamine-Zolazepam** (Zoletil, Telazol): It is the combination of dissociative agent tilatamine and benzodiazepine –zolazepam. The advantages of this combination is that zolazepam is less depressive to cardio- respiratory system. Anti-convulsive effect of zolazepam cause relaxation of dissociated animal and minimize seizures (Dein et.al.1991)

The dose of zoletil is as follows:

|           |               |
|-----------|---------------|
| Canidae : | 2.5 -16 mg/kg |
| Falidae   | 4-6 mg/kg     |

### 3. **Azaperone** ( stesnil) :

It is a butyrophenone derivative tranquilizer. Butyrophenone has minimal effect on respiration and has been shown to increase ventilation in pig and horse. It also proposed to inhibit some of the respiratory depressant action of both opioid and general anaesthesia (Redcliffe et.al.2000). Azaperone is available as 40 mg/ml solution in 50ml vial. It is a potent and specific tranquilizer of swine @ 4-8 mg /kg. It is also used for capture of wild animals like rhino , deer etc. by mixing with medetomidine, and butorphanol .

### 4. **Etorphine** ( M-99) :

It is an oripavine derivative , chemically related to morphine.It is supplied in a vial containing 10 or 20 mg. Dose rate for the larger mammals is 0.5 mg/500kg body weight. Etorphine is 1000 times more potent than morphine. The species sensitive to etorphine are elephant, rhino, hippo, bear and primate . This drug is commonly used in combination with acepromazine and popularly known as Immobilon-LA. In ungulate etorphine produces tachycardia, depression of respiration, total analgesia and drop in temperature, severe hypoxia, hypercarbia, and progressive acidosis

### 5. **Butorphanol** (stadol):

Butorphanol is a synthetic analgesic with both narcotic agonist and antagonist properties and 5 times more potent than morphine.. It is available as 30 mg/ml solution. Its narcotic antagonist activity is equipotent with nalorphine or 50 times less potent than naloxone..It is used in combination with azaperone and medetomidine for sedation of deer , rhino etc. one of the most notorious adverse effect is hypoxia, secondary to direct depression of CNS , respiratory centre and alveolar collapse ( Redcliffe et.al.,2000). A mixer of Butorphanol 69 mg and azaperone 103 mg was injected for immobilization of rhino.

## Reversal Drugs

Invention of reversal drug has tremendously changed the way of wildlife anaesthesia. With the availability of different antagonists, the wild animal can be reversed to normal from any anaesthetic depth and duration. Thus it has increased the margin of safety. Before the specific reversal, some non specific drugs particularly stimulants were used to combat the anaesthetic depression. Some of the specific antagonist are mentioned below:

### 1. **Alpha-2 adrenoceptor Antagonist:**

i) **Atipamezole** ( Antisedan) : Atipamezole is a novel  $\alpha$ -2 antagonist compound, recently developed with an aim of antagonizing the effect of medetomidine in non domestic animals. As it can reverse animal at any depth and duration of anaesthesia ,the mortality during anaesthesia can be totally avoided . It is potent selective and specific antagonist for both



centrally and peripherally located  $\alpha$ -2 adrenoceptors. Atipamezole is able to antagonize the cardiovascular, neurochemical and hypothermic effect of medetomidine (Savola et.al,1989). Atipamezole in double dose of medetomidine can effectively reverse from the anaesthesia but injection of equal amount of atipamezole to  $\alpha$ -2 adrenoceptors specially medetomidine exerts rebound effect and the animals exhibited drowsiness after recovery (Sarma and Pathak, 2005). Atipamezole @ 5mg/kg can reverse the deeply sedated elephant within 2 minutes, one horned Asian Rhino anaesthetized with medetomidine-ketamine was reversed within 8 minutes. Royal Bengal tiger, brown bear, black bear, black buck and hyena were effectively reversed within 5-10 minutes after intravenous injection of atipamezole.

**ii) Yohimbine (antagonist):** It has preferential affinity for  $\alpha$ -2 adrenoceptors, though significant  $\alpha$ -1 binding occurs. It is available as 5 mg/ml solution. The dose of yohimbine ranges from 0.125-0.250 mg/kg and preferably injected intravenously. The safety margin is relatively narrow. At high concentration it may affect serotonin and dopamine receptors and at very high concentration, it may have non specific local anaesthetic action (Goldberg and Robertson, 1983). The adverse effects of this drug are tachycardia, cardiac arrhythmias and change in blood pressure. Yohimbine in combination with 4-amino pyridine have been used to antagonize the effect of sedation and anaesthesia induced by xylazine but not good in reversing medetomidine.

**iii) Idazoxan :** It is potent  $\alpha$ -2 adrenoceptor antagonist with high selectivity and specificity. It effectively reversed the sedation induced by xylazine or detomidine (Doherty et.al.,1987).

**iv) Tolazoline :** It is a non selective  $\alpha$ -1 and  $\alpha$ -2 antagonist reversed the xylazine induced sedation. It is available as 100 mg/ml concentration.

**2. Narcotic Antagonist :** Action of etorphine can be reversed by intravenous injection of **diprenorphine** (M50:50) at the ratio of 1:1 or 1:2. It is available as 3mg/ml solution. Cardiovascular alteration in equine caused by etorphine is fatal. It is extremely dangerous to human and needs appropriate safety precaution. Droplet of etorphine coming in contact of the eye and any abrasion may cause fatality of the handlers. Therefore, anaesthetist should be cautious enough to prevent him from any casualty by using goggles, mask, gloves, shoes etc. **Naltrexone** (50 mg/ml) is another reversal, which can reverse the action of butorphanol.

**3. Benzodiazepine antagonist : Flumazenil** is an example of this group which can completely reverse the behavioral and neurological response of all benzodiazepine agonist (Hunkeler et.al. 1981)

#### **Anaesthetic Delivery System :**

There are two commonly used drug delivery systems, i.e. dart gun, pole syringe. The latter is practiced in captive wild animals, while the dart gun method is used for chemical immobilization of free ranging animals. Immobilization equipment is constituted by two items:

- A. The projector or dart gun -the blow pipe, rifle and pistol
- B. The projectile- the dart or flying syringe.

#### **A. Dart Gun:**

**i) Blow pipe:** This simplest type of dart projector consists of a straight aluminium pipe of 1 metre length and 10 mm in diameter. It propels a small plastic dart over a distance of 10 metres in enclosures. Rapid blow from the mouth is used to propel the dart. It causes minimum disturbances to the non target animals.

**ii) "Blow Gun" Rifle :** It consists of a blowpipe fitted to a gun stock, which has a compression chamber pressurized by foot pump connecting through a tube. Compressed air is released into the barrel to propel the dart by pulling a trigger.

**iii) Powder charged Rifle :** This lightweight 32 calibre (13mm) rifle propels dart upto 15 ml capacity to a range of 50 metres



by means of an explosive charge. Charges are available in different strength depending on dart weight and distance of the target. An aluminium dart is assembled as per requirement of drug volume and needle size, which may be reused for several times. Ready prepared disposable plastic dart is also available.

A pistol is also available for short range upto 20 metres with same kind of dart and useful for animals in zoo enclosures. ( Dein et. al., 1991)

**B. Darts :** Darts are of different types such as : reusable plastic dart, disposable plastic dart and metal dart.

**i) Reusable Plastic Dart :** Blow pipe and blow gun fire a reusable plastic dart of 1-3.5 ml capacity . The drug is loaded into the front chamber of the dart from a hypodermic syringe and then add an appropriate needle. The needle opening is at side and covered with a tight fitting plastic sleeve, which prevent loss of drug during darting. An inert gas or compressed air is filled into the rear chamber of the dart, behind the plunger. The stabilizer is then attached . After firing the needle penetrate the animal and the sleeve is pushed backward and allow the drug to enter the animals body.

**ii) Disposable plastic dart :** Ready made plastic dart with a fixed needle and explosive cap for activation of plunger are available for powder charged rifle .The dart volume ranges from 1-3.5 ml. This lightweight dart is to be loaded through the needle . Due to lightness, they are not causing tissue injury of the targeted animal but deflected by wind.

**iii) Metal dart :** This dart ranges from 1-15 ml . The barrel is made of aluminium and can be selected as per requirement of the drug volume. A greased rubber plunger, fitted with an impact sensitive explosive charge, is placed inside the barrel towards the rear end. A flight stabilizer is screwed behind it. The drug is loaded from front and a needle is screwed into the barrel. Little amount of vaseline is smeared on the needle hole to prevent seepage of the drug.

The needle used in the dart may be smooth, collared and barbed, the later two are useful to fix with the animal body and thereby preventing needle loss during tranquilization. The powder charged syringe leave the gun with high velocity. The needle should puncture the target animal perpendicularly , otherwise oblique puncturing will deposit the drug in dermal layer , causing long induction time. The accuracy of the equipment is largely dependant upon the practice before field trial.

#### **Site of Darting:**

The most preferable site of darting is gluteal muscles and prescapular region ( shoulder and neck muscles) .Because of the heavy musculature dart easily pierces and the drug is quickly absorbed.

#### **Time of immobilization:**

Immobilization should be in day time and most preferably in morning hours .Because it will provide ample time for observation of the immobilized animals. Moreover in the morning hours, the ambient temperature is low, thus it never insist for hyperthermia. The anaesthetist should remember that he must stay until recovery occurs.

Neither very hot nor very cold weather is suitable for immobilization of wild animal. Because they may adversely effect the body temperature .In emergency , darting may be at any time either day or night for the safety of the animal. Such attempts are required for rescue in flood, to save injured from poachers and for rescue of trapped animal in human habitat.

**Selection of the drug:** The selection of the anaesthetic depend upon :

- i) Species of the animal
- ii) Expected duration of anaesthesia
- iii) Age of the animal ; very young and old animal require small dose, as their metabolic power is less than the adult.
- iv) Sex : In female particularly in pregnant careful selection of anaesthetic can only save the animal from abortion.
- v) Body weight





- vi) Geography of the area : It should be considered whether the place of darting is plain, hilly, dense forest or water body nearby. Near water body or in hilly terrain always need “standing anaesthesia”
- vii) Excitement of the animal : some of the drug are not working in excitement .
- viii) Full stomach animal require small dose to avoid regurgitation and aspiration

#### **Monitoring of the immobilized animal:**

Prior to administration of any immobilizing drug , one should make special effort to ensure good health of the animal. The person responsible for injecting the drug must simultaneously assume the responsibility for safety of the animal. Safety is possible, only when the worker is aware of normal behaviour of the animal, the effect of the drug, and possible complications produced by the drug. Following immobilization, the anaesthetist should keep constant eye on the depth of sedation. During sedation elephant produces large snoring, relaxed trunk touching ground , protruded penis hanging completely, limbs are extended and kept wide .This indicate immobilization in standing .Anaesthetist should be able to assess pulse ,respiration and temperature. Oxygen saturation and blood pressure may be recorded by pulse oxymeter. Any emergency should be counteracted by injecting specific drug i.e. atropine to prevent A-V block, steroid to prevent shock or otherwise reversal of the anaesthesia. Hyperthermia is one of the complications developed during capture of wild animals and to be dealt seriously. It happens in high ambient temperature. Body temperature above 42 °C, cellular hypoxia results in multi organ failure which is life threatening. Since oxygen consumption exceed oxygen supply in hyperthermic animal, oxygen supplementation to meet the increased demand is advantageous. During recovery shivering can increase oxygen consumption up to 500% and anaesthetic recovery may be prolonged . In immobilized state neck of the animal should be extended. Elephant should never be in sternal recumbancy to avoid respiratory failure .Therefore, it is suggested to place in lateral recumbancy. On the other hand rhino is to be kept on sternal recumbancy during sedation to avoid hypoxia. Buffalo,deer etc. developed bloat in lateral position and should be cared to avoid aspiration of stomach content.Tiger should be placed in lateral recumbancy.

\* \* \*

## **Man – Wildlife Interaction: Role of a Veterinary Surgeon**

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In nature, human beings and wild animals interact at various levels and at different intensities. As human population invades into wild animal habitats, the natural wildlife territory is displaced. The human and wildlife populations overlap at various zones, thus increasing the frequency of their interaction between them. More often, these interactions end up in negative results and hence ‘Human-Wildlife Conflicts’ are a matter of great concern for all those involved in wildlife management. Veterinary Surgeons also share this concern at different levels to reduce the negative impact as much as possible.

### **The Problem**

Human-Wildlife conflict refers to the interaction between people and wild animals and the resultant negative impact on people or their resources, or wild animals or their habitat. It occurs when the growing human population encroach an established wildlife territory, creating reduction of resources or life to some people and/or wild animals. Byproducts of human existence offer un-natural opportunity for wildlife in the form of food and shelter, resulting in increased interference and potentially destructive threat for both men and animals.

Living close to the forests, traditional forest dwellers called as tribals have direct interaction with forests. Their cultural pattern and economic activities such as food gathering, pastoral, cultivation, handicrafts and other labour activities are largely based on the forests. Increasing encroachment of forest land by tribals and non tribals, monoculture plantations, roads and





other development activities cause fragmentation of wildlife habitats. Such fragmentation narrows down the territories and corridors of wild animals, often has an impact on the nearby human population in the form of man slaughter, crop damage, cattle lifting and destruction of assets. Regular confrontations with such hardships evoke a feeling of fear and hatred in the behaviour of victim and are ventilated towards the wild animals.

Various forms of human – wildlife conflict occur with negative results. Some of them are,

1. Animal deaths
2. Crop damage
3. Damage to property
4. Destruction of habitat
5. Injuries to people
6. Injuries to wildlife
7. Wildlife depredation
8. Loss of human life

Hence, in order to make possible the continual use of forests for the human benefits in the long run, it is very much essential to protect the forest and wildlife resources in a sustainable manner.

### Current Situation

The chunk of the problem is mutual loss of habitat: those of forest dwellers as well as the wildlife. This sort of conflicts will make the affected people really irritated and in such cases forest officials and local administration find it very difficult to settle the issue amicably. Often it warrants the services of a veterinarian to avoid further damage.

The role of the veterinarian is to find an immediate solution to the conflict, if not a lasting one. The common demand from the public as well as the local administration used to be the removal of the pest from the vicinity. It used to be a big challenge for the veterinarian to translocate a wild animal, without causing further damage to the properties of lives, both human as well as the wild animal.

There were several instances in the recent past, in Kerala, where leopards, tigers and sloth bear were captured and effectively translocated into deeper forests. Crop raiding elephants, deer and peacock also pose a greater menace in several parts of Kerala. There are certain areas where crocodiles are creating hindrance to people crossing water bodies for their routine activities and livelihood. Effective translocation of them could not be attained so far since, they tend to come back. Often we used 'kunkies' to ward them off, though they tend to return soon. 'Monkey menace' is another issue we face at several towns and villages nearing forests. Here also the translocation of one or two individuals are successful. But, when a big troop is ruling an area, we are still short of ideas. Crop raiding by wild boars, gaur and deer are another problem. A pair of gaur entered into the campus of Kannur Airport which is under construction is still eluding all our efforts. Many airports are facing the issue of rapidly growing population of deer as well as bigger birds like kites and vultures in the locality which often pose serious threat to the air traffic. Population explosion of deer and some other captive animals is a big problem in many zoos and wildlife rescue shelters.

### What we can do?

In the case of heavy herbivores like elephants and rhinos which threaten the crop as well as people live in the periphery of the forests, several methods are being employed to ward these heavy mammals off. In Tamil Nadu, the forest department has deployed 'Elephant Police' at several strategic locations, for warding off the wild elephants back into the deeper forest. But, to do this effectively we have to have an idea about the movements of elephants in the forest.

In many parts the world, 'lookouts' are posted at key positions to detect the approaching elephants and to intimate the villagers about it. Now-a-days, we use radio collaring of elephants and rhinos to locate their movements and take necessary



steps to avoid invasion of human habitats and farming areas.

Radio collaring in elephants or rhinos are being done all over the world with the help of veterinarians. The animal has to be tranquilized before radio collaring is done and revived back into senses after the procedure. Radio collaring is done in several other species for the purpose of research and to aid in conservation activities. The service of an experienced veterinary surgeon or anaesthetist is very valuable to perform successful chemical immobilization.

Translocation of conflicting wild or captive animals, individually or as a group, is another tool to avoid conflicts with incontact human beings. Recently, in Kerala as well as other parts of the country, there were several incidents of leopards wandering into human settlements causing loss of human lives as well as creating anarchy in the social life of villagers. In almost all incidents, veterinary surgeons could capture them successfully and translocated to deeper forests.

Occasionally, forest department officials used to seek the help of veterinary surgeons in treating surgical ailments in free ranging elephants. This also necessitates tranquilization of the animal before performing any surgical intervention. Treatment of injured and orphaned elephant calves was also required by the forest officials, often. These animals may require prolonged periods of treatment and rehabilitation and Veterinary Surgeons are the best people to undertake that activity satisfactorily.

Population control and translocation of captive wild animals is another area which requires the services of Veterinary Surgeons. Wild animals in captivity in zoo and wildlife rescue shelters like deer and monkeys multiply very rapidly creating both managerial and environmental crisis. Recently such a population explosion took place in a rescue centre at Kodanadu in Kerala, belonging to the Department of Forest and Wildlife. Veterinary Officers of the forest department and surgeons from the Veterinary College, Mannuthy could successfully translocate nearly hundred spotted and Sambar deer to the newly created Abhayaranyam Project, a sophisticated wildlife rescue shelter, nearly four kilometers away. All the adult males were subjected to sterilization (caudectomy) to control further increase in population. Some of the Bonnet Monkeys of Thrissur Zoo also were subjected to caudectomy as a measure of population control.

### **Conclusion**

Conflicts between man and wildlife occur at different levels, whether they are free ranging or in captivity. Even though there are several mitigation strategies being discussed, the role of Veterinary Surgeons is limited to translocation and transportation of animals, population control and treatment/management of diseases and rehabilitation of survived animals. Rehabilitation of orphans and aged animals also may require veterinary care. All these tasks are accomplished by the surgeons because of their skills in performing chemical immobilization, disease diagnosis and surgical or medical treatment.

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## 1. Surgical management of bilateral epulides in a bear

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A bear of the Nandankanan Zoological Park developed bilateral swellings protruding out of the oral cavity, impeding with the normal feeding and drinking. The animal rubbed the swellings on hard surfaces of the enclosure resulting in abrasions which further lead to ulcers. The animal was tranquilized and the swellings were diagnosed as epulides, which demanded immediate surgical intervention. The epulis of the left gum was surgically removed; ligations were applied to the bleeding vessels and the wound was sutured. Radiograph was taken to rule out chances of any bony involvement. Histopathology of the operated mass revealed it as fibromatous and ossifying epulis. After complete healing of the wound, the bear was operated for removal of the epulis of the other side. The hemorrhage was checked by ligatures and pressure application of adrenaline soaked gauzes and wound was closed as routine. There was also complete healing of the wound of the right side and the bear is performing well with normal feeding and drinking.

## 2. Lacerated trunk injury in an asian elephant calf

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A seven days old baby elephant calf with a deep lacerated wound in the distal third of its trunk was rescued from the Jashipur forest division. The calf was shifted to a dry, clean and calm place. The wound was debrided, necrotic materials were removed and sutured keeping the airway patent and bandaged under general anesthesia. The calf was administered with systemic antibiotics and NSAIDs which was later on continued for five subsequent days. It was fed every two hours with a specially prepared sterile milk replacer containing cow milk, lactogen 2, vitamins, minerals and coconut water through a specially designed feeding container. The bandage was removed in the evening of the same day as the calf seemed to feel very much uncomfortable with breathing difficulties. The wound was cleaned twice daily and was irrigated with povidone iodine solution five times a day. Infrared therapy was applied on the wound twice daily. After eight days of the surgery, there was wound dehiscence and so, open dressing was started however there was development of hypothermia, pneumonia with open mouth breathing and respiratory noise and finally the calf died 11<sup>th</sup> day post-operatively. PM examination revealed death due to pneumonia. The lessons learned from this case will be presented in the seminar.

## 3. Successful surgical management of gastro-intestinal evisceration in common langur (*Semnopithecus entellus*)

*S. K. Tiwari, G. D. Kaushal, Harinder Singh, Dilip Kumar and Yugesh Kumar Choudhary*

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A Langur aged approximately 3 years was presented with history of a dog bite that resulted in abdominal evisceration. The eviscerated organs were most part of stomach and some part of small intestine which were contaminated. Immediate stabilization using administration of fluid therapy and dexamethasone and surgical intervention were carried out to save the



life of patient under sedated with administration of Xylazine @ 2mg/kg and Ketamine @ 10 mg/kg body weight intramuscularly. The eviscerated mass was rinsed with normal saline solution and replaced into the peritoneal cavity. The peritoneum and the muscular layers were apposed in routine manner using chromic catgut no.1. The skin was apposed with mattress suturing pattern using silk size no.1. Postoperatively; the animal was given cefotaxime 25 mg/kg body weight i/v and meloxicam 0.3 mg/kg body weight i/m along with B complex 2 ml i/m for five days. The antiseptic dressing of surgical wound was done by silver sulfadiazine ointment till removal of skin sutures. There was an uneventful recovery in a period of ten days.

#### 4. Tranquilization and Rescue of injured leopard

*S. J. Gaikwad*

Nashik Maharashtra

The leopard was lying near by a village Kotul Tal-Akole Dist-Ahmednagar for two days. He was in tremendous pain & unable to walk but growling at the village people. We planned & darted the leopard. After tranquilization it by using **Inj. Xylazine 1 mg & ketamine 4 mg per kg body weight**, it was examined closely & found that his all foot pads & some body part were burned. This burn could be because of fire in the farm. The eyes were instilled with eye ointment. The wounds were dressed with antibiotic ointment & fly repellent spray. Inj. Benzathine Penicillin 12 L & Inj Doramectin was given. Then daily dusting was advised with turmeric powder. The leopard recovered after 45 days and he was released in the natural habitat.

#### 5. Removal of fishing hook from Indian Cobra - case report

*S. J. Gaikwad*

Nashik Maharashtra

A cobra was presented with history of swallowing two fishing hooks while engulfing a frog. On examination, one small hook engaged in the mucosal fold oral cavity was removed carefully. But it was very difficult to locate the second big hook. It was palpated in the neck region, but considering chances of tear while removing per os, we anaesthetized the cobra with Inj. Ketamine @ 20mg /Kg BW. After the effect of anesthetic, the hook was located and fixed with the thumb. The string was pulled slightly carefully and point of the hook was pushed towards left lateral body wall to prevent tracheal puncture. It was lifted up and then pulled through a puncture in the skin. The visible pointed u-part of the hook was cut with the help of a wire cutter. The string & remaining part of hook was pulled slowly back through the mouth. This way after removing both small & big the hook the cobra was observed for one hour till complete recovery. The wound was dressed with Pendistrin SH ointment. Recovery of the cobra was uneventful. It was maintained for seven days before releasing in its natural habitat.

#### 6. Mongoose Injured Indian cobra - case report

*S. J. Gaikwad*

Nashik Maharashtra

A cobra was brought to clinic in a very critical state. It was bitten by mongoose 18 hours before. It was lying in the state of shock and hardly responding to stimuli. On examination it was badly bitten by mongoose on its head. Compound fracture of right horizontal ramus of mandible was evident. Mud covering the head and jaw was cleaned and with savlon and distilled water. The venom gland on right side was exposed due to tearing of skin. The upper jaw was severely congested & inflamed. Right fang tooth was fractured partially & left was broken completely. Deep teeth marks of mongoose bite were seen on the upper jaw. The cobra was anaesthetized with Inj. Ketamine @ 10Mg /Kg B W by considering its condition. The exposed bone was covered with mucous membrane by using catgut No 3/0 and the skin with Nylon using horizontal mattress suture.



The cobra kept under close supervision, recovered after two and half hours. Now, water was fed with infant feeding tube .Subsequently, raw chicken egg was administered through feeding tube .After seven hours; it started showing tongue movement, lifting of head as the most pronounced symptoms of recovery. Alternate day it was fed with raw egg with feeding tube once in a day .Recovery of the cobra was uneventful. It was kept under observation for fifteen days then, it was released in its natural habitat.

## 7. Management of palate fracture in a mongoose

*S. J. Gaikwad*

Nashik Maharashtra

A mongoose was brought to the clinic with history of accident (banging against motor bike). Respiratory distress, epistaxis and discomfort were evident. As he was clawing his jaw intermittently, fore limbs were tied with string. It was very difficult to restrain him due to sharp teeth.General anesthesia was performed with Xylazine 1mg and Ketamine 4mg /kg body weight was given separately. After complete sedation, he was examined and it was found that there was a fresh longitudinal wound on hard palate involving nasal bones. Under aseptic precautions, the cleft was repaired using interrupted suturing of Vicryl 1/0. Benzathine Penicillin was given.Thoraco-abdominal jacket prepared from PVC saline bottle was applied to prevent self mutilation.After surgery there was no scratching as he was comfortable .The Mongoose was kept fasting for two days, only water was given with a dropper. There was a huge swelling on face region, congestion of buccal cavity and edematous swelling of eyelids. From third day small amount of semi liquid diet was given for two days with the help of tube. Sneezing reduced slowly .From sixth day, semisolid food was administered. By sixth day,there was remarkable reduction in facial & eye lid swelling, sneezing reduced to great extent. He became very active. He started eating small amounts of banana on his own from eighth day. He was released after eventful recovery.

## 8. Abdominal rupture in a Indian cobra

*S. J. Gaikwad*

Nashik Maharashtra

The cobra was brought to clinic in very bad state with abdomen ruptured due to oversized rat. The skin was torn and portion of rat was protruding through the rupture. Under Inj.Ketamine @10Mg /Kg BW, the wound was cleaned and washed with antiseptic solution.The rat was pulled out carefully .The internal wound was again washed and cleaned. Then the stomach was sutured with catgut No. 3/0 with continuous suture. The muscles and skin was closed by proper apposition. After recovery from anaesthesia, the cobra started attacking. The wound was dressed with Betadine every third day with abdominal bandaging and paper tape was wrapped around the wound .The wound healed by 15<sup>th</sup> day. It was then released in the natural habitat.

## 9. Management of surgical affections in wild animals

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There is an increase in number of wild animals being presented to different veterinary hospitals because of alarming increase in urbanization in our country. The present communication deals with some of the clinical cases of wild animals presented to Division of Surgery, IVRI, Izatnagar for expert opinion and treatment. The different clinical cases included, dog bite wounds,



shock, electrocution injury, aural hematoma, fractures, maggoted wounds, limb amputation, Robert jones bandaging, fish hook retrieval, rat bite wounds, external skeletal fixation and road traffic accidents. The details about management of all of these cases will be presented and discussed.

## 10. Endoscopic guided retrieval of pharyngeal foreign body in a leopard

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One and half year old female leopard (*Pantherapardus*) was presented with anorexia, retching, dullness and had the history of hunting poultry before two days. Lateral radiography of head and neck under xylazine-ketamine anaesthesia revealed lodgment of a bone piece in the lower pharyngeal region. Endoscopy was performed to arrive at confirmatory diagnosis and to retrieve the bone piece successfully. Post-operative antibiotic, anti-inflammatory and antihistaminic were administered in prescribed doses for three days. Animal started feeding and watering from next day and was released in the forest after 10 days.

## 11. Management of crushing and corrosive injuries in pythons

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Two pythons (*Python molurus*) were presented with the history of accidental wounds on head and oral cavity, respectively. In one case, python had trauma on its head and neck. Radiographic examination of head revealed maxillary and mandibular fractures of one side, while radiograph of body showed two fractured ribs. Under Ketamine HCl anesthesia, correction of damages was carried out. While, in second case, corrosive type wound was present inside the oral cavity. The eroded surfaces were cleaned and dressed. Both the cases recovered uneventfully and they were released in forest after 40 days.

## 12. Incidence of bursitis in working elephants

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Bursitis is a commonly encountered surgical problem in working animals like the cattle and horses. Carpal hygroma in bovine, capped elbow in equine have been frequently reported. Capped elbow has also been commonly encountered in heavy breeds of dogs. Elephants are an integral part of socio-religious economic ethos of India. They are maintained in captivity in this country for several thousand years. Uses of the captive elephants in unscientific manner often expose them to injuries out of which bursitis is of common occurrence. Most commonly encountered bursitis are capped elbow, hygroma over the stifle, carpal hygroma and bursitis over the scapular spine. In his long years of elephant practice, the author has encountered many such bursitis cases which were often complicated by suppuration, fibrosis, induration or even haematoma formation. In the present paper, a discussion will be presented to elucidated the different types of bursitis and their management





### 13. Peotomy in injured common cobra

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A severely injured common cobra weighing 700 gm was brought to the teaching Veterinary Clinical Complex by an authorized snake catcher with the history of accidental injury near the cloaca and prolapse/phimosis of penis. Clinical examination was carried out under general anesthesia with Xylazine @ 0.5 mg/kg and Ketamine @ 25mg/kg intramuscularly and revealed that phimosis and necrosis of penis and deep lacerated wound near cloaca. Radiological examination of whole vertebral column indicates that complete fracture at the tail vertebrae. Peotomy was carried out under general anesthesia and lacerated wound near the cloaca was sutured with catgut no 3-0. Wound was dressed with oint. Silverex for 5 days and Inj. Chloramphenicol succinate was administered intramuscularly at the dose rate of 20 mg/kg body weight postoperatively. Uneventful recovery was observed after 5 days and the cobra was rehabilitated after complete healing of the surgical wound.

### 14. Traumatic evisceration in a python and its surgical management

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A python (*Python molurus*) measuring 2.9 meters and weighing 18kg was injured when a compound around a residence was being cleared using a JCB. There was severely lacerated wound on the dorsal and lateral aspect of the body, loss of skin and scales, and rupture of the ventral aspect. The stomach and parts of intestine along with other visceral organs were come out. The snake was manually controlled and brought to University Veterinary Hospital, Kokkalai, Thrissur by the Forest officials and snake catchers. On examination it was found that the visceral organs are partially prolapsed and soiled. The snake was controlled on ketamine anaesthesia. The wound was cleaned with potassium permanganate solution followed by normal saline. Reduced the contents back and sutured the wound in simple continuous manner using vicryl. The skin sutured in simple interrupted manner using vicryl. The wound was sealed with Tr.benzoin and sprayed Charmyl spray. Administered Amoxicillin cloxacillin intramuscularly and handed over to Forest officials for observation. Antibiotic therapy continued for five days. The snake recovered uneventfully. The snake was kept under captivity for 232 days and released to reserve forest after regaining the full health

### 15. Successful retrieval of fish hook in turtles

*Chaudhary P.S., Varshney J.P. and Deshmukh V.V.*

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Three soft shell turtles were reported with the nylon string protruding through the mouth that could not be pulled out even with force. Radiographic examination revealed the presence of metallic fish hook in the oral cavity. In two cases the hooks were retrieved directly through oral cavity with help of forceps whereas esophagotomy was performed in turtle with the fish hook deeply entangled within the wall of esophagus. Anesthesia was achieved with ketamine @ 50mg/kg and diazepam @ 0.3mg/kg im. Parallel incision was given along the line of palpable foreign body as the inner sloughed layer of esophagus lining was easily noticeable. The esophagus was sutured using 4-0 chromic catgut in single layer continuous suturing pattern and the skin was closed routinely. Inj. Amikacin 5mg/kg, Inj. Carprofen @ 2mg/kg every 72 hrs.were given post operatively and daily dressings conducted with povidone ointment. Turtles showed uneventful recovery.



## 16. Correction of rectal prolapse in turtles

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Five star turtles were presented at hospital with the rectal prolapse. Chronic affection with necrosis of gland tissues were found in two turtles whereas oedema and congestion was prominent in others. The prolapsed parts were cleaned with povidone solution and were massaged with ice pack. Necrotic tissues were desected and the prolapsed organs were replace in situ with application of xylocaine jelly. Purse string sutures were applied in two turtles showing spontaneous straining and recurrence. Inj. Enrofloxacin @ 7 mg/kg and inj. Carprofen @ 2 mg/kg were given intramuscularly every 48 hrs. All the turtles showed normal recovery.

## 17. Anaesthetic combinations for laparoscopic sterilization in free ranging Rhesus macaques (*Macacamulatta*)

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The study was conducted in 30 apparently healthy Rhesus macaques (*Macacamulatta*) scheduled for laparoscopic sterilization, with an objective to standardize intramuscular injectable anaesthetic protocols using Xylazine (2mg/kg) + Ketamine (8mg/kg) or Medetomidine (0.15mg/kg) + Ketamine(8mg/kg) combinations. Free ranging Rhesus macaques were captured by Net/Jala method. The macaques were divided into 2 groups of 15 animals (9 males, 6 females) each, weighing  $7.93 \pm 0.45$  Kg and  $7.87 \pm 0.65$  Kg. Sedative and behavioural changes, analgo-clinical, cardiovascular, hemodynamic and haematobiochemical alterations were clinically investigated at various time intervals. Xylazine-ketamine one syringe combination induced anaesthesia in  $141.9 \pm 11.6$  seconds, provided surgical anaesthesia for  $63.93 \pm 2.44$  minutes with complete recovery in  $113.9 \pm 3.89$  minutes. Medetomidine-ketamine one syringe combination induced anaesthesia in  $125.5 \pm 10.51$  seconds, provided surgical anaesthesia for  $63.53 \pm 3.08$  minutes with complete recovery in  $130.3 \pm 2.96$  minutes. Induction parameters, quality of recovery and myorelaxation were better in medetomidine-ketamine group. Both the combinations produced hypotension, bradycardia and respiratory depression. Cardiopulmonary alterations were more pronounced in Xylazine-Ketamine group. Both the combinations produced adequate sedation, analgesia, muscle relaxation and smooth recovery and the combinations can be considered effective for laparoscopic sterilization in rhesus macaques.

## 18. Unusual rupture of G.I. tract and the intestinal anastomosis in a rat snake.

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One male rat snake was rescued by the snake help line Bhubaneswar and was presented for typical swelling below vent region suspecting one tumour growth. It was examined under C-arm and on palpation it was revealed that some hard masses were in that area. So it was prepared surgically for correction of the condition. Injectable GA of ketamine HCL was administered and strict under aseptic measures 2 cm long incision was given at mid belly scales. Some blackish hard materials were removed from the site. After cleaning the site it was seen that the gut has been ruptured and these were the faecal materials. After thorough cleaning with normal physiological saline it was prepared for intestinal anastomosis. After repair of the intestine, the under lying belly muscles were repaired successfully. The snake was maintained with glucose water orally for 5 days. After 12 days the sutures were removed and the snake recovered well with normal defecation and appetite.