NAVSARI AGRICULTURAL UNIVERSITY

XLII Annual Congress of
Indian Society for Veterinary Surgery
and
National Symposium
on

Advances in Diagnostic Imaging and Surgical Techniques in Farm and Companion Animals

22nd – 24th November, 2018

COMPENDIUM

Editors

Dr. V. S. Dabas

Dr. S. K. Jhala

Dr. D. N. Suthar

-:: Organized by ::-

Department of Veterinary Surgery & Radiology

College of Veterinary Science & Animal Husbandry

Navsari Agricultural University, Navsari, Gujarat (India)

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Fisheries and Transport,
Government of Gujarat
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Sachivalay, Gandhinagar-382 010
Date : 14 Nov. 2018

MESSAGE

I am happy to note that the Department of Veterinary Surgery and Radiology, College of Veterinary Science and Animal Husbandry, Navsari Agricultural University, Navsari's Organizing a National Symposium on "Advances in diagnostic imaging and surgical techniques in farm and companion animals"alongside of 42nd Annual Congress of ISVS during period of 22nd - 24th November, 2018.

Farm and companion animal surgery is a broader topic that deals with comparative diagnostic imaging and appropriate surgical considerations in domestic and pet animals. Institutionally developed advanced and lifesaving surgical procedures need to reach the field hospitals/Dispensaries in appropriate module to fit in to the available infrastructure. In other words it is high time to propagate field tested surgical procedures for farm well as pet animals.

I am sure that, this symposium will offer an excellent opportunity to bring together national expertise from academicians, professionals, scientists, government and private field veterinarians on a single platform and facilitate sharing of experiences, recent global development in the area of farm animal surgery for promoting production and health among small animal, equines, avian and wild & zoo animals.

I extend my warm wishes and all the good luck to the organizers as well as the delegates for the successful scientific interaction.

(R. C. Faldu)

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Dr. C. J. DANGARIA
Vice Chancellor

MESSAGE

It is a matter of pride and privilege that Navsari Agricultural University has got an opportunity to host XLII Annual Congress of ISVS and National Symposium on "Advances in diagnostic imaging and surgical techniques in farm and companion animals"organized by Department of Veterinary Surgery and Radiology, College of Veterinary Science & Animal Husbandry, Navsari in collaboration with Indian Society for Veterinary Surgery during 22nd - 24th November, 2018. Such a scientific endeavor is always a welcome step for any academic Institution.

The theme of the conference has been planned to give a focus on new horizons in the field of Veterinary Surgery and Radiology with an added attention on advance diagnostic aids and surgical techniques in farm and companion animals, Recently, with emergence of non-invasive and safer diagnostic imaging modalities an early diagnosis of many medical and surgical conditions in large and companion animals gained wide response amongst clinicians.

From time to time, it is very important to collect and update available scientific and clinical information and discuss amongst academicians, field veterinaries and clinicians on such platform that will definitely help in efficient diagnosis and surgical treatment of various conditions encountered in livestock and pet animals.

On behalf of the university, I welcome all the delegates, congratulate my team and wish the conference a grand success.

(C.J. Dangaria)
Vice Chancellor

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S. R. Chaudhary
I/c Director of Research

MESSAGE

I am delighted to know that Indian Society for Veterinary Surgery is organizing National Symposium and XLII Annual Conference on "Advances in diagnostic imaging and surgical techniques in farm and companion animals" during 22nd- 24thNovember, 2018 at Department of Veterinary Surgery and Radiology, Vanbandhu College of Veterinary Sciences & Animal Husbandry, Navsari Agricultural University, Navsari.

The topic chosen for the symposium is the need of the hour as it gives a focus for research activities as well as indicates the need to train in surgical skills of veterinarians in the area of newer diagnostic and surgical techniques in farm and pet animals for augmenting the health, production and rural economy. This scientific gathering is important and essential for exchange of scientific ideas between institute personnel, apart from helping and motivating the students and young scientists.

I am very confident that the deliberations and recommendations that comes out of the symposium would be very useful for building up the national economy.

I wish the XLII Annual Conference of Indian Society for Veterinary Surgery and the National Symposium all success.

(S. R. Chaudhary)

From the President's Pen

Dr. Gajraj Singh
President
Indian Society for Veterinary Surgery (ISVS)

It gives me immense pleasure and joy to welcome all distinguished delegates, participants and invitees to the 42nd Annual Congress of Indian Society for Veterinary Surgery and National Symposium on "Advances in Diagnostic Imaging and Surgical Techniques in Farm and Companion Animals".

Remarkable advances have been gained in the past few decades with regard to veterinary surgery and radiology. Novel investigational techniques and medical procedures have greatly enhanced our abilities to diagnose and treat animals. Use of minimally invasive diagnostic and procedural techniques, improvements in medical equipment, and the advent of molecular biological methods have advanced veterinary surgery to a level well beyond what was possible just a few years ago.

However, tough challenges remain that will require novel approaches and new ways of thinking. Education of future clinician and scientists is at the heart of this advancement; traditional instructional techniques may not meet the needs of future students. An increase in the flexibility and efficiency of veterinary surgery education will be needed. There is a big gap between surgical procedures undertaken at University Hospital and under field conditions. This demands serious efforts on part of academicians, administrators and policy makers for delivering the surgical services to the last man in the remote field or a pet owner in a small town.

I am confident that Organizing Secretary and his team will not leave any stone unturned to make this Symposium a grand success.

(Gajraj Singh)

From the Executive Secretary's Pen

Dr. D. B. Patil
Executive Secretary
Indian Society for Veterinary Surgery (ISVS)

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

I am glad that the ISVS is organizing the 42nd AnnualCongress and National Symposiumon an important topic"Advances in Diagnostic Imaging and Surgical Techniques in Farm and Companion Animals".

In India, the stream of radiology is evolving rapidly in Veterinary practice. The functioning of first CT Unit in RAJUVAS, Bikaner followed by that of State Veterinary Hospital, Animal Husbandry Department at Bhopal is a new milestone in the radiological journey of India. The usage of other modalities like ultrasonography, CR &DDR panels, referrals to human, CT & MRI Units and implementation of Picture Archiving and Communication system(PACS) is a giant step. In honing large animal ultrasonography, skills sets developed by GADVASU, Ludhiana are noteworthy. With TANUVAS and other Universities contemplating to add CTs, an ecosystem for imaging modalities to provide cutting edge in diagnosis juxtaposed with newer surgical techniques ushers a paradigm shift in the management of surgical disorders of large and small animals.

I am confident of meaningful deliberations during different scientific sessions. The technical interactions will go a long way in updating academicians, researchers, postgraduates and field Veterinarians.

I am confident that 42nd ISVS Symposium in this historical city, Navsari will be cherished by all with strong sentiments wafted from 'Dandi March' to contribute for the surgical disciplines and ameliorate the sufferings of Animal World.

I wish this event a grand success and trust all will enjoy their stay in this green campus and historical city.

D. B. Patil

College of Veterinary Science and A. H.
Navsari Agricultural University, Navsari

Dr. V. B. Kharadi
I/c Principal and Dean

MESSAGE

It is a matter of privilege for our Institution to host XLII Annual Congress of Indian Society of Veterinary Surgery and National Symposium at Department of Veterinary Surgery & Radiology, College of Veterinary Science and Animal Husbandry, Navsari Agricultural University, Navsari, Gujarat, during November 22-24, 2018 under the aegis of Indian Society of Veterinary Surgery.

The theme of the symposium is relevant and required in the field of Veterinary Surgery in order to compete global competition. Newer concepts are absolutely necessary to improve our clinical services in the area of animal health in this country, since the revenue contribution to this great country from the Animal Husbandry Sector is increasing in the recent years.

The members of the organizing committee have been working untiringly for the last few months for organizing and making this great event a grand success. We have tried our level best to provide all the comforts to our learned guests and make their stay memorable at the campus.

I extend my warm welcome to the participants and delegates and convey best wishes for success of this conference.

(V. B. Kharadi)

From Organizing Secretary's Desk

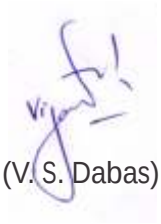
Dr. V. S. Dabas
Organizing Secretary
ISVS - 2018

I am privileged to welcome the delegates of National Symposium on "Advances in Diagnostic Imaging and Surgical Techniques in Farm and Companion Animals" being organized on the occasion of XLII Annual Congress of the Indian Society for Veterinary Surgery at Department of Veterinary Surgery and Radiology, College of Veterinary Science and Animal Husbandry, Navsari Agricultural University, Navsari, Gujarat, India, during 22nd - 24th November, 2018. I am pleased to place before you the Souvenir, a compilation of lectures in addition to lead papers and abstracts to be presented in different technical sessions of the symposium.

Since, the animals play an important role in the survival and sustenance of man on earth; the promotion of farm and companion animal health care are important key factors to improve the economy of our country and taking care the needs of pet animal owners. The recent development in diagnostic imaging and surgical techniques will pave way to improve the skills of practicing veterinary surgeons in the field of veterinary surgery.

At the outset, I would like to thank the executive committee of Indian Society for Veterinary Surgery for providing an opportunity to host the symposium at Navsari. I am grateful to Hon'ble Vice Chancellor, Navsari Agricultural University Dr. C. J. Dangaria for extending whole hearted support and providing the necessary facilities for the organization of this conference. The different committees constituted for the smooth conduct of the symposium has worked in tandem and multiplied our efforts. I would like to thank all who have contributed to the success of the conference and the authors of the papers that are making up this publication.

I extend a warm welcome to all and wish them a comfortable stay.



(V. S. Dabas)

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Scientific Programme

22-11-2018 (Thursday)

Sr. No.	Time	Event	Venue
1.	07:30 to 09:00 am	Breakfast	Veterinary College Lawn
2.	08:00 to 09:30 am	Registration	Veterinary College Hall
3.	09:30 to 11:00 am	Inaugural Function	University Auditorium
4.	11:00 to 11:15 am	High Tea	
5.	11:15 to 11:30 noon	Theme Session	
6.	12:00 to 12:20 pm	O. Ram akrishna Oration award	
7.	12:20 to 12:40 pm	P. E. Kulkarni Oration award	
8.	12:40 to 02:00 pm	Lunch	Veterinary College Lawn
9.	02:00 to 06:00 pm	Small Animal Surgery Session	Veterinary College Hall I
10.	02:00 to 04:00 pm	Avian Surgery Session	Veterinary College Hall II
11.	04:00 to 06:00 pm	Ophthalmology Session	Veterinary College Hall II
12.	07:00 to 08:00 pm	Cultural Programme	University Auditorium
13.	08:00 pm onwards	Dinner	Veterinary College Lawn

23-11-2018 (Friday)

Sr. No.	Time	Event	Venue
1.	07:30 to 08:30 am	Breakfast	Veterinary College Lawn
2.	08:30 to 11:30 am	Anesthesiology Session	Veterinary College Hall I
		Orthopedic Surgery Session	Veterinary College Hall II
3.	11:30 am to 01:00 pm	Equine Surgery Session	Veterinary College Hall I
		Wild and Zoo Animal Surgery Session	Veterinary College Hall II
4.	01:00 to 02:00 pm	Lunch	Veterinary College Lawn
5.	02:00 to 05:00 pm	Ruminant Surgery Session	Veterinary College Hall I
		Radiology and Imaging Session	Veterinary College Hall II
		Large animal poster session	Veterinary College Hall III
6.	08:00 pm onwards	Dinner	Veterinary College Lawn

24-11-2018 (Saturday)

Sr. No.	Time	Event	Venue
1.	07:30 to 08:30 am	Breakfast	Veterinary College Lawn
2.	08:30 to 10:30 am	Award (Dr. M. R. Patel Award for Best Field Veterinarian) Session	Veterinary College Hall I
3.	09:00 to 11:00 am	Small animal poster session	Veterinary College Hall III
4.	11:00 to 12:00 noon	Plenary Session and General Body Meeting	Veterinary College Hall I
5.	12:00 to 01:30 pm	Lunch	Veterinary College Lawn

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Theme Session

Advances in diagnostic imaging and surgical techniques in farm and companion animals

Dr. Adarsh Kumar

Professor and Head

Dept. of Surgery and Radiology, COVAS, CSKHPKV, Palampur

Image-guided intervention is the general term used for any computer-based surgical procedure where the surgeon employs tracked surgical instruments in conjunction with preoperative or intraoperative images in order to indirectly guide the procedure so as to precisely visualize and target the surgical site. It helps surgeons to perform safer and less invasive procedures with markedly enhanced visualization. Image-guided interventions is the use of imaging modalities, such as ultrasound, fluoroscopy, endoscopy, CT scan and MRI to guide therapeutic procedures. In most cases, these procedures are performed through the use of very small incisions, or sometimes no incision at all, which makes them very minimally invasive. Advantages of these therapies include reduced complications, shorter hospital stays, and the ability to treat conditions for which no treatments may exist or in which conventional treatments involve risks that are unacceptable to the client or veterinary patient. Image-guided interventions have many far reaching applications across species, organ systems, and diseases. These interventions are often complex and require considerable technical expertise.

The ?rst steps in the use of imaging to guide surgical procedures were taken more than 100 years ago, when in 1895, a mere eight days after Roentgen's ?rst paper on X –rays were published, a surgeon in Birmingham, England, used the new technique of X-ray imaging to guide the removal of an industrial sewing needle from a woman's hand. Uses of these techniques in diagnostic and therapeutic approaches have great value in narrowly defined clinical and anatomical conditions.

Interventional ultrasonography, including diagnostic, therapeutic, and intraoperative interventions, is a rapidly developing field in both human and veterinary medicine. Growing expertise and significant improvements in the technology have contributed to the innovation of numerous ultrasound-assisted procedures. Ultrasound can efficiently detect, localize and characterize most soft tissue lesions. The real-time imaging capabilities of ultrasound are a significant advantage for interventions in the musculoskeletal system, allowing monitoring of the needle position at all times. Several procedures may be performed under ultrasound guidance including aspiration of cysts, fluid collections and abscesses drainage, arthrocentesis, installation of the drainage catheter, biopsy, steroid injections, treatment of calcified tendinitis, and foreign body retrieval. Ultrasonography allows the identification of the neural structures and the adjacent anatomic structures, besides eventual anatomic variants. Advantages of these procedures include reduced complications, getting actual views of affected organs and evaluation of the damage caused to them.

Ultrasound guided nerve block techniques benefit from administering the drug in the right place with the lowest effective dose. Ultrasonography guided biopsy and centesis of various organs and body cavities is quite helpful for diagnostic purpose. Ultrasound guidance enables us to perform the procedure in even very small and sensitive areas where other imaging modalities fail to serve the purpose such as the drainage of space occupying lesions in the vital visceral organs and in special sensory organs. Therefore, clinicians may

anticipate the description of ultrasound-guidance for most techniques already performed blindly in the clinical setting and where a higher degree of success is desirable

The examination of cerebrospinal fluid (CSF) plays a major role in the diagnosis of central nervous system diseases in animals. The exact site of needle insertion at both locations is determined by skeletal landmarks but puncture is carried out blindly without visualisation of the subarachnoid space. Blind aspiration of CSF from the atlanto-occipital space frequently results in contamination of the sample with blood, which can impair the diagnosis. This emphasizes the importance of the collection of uncontaminated CSF samples. Since spinal cord and the surrounding structures could be visualized sonographically, the ultrasound guided collection of spinal fluid and myelographic procedures becomes a technique of choice as far as precision is concerned

In Veterinary patients, biopsy of parenchymatous organs is commonly performed to evaluate the type and severity of lesions. Complications of biopsy are many, for instance renal biopsy sometimes results in penetration of large blood vessels and include microscopic and macroscopic hematuria, obstruction of the renal pelvis by blood clots resulting in hydronephrosis and severe renal, subcapsular or perirenal hemorrhage resulting in hemorrhagic shock. Ultrasound guidanceprovides more accurate localization of the needle in relation to the kidney and subsequent biopsy site in the renal cortex, which seems to be the reason for the low complication rate.

In cattle, a number of indications exist for examination of bile. Previously, cholecystocentesis in human beings and animals could only be performed surgically. Percutaneous ultrasound-guided cholecystocentesis is a minimally invasive technique for bile collection in cows and deleterious side effects are not encountered after ultrasound-guided cholecystocentesis.Hepatic portal blood has been the subject of a variety of physiological and/or nutritional studies in cattle. In most of them,portocentesis was performed via catheterisation of the vein during laparotomy. Ultrasound-guided percutaneous portocentesis is a simple and safe procedure, provided that it is performed carefully.

Exploratory surgery is one of the diagnostic procedures followed to detect various abdominal disorders in animals. Laparoscopy is a minimally invasive surgical technique using an endoscope inserted trans-abdominally to observe organs within the abdominal and pelvic cavities. The advantages of the use of laparoscopy-guided biopsy techniques are the direct visualization of the target organ and the selection of the exact biopsy site. The direct view of the target organ can provide additional information concerning the condition and eventually its prognosis.Laparoscopic surgery is now considered, an important aspect of general large animal surgery. Apart from diagnostics, its current applications are serial renal biopsies, liver and splenic biopsies, correction of abomasal displacement, and ovariectomies etc. Specimens obtained by laparoscopic guided biopsy techniques have minimal distortion of tissue as evaluated microscopically and are considered an accurate representation of the organs.

The recent diagnostic techniques in veterinary practice related to teat and udder in large animals. The minimum invasion has become the main motto and there is no enhanced technique to accomplish this other than theloscopy for diagnosis, therapeutic and to monitor the treatment. The theloscopy permits safe and

assured intervention for the situation with moderately less risk and troublesomeness to the patient than the conservative procedures for diagnosis, therapeutic and to monitor the treatment.Interventional imaging involves the use of contemporary imaging methods to gain access to different structures of the animal's body for diagnostic and therapeutic reasons without the need for traditional surgery.

Fluoroscopy plays an important role in surgery, it provides radiographs in a dynamic manner and helps the surgeon or the interventional radiologist to perform any procedure under great control and with precision. The fluoroscopic images taken during procedures provide road maps that allow the clinician to guide instruments such as catheters and guide wires through the body to the areas of interest. Many procedures are performed by fluoroscopic assistance such as oesophageal feeding tube, chest drainage catheter placement, removal of foreign bodies and repair of joint luxation. Intraosseous fluid administration and intra-articular injections can be performed by using fluoroscopy and with great accuracy, as the site of intervention is continuously under the control of the operator by using image guidance

Natural orifice translumenal endoscopic surgery (NOTES) is a developing field with the potential to revolutionize our approach to abdominal surgery. Performing operations via a flexible endoscope introduced through a natural orifice presents several challenges to physicians. Orientation and interpretation of the endoscopic video image can be difficult. The surgeon must also learn to operate with the camera and instruments “in line.” Advances in technology are currently addressing the challenges of NOTES. Image-guided navigation could potentially provide invaluable assistance during NOTES. Real-time information on spatial positioning and orientation as well as assistance with the identification of anatomy and localization of pathology are some of the possibilities. Image-guided surgery has become commonplace in disciplines such as neurosurgery where the anatomy is relatively rigid. To become widespread in intra-abdominal procedures and NOTES, advances that will allow systems to adapt to moving and deforming anatomy are needed. Interventional Endoscopy (IE) utilizes advanced endoscopic techniques to provide minimally invasive therapeutic procedures as an alternative to surgery or in patients in which surgery may not be appropriate.

Interventional video tomography (IVT), a new imaging modality, achieves virtual visualization of anatomic structures in three dimensions for intraoperative stereotactic navigation. Partial immersion into a virtual data space, which is orthotopicallycoregistered to the surgical field, enhances, by means of a see-through head-mounted display (HMD), the surgeon's visual perception and technique by providing visual access to nonvisual data of anatomy, physiology, and function.

Interventional magnetic resonance imaging (IMRI), is the use of magnetic resonance imaging (MRI) to do interventional radiology procedures.Because of the lack of harmful effects on the patient and the operator, MR is well suited for "interventional radiology", where the images produced by an MRI scanner are used to guide a minimally-invasive procedure intraoperatively and/or interactively. Interventional MRI can be used for a variety of specialized procedures. It is used for doing biopsies of lesions, resections of tumors, guiding thermal ablation of tissue, as well as other procedures. It is commonly used in neurosurgery where every millimeter of tissue spared in surgery can make a difference for patient recovery.

The field of biomedical optics has matured rapidly over the last decade and is poised to make a significant

impact on patient care. In particular, wide-field (typically > 5 cm), planar, near-infrared (NIR) fluorescence imaging has the potential to revolutionize surgery by providing real-time image guidance to surgeons for tissue that needs to be resected, such as tumors, and tissue that needs to be avoided, such as blood vessels and nerves. Autofluorescence refers to the intrinsic fluorescence of the tissue that is excited when activated by ultraviolet, visible, or near-infrared (NIR) radiation of suitable wavelength. Because cancerous transformation leads to morphologic and biochemical alterations, which affect the optical properties of the tissue, in some cases, the autofluorescence may actually illuminate the structures of interest and can serve as a useful diagnostic indicator. This holds a significant advantage, for there is no exogenous agent required which could complicate regulatory approval for clinical use. Using this technique, dysplastic and malignant tissues have been shown to excite increased red fluorescence. If adequate imaging resolution can be achieved, intra-operative tumor visualization may improve radical resection without unnecessary damage to healthy tissue and has the potential to more accurately assess tumor margins during surgery. Moreover, through biochemical changes involved in the earliest stages of neoplastic development, this technique promises to identify malignant lesions before they become visible to the naked eye or currently available intra-operative imaging modalities.

Although most of the procedures utilizing imaging interventions are investigational at this time, they have great potential in offering an improved and sophisticated methodology for currently available techniques to veterinary patients. Veterinary medicine has tended to adopt changes that have occurred in human medicine, from increased specialization and imaging advancements in medical and surgical treatments. Although veterinary patients tend to recover more rapidly following surgery than do human patients and cosmetic concerns typically are not as great, animals can still benefit from interventional techniques. Some of the important Imaging based interventions/surgeries are

- Airway/respiratory:Tracheal stenting for tracheal collapse, Nasopharyngeal stenosis dilation/stenting, Tracheobronchial foreign body removal, Tracheal mass removal, Thoracic duct glue embolization (closure) for chylothorax
- Cardiac (heart):Pacemaker implantation, Balloon valvuloplasty for pulmonic and subaortic (heart valve) stenosis, Patent ductus arteriosus (PDA) occlusion, Heartworm extraction, Balloon pericardiotomy, Occlusion of other cardiac shunts (atrial and ventricular septal defects, Balloon dilation/stenting.
- Gastrointestinal:Gastrointestinal foreign body removal, Esophageal dilation for esophageal strictures, Colonic stenting for tumors or strictures, Feeding tubes.
- Hepatobiliary (liver and gall bladder): Coil embolization of intrahepatic portosystemic shunts, Glue embolization of hepatic arteriovenous (blood vessel) malformations, Gall bladder drainage
- Oncology:Intra-arterial chemotherapy and chemoembolization (directly to the blood vessels supplying the tumor), Stenting of obstructions by tumors (airway/breathing, gastrointestinal, peripheral vascular, urinary)

- Peripheral vascular (blood vessels):Embolization (closure) of arteriovenous (blood vessel) malformations/fistulas, Intravascular foreign body removal, Embolization for epistaxis or other hemorrhage, Stenting for vascular stenosis
- Urinary System:Urethral stenting for strictures and tumors, Ureteral stenting for stones, strictures, and tumors, Laser lithotripsy, Laser ablation of ectopic ureters, Renal drainage
- Large Animals:Arterial embolization (blood vessel closure) for guttural pouch mycosis, Electrical cardioversion (synchronized shock) for atrial fibrillation, Laser lithotripsy, Compression of the infraorbital nerve for idiopathic head shaking.

In addition, although many of the proposed benefits have not yet been critically evaluated. In the near future, technical and cost barriers willcontinue to limit widespread adoption and availability of advanced imaging tools in general veterinary practice.The field of image-guided interventions is still evolving as medical imaging and computing powercontinue to improve, enabling the development of new image-guided systems. The core component technologies of tracking systems, registration methods, visualization techniques, and softwareare becoming established while continuing to evolve. As surgery continues to move toward minimally invasive interventions,image-guided systems will increasingly be used to improve the precision and quality of medical procedures. Continued improvements in medical imaging, including further development of will allow for integration of real-time imaging so that a true and accurateoperative picture can be provided to the interventionalist at all times. Therefore, multidisciplinary partnerships between scientific and clinical personnel are essential tomove the field forward.

Dr. O. Ramakrishna
Oration Award

Current Status and Future Prospects of Large Animal Fracture Repair

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Despite of several challenges such as heavy body weight, angular placement of bones, difficulty in restricting the weight bearing on the limb and animal's movement during the post-fixation period and economic constraints, large animal orthopaedic surgery continues to make strides in the management of fracture repair. Some of the specific advances include development of interlocking nail systems, locking plate-screw constructs, and external skeletal fixation systems, specific for large animal fracture repair. Use of arthroscopes and image intensifiers has shown the way for minimally invasive techniques and biological osteosynthesis. Development of balanced anaesthetic techniques, and improved proactive post-fixation management practices have improved the outcome of surgical fixation of fractures. In spite of several advancements, however, only a few large animals are treated for fractures mostly due to economic considerations (especially in bovines) and requirement in most circumstances for a return to athletic soundness (in equines).

The choice of type of fracture treatment in large animals depends on many factors. Although many fractures can be better repaired with internal or external skeletal fixation techniques, often the less expensive conservative approach is chosen. Instruments and implants for internal fixation are expensive, and are not readily available in most hospitals/clinics, limiting their choice of repair. Further, large animal fracture fixation expertise is not available in most veterinary colleges/hospitals; hence a particular repair technique is preferred by a particular hospital/surgeon, although many fractures can be better treated using a different technique. Inability to take a patient to a distant hospital with adequate facilities and non-availability of trained veterinarians at the local level often leads to opt for conservative treatment approach. Hence the decision about whether a fracture patient should be treated conservatively or surgically is not always made using the merit of the case/ technique.

Plaster cast is one of the oldest external fixation techniques, which is still used frequently for immobilization of distal limb bone fractures in large animals. As fractures below the elbow and hock joints are common (about 50%), many of them can be effectively treated by cast application. In recent days, fiberglass cast, a synthetic alternative to plaster cast, has been introduced and being used more often. Fiberglass cast, which is stronger, light weight and fast setting, has a better prospect in large animal fracture fixation, and it can be used for effective fixation of metatarsal, metacarpal, radius-ulna and phalangeal fractures even in heavy large animals. However, presently it is not in routine clinical practice due to the cost factor. Further there is also a need to popularize this technique among the practicing veterinarians, as many fractures can be effectively treated even at field level with fiberglass cast application.

Internal fixation of fractures by open reduction has the advantage of providing good alignment of fracture

fragments and also rigid fixation of bone fragments, and is often preferred in animals of high economic value, especially in fractures of proximal bones such as femur, humerus, tibia and radius-ulna. Intramedullary Steinmann pins, Rush pins, cross pins and stack pins have been used with success, especially in young animals. Multiple cross pin fixation (using 3-4 mm K-wires) is a simple and effective technique for repair of distal femoral and humeral fractures in young animals. In recent years, interlocking nails (ILNs) have been introduced in large animal fracture fixation as well. ILNs decrease torsional instability, prevent collapse of comminuted fractures and migration of nail. ILNs having a diameter of 10-14 mm with screw holes placed along the length of nail were found adequate for fixation in femur, humerus and tibia in young animals. By increasing the number of bolts, the strength of ILN-bone fixation against bending, compression and torsion loads increases, hence ideal in large animal fixations. Some of the recent modifications in ILN systems include development of an hourglass shaped nail to reduce torsional instability at the fracture site, locking screws that reduce slack at the level of nail holes, and use of flexible segmented ILN that facilitate easy insertion with limited morbidity at the surgical site. The custom-made ILNs have been developed and used successfully in different long bone fractures in cattle and horses. Solid ILNs (vs. cannulated) for femur and angular nails (vs. straight) for tibia were found more resistant and provide stable fixation in bovines. A novel ILN with 4 divergent pins at the distal end was also developed for repair of distal femoral fractures in calves to prevent rotation of the nail; however, it is not commercially available. Various polymers (light, inexpensive, biocompatible and absorbable) have been tested for use as ILNs for repair of fractures of the humerus and femur in calves; the results were encouraging in humerus, but in femur they could not provide sufficient stability during locomotion. The outcome after surgical repair of mid daiphyseal humeral and femoral fractures was improved by the use of ILN and ILN-plate combinations. Overall, the ILNs can provide stable fixation of fractures in light weight animals weighing up to about 250 kg. Unfortunately ILNs are not being used in routine clinical practice due to non-availability of ILN systems commercially and also due to lack of technical knowhow.

The fixed angle screw-plate construct (Locking Compression Plate system) was perhaps the most recent concept and advancement in fracture fixation in the past decade. Locking compression plate (LCP) usually has holes that allow placement of either locking or traditional non-locking screws (combi plates). It has improved holding strength of constructs with a lower risk of implant loosening or constructs failure. LCP has been used for repair of different long bones such as femur, humerus, tibia, radius-ulna, metacarpus and metatarsus, both in young cattle and horses. LCPs are very versatile, and a 5.5 broad LCP was effective for fracture fixation in adult cattle and horses. In relatively heavy animals, double plate fixation is done, especially in tibia and radius-ulna fractures. Double plating improves the torsional and bending strengths of the bone-implant unit considerably. The screw placement, however, is relatively more difficult in LCP double plating, the plates should be placed in such a way that the holes do not align with each other and locking

screws are inserted orthogonally to the long axis of the plate. Customised contoured locking plates have been developed and tested for use in different long bones of bovine. Experimental studies have shown that they can provide nearly as rigid fixation as a double plate construct, however, extensive clinical studies are yet to be done. A new design of LCP with the stacked combi hole at one end has been developed for pastern arthrodesis in horses to avoid the disadvantages of the long pointed end interfering with the extensor process of the third

phalanx; however, long term studies are not yet available. The LCP may be particularly suited for osteopenic or osteoporotic bone; hence, fractures of humerus and femur, which are more common in young calves and are not amenable to external fixation, may be better treated with LCPs. However, except for few individual reports, no extensive studies have been published on the use of locking plate systems in large animals. Though locking plates are available for general orthopaedic applications for the last 10-15 years, heavy cost and commercial non-availability has limited their use in routine veterinary practice. In the future, development of specific locking plates should allow successful management of long bone fractures in newborn calves as well as heavier cattle.

Modified clamp-rod internal fixator was also developed and tested for use in large animals, which was found suitable for the treatment of fractures as it has been claimed to have more advantages over plate and intramedullary nail fixation. However, long term results are lacking and the device is not readily available commercially.

The External Skeletal Fixation (ESF), which was used for more than 100 years in human and veterinary orthopaedics, has only recently enjoyed resurgence in popularity among large animal practitioners. Recent emphasis on minimal invasive surgery and biological healing has renewed interest in the use of ESF in cattle, buffaloes and horses. Excellent mechanical properties of ESF with an early return of the affected limb to function make it an ideal technique for use in large animals, especially in open infected fractures. Diversity in design and versatility of the ESF techniques may allow their application to numerous types of fractures including short segment fractures (near the joints) by transarticular application. Reusability of components with multiple applications makes it economical too.

Transfixation pinning and casting (TPC), wherein a cast material is used as the external supporting frame for transfixation pins, has been successfully used in adult cattle to treat fractures of various bones, especially of tibia and radius-ulna. This allows placement of pins in different planes as per the anatomic structures and fracture configuration, and metal bars can also be placed on the compression and tension sides of the limb to improve the fixation rigidity. Use of fibreglass cast has distinct advantage (lighter in weight and stronger) over plaster of Paris cast. However, disadvantages with TPC include inability to adjust the pin position and fixator configuration after the cast has been applied, difficulty to manage open fractures and assess the development of cast sores. Different types of novel bilateral linear fixation systems have been developed for use in bovines and equines; 6-7 mm threaded pins are effective to treat fractures of straight long bones such as metatarsus, metacarpus, radius-ulna and phalanges. Circular External Skeletal Fixation (CEF) wherein

relatively small diameter pins (K-wires) are used in pairs (crossed approximately in 90? angle) as transfixation pins, and are fixed to the external rings under tension, has several advantages such as excellent mechanical properties, better stabilization of short segments and adjustment of the frames after bone fixation allowing translation, rotation or angulation of bone segments. In recent years, use of CEF in large animal practice is gaining popularity to treat fractures below the stifle or elbow joint. It has been seen that circular fixators are well tolerated in adult ruminants as well as in equines, and may be useful to treat some of the fractures that are currently unrepairable with the use of conventional techniques, especially in transtarsal applications (distal

tibial and proximal metatarsal fractures) in heavy animals. Hybrid fixation systems (with circular and linear components) may be more versatile for treatment of tibial diaphyseal fractures where angularly placed bone and heavy muscular covering at proximal tibia region hinder the use of conventional circular rings. Rings used in CEF systems are normally developed using either stainless steel, aluminum or carbon fibres. Carbon fibre and stainless steel rings are costly, hence attempts were made to develop circular rings using readily available mild steel alloy to reduce the cost of fixator; mild steel rings (5-6 mm thick, 20 mm wide rings of varied diameter) are shown to provide stable fixation in cattle and horses. Aluminum rings of similar dimensions are strong enough to provide fixation in light weight animals. Epoxy-pin fixation (a free form fixation), wherein bent transfixation pins and epoxy putty are used to make an ESF construct, has been found effective for management of open fractures and luxations in calves and foals. In this technique, fractures/dislocations are reduced and immobilized using 2.0-3.0 mm K-wires fixed at different levels (at least at 2 points in each fragment), the fixation pins in the same plane are bent and joined to make a temporary scaffold, and thoroughly mixed epoxy putty is then applied using the scaffold as guide and by incorporating the pins within the epoxy mold. The technique of epoxy-pin fixation is easy, less cumbersome, needs minimal instrumentation, economical and also provides stable fixation of fractures in animals weighing up to about 100 kg, and the technique can be easily practiced by a veterinary surgeon at field level.

ESF fixation is useful and indicated in highly comminuted limb bone fractures of heavy animals, which cannot be treated using other techniques. Different new ESF designs specific for cattle and horses are being developed. A pinless external fixation system has also been developed for use in mandibular fractures of cattle. However, ESF has not yet got wide spread acceptance in large animal practice due to lack of suitable fixation devices that can withstand heavy weight of the animals and also due to postoperative management problems and economic constraints. There is a large scope to develop ESF designs, which not only provide stable fixation but also allow immediate weight bearing, are less cumbersome to apply and above all economical for routine use in large animal practice.

In spite of several advances in large animal fracture repair, very few animals are treated for fracture in our country. The treatment facilities are restricted to certain colleges/institutes/ individuals. A common veterinarian at field level is unable or hesitant to treat a large animal fracture case by surgical fixation. This is mainly due to lack of technical

knowledge and also non-availability of suitable implants. There is a need to create awareness about the large animal fracture repair by training the veterinarians at grass root level. Orthopaedics, fracture fixation, should also be a part of UG and PG course curriculum to create interest among the veterinary graduates. There is also need to improve and develop customised implants and techniques which are cost effective, versatile and user friendly in addition to provide stable bone fixation in large animals.

Summary:

- Treatment of fractures in large animals is now imperative due to changing socio-economic and religious concerns.
- Bovines when compared to equines are better patients for treatment of fractures as they generally do not

resist but protect the fixation devices on their limbs; spend more time lying down; more resistant to infection, contralateral limb breakdown and laminitis; and have a tremendous potential for bone healing.

- Fracture treatment is more favourable in young animals with less body weight; older and heavier animals have guarded prognosis, as specific implants which can withstand heavy body weight are not readily available.
- Fractures of distal bones of the limb, such as metacarpus/metatarsus/phalanges, can be better managed than the proximal bones such as tibia, femur and humerus.
- Closed fractures of distal limb bones in large animals can be treated satisfactorily by conservative treatment such as fibreglass cast application or transfixation pinning and casting.
- Internal fixation should be preferred in animals of high economic value, and also in certain types of fractures which are expected to heal rapidly and uneventfully. However, internal fixation alone may not provide sufficient stability in heavy adult animals and external coaptation is needed to protect the bone fixation.
- Plate osteosynthesis using locking compression plates can provide stable internal fixation in a variety of fractures both in young animals and heavy adults.
- External skeletal fixation is very versatile and has several advantages; development of suitable ESF techniques for large animals may allow treatment of a variety of fractures which are difficult to treat by other conventional techniques. Epoxy-pin fixation is a promising technique for fracture management in young animals weighing up to about 100 kg.
- Overall, the treatment options for repair of long bone fractures in large animals have improved, but the high cost, non-availability of implants and trained veterinarians, and often guarded prognosis limit their routine clinical application.
- Attempt should be made to develop customized fracture fixation devices that can not only provide rigid fixation, but also allow immediate weight bearing, easily applied and maintained, and are economical. Further, efforts should be made to train more veterinarians in large animal fracture repair. Until then, management of fractures in large animals will remain a challenge.

Dr. P. E. Kulkarni
Oration Award

A perspective on desirable surgical skills in neophyte vets-private practitioners and field vets

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The world of knowledge is taking great strides in the recent times. Information existing today becomes obsolete tomorrow. Every individual has to keep abreast with the latest technologies be it the application form or in the reporting form. It is imperative for veterinary practices large and small to embrace these developments, to stay relevant in changing times. However, it is not possible for a neophyte practitioner to employ these in practice in the beginning. Need based technologies have to be included when the necessary. This becomes difficult at times due to technical and financial constraints. Hence this lecture is an attempt to explore minimum database required at the neophyte stage of practice for veterinarians in the private set up.

I am more companion animal oriented practitioner though I have spent some good movements in large animal private practice too. However, I have lost contact with that for the past 20 years and also that under Indian circumstances, exclusive large animal surgical private practice is a far stretched fantasy. Hence most of my views will be restricted to small animal practice. My comments on large animal surgery are based on my old memories and the narrations of my younger colleagues who are into active surgical practice.

Currently, many pass outs are venturing into private practice in companion animals in towns and cities. Having a strong financial background, beautifully decorated clinics are started soon after graduation or post graduate studies. People from disciplines other than surgery also start performing various surgeries at these clinics. They do not take adequate training or the requisite professional qualification. Many such attempts end into disastrous fatalities or have to shut down for various other reasons. Therefore one must determinately set a goal before venturing in these activities. Training under an established practitioner gives both technical and mental strength. It is a matter of solace that some of the institutes have started offering short courses in this direction. I may proudly say that apart from such recognised educational bodies, associations of private practitioners have made commendable contribution in this field by way of arranging series of lectures and hands on training. It is worthwhile to attend such career advancement courses before and while in private practice especially if you wish to try a hand in surgical procedures. I have also seen facilities that offer simulation training that closely mimics live surgery. Hover, one must understand that tactile feel or the nature of complications like haemorrhage is still lacking in such software. May be in future, these developments will replace live surgical training.

As a private practitioner especially performing surgeries, one must have good communication skills. It is imperative to clarify the nature of surgical procedure to be performed on the animal to its owner/caretaker. The owner also has to understand the necessity of the operation, risks involved, post-operative care & follow up and the possible outcome. In the absence of these, one may have to face unpleasant situations. Surgeons are said to be 'god fearing' community. This is partly true. Often, the situation demands that you have to use courage, sense of proportion and common sense. It is expected that whatever comes to you has to be faced. To

minimise such incidences, one must prepare by reading, referring to other seniors and defining Standard Operating Procedures.

As a beginner, choosing properly laid out operation theatre may not be possible particularly in large animal practice. A well-lit, clean and isolated place may suffice. VCI recommended regulations are not practical in this regard. Similarly, it is wise to have an experienced person to assist. This is true for large animal surgery wherein lot of exhaustion takes place if surgery is to be performed single handed. Also the person is boon in difficult situations.

Though not a common practice yet under Indian scenario, a dedicated anaesthetist is welcome. If not, a good anaesthetic technique may be practised with available means. Currently, many of small animal surgeons are using inhalation methods which can be customised with minimum investment. Good monitoring system is also advised.

Basic surgical set for any type of surgery is included in the curriculum for undergraduate studies. Hence I will not enlist that. However, I recommend two things about the set. 1. Preferably autoclave the set, though steam sterilisation in pressure cooker yields satisfactory results. 2. I prepare two sets every time particularly for abdominal surgery.

Depending on the experience, mental set up and instrumentation, performing common surgical operations like spay, castrations, aural haematoma etc. should be easy to begin with. After acquiring enough experience, one may proceed for special techniques. This low risk procedures help in promoting the brand name of the surgeon/clinic. Once the confidence is built in both i.e. yourself & the clientele, special procedures can be attempted.

There should be no hesitation in attempting any procedure new to you. It is however good to go through literature, try a hands on cadaver if possible and plan your own procedure. I would recommend involving, talking to seniors who will give valuable suggestions. Whenever facility is available, do not shy from referring the case to your seniors. Attending various professional meets and advanced trainings enlighten you on new developments as well as offers an opportunity to meet doyens in various fields. Do not fall prey to medical companies who sponsor for such events because they oblige and then demand disproportional reciprocation.

It is recommended to write Standard Operating Procedure (SOP) before undertaking actual surgery. This gives a piece of mind during the surgical procedure. It is a good idea to involve assistants in this thought process. I have received many practical tips from such assistants who are illiterate but sensible. However, it is also important to keep monitoring the entire scenario yourself because a small neglect from any one can compromise success rate.

Depending on one's proficiency special procedures should be carried out. These include orthopaedic, ophthalmic, soft tissue, neurological etc. in small animals.

In large animal surgery, the situation is slightly different. Common operations like rumenotomy, patellar desmotomy, amputations (horn, tail etc.) may not require special assistance. However, operations like caesarean section may be exhausting and an experienced hand to help is an asset.

Most important part of surgery is follow up. A good brief of anaesthetic and post-operative recovery must be detailed out to the owners. Quite a few are sensitive about even small issues with their pet. These must be dealt with carefully. A minor problem may be magnified or sometimes even a major issue is overlooked by these owners. This may significantly affect the outcome. In metro cities, frequent visits for follow ups may be difficult on account of distances. On line contact and referral to nearest vets in emergency may resolve these.

I want to draw attention of everyone on appoint of "Consumer Protection Act". Medicos and Vets are covered under this act. So while deciding every action, thought must be given to this. Owner's informed consent is becoming very necessary for not only surgical procedure but for medical follow up as well. A well written record of every case must be available at any time. This does not mean that no work shall be held. A sense of proportion has to be used in dealing with owners diligently. A government working practitioner has so called shield of his official position but a private practitioner has to handle individually. Owners who are loyal to a surgeon suddenly go hostile when something goes wrong. It is therefore better to be safe than sorry. Detailed records such as well spelt out consent form, case papers, diagnostic images, laboratory reports must be properly documented. Similarly, while referring the case to a fellow veterinarian, clear write up of diagnosis, treatment given, suggested follow up and a discharge document must be handed over to the owner. It is always welcome to contact the referred practitioner personally. Compassion towards the animal, courteous but firm expressions and considerate behaviour is though good, to be too good also is sometimes 'bad'. Success isn't a magical formula. What works for one kind of practice may not be equally relevant to another. Urge to upgrade will yield satisfying results.

Anaesthesiology Session

Management of anaesthesia in ruminants

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The term anaesthesia is derived from the Greek word '*anaisthaesia'*, meaning "insensibility". It is used to describe the loss of sensation to the entire or any part of the body. Anaesthesia is induced by drugs that depress the activity of nervous tissue locally, regionally, or within the central nervous system. General anaesthesia is drug-induced unconsciousness that is characterized by controlled but reversible depression of the CNS and analgesia. In this state, the patient is not arousable by noxious stimulation. Sensory, motor, and autonomic reflex functions are attenuated. Selection of an anaesthetic is based on the patient's physical status and temperament, the type of procedure for which anaesthesia is being considered, the anaesthetist's familiarity with the anaesthetic drugs, the type of facility, and the available equipment and technical assistance. There is no single best method for anaesthetizing large animals, but familiarity with just one anaesthetic technique limits the veterinarian's ability to perform the numerous surgical and diagnostic procedures. The one thing that should not vary among anaesthetic procedures is the degree of monitoring vigilance. Early warning of an impending anaesthetic emergency is the single most important factor for decreasing anaesthetic related morbidity and mortality.

Physical restraint and local anesthetic techniques are frequently used in ruminants to provide immobility and analgesia. General anaesthesia techniques are almost similar to those for dogs, cats or horses. Regurgitation of rumen contents and bloat (distention of the rumen) are potential hazards not usually encountered in dogs, cats or horses. Close observation and monitoring of palpebral and ocular reflexes, eyeball position, and pupil size can be used to monitor the depth of anaesthesia in ruminants. Recovery from anaesthesia is generally quiet and uneventful and does not routinely require assistance.

General considerations

The most important factor in decreasing the risk of regurgitation. Withhold food for 12 to 36 hours and water for 8 to 12 hours in large ruminants, whereas, withhold food for 12 to 24 hours in sheep and goats; there is no need to withhold water. Withhold food for 2 to 4 hours in calves, lambs and young kids.

Preanaesthetic Medication

Preanaesthetics help both the anaesthetist and animal, as it makes the induction and maintenance of anaesthesia easier for the anaesthetist, while at the same time rendering the experience safer and more comfortable for the patient. It implies the administration of sedatives, anxiolytics and analgesics, with or without anticholinergics.

The classical aims of premedication are:

1. To relieve anxiety, thus overcoming the apprehension, fear and resistance to anaesthesia.

2. To counteract side-effects of anaesthetic agents.
3. To reduce the dose of anaesthetic.
4. To provide analgesia.

Anticholinergics

Anticholinergic agents are widely used for premedication in anaesthesia to antagonize the muscarinic effects of acetylcholine and thus block transmission at parasympoathetic postganglionic nerve endings. The main objectives are:

1. To manage bradycardia and atrioventricular (AV) block associated with surgical manipulation (oculovagal and viscerovagal reflexes) or with the administration of other anaesthetic adjunctive drugs (*e.g.*, alpha2 agonists or opioids).
2. To control excessive oral and airway secretions.

Atropine

Atropine is also known as *dl*-hyoscyamine and the alkaloid obtained from *Atropa belladonna* and is used as the water soluble sulphate. This agent is a racemic mixture of the l (-) and d (+) isomers of hyoscyamine. The l (-) isomer is at least 100 times more potent than the d (+) isomer. Chemically, atropine consists of two components (tropic acid and an organic base) that are bound by an ester linkage. Atropine is rapidly absorbed after intramuscular (IM) administration. Onset of cardiovascular effects occurs within 5 min, and peak effects occur within 10 to 20 min. After intravenous (IV) administration at a dose of 0.03 mg/kg, onset of cardiovascular effects occurs within 1 min, peak effects occur within 5 min, and heart rate increases by 30% to 40% for approximately 30 min. The effects of atropine on other body systems subside within a few hours, but ocular effects can persist for 1 to 2 days. At therapeutic doses, atropine administration produces limited effects on the CNS. A mild sedative effect may be observed.

- Blockade of the pupillary constrictor muscle and the ciliary muscle produces long-lasting mydriasis and cycloplegia, respectively.
- Lacrimal secretions are also reduced, which may contribute to corneal drying during anesthesia unless artificial tears are applied concurrently.
- Atropine should be used carefulness in animals with acute glaucoma and increased intraocular pressure because its mydriatic effect may impede drainage from the anterior chamber.
- Atropine administration produces very remarkable effects on heart rate and rhythm. The SA and AV nodes and the atrial myocardium all receive vagal parasympathetic input. Muscarinic receptors are located both presynaptically and postsynaptically in the SA and A V nodes. The typical response to IV or IM administration of therapeutic doses (0.02 to 0.04 mg/kg) of atropine is blockade of postsynaptic muscarinic receptors that leads to an increase in sinus rate, an acceleration of AV nodal conduction, and an increase in atrial contractility.
- Airway smooth muscle and secretory glands also receive parasympathetic input from the vagus nerves.

- Atropine administration reduces secretory activity and motility of the gastrointestinal system.

Atropine may be given subcutaneously (SC), IM, or IV, but the IM and IV routes are preferred because uptake from subcutaneous sites can be unpredictable. The therapeutic doses range from 0.02 to 0.04 mg/kg. Atropine can also be used to control muscarinic side effects when anticholinesterases (*e.g*., edrophonium) are administered to reverse neuromuscular blockade produced by nondepolarizing muscle relaxants (*e.g*., atracurium).

Glycopyrrolate

This is a synthetic quaternary ammonium muscarinic antagonist. Like atropine, the drug consists of two components (mandelic acid and an organic base) bound together by an ester linkage. Glycopyrrolate is four times as potent as atropine and has approximately the same affinity for all three major types of muscarinic receptors. The drug's polar structure (quaternary amine) limits diffusion across lipid membranes and into the CNS and fetal circulation. Absorption, metabolism, and elimination of glycopyrrolate are similar to that of atropine. Absorption is rapid after IM administration. Onset of cardiovascular effects occurs within 5 min, peak effects occur within 20 min, and heart rate remains elevated for approximately 1 h.

- At therapeutic doses, glycopyrrolate produces few effects on the CNS.
- Unlike atropine administration, sedation is not observed, and recovery is not prolonged.
- Administration of glycopyrrolate to conscious animal with normal intraocular pressure does not alter pupil diameter and intraocular pressure.
- Glycopyrrolate administration produces effects on the heart that are comparable to those of atropine. Studies in people suggest that glycopyrrolate produces less tachycardia than atropine, but the two drugs produce similar increases in heart rate when administered IV to sedated or anesthetized animals.
- The typical response to IV or IM administration of therapeutic doses (0.01-0.02 mg/kg) of glycopyrrolate is an increase in sinus rate, acceleration of AV nodal conduction, and an increase in atrial contractility.
- Glycopyrrolate can also be given intraoperatively to correct bradycardia.

Glycopyrrolate is used perioperatively to prevent severe bradycardia caused by surgical manipulation (vagal reflexes) or by administration of other anaesthetic drugs (alpha2-agonists and opioids). Glycopyrrolate can be given subcutaneously (SC, IM, or IV, but the IM and IV routes are preferred because uptake from SC sites can be inconsistent in patients with altered hydration and peripheral circulation. The therapeutic doses for ruminants range from 0.01 to 02 mg/kg.

Tranquillizers and Sedatives

Tranquillizers and sedatives are used to provide restraint, induce sedation and reduce the amount of injectable and inhalant anaesthetics required for induction and maintenance of anaesthesia. The phenothiazine derivatives and alpha2-agonists are effective tranquillizers/sedatives in ruminants.

Phenothiazines

Phenothiazines produce a wide variety of behavioural, autonomic, and endocrine effects. The

behavioral effects of these drugs are mediated primarily by blockade of dopamine receptors in the basal ganglia and limbic system. At therapeutic doses, phenothiazines inhibit conditioned avoidance behavior and decrease spontaneous motor activity. At higher doses, extrapyramidal effects (tremor, rigidity, and catalepsy) can occur.

Acepromazine

This is one of the most widely used tranquillizers/sedatives in veterinary medicine and used as acepromazine maleate. The chemical name of acepromazine is *2-acetyl-10-(3-dimethylaminopropyl) phenothiazine*. The drug is more potent than other phenothiazine derivatives and produces sedation at relatively low doses. Acepromazine administration produces some muscle relaxation but has no analgesic effect. Acepromazine produces dramatic effects on the cardiovascular system in both conscious and anaesthetized animals. In conscious animals, stroke volume, cardiac output, and mean arterial pressure decrease 20% to 25% after IV administration of acepromazine (0.1 mg/kg), and mean arterial pressure is reduced for at least 2 h. Heart rate does not change appreciably in conscious animals administered acepromazine (0.1 mg/kg IV). Increases in heart rate and sinus tachycardia can occur in some patients. At very high doses (I mg/kg), bradycardia and SA block can occur in animals given acepromazine, but these arrhythmias are not usually observed at lower doses. Administration of acepromazine to conscious or anaesthetized animals has little effect on pulmonary function. In conscious animals, respiratory rate decreases, but arterial pH, partial pressure of carbon dioxide (PCO2), partial pressure of oxygen (PO2), and haemoglobin saturation do not change after IV administration of acepromazine. Acepromazine administration produces significant gastrointestinal and urogenital effects.

Acepromazine administration can produce significant haematologic side effects in animals. Haematocrit decreases by 20% to 30% within 30 min of acepromazine administration and remains well below baseline values for at least 2 h. Acepromazine administration also inhibits platelet aggregation but does not appear to alter haemostasis in normal animals. Bradycardia and hypotension can occur after acepromazine administration.

Clinical uses of acepromazine are usually restricted to healthy animals. The drug is administered alone as a sedative for nonpainful diagnostic procedures or in combination with an opioid for painful diagnostic and minor surgical procedures. Acepromazine is also given alone and in combination with opioids as a preanaesthetic to facilitate placement of IV catheters and to reduce the dose of injectable and inhalational anaesthetics required to induce and maintain anaesthesia. Small doses of acepromazine can also be given postoperatively to smooth recovery-provided that patients are haemodynamically stable and that pain has been managed effectively. Administration of acepromazine postoperatively to quiet patients in the absence of effective analgesic therapy makes

accurate assessment of pain impossible and is inhumane. Acepromazine can be administered in ruminants at the doses of 0.05 to 0.1 mg/kg, IM, IV.

Alpha2-Agonists

Alpha2-agonists are the most widely used class of sedatives in veterinary medicine. In most species,

these drugs induce reliable dose-dependent sedation, analgesia, and muscle relaxation that can be readily reversed by administration of selective antagonists.

Xylazine

The drug was synthesized in West Germany in 1962 for use as an antihypertensive in people but was found to have potent sedative effects in animals. Xylazine administration decreases injectable and inhalational anaesthetic requirements dramatically in several species. Intravenous administration of xylazine induces a brief period of hypertension and reflex bradycardia, followed by a longer lasting decrease in cardiac output and arterial pressure. The initial hypertensive phase is caused by activation of peripheral postsynaptic α2-receptors, which produces vascular smooth muscle contraction and vasoconstriction. Subsequent reductions in arterial pressure are due to decreases in sympathetic tone resulting from activation of central and peripheral (presynaptic autoreceptors) α2 receptors. Xylazine administration also decreases heart rate by enhancing vagal tone and baroreceptor reflexes. In contrast to the cardiovascular effects observed after IV injection, increases in arterial pressure and vascular resistance are not as remarkable after IM administration of xylazine. Sinus bradycardia and AV block are the arrhythmias that are encountered most commonly after xylazine administration. Development of these arrhythmias is a normal physiological response to the increase in vagal tone induced by xylazine. Although respiratory rate decreases after administration of clinically recommended doses of xylazine, arterial pH, PO2 and PCO2 remain virtually unchanged. Decreases in respiratory rate are accompanied by increases in tidal volume, which keep alveolar ventilation and arterial blood-gas values relatively constant. Excessive salivation can occur in animals that have not been given anticholinergics. Xylazine decreases gastrointestinal motility and prolongs gastrointestinal transit time in several species. It decreases gastrin secretion and gastrointestinal motility, and prolongs gastrointestinal transit time. Transient hypoinsulinemia and hyperglycaemia have been reported in several species sedated with xylazine or that are anaesthetized using a regimen that incorporates xylazine. Other hormonal changes induced by xylazine include transient alterations in growth hormone, testosterone, prolactin, antidiuretic hormone, and follicle-stimulating hormone levels. Xylazine causes mydriasis, which may be due to either central inhibition of parasympathetic input to the iris, direct activation of α2 receptors located in the iris, or both. Xylazine can be given IV or 1M, but the IM route is preferred because cardiovascular side effects are reduced. Xylazine can be administered at doses of 0.05 to 0.20 mg/kg.

Detomidine

The dose rates for detomidine in cattle are similar to those used in horses. Dose rates of 0.03–0.06mg/kg, IM, have been used in clinical trials, however lower doses may provide sufficient sedation for combination with local analgesic techniques for surgery. Detomidine, 0.04 and 0.06 mg/kg, increases electrical activity of the bovine uterus, although administration of detomidine, 0.05 mg/kg, to a group of pregnant cows was not followed by abortions. A lower dose rate of detomidine, 0.02 mg/kg, decreased electrical activity of the uterus and sedation at this dose rate may be safe in the pregnant animal. The pharmacologic effects of detomidine in cattle are very similar to those of xylazine in that it causes bradycardia, hyperglycaemia, and increased urine production.

Medetomidine

This is the most widely used α2 agonist in small animals. It is more potent than xylazine. Medetomidine is a highly selective α2-agonist that is supplied as a racemic mixture of two optical enantiomers. Dexmedetomidine is the active enantiomer, and levomedetomidine has no apparent pharmacological activity.

In addition to providing sedation, analgesia, and muscle relaxation, the preoperative administration of medetomidine substantially reduces the amount of injectable and inhalational anaesthetic required to induce and maintain anesthesia. Medetomidine administration also attenuates the stress response to surgical trauma by reducing catecholamine and cortisol levels postoperatively. As a general rule, medetomidine should not be administered to paediatric or geriatric animals, or to animals with significant neurological, cardiovascular, respiratory, hepatic, or renal disease. Once preanaesthetic and anaesthetic drugs are administered, patients should be monitored carefully throughout the peri operative period, with special attention being paid to heart rate and rhythm. In patients with good cardiopulmonary reserve, the concurrent administration of an anticholinergic agent will prevent bradyarrhythmias while slightly improving cardiac output at the expense of a rather large increase in myocardial work and oxygen consumption. Deep sedation without recumbency can be obtained with intravenous doses of medetomidine, 0.005 mg/kg, while 0.01 mg/kg produces recumbency and sedation equivalent to that obtained with intravenous doses of 0.1–0.2 mg/kg xylazine. Medetomidine, 0.04 mg/kg, has been given intravenously alone or with ketamine for anaesthesia in calves. Medetomidine, 0.015mg/kg, has been administered by epidural injection for analgesia in cows.

Alpha2-Antagonists

Alpha2-antagonists are used to reverse the sedative and cardiovascular effects of α2-agonists. Currently, three antagonists (tolazoline, yohimbine, and atipamezole) are available for use in animals.

Yohimbine

This agent is used as a selective α2 receptor antagonist of the sedative and cardiovascular effects of xylazine in dogs. At high concentrations, yohimbine may interact with dopaminergic and serotonergic receptors, and, at very high concentrations, it may have a nonspecific local anaesthetic effect. Yohimbine, 0.125 mg/kg, with aminopyridine, 0.3 mg/kg, will awaken cattle sedated with 0.2–0.3 mg/kg of xylazine, but will not restore a normal state of consciousness. Like tolazoline, yohimbine is usually administered slowly IV to avoid neurological (excitement) and cardiovascular (hypotension and tachycardia) side effects.

Atipamezole

This highly selective α2 receptors antagonist is used to reverse the sedative and cardiovascular effects of medetomidine in dogs, cats, and several other species. Atipamezole is 200 to 300 times more selective for the α2-receptor than is yohimbine and has no effect at adrenergic, dopaminergic, serotonergic, histaminergic, muscarinic, opiate, gamma aminobutyric acid (GABA), or benzodiazepine receptors. Atipamezole is usually administered to reverse the effects of medetomidine after nonpainful diagnostic or therapeutic procedures, and it is not usually administered peri operatively.

Atipamezole in doses of 25 and 50µg/kg, intravenously or intramuscularly, causes awakening in cows

sedated with 0.2 mg/kg of xylazine, with restoration of ruminal motility to normal. Atipamezole given to unsedated cattle, or as medetomidine sedation is waning, may induce a state of hyperactivity, kicking and bucking. Because of the potential for excitation and cardiovascular side effects (hypotension and tachycardia), atipamezole is not labeled for IV use. However, it can be given IV to reverse the cardiovascular effects of medetomidine in emergency situations. Atipamezole and anticholinergics can both cause dramatic increases in heart rate, and the concurrent use of these drugs should be avoided.

Benzodiazepine Agonists

Benzodiazepines produce most of their pharmacological effects by modulating GABA-mediated neurotransmission. GABA is the primary inhibitory neurotransmitter in the mammalian nervous system and cell membranes of most CNS neurons express GABA receptors. These receptors are also found outside the CNS in autonomic ganglia.

Diazepam

This is the most widely used benzodiazepine in both small and large animals. Diazepam is not soluble in water, and parenteral formulations contain 40% propylene glycol and 10% ethanol. Because of this insolubility, diazepam should not be mixed with diluents or other drugs. Further, the drug should not be administered IM because it is very irritating and is poorly absorbed. The parenteral formulation of diazepam is administered by slow IV injection to avoid pain, thrombophlebitis, and cardiotoxicity. Diazepam is used primarily as a muscle relaxant and as an anticonvulsant. Diazepam is highly lipid soluble and is rapidly distributed throughout the body. Approximately 90% of the drug is protein bound, and diazepam is metabolized by demethylation and hydroxylation to N-desmethyldiazepam (nordiazepam), 3-hydroxydiazepam, and oxazepam. Nordiazepam and oxazepam produce significant pharmacological effects at clinically relevant concentrations. Diazepam administered preoperatively reduces injectable and inhalational anaesthetic requirements. Diazepam produces limited effects on cardiovascular and pulmonary function in animals. Diazepam also can be administered (0.5-1.0 mg/kg) prior to induction of anaesthesia with thiopental, propofol, etomidate, or an opioid.

Midazolam

Midazolam is a benzodiazepine with a fused imidazole ring that accounts for the water solubility of the drug at pH values below 4.0. Unlike diazepam, the drug is nonirritating and well absorbed after IM administration. Midazolam is almost completely (>90%) absorbed after IM injection, and peak plasma concentrations are reached within 15 min. The drug is also highly protein bound (>95%) and rapidly crosses the blood-brain barrier. Onset of sedation and muscle relaxation is rapid after IV or IM administration in most species. Midazolam (0.1-0.2 mg/kg, IV or IM) produces muscle relaxation, ataxia, transient agitation, or mild sedation. Because midazolam has limited effects on cardiopulmonary function, the drug is an ideal sedative for many older or compromised animals.

Benzodiazepine Antagonists

Flumazenil

This is a highly selective, competitive benzodiazepine receptor antagonist. The drug is used to reverse

the unwanted behavioral and muscle relaxing effects of diazepam and midazolam in mammals and birds. Flumazenil administration completely reverses the behavioral and muscle-relaxant effects of an overdose of diazepam (2 mg/kg, IV) or midazolam (1 mg/kg, IV) within 5 min. These doses correspond to agonist/antagonist ratios of 26: 1 and 13: 1 for diazepam/flumazenil and midazolam/ flumazenil, respectively.In addition, flumazenil may reverse the anticonvulsant effects of benzodiazepine agonists. Although flumazenil has minimal intrinsic activity, administration of the antagonist could facilitate development of seizures in predisposed animals.

Injectable Anaesthetics

The injectable agents were considered as being particularly useful for either the induction of anaesthesia to be continued by an inhalation technique or for anaesthesia of short duration. No injectable anaesthetic produces all of the components of general anaesthesia without depressing some vital organ function.

Barbiturates

Barbituric acid was first prepared by Conrad and Gutzeit in 1882. In 1903, Fischer and von Mering introduced a derivative, diethyl barbituric acid (veronal or barbital), for use as a hypnotic. The barbiturates have been classified into four groups according to duration of action: long, intermediate, short, and ultra short. All of those used for clinical anaesthesia fall in the short or ultra short classification, whereas those used for sedation or control of convulsions are of long or intermediate action. Racemic mixtures of the barbiturates are used both as hypnotics and as general anaesthetics. The principal effect of a barbiturate is depression of the CNS by interference with passage of impulses to the cerebral cortex. Barbiturates act directly on CNS neurons in a manner similar to that of the inhibitory transmitter GABA. In hypnotic doses, the barbiturates have little effect on respiration, whereas, in anaesthetic doses, respiration is depressed. Over dosage produces respiratory paralysis and death. With anaesthetic doses, there is cardiovascular depression, both centrally and peripherally, with a fall in blood pressure. In hypnotic doses, barbiturates have little effect on the basal metabolic rate. With anaesthetic doses, basal metabolism is depressed, resulting in lowered body temperature. Barbiturates diffuse throughout the body, penetrating cell walls and crossing the placenta. The extent of ionization, lipid solubility (partition coefficient), and protein binding are the three most important factors in distribution and elimination of barbiturates. Barbiturates are sodium salts of barbituric acid derivatives.

Thiopentone

Thiopentone was the first thiobarbiturate to gain popularity as an anaesthetic agent for animals. Thiopentone sodium is a yellow crystalline powder that is unstable in aqueous solution or when it is exposed to atmospheric air. For this reason, it is dispensed in sealed containers as a powder buffered with sodium carbonate. It is usually mixed with sterile water or saline to form 2.5%, 5.0%, or 10% solutions. Thiopentone solutions should be stored in a refrigerator at 5° to 6°C (41° to 42°F) to retard deterioration. The initial toxic effect produced by thiopentone is a marked depression of the respiratory centers. Both rate and amplitude are affected. By 5 min after administration of thiopentone, heart rate, aortic pressure, peripheral vascular

resistance, and left ventricular systolic and end-diastolic pressures increase. Bigeminy is common. Cardiac arrhythmias associated with thiobarbiturate anaesthesia can be accentuated by xylazine, halothane, methoxyflurane, and epinephrine. Observed arrhythmias include sinus tachycardia, bigeminy, extrasystoles, ventricular tachycardia, multifocal ventricular tachycardia, and ventricular fibrillation. During prolonged thiopentone anaesthesia, there is a pronounced hyperglycaemia, increased lactic acid and amino acids in blood, and decreased liver glycogen. Insulin either prevents a decrease or favors increased storage of liver glycogen. Repeated doses of thiopentone have a cumulative effect.

Thiopental has an ultrashort action because it is rapidly redistributed (*e.g*., into muscle tissue) and becomes localized in body fat. As concentrations in the plasma, muscle, and viscera fall, the thiopental concentration in fat continues to rise. On the other hand, an appreciable amount is metabolized by the liver, and this contributes to the early rapid reduction of arterial thiopental concentration. For small animals, 1.25%, 2.5%, and 5.0% solutions of thiopental are used, depending on the animal's size. Whenever convenient, the more dilute solutions should be used, because over dosing is less likely and irritation is less in the event of accidental perivascular injection. For rapid induction of anaesthesia of short duration, the dose is 10 to 12 mg/kg. One-third of the estimated dose is injected rapidly within 15 s, and the remainder is administered slowly to effect. Additional doses may be administered to prolong anaesthesia when required. The use of thiopental is contraindicated in neonates.

A reanesthetizing action, termed the *glucose effect,* has been observed in animals recovering from barbiturate anaesthesia that were subsequently given glucose. The glucose effect presumably occurs with most barbiturates and thiobarbiturates, but not with inhalation or other anaesthetics. Glucose causes a decrease in activity of the components of the microsomal electron chain, resulting in decreased microsomal metabolism. A study on the glucose effect on respiration and electroencephalogram in dogs following pentobarbital administration found no evidence of significant deepening of anesthesia as judged by cortical depression, decreasing rate or depth of respiration, or a decrease in minute volume.

Occasionally, animals may struggle during induction of barbiturate anaesthesia, and some of the drug may be administered perivascularly because a tissue slough may develop. If it is suspected that barbiturate solution has been injected perivascularly, the area should be infiltrated with 1 or 2 ml of 2% Lignocaine. Local anaesthetics are vasodilators and prevent vasospasm in the area, and thus aid in dilution and absorption of the barbiturate. Second, they are broken down in an alkaline medium, and this reaction neutralizes the alkali (barbiturate).

Propofol

Propofol (*2,6-diisopropylphenol*) is unrelated to barbiturates, euganols, or steroid anaesthetics. It is slightly soluble in water and is marketed as an aqueous emulsion containing 10 mg of propofol, 100 mg of soybean oil, 22.5 mg of glycerol, and 12 mg of egg lecithin. Sodium hydroxide is added to adjust the pH. It is available in sterile glass ampules and contains no preservatives. Propofol emulsion can support microbial growth and endotoxin production. Because of the potential for iatrogenic sepsis, unused propofol remaining in an open ampule should be discarded and not be kept overnight for use the next day. Some formulations

contain bacterial growth inhibitors to slow the growth rate of contaminants after a vial is opened, but these additives will not completely inhibit bacterial growth, so any unused propofol should still be discarded 6 h after a vial or ampule is opened. The growth inhibitors used are 0.005% disodium edentate or 0.025% sodium metabisulfite. Rapid onset of action is caused by rapid uptake into the CNS. The short action and rapid smooth emergence result from rapid redistribution from the brain to other tissues and efficient elimination from plasma by metabolism. In general, after a single bolus injection, propofol induces a rapid, smooth induction followed by a short period of unconsciousness. In people, recovery is rapid and free of emergence excitement after constant infusion or repeated bolus administration.

Propofol is usually injected as a single bolus for induction of general anaesthesia in ruminants to enable intubation and initiation of inhalation anaesthesia. It should be remembered that propofol is a sedative-hypnotic and has only minimal analgesic action at a subanaesthetic dose. As with other hypnotics, even when an animal is rendered unconscious with propofol, it will respond to painful stimuli unless analgesic drugs such as the opioids or α2-agonists are administered concurrently. The dose for induction of anaesthesia in nonpremedicated ruminants ranges from 6 to 8 mg/kg IV, whereas the dose in sedated animals may be as low as 2 to 4 mg/kg IV. Propofol induces depression by enhancing the effects of the inhibitory neurotransmitter GABA and decreasing the brain's metabolic activity. Propofol decreases intracranial and cerebral perfusion pressures. It transiently depresses arterial pressure and myocardial contractility similar to the ultra-short-acting thiobarbiturates. Hypotension is primarily the result of arterial and venous vasodilation. Propofol enhances the arrhythmogenic effects of epinephrine, but is not inherently arrhythmogenic. Propofol, unlike barbiturates, does not damage tissue when injected perivascularly or intra-arterially.

Dissociative Anaesthetics

Three cyclohexylamine derivatives have been used in several species of animal to produce a state that enables a surgical operation to be carried out. These substances, phencyclidine, tiletamine and ketamine, differ markedly both in chemical and physical properties as well as in their clinical effects. They have been described as having cataleptic, analgesic and anaesthetic action, but no hypnotic properties. The state produced by these agents is known as dissociative anaesthesia which is characterized by complete analgesia combined with only superficial sleep. In man, hallucinations and emergence delirium phenomena are known to occur. It cannot be established whether similar phenomena are experienced by animals but the state produced by these substances is clinically very different from anaesthesia produced by other agents. Spontaneous involuntary muscle movement and hypertonus are not uncommon during induction and purposeless tonic-clonic movements of the extremities may be mistaken to indicate an inadequate level of anaesthesia and the need for additional doses and unless this possibility is recognized, overdoses may be given. The animals may remain with their eyes open and have a good tone in the jaw muscles with active laryngeal and pharyngeal reflexes, whilst analgesia appears to be extremely good.

Ketamine

The ketamine molecule exists as two optical isomers and the racemic mixture is currently used clinically. It is available in 10, 50 and 100 mg/ml strengths suitable for i.m. or i.v. injection. The effects of

ketamine on the central nervous system become apparent rapidly for the brain/plasma ratio becomes constant in less than one minute. It also rapidly crosses the placental barrier. Ketamine produces profound analgesia without muscle relaxtion, and tonic-clonic spasms of limb muscles may occur even in the absence of surgical or other stimulation. Salivation is increased and saliva can obstruct the airway even though laryngeal and pharyngeal reflexes are retained. To eliminate side effects a variety of other compounds such as atropine, diazepam, midazolam, xylazine, detomidine, medetomidine and even the thiobarbiturates or an inhalation agent are commonly given concurrently with ketamine. Mild respiratory depression has been reported and in clinical practice this is usually manifested by an increased rate which does not compensate for a decreased tidal volume. Although laryngeal reflexes may be present it is still necessary for the airway to be kept under close observation because the degree of protection of the upper airway is less than was once thought. In contrast with the action of other i.v. induction agents ketamine causes a rise in arterial blood pressure. The rate of injection is not an important factor in the production of hypertension and i.m. injection results in no less a rise in blood pressure than the i.v. route. Ketamine produces little, if any, muscle relaxation. There is generally an increase in skeletal muscle tonus and tendon reflexes are brisk. Athetoid limb movements occur without external stimuli and are not dose-related.

Inhalant Anaesthetics

Inhalant anaesthetics are unique among the anaesthetic drugs because they are administered, and in large part removed from the body, via the lungs. Administration of inhalants appeared to be safer because most currently used inhalants are minimally metabolized. The apparatus used to deliver the anaesthetic agents includes a source of oxygen and a patient breathing circuit that in turn usually includes an endotracheal tube or face mask, a means of eliminating carbon dioxide, and a compliant gas reservoir. Measurement of inhalation anaesthetic concentration enhances the precision and safety of anaesthetic management beyond the extent commonly possible with injectable anaesthetic agents. Inhalation anaesthetics are either gases or vapors. In relation to inhalation anaesthetics the term gas refers to an agent, such as N2O or cyclopropane or xenon that exists in its gaseous form at room temperature and sea level pressure. The term vapor indicates the gaseous state of a substance that at ambient temperature and pressure is a liquid. With the exception of N2O and xenon, all the contemporary and new anaesthetics fall into this category. Relationships such as those described by Boyle's law (volume *vs*. pressure), Charles's law (volume *vs*. temperature), Gay-Lussac's law (temperature *vs*. pressure), Dalton's Law of Partial Pressure (the total pressure of a mixture of gases is equal to the sum of the partial pressures of all the gaseous substances present), Graham's law (the rate of diffusion is inversely proportional to molecular weight, or the heavier molecule is less diffusible), and others are important to our overall understanding of aspects of respiratory and anaesthetic gases and vapors. Precision vaporizers used to control delivery of inhalation anaesthetics are calibrated in percentage of agent, and effective doses are almost always reported in percentages.

The solubility or partition coefficient of an anaesthetic is a major characteristic of the agent and has important clinical ramifications. For example, anaesthetic solubility in blood and body tissues is a primary factor in the rate of uptake and its distribution within the body. It is, therefore, a primary determinant of the speed of anaesthetic induction and recovery. A partition coefficient describes the distribution of an inhalant

anaesthetic between two phases at equilibrium. It depicts the ability of two phases to accept anaesthetic. The amount, that is, the total number of molecules of a given gas dissolving in a solvent, depends on the chemical nature of the gas itself, the partial pressure of the gas, the nature of the solvent and the temperature.

Inhalation anaesthetics induce a reversible generalized CNS depression. The degree of depression is often described as depth of anaesthesia. Inhalation anaesthetics depress respiratory system function. In otherwise unmedicated animals respiratory arrest occurs at 2 to 3 MAC. All contemporary inhalation anaesthetics depress alveolar ventilation and as a consequence increase PaCO2 in dose related fashion. All the volatile anaesthetics decrease cardiac output and cause a dose-dependent decrease in arterial blood pressure. All present-day potent inhalation anaesthetics reduce renal blood flow and glomerular filtration rate in a dose-related manner. During anaesthesia healthy animals produce small volumes of concentrated urine. An increase in serum urea nitrogen, creatinine, and inorganic phosphate may accompany especially prolonged anaesthesia. Depression of hepatic function and hepatocellular damage may be caused by the action of volatile anaesthetics. The undesirable effects of inhalants which are minimally used nowadays include: the

sensitization of the myocardium to epinephrine-induced arrhythmias (e.g., halothane), necrotizing hepatitis (e.g., halothane), malignant hyperthermia (e.g., all inhalants but particularly halothane), seizures (e.g., enflurane), flammability (e.g., ether, cyclopropane) and renal compromise (e.g., methoxyflurane with concurrent flunixin administration).

Halothane

Halothane is a halogenated hydrocarbon anaesthetic and is one of the most useful anaesthetic, because it is nonflammable, potent, nonirritating, controllable, and relatively nontoxic. Chronic low-level exposure to halothane may result in necrotizing hepatitis in humans who are subsequently anaesthetized with halothane. During halothane anaesthesia, respiratory rate increases and tidal volume decreases as MAC concentrations increase. Halothane depresses body temperature-regulating centers, resulting in hypothermia. The heart rate during halothane anaesthesia is decreased more or unchanged compared to isoflurane or sevoflurane anaesthesia. Arterial blood pressure is decreased during halothane anaesthesia. The decrease in cardiac output with halothane is due to depression of myocardial contractility; systemic vascular resistance may be maintained. Halothane decreases the threshold for epinephrine-induced arrhythmias. Intraoperative ventricular arrhythmias may be due to sympathetic stimulation associated with inadequate anaesthesia i.e. too light. Halothane is hepatotoxic, hence its administration be avoided in patients suffering from liver diseases.

Isoflurane

Isoflurane, an isomer of enflurane (enflurane is no longer clinically used), is a halogenated ether and is nonflammable at clinical concentration. It produces comparatively rapid induction and recovery from anaesthesia. It also produces excellent muscle relaxation. Isoflurane anaesthesia causes a dose-dependent decrease in ventilation. Isoflurane is pungent and may be difficult to use for mask inductions. Heart rate is maintained or slightly increased and arterial blood pressure is decreased during isoflurane anaesthesia

whereas systemic vascular resistance is decreased.

Sevoflurane

Sevoflurane, is halogenated ether and is nonflammable at clinical concentrations. It is less potent than isoflurane and more potent than desflurane. It is nonpungent and nonirritating and lends itself to mask inductions. It results in rapid, smooth induction and rapid recovery and produces good muscle relaxation. Sevoflurane anaesthesia causes a dose-dependent decrease in ventilation that is very similar to isoflurane anaesthesia. Arterial blood pressure is decreased during 1, 1.5, and 2 MAC sevoflurane anaesthesia. Similar to isoflurane, systemic vascular resistance is decreased.

Desflurane

Desflurane is halogenated ether that is nonflammable at clinical concentrations. It has a high vapor pressure (664 mmHg at 20ºC). It is an expensive and a pungent inhalant which produces airway irritation, provoking coughing or breath holding. It produces good muscle relaxation and analgesia. The boiling point of desflurane (23.5ºC) is near room temperature, which necessitates a special vaporizer. Desflurane is a more stable product, and it is the least soluble inhalant anaesthetic. Dose-dependent decreases in ventilation occur during desflurane anaesthesia. Heart rate is maintained or increases with spontaneous ventilation. The recovery is so rapid that resedation is needed to avoid emergence delirium.

To conclude, the selection and choice of anaesthetic drug(s) and the technique should be based on the need of the patient rather than on the theoretical assumptions. I has been truly quoted that *"There are no safe anaesthetic agents; there are no safe anaesthetic procedures;there are only safe anaesthetists*".

ANS 1

Evaluation of balanced anaesthesia using butorphanol with midazolam or diazepam as preanaesthetic combinations in thiopentone sodium induced and isoflurane maintained bovines

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The study was conducted on 14 clinical cases after dividing into two groups having seven animals each to evaluate and compare the efficacy of balanced anaesthesia using butorphanol-midazolam and butorphanol-diazepam preanaesthetics in thiopentone induced and isoflurane maintained bovines. In group I, animals were premedicated with butorphanol (0.02 mg/kg BW, IV) and midazolam (0.2 mg/kg BW, IV), while butorphanol (0.02 mg/kg BW, IV) and diazepam (0.2 mg/kg BW, IV) were used in animals of group II. Animals of both the groups were induced with 5% thiopentone sodium intravenously "till effect" after five minutes of premedication and maintained on isoflurane during the surgical intervention. Results revealed that preanaesthetic combination of butorphanol-diazepam produced good to excellent quality of sedation along with potent dose sparing effect on induction dose of thiopentone sodium and maintenance dose of isoflurane in group II as compared to group I. Thiopentone sodium produced smooth and excitement free induction along with excellent quality of analgesia and adequate muscle relaxation in both the groups. Isoflurane was satisfactorily maintained proper depth of general anaesthesia and after cessation of isoflurane supply, animals of both the groups showed uneventful and excitement free recovery, however, quick recovery was noticed in animals of group II. Clinico-physiological observations showed significant decrease of respiration rate and heart rate in group I, while non-significant decrease of rectal temperature in both the groups. Haemodynamic parameters like saturation of peripheral oxygen was non-significantly decrease in group I, while systolic, diastolic and mean blood pressure showed falling trend with significant difference after induction in both groups. Haemato-biochemical parameters were not showed any alteration except non-significant increased in blood glucose level in both the groups. Overall observations revealed satisfactory results of balanced anaesthesia in both groups; however, anaesthetic protocol of group II (BDTI) was found better as compared to group I (BMTI) in bovines.

ANS 2

Comparative evaluation of intravenous dexmedetomidine-butorphanol and dexmedetomidine-midazolam as preanaesthetic with propofol anaesthesia in dog

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The present study was conducted on 14 clinical cases of canine presented to the T.V.C.C, COVAS, Parbhani for various surgical interventions randomly divided into two groups each consisting of seven dogs. All the dogs in study were administered with inj. Atropine sulphate. In group A, combination of Inj. Dexmedetomidine HCL

and Inj. Butorphanol tartarate whereas in group B, combination of Inj. Dexmedetomidine HCL and Inj. Midazolam maleate mixed in single syringe was administered intravenously. Quality of sedation was assessed followed by inj. Propofol was administered till the effect to get the surgical stage of anaesthesia and required amount was calculated as induction dose. From the present study it was concluded that intravenous administration of dexmedetomidine-butorphanol and dexmedetomidine-midazolam as preanaesthetic combinations produced profound sedation, rapid onset of action and excellent degree and depth of analgesia and anaesthesia for the minor and major surgeries in canine patients without alarming changes in haematobiochemical parameters.

ANS 3

Clinical evaluation of dorsolumbar epidural xylazine-lignocaine anaesthesia in cattle

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The study was conducted on 14 cattle to evaluate quality, cardio-pulmonary and haemato-biochemical response of dorsolumbar epidural anaesthesia by using two different dosage of lignocaine hydrochloride in combination with xylazine hydrochloride. The animals of both groups showed signs of sedation, good analgesia sufficient for surgery in both the groups. Similar ataxic effects observed in groups. A significant decrease was found in rectal temperature, heart rate and respiration rate during anaesthesia in both the groups. The haematological parameters like Hb, PCV, TEC, TLC and lymphocyte count decreased significantly except neutrophil in both the groups during anaesthesia. Eosinophil count and monocyte count altered non-significantly during anaesthesia in both group A and group B. Biochemical parameters like ALT, AST, BUN and serum creatinine increased significantly during anaesthesia in both the groups. The dorsolumbar epidural anaesthesia was easy to perform in cattle. All parameters studied returned to the base level after anaesthesia.

ANS 4

Optimization of standing sedation with dexmedetomidine combined with butorphanol and pentazocine in cattle

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The study was conducted on 16 clinical cases of animals divided in 2 groups viz., I and II with 8 animals in each group. Group I animals were sedated with dexmedetomidine (1µg/kg b.w. IV) and butorphanol (0.05 mg/kg b.w. IV) and group II animals were sedated with dexmedetomidine (1 µg/kg b.w. IV) and pentazocine (0.05 mg/kg b.w. IV). Faster onset of sedation, longer duration of sedation and better degree of sedation was noticed in group I than group II. Heart rate, Respiratory rate decreased significantly in animals of both the groups whereas; rectal temperature varied non-significantly in both the groups after sedation. Haemato-biochemical

changes were observed in both the groups after sedation. Combination of dexmedetomidine (1µg/kg IV) and butorphanol (0.05 mg/kg IV) proved to better sedative agent in respect to haemato-biochemical changes than combination dexmedetomidine (1µg/kg IV) and pentazocine (0.5 mg/kg IV) in cattle for standing sedation.

ANS 5

Diagnostic nerve and joint blocks for the localization of distal limb lameness in equine

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The objective of this study was to evaluate the role of nerve / joint blocks for the localization of distal limb (bone and joints) lameness in equine. Fifteen obviously lame horses (i.e. with lameness of grade 2-5) with a mean ± SD age of 8.85 ± 3.78 year, and detected with radiographic lesions, were subjected to nerve / joint blocks using inj. bupivacaine (0.5%) or ropivacaine 0.75%. All the lame horses were evaluated in various gaits and video recording was done before and after the nerve / joint blocks. Horses with various disease condition such as navicular disease, solar abscess, proximal sesamoiditis, white line disease, foot puncture, bone chip in hock joint, septic arthritis, spavin and carpal osteoarthritis were subjected to nerve (palmar digital, abaxial and low four) and joint (hock and carpal) blocks. A positive or partial response to nerve / joint block was recorded in 60.0% (n=9) cases. A negative response in 2 out of the 6 cases also helped in making the diagnosis for high nerve injury. In conclusion, diagnostic nerve/ joint blocks were found useful in confirming the site of lesion causing lameness.

ANS 6

Total intravenous anaesthesia using propofol in atropine sulphate, butorphanol and diazepam or midazolam premedicated dogs

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The objective of the study was to evaluate & compare the dose sparing effect of diazepam-butorphanol and midazolam-butorphanol combination as basal anaesthesia on induction and maintenance dose of propofol used as Total intravenous anaesthesia (TIVA) in dogs. Thirteen dogs were randomly divided into group I (n=7) & group II (n=6), wherein atropine, butorphanol, diazepam/midazolam were given as preanaesthetic drugs, whereas; induction and maintenance of anaesthesia was done with propofol. Systolic blood pressure, diastolic blood pressure, mean arterial pressure and Spo2 were recorded after induction of anaesthesia, at 15 minutes interval, up to 45 minutes. The physiological parameters were recorded before giving any drug and thereafter regularly at 15 minute interval post induction. In midazolam-butorphanol group, the induction dose (4.02 ± 0.10 mg/kg) and maintenance dose (0.27 ± 0.03 mg/kg/min.) of propofol was non-significantly (P=0.05) higher than in diazepam-butorphanol group (3.58 ± 0.29 mg/kg and 0.18 ± 0.03 mg/kg/min, respectively). In

conclusion, both diazepam-butorphanol and midazolam-butorphanol have dose sparing effect on induction and maintenance dose of propofol, however, diazepam-butorphanol combination is slightly better than midazolam-butorphanol combination.

ANS 7

Studies on Glycopyrrolate-Acepromazine/Xylazine -Butorphanol-Propofol-Sevoflurane Anaesthesia in Buffaloes Undergoing Diaphragmatic Herniorrhaphy

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The study was undertaken for evaluation of efficacy and safety of glycopyrrolate-acepromazine/xylazine-butorphanol-propofol-sevoflurane anaesthesia in buffaloes undergoing diaphragmatic herniorrhaphy. Animals were randomly divided in two groups of six animals each. After premedication with glycopyrrolate (0.01 mg/kg), acepromazine (0.02 mg/kg) in Group I and xylazine (0.05 mg/kg) in Group II and butorphanol (0.03 mg/kg); induction and maintenance of anaesthesia was performed with propofol (1.3 mg/kg) and sevoflurane respectively. Scores for premedication, induction, maintenance and recovery were good while scores for sedation, analgesia and muscle relaxation were fair in both groups without any significance difference between them. No significant change was recorded in rectal temperature, heart rate and respiration rate during the entire period of anaesthesia within both groups. Significant increase in the diastolic and mean phase of non-invasive blood pressure was recorded at 30 minutes of sevoflurane administration compared to previous value in Group I but not in Group II. Maintenance dose of sevoflurane was higher in Group II as compared to Group I and complete recovery was earlier in Group II. No significant difference was recorded in haematological values in Group I but significant decrease in total leucocytes count at five minutes of propofol from preanaesthetic value was recorded in Group II. Significant increase in glucose, blood urea nitrogen and AST in Group I and BUN, AST, LDH and creatinine in Group II was observed on second day before any drug administration as compared to previous day. Significant and non-significant increase in cortisol was recorded in Group II and group I respectively at 30 min. of sevoflurane administration as compared to previous value. Both anaesthetic combinations were found effective as well as safe for buffaloes undergoing diaphragmatic herniorrhaphy.

ANS 8

Studies on Atropine-Acepromazine/Xylazine-Butorphanol-Thiopentone-Sevoflurane Anaesthesia in Buffaloes Undergoing Diaphragmatic Herniorrhaphy

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The study was undertaken for evaluation of atropine-acepromazine/xylazine-butorphanol-thiopentone-sevoflurane anaesthesia in twelve buffaloes undergoing diaphragmatic herniorrhaphy. Animals were randomly divided in two groups having six animals in each group. After premedication with atropine (0.04 mg/kg) and sedatives used as acepromazine (0.02 mg/kg) /xylazine (0.05 mg/kg) ,induction was performed with thiopentone (5.0 mg/kg). For maintenance of anaesthesia, sevoflurane was used through agent specific vaporizer along with 100% oxygen through a semi closed rebreathing system. In comparing between sedative, xylazine produces rapid sedation than acepromazine. While time of recovery was found to be longer in acepromazine group. For quality of maintenance, maintenance with sevoflurane was found good to excellent in both groups. No significant difference was observed in heart rate and rectal temperature during anaesthesia with both anaesthetic combinations while respiratory rate fluctuated near base value in all groups. A decrease in PCV was seen in both groups during anaesthesia. Non-significant hyperglycemia was seen during anaesthesia in group I while significant hyperglycemia seen in group II. Decrease in total proteins and globulin was seen within group during anaesthesia. No significant change was observed in heart rate, rectal temperature, AST, ALP, ALT, BUN, total proteins, albumin ,globulin, A:G ratio, sodium, potassium, calcium in between groups. Balanced anaesthetic combinations of atropine–acepromazine/xylazine- butorphanol-thiopentone-sevoflurane were effective as well as safe for buffaloes undergoing diaphragmatic herniorrhaphy.

ANS 9

Anaesthetic protocols for centralization of eye ball for different operative procedures in dogs

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Fifteen dogs presented to the department were subjected to two different anaesthetic protocols for performing the eye ball surgeries. The dogs were premedicated with Atropine, Butorphanol and Diazepam, induced with propofol and maintained on isoflurane. In protocol I (8 animals) Inj. Atracurium (0.5 mg/kg IV) and in protocol II (7 animals) Inj. Vecuronium (0.1 mg/kg IV) was given 5 minutes respectively after anaesthetic stabilization. Immediately after injection of muscle relaxant, the assisted ventilation with volume controlled mode of intermittent positive pressure ventilation was started in both the protocols. A total of 15 ophthalmic interventions involving globe (viz. cataract surgery, keratomies and anterior chamber flush) were successfully performed under both the protocols. The ventromedial deviation produced by anaesthetic induction was

offset by the use of NMBA within 30 seconds and eye ball returned to perfect central position allowing maximal visualization allowing ocular interventions. Atracurium and Vecuronium provided muscle relaxation for 40.1 ± 4.71 and 37.7 ± 1.01 minutes respectively followed by the hassle free spontaneous respiration and subsequent weaning from ventilator. The uniform and pronounced muscle relaxation along with excellent sedation was found in both the protocols. All the cardio-pulmonary parameters remained within normal range without any clinical consequences in both the protocols. Thus, these protocols can be considered as complication-free anaesthesia for procedures necessitating central positing of eye ball with perfect muscle relaxation.

ANS 10

Clinical physiological hematological and biochemical romifidine and xylazine sedation with ketamine - isoflurane anaesthesia for surgeries in buffaloes

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The present clinical study was carried out in 12 clinical cases of buffaloes presented for various surgical procedures at Veterinary College, Bidar. All the buffaloes were randomly divided into two groups consisting of six buffaloes in each group. The animals of group I were pre-medicated with romifidine hydrochloride1 @ 10 µg/kg body weight intravenously. In this group, six buffaloes were presented for different surgical conditions and were subjected to surgery under ketamine hydrochloride induction with isoflurane anaesthetic maintenance. The animals of group II were pre-medicated with xylazine hydrochloride3 @ 0.1 mg/kg body weight intravenously. In this group, six buffaloes were presented for different surgical conditions and were subjected to surgery under ketamine hydrochloride induction using isoflurane maintenance. Anaesthetic combinations were compared by clinico-physiological, haemodynamic, haematological and biochemical observations. The onset of action was non-significantly quicker with romifidine when compared to xylazine. The induction was significantly quick in the animals pre-medicated with romifidine – ketamine combination, as compared to that in the animals pre-medicated with xylazine. Physiological and haemodynamic parameters like heart rate, respiratory rate , rectal temperature, mean arterial pressure and heamoglobin oxygen saturation were decreased non-significantly and fluctuated within normal limit .non-significant bradycardia and intermittent apnoea was observed in all animals. Heamoglobin, packed cell volume and total erythrocyte count were decreased non-significantly in all the animals. Neutrophilia and relative lymphocytopenia was recorded in both the animals. Biochemical parameters were fluctuated within physiological limits. In conclusion romifidine as pre-anaesthetic for ketamine and isoflurane anaesthetic maintenance was a better combination than xylazine –ketamine and isoflurane anaesthetic maintenance in buffaloes.

ANS 11

Comparative evaluation of romifidine and xylazine sedation with glycerolglycolate–ketamine as induction agent for isoflurane anaesthesia in cattle undergoing various surgeries

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The present clinical study was carried out in 12 clinical cases of cattle presented for various surgical procedures at Veterinary College, Bidar. All the cattle were randomly divided into two groups consisting of six cattle in each group. The animals of group I were pre-medicated with romifidine hydrochloride @ 10 µg/kg body weight intravenously. In this group, six cattle were presented for different surgical conditions and were subjected to surgery under Guaifenesin (50 mg/kg body weight, 5% solution intravenously) ketamine hydrochloride (3 mg/kg body weight intravenously) as induction agents with isoflurane anaesthetic maintenance. The animals of group II were pre-medicated with xylazine hydrochloride @ 0.1 mg/kg body weight intravenously. In this group, six cattle were presented for different surgical conditions and were subjected to surgery under Guaifenesin (50 mg/kg body weight, 5% solution intravenously) ketamine hydrochloride (3 mg/kg body weight intravenously) as induction agent using isoflurane anaesthetic maintenance. Anaesthetic combinations were compared by clinico-physiological, haemodynamic, haematological and biochemical observations. The induction and recovery were smooth and unevenful in both the groups. Induction and recovery time were quicker in group-I cattle with excellent analgesia and muscle relaxation. Physiological and haemodynamic parameters fluctuated within the normal limits. Intermittent apnoea was observed in all the animals. Heamoglobin, packed cell volume and total erythrocyte count were decreased significantly in both the groups. Neutrophilia and relative lymphocytopenia was recorded in both the group animals. Biochemical parameters were fluctuated within physiological limits. In conclusion romifidine as pre-anaesthetic for guaifenesin-ketamine induction combination and isoflurane anaesthetic maintenance was a better combination than xylazine pre-anaesthetic for guaifenesin-ketamine induction combination and isoflurane anaesthetic maintenance in cattle.

ANS 12

Transdermal fentanyl patches for post-surgical pain in dog

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The present study was conducted on 12 clinical cases of dogs to evaluate the clinical efficacy of transdermal fentanyl patches for managing post-operative pain following ovariohysterectomy. These cases were randomly divided into two equal groups; dogs from Group-I received a transdermal fentanyl patch (as per body weight) applied 18 h prior to ovariohysterectomy while dogs from Group-II received inj. buprenorphine @ 0.01mg/kg BW over three days. Various clinico-physiological, haemato-biochemical attributes and pain scores were

evaluated during the study. Mean ranks of pain score did not differ significantly ($p>0.05$) between both groups. Transdermal fentanyl patches provided post-operative analgesia over 3 days and was non-inferior to repeated injections of buprenorphine.

ANS 13

Clinical efficacy of ketofol and propofol as general anesthetic in dog

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The clinical study was conducted on 12 cases of dog of either sex irrespective of age, breed and surgical intervention. These 12 clinical cases were divided into two equal groups. All dogs were pre-medicated with Inj.Xylazine + inj.Butorphanol, Inj. Atropine sulphate and Inj. Meloxicam intramuscularly. Group 1 and Group 2 dogs were anaesthetized with propofol @ 4mg/kg and ketofol (1:1) @ 4mg/kg respectively. Anaesthetic assessment revealed quick induction and recovery with reduction in induction dose of propofol and ketamine in group 2. All Haemato-biochemical changes were statistically non-significant and appeared within normal physiological limit. Ketofol (1:1) can be used as better anesthetic protocol for various surgical intervention in dogs. Opposing hemodynamic and respiratory effects of each drug may enhance the utility of this drug combination, increasing both safety efficacy and greater cardiopulmonary stability for dogs when compared to propofol alone.

ANS 14

Comparative efficacy of two methods of local analgesia for castration in cow bull

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The study was conducted on 12 clinical cases of cow bull brought for castration. These cases were randomly divided into two equal groups. All animals were pre-medicated half an hour prior to castration with Inj. Tolfenamic acid @ 4 mg/kg b.wt. Group I - 2% lignocaine HCl @ 2mg/kg b.wt. was infiltrated at the neck of the scrotum as ring block and Group-II 2% lignocaine HCl @ 2mg/kg b.wt it was injected into the spermatic cord as linear infiltration where jaws of burdizzo castrator were to be applied. Assessment of anaesthesia, clinico-physiological and Haemato- biochemical estimations were carried out. On the basis of parameters studied it can be concluded that linear infiltration is comparatively superior to that of the ring block at the neck of scrotum with 2% lignocaine HCl.

ANS 15

Effects on clinico-physiological profiles after administration of buprenorphine-propofol anaesthesia in atropinized goats

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The experiment was conducted on six healthy non-descript goats of either sex weighing between 20-25 kg by administrating atropine sulphate @ 0.04 mg/kg I/M followed by buprenorphine @ 10 mg/kg I/M and 10 min. later followed by induction of anaesthesia with propofol @ 5mg/kg I/V. After buprenorphine administration, lowering of head was observed in all the animals within 8.20±0.58 min. After propofol injection, there was rapid and smooth onset of anaesthesia (0.50? 0.55 min). Swallowing reflex, corneal and palpebral reflexes abolished within 3 min after onset of anaesthesia which remained throughout the period of duration of anaesthesia. The anal pinch and pedal reflexes were fully abolished along with complete muscle relaxation of jaw, tail, anus sphincter and limbs which was good but for short duration. The mean duration of anaesthesia was 31.33±1.20 min. and lasted by raising of head. The mean returned to sternal recumbency was 43.45± 2.50 minutes. All the animals tried to stand with ataxia at 51.20 ±1.50 and complete recovery i.e. animals stand without ataxia took 60.00 ± 2.58 minutes after propofol administration. Rectal temperature did not show any significant variation whereas heart and respiration rate showed significant ($P<0.05$) decrease after buprenorphine-propofol administration and returned to near base value by 180 min. It can be concluded that buprenorphine-propofol combination may be safely used for short duration anaesthesia in atropinized goats.

ANS 16

Alternation on haematobiochemical profiles after administration of buprenorphine-propofol anaesthesia in atropinized goats

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The study was conducted to evaluate the haemato-biochemical changes in response to buprenorphine-propofol anaesthesia in six healthy non-descript goats of either sex weighing between 20-25 kg by administrating atropine sulphate @ 0.04 mg/kg I/M followed by buprenorphine @ 10 mg/kg I/M and 10 min. later followed by induction of anaesthesia with propofol @ 5mg/kg I/V. Hb, PCV and TLC showed non-significant decrease at 60 min. however, the values of afterwards showed increasing trends at different time intervals of observation and returned to near base value by 6 hrs. There was significant ($P<0.05$) increase in neutrophils with significant ($P<0.05$) decrease in lymphocyte. Serum glucose and AST showed significant ($P<0.05$) elevation at 60 min. after buprenorphine-propofol administration whereas non-significant increase in serum urea nitrogen, serum creatinine, ALT was observed at different time intervals. However, these changes were within normal physiological limits. Therefore, it can be concluded that buprenorphine-propofol combination does not produced any deleterious effect on vital organs and changes remained within physiological limits, thus can be safely used in atropinized goats.

ANS 17

Comparative evaluation of guaifenesin and diazepam in xylazine-ketamine induced total intravenous anaesthesia in equines for gelding

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The study was conducted in 20 horses presented for gelding at TVCC, Nagpur, VP, Nanded and VD, Mathran in Maharashtra. During this research study the open covered technique of gelding was selected to carry out the castration in horses. The maintenance of anaesthesia was performed with the GKX (25 g of guaifenesin, 500 mg of ketamine and 250 mg of xylazine in 500 mL normal saline) and DKX (25 mg of diazepam, 500 mg of ketamine and 250 mg of xylazine in 500 mL normal saline) in group I and II respectively by TIVA, the maintenance @ 2.2 mL/kg/hr and amount of solution required with triple drip was 407.20±18.92 mL and 369.80±25.01 mL for GKX and DKX groups respectively, that found to produce the adequate level of anaesthesia and quality of anaesthesia was excellent to satisfactory to perform the gelding. The maintenance of TIVA flow rate @ 2.2 mL/kg/hr with an average flow rate of 41 drops/10 sec for Group I and 37 drops/10 sec for Group II, was found suitable to perform surgery. Further, induction and maintenance of anaesthesia was satisfactory and acceptable to perform castration in field level.

ANS 18

Comparative evaluation of xylazine-ketamine-guaifenesin and ketamine-guaifenesin anaesthesia for urogenital surgeries in male cattle

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The study was conducted at the TVCC, Udgir, total 12 animals i.e. bull and bullocks suffering from urogenital affections were randomly divided into two equal groups, as Group I and Group II. In Group I the induction of anaesthesia was achieved with the solution of triple drip containing 50 mg/mL guaifenesin, 1.00 mg/mL ketamine and 0.10 mg/mL xylazine @ 1.00 mL/kg body weight and in group II double drip solution was administered @ 1.50 /kg containing guaifenesin 50 mg/mL and ketamine 1.00 mg/mL for the induction of anaesthesia. Further, maintenance of anaesthesia was carried out with the tiple drip in Group I and double drip in Group II @ 2.50 mL/kg/hr. Mean duration of anaesthesia was 54.66±2.44 min and 44.83±2.16 min in Group I and Group II respectively. The overall quality of induction of anaesthesia of Group I animals was better than Group II animals. There was significant lower onset of analgesia in between the groups however; loss of analgesia was significantly higher in Group I as compared to Group II. Tube cystostomy, cryptorchiedectomy/ orchidectomy, cystorraphy and urethrotomy was carried out in Group I and Group II animals after achieving the surgical plain of anaesthesia.

ANS 19

Clinical studies on different combinations of butorphanol, acepromazine and dexmedetomidine premedication along with midazolam ketamine and propofol induction and isoflurane maintenance in dogs

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A clinical study, on 24 dogs presented at Department of Veterinary Surgery & Radiology for various surgical affections were randomly allotted to four groups of six dogs (n=6) each to evaluate sedative and anaesthetic effects of various combinations. All the 24 dogs were premedicated with atropine sulphate @0.02mg/kg b.wt s/c and butorphanol @0.2mg/kg b.wt i/v. After 15 minutes, in group I and II dexmedetomidine was administered @ 0.003mg/kg i/v While, in group III and group IV acepromazine was administered 0.02mg/kg i/v. Induction of anaesthesia was achieved by combination of Ketamine- Midazolam (2:1) in group I and III till the effect) and Propofol (i/v till the effect in group II and IV). Maintenance of anaesthesia was done by isoflurane after endotracheal intubation in all the animals. All dogs were evaluated for various clinical, physiological & haematobiochemical parameters viz. duration of anaesthesia, induction of anaesthesia, standing time and complete recovery time, rectal temperature, pulse-rate, respiratory rate, haemoglobin, packed cell volume, total leucocyte count, total erythrocyte count, total protein, aspartate transaminase and alanine transaminase. Duration of anaesthesia, induction of anaesthesia, standing time and complete recovery were noted. B+D+KMI group showed delayed standing and complete recovery time compared to other groups. Among all the parameters, the difference noted in mean values of PCV and TEC in group I and group III at 15 min. and 30 min. were statistically significant. Whereas rest of the parameters showed nonsignificant difference. In all the above groups, administration of preanaesthetic resulted into satisfactory analgesia and sedation. Ketamine-midazolam & propofol administration was easily performed under satisfactory sedation & it resulted into smooth administration of endotracheal tube without any difficulty in all the animals. Isoflurane produced excellent quality of maintenance and recovery of anaesthesia in all groups. Overall observations showed satisfactory results of balanced anaesthesia in all groups.

ANS 20

Clinical studies on thiopental induction and isoflurane maintenance anaesthesia under different preanaesthetics combinations in dogs

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The present study was conducted to compare the effect of pre-anaesthetic combinations such as glycopyrrolate-xylazine-tramadol, glycopyrrolate-midazolam-butorphanol and glycopyrrolate-dexmedetomidine-fentanyl on thiopental induction and isoflurane maintenance general anaesthesia in 18 dogs of either sex presented to the department of Veterinary Surgery and Radiology, the animals were randomly divided into three groups six dogs of either sex in each group (n=6). Group-I received a combination

of glycopyrrolate, xylazine and tramadol @ 0.01, 0.5 and 4 mg/kg b.wt. respectively and group-II received a combination of glycopyrrolate, midazolam and butorphanol @ 0.01. 0.2 and 0.2 mg/kg b.wt. respectively and group-III received a combination of glycopyrrolate, dexmedetomidine and fentanyl @ 0.01, 0.05 and 0.05 mg/kg b.wt. respectively, were given intramuscular as premedication 30 minutes prior to induction. Thiopental was administered as a induction agent intravenously "to effect" and maintained with isoflurane in oxygen. Thereafter clinico-physiological, haemodynamic, haemato-biochemical parameters were studied. The serum biochemical parameters like serum creatinine, BUN, AST, ALT and serum glucose showed non-significant differences and remained within normal range in all groups. The group-I and group-III showed better sparring effect in dogs induced with thiopental compared to group-II and group-III showed better sparring effect in dogs maintained with isoflurane compared to group-I and group-II. The recovery was smooth, fast and uneventful without any complication during observation periods in group-I and group-III as compared to group-II.

ANS 21

Clinical studies on the effect of glycopyrrolate, xylazine, acepromazine, dexmedetomidine and butorphanol in different combination on propofol-isoflurane anaesthesia in dogs

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The present study was conducted to compare the effect of pre-anaesthetic combination such as glycopyrrolate-xylazine-butorphanol, glycopyrrolate-dexmedetomidine-butorphanol and glycopyrrolate-acepromazine-butorphanol on propofol induction and isoflurane maintenance general anaesthesia in 18 dogs of either sex presented to the Department of Veterinary Surgery & Radiology, COVS&AH, JAU, Junagadh. The animals were randomly divided into three groups of six animals in each group. Group-I received combination of glycopyrrolate-xylazine-butorphanol @ 0.01.0.05, and 0.2 mg/kg b.wt. and Group-II received combination of glycopyrrolate-dexmedetomidine-butorphanol @ 0.01, 0.005 and 0.2 mg/kg b.wt. and Group-III received a combination of glycopyrrolate-acepromazine-butorphanol @ 0.01, 0.05 and 0.2 mg/kg b.wt. respectively, given I/M as premedication 15 minutes prior to induction with propofol administered I/V "to effect " and maintained with isoflurane in oxygen. Thereafter clinico-physiological, haemodynamic, haemato-biochemical parameters were studied. Acepromazine (Gr-III) had good quality of sedation, abolished palpebral and pedal reflexes, response to intubation as compared to xylazine and dexmedetomidine groups. Total quantity of isoflurane was consumed in dexmedetomidine group. All physiological parameters altered non-significantly within all three groups. ECG did not shows any abnormality except slight increase in QRS duration and T wave amplitude in xylazine group. The serum biochemical parameters like sr. creatinine, BUN, AST and ALT remained within normal range, whereas serum glucose increased in dexmedetomidine and acepromazine group. Acepromazine group showed better sparring effect in dogs induced with propofol, whereas dexmedetomidine showed better sparring effect in dogs maintained with isoflurane. Recovery time was lowered in dexmedetomidine group and total recovery was smooth, fast and uneventful without any complication in all three groups.

ANS 22

Evaluation of 1% lignocaine hydrochloride for Distal Paravertebral Anaesthesia in sheep undergoing Caesarian section

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Eighteen ewes randomly allotted to two equal groups were pre-medicated with diazepam (0.2mg/kg, IV) and injected 15ml (5ml per spinal nerve) of either 2% or 1% lidocaine hydrochloride for inducing distal paravertebral anesthesia. Onset time and duration of satisfactory anaesthesia in flank was assessed by nociceptive stimuli (superficial and deep pinpricks pre and postoperatively and reaction of the animal to the surgical interventions). Satisfactory regional anaesthesia developed in all the animals. Although one sheep belonging to each group showed temporary mild reaction while incising the abdominal muscles in the ventral third but required no rescue analgesia. Onset time in Group I and Group II ewes was 4.55 ± 1.51min and 5.44 ± 1.81min respectively. Satisfactory analgesia duration was 87.22 ± 4.93min and 97.77 ± 5.78min in Group I and Group II animals respectively. The anaesthetic onset time as well as the duration of paravertebral anaesthesia was not significantly different between the groups. The recommendation to preferably use 1% lignocaine hydrochloride for local anaesthesia in sheep is thus validated.

ANS 23

Evaluation of dexmedetomidine as premedicant in propofol induced gaseous anaesthesia for caesarean section in dogs – a report of 12 cases

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The study was conducted in 12 pregnant dogs presented with history of dystocia to the Small Animal Surgery Unit of Department of Veterinary Surgery and Radiology, Veterinary Clinical Complex, Namakkal and they were divided into two Groups namely Group I and II consisting of six animals each. Vaginal, ultrasound and radiographic examinations were performed on all the animals and total number of live/dead foetus was assessed. Group I dogs were premedicated with dexmedetomidine at the dose rate of 5 to 15 µg.kg-1, induced with propofol at the dose rate of 0.5 to 5 mg.kg-1. Group II animals were directly induced with propofol without premedication at the dose rate of 5 mg.kg-1 and endotracheal intubation was accomplished in all the animals with cuffed Murphy type endotracheal tube to provide a secure leak-free airway. Anaesthesia was maintained with isoflurane using small animal anaesthetic machine in both the Groups. The antinociceptive efficacy was evaluated based on withdrawal reflex, sudden elevation in heart rate and respiratory rate beyond 20 per cent from the base line value during maintenance. All the dogs in both the Groups recovered

uneventfully. The dogs in Group I showed adequate analgesia, good muscle relaxation, smooth induction and smooth recovery compared to Group II animals. The total dose of propofol and isoflurane reduced in Group I as compared to Group II animals. It is concluded that dexmedetomidine was excellent premedicant and was safe during pregnancy.

ANS 24

Efficacy of ketamine and propofol as a general anaesthetic in dexmedetomidine – butorphanol premedicated calves

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The study was conducted in six crossbreed calves weighing around 40 to 55 kg body weight presented to Department of Veterinary Surgery and Radiology, Veterinary Clinical Complex, Veterinary College and Research Institute, Namakkal for surgical interventions under general anaesthesia. All animals were premedicated with Dexmedetomidine at the dose rate of 1 µg per kg body weight and Butorphanol at the dose rate of 0.02 mg per kg body weight intravenously. Anaesthesia was induced by 1% propofol at the dose rate of 2 mg per kg body weight and ketamine at the dose rate of 2 mg per kg per kg body weight and maintained by propofol and ketamine as total intravenous infusion. Haematobiochemical parameters were studied before, during and 24 hours after surgery. Cardiopulmonary response was recorded at periodical intervals during maintenance phase of anaesthesia. No significant changes were observed in haematobiochemical parameters. Vital signs were maintained within the baseline values in all the animals. The induction and recovery from anaesthesia was smooth in all the animals without any complications. It was concluded that the anaesthetic protocol developed was highly safe for surgical interventions in calves.

ANS 25

Efficacy of medetomidine as premedicant to ketamine anaesthesia in atropinized goats

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The study was conducted on six healthy non-descript goats of either sex weighing between 20-25 kg by administrating atropine sulphate (0.04 mg/kg I/M) followed by medetomidine (10 µg/kg I/M) and 10 min. later followed by induction of anaesthesia with ketamine (5mg/kg I/V). The induction was smooth with marked sedation and protrusion of tongue from buccal cavity after onset of anaesthesia (0.83? 0.02 min.). Eyes remained open throughout anaesthesia and pupillary dilatation and side ward movement of the eyeball was also observed. The anal pinch and pedal reflexes were abolished completely. The muscle relaxation was excellent. The duration of anaesthesia was 50.17 ± 2.83 min. and recovery was smooth with no excitement (91.60 ± 3.45 min.). There was significant decrease in heart rate and respiration rate up to 120 min. A non-significant decrease in Hb, PCV and TLC. Serum glucose level showed significant increase. Serum urea nitrogen,

creatinine and ALT values showed non-significant changes at various time intervals whereas serum AST values showed a significant increased up to 60 mins. However, these changes were within normal physiological limits. It is concluded that medetomidine-ketamine combination does not produced any deleterious effect on vital organs, thus can be safely used in atropinized goats.

ANS 26

Comparison of xylazine-midazolam-ketamine-isoflurane and xylazine-guaifenesin-ketamine-isoflurane combinations for general anaesthesia in horses

Amandeep Kaur, Navdeep Singh, Rahul Udehiya, S K Mahajan

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The present study was conducted on 10 horses to evaluate xylazine –midazolam-ketamine-isoflurane and xylazine-guaifenesin- ketamine-isoflurane combinations. The animals were randomly divided into two groups having 5 animals each. In group I (n=5) xylazine and midazolam was given as preanaesthetic agents while in group II (n=5) preanaesthetic agents were xylazine and guaifenesin. Induction of anaesthesia was done by ketamine (2.2-5mg/kg) in both the groups and isoflurane (2-4%) was used as maintenance agent in both the groups. The groups were compared base on induction, physiological parameters, hematobiochemical parameters and recovery. Sedation and analgesia was adequate in both the groups while muscle relaxation was maximum in group II. Xylazine-guaifenesin combination was found to be better preanaesthetic combination in terms of induction quality, clinicophysiological, hematobiochemical and recovery quality as compared to xylazine alone. Both the drug combinations are safe in horses. However, xylazine-guaifenesin-ketamine-isoflurane combination could be recommended for lengthy procedures because of its better induction, moderate analgesia, excellent muscle relaxation, smooth recovery quality and less recovery time with minimal adverse effect on cardiorespiratory system and hematobiochemical parameters.

ANS 27

Comparison of xylazine- ketamine-isoflurane and xylazine-guafenesin-ketamine-isoflurane combinations for general anaesthesia in horses

Amandeep Kaur, Navdeep Singh, Rahul Udehiya, S K Mahajan

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The present study was conducted on 10 horses to evaluate xylazine-ketamine-isoflurane and xylazine-guafenesin- ketamine-isoflurane combinations. The animals were randomly divided into two groups having 5 animals each. In group I (n=5) xylazine (1.1mg/kg) was given as preanaesthetic agent while in group II (n=5) preanaesthetic agents were xylazine and guaifenesin. Induction of anaesthesia was done by ketamine (2.2-5mg/kg) in both the groups and isoflurane (2.2-4%) was used as maintenance agent in both the groups. The groups were compared based on induction, physiological parameters, hematobiochemical parameters and

recovery. Sedation and analgesia was adequate in both the groups while muscle relaxation was maximum in group II. Xylazine-guaifenesin combination was found to be better preanaesthetic combination in terms of induction quality, clinicophysiological, hematobiochemical and recovery quality as compared to xylazine alone. Both the drug combinations are safe in horses. However, xylazine-guaifenesin-ketamine-isoflurane combination could be recommended for lengthy procedures because of its better induction, moderate analgesia, excellent muscle relaxation, smooth recovery quality and less recovery time with minimal adverse effect on cardio respiratory system and hematobiochemical parameters.

ANS 28

Comparison of dexmedetomidine and xylazine as preanaesthetic for general anaesthesia in equine colic surgery patients

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Ten adult horses with the history of colic were included in this study. The cases were divided into two groups of 5 animal in each group. After sedation with Xylazine (@1mg/kg) and butorphanol (@0.05 mg/kg) (group A) or Dexmedetomidine (@3.5 µg/kg IV) and Butorphanol (@0.0.05 mg/kg) (group B) intravenously, anaesthesia was induced with midazolam (@ 0.04mg/kg IV) and ketamine (@5mg/kg IV) and maintain with isoflurane in oxygen. Heart rate (HR), mean arterial blood pressure (MAP), oxygen saturation (Spo2), End tidal carbon dioxide (EtCO2), ALT, AST, ALKP, BUN, CREATINE, GGT, Total Protein and blood gas analysis, were measured before treatment (baseline), after sedation, and during anaesthesia. Sedation, induction and recovery quality were measured on a 0-3 scale. The induction quality was good in both the groups. Dobutamine were used for keeping arterial pressure in normal range in few cases. Both drug combinations were suitable to maintain anaesthesia for 2 hours or more, with good cardiovascular and good to excellent recovery.

ANS 29

Evaluation of two different protocols for general anaesthesia in geriatric dogs

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The present study was undertaken to arrive at a safe protocol for geriatric dogs undergoing abdominal surgeries. A total of 16 apparently healthy geriatric dogs, were subjected for two different induction protocols by dividing them in to two groups of eight each and elective ovariohysterectomy was performed in all the cases. All the dogs were premedicated with glycopyrrolate @ 0.01 mg/kg body weight IM and induced with ketamine-diazepam in group I; while butorphanol-propofol in group II. Maintenance of anaesthesia was carried out with isoflurane both the groups. In both the groups, the quality of induction was rated as good to excellent. The lowest number of respirations were eight and six per minute in groups I and II respectively.

Tachycardia was recorded in two animals in group II. SpO2 values varied from 91 and 95. Among haematological parameters, neutrophilia and lymphopenia were observed at different time intervals in both the groups. Among biochemical parameters, serum creatinine and total protein values gradually increased while blood glucose gradually increased in both the groups. Isoflurane sparing effect was seen with ketamine-diazepam when compared to butorphanol-propofol in the present study. The geriatric dogs induced with butorphanol-propofol had good traits of recovery from anaesthesia when compared to ketamine-diazepam group. It was concluded that, both the protocols were found safer and useful for geriatric dogs. But given a choice, the combination of ketamine-diazepam induction can be chosen as it produced excitement free anaesthesia with adequate muscle relaxation to permit endotracheal intubation in dogs. There were no episodes of induction apnoea in ketamine-diazepam group, unlike in butorphanol-propofol group. Hence, the glycopyrrolate premedication, ketamine-diazepam induction and isoflurane maintenance can be recommended for anaesthesia in healthy geriatric dogs.

ANS 30

Assessment of dose of ketamine with dexmedetomidine-midazolam drug combination as a single intramuscular injection for induction of anaesthesia in dogs

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Six dogs presented for various elective surgeries at the Teaching Veterinary Clinical Complex of CV & AS, Pookode, was subjected to a clinical study to ascertain the minimal dose of ketamine required with dexmedetomidine-midazolam drug combination as a single intramuscular injection to induce anaesthesia . The animals were divided into groups of three. The drugs were administered intramuscularly as a single combination dose. All the three groups received dexmedetomidine and midazolam at the dose rates of 5µg/kg and 0.2mg/kg body weight respectively. Group I animals received ketamine at the dose rate of 10mg/kg, Group II animals receiving ketamine at the rate of 7mg/kg and Group III receiving ketamine at the dose rate of 5mg/kg body weights. Induction of anaesthesia was profound in all the three groups. Both the rate and depth of respiration showed drastic decrease in groups I and II necessitating immediate positive pressure ventilation. Spontaneous respiration was noted only in the Group III animals that received 5 mg/kg body weight ketamine. Hence it was concluded that administration of ketamine at the dose rate of 5 mg/kg body weight could produce a smooth anaesthetic induction with lesser ventilatory compromise, according to ventilation studies.

ANS 31

Clinical evaluation of dexmedetomidine-midazolam-ketamine with atracurium for isoflurane anaesthesia in dogs

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The study was conducted in twelve dogs which underwent various surgical procedures, in the Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences, Pookode, Wayanad. These dogs were randomly allocated into two groups – Group I and Group II, of six animals each. Animals of Group I were anaesthetised with a drug combination of dexmedetomidine, midazolam and ketamine at the rate of 5 µg/kg, 0.2 mg/kg and 5 mg/kg body weight respectively as a single intramuscular injection. Following endotracheal intubation, isoflurane was administered in oxygen to maintain anaesthesia. In Group II, following induction with the same injectable drug combination and maintenance with isoflurane, a loading dose of atracurium at the dose rate of 0.1 mg/kg body weight was administered intravenously, immediately followed by a continuous rate infusion of atracurium at a dose rate of 0.1 mg/kg/hour. The quality of anaesthetic induction, produced by the dexmedetomidine-midazolam-ketamine combination was excellent in all the animals. There was profound sedation and reduced rate of respiration in all the twelve animals following the intramuscular administration of the injectable anaesthetic combination. Administration of atracurium in animals of Group II produced pronounced reduction of respiratory rate and resultant shallow respiration was insufficient in maintaining eucapnia, which necessitated manual assisted ventilation for every spontaneous breath. All four muscle twitches were present in the animals of Group I, after induction and during maintenance of anaesthesia. Whereas the twitches, assessed visually, were not as strong as those before administration of the injectable anaesthetic drug combination after administration of Atracurium. There were no significant changes in the haematological, serum biochemical, blood gas and electrolyte values in both the groups. It could be thus concluded that dogs anaesthetised with intramuscular injection of dexmedetomidine-midazolam-ketamine combination and maintained on isoflurane when administered atracurium intravenously followed immediately by a continuous rate infusion, provided profound muscle relaxation for various surgical procedures without compromising the haemodynamic functions, but resulted in marked reduction in the rate and depth of respiration which necessitated assisted ventilation.

ANS 32

Inhalation anaesthesia in a cow using small animal anaesthesia machine

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Inhalation anaesthesia in bovines is generally carried out using large animal anaesthesia machines. These

machines are imported ones and very expensive. As an alternative to the dedicated large animal anaesthesia machine, use of a small animal anaesthesia for maintenance of inhalation anaesthesia in a 300 kg cow, is presented here. A routinely used small animal anaesthesia machine was modified and customized to suit the attachment of the endotracheal tube and reservoir bag of large animals. Following injectable induction, and endotracheal intubation, anaesthesia was maintained with isoflurane in 100% oxygen using this modified machine. Maintenance of anaesthesia was smooth and the recovery was uneventful. Except for the airway resistance due to smaller diameter of the corrugated tubings, the cardiorespiratory parameters were found satisfactory for maintenance of inhalation anaesthesia in this cow. The present finding suggests that, a small animal anaesthesia machine could be satisfactorily used for maintenance of inhalation anaesthesia in a cow.

ANS 33

Clinical evaluation of multimodal analgesia for visceral pain management in canine surgery

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The study was conducted on 12 referred dogs in department of Veterinary Surgery and Radiology for major abdominal surgeries to compare the efficacy of different analgesics on the basis of clinico-physiological, haemato-biochemical analysis and behavioural responses. The animals were randomly divided into two groups as A and B. In group 'A' inj. Carprofen hydrochloride (S/C) @ 4mg/kg b.wt and in group 'B' inj. Tramadol hydrochloride (I/M) @ 4mg/kg b.wt, respectively were administered as pre-operative analgesia and followed on 1st, 2nd, 3rd and 4th day post-operatively. Inj. bupivacaine hydrochloride @ 1mg/kg b.wt was administered as incisional block after sedation in all the animals. Clinico-physiological and haemato-biochemical parameters varied within normal limits in both the groups after recovery. Multifactorial numerical rating scale was used to assess behaviour parameter. The mean total pain score (MTPS) was non-significantly higher in group B than group A. It was concluded that both the drugs along with bupivacaine provided adequate analgesia in peri-operative and post-operative period but Carprofen hydrochloride provided better analgesia as evident by low MTPS.

Avian Surgery Session

Challenges in the anaesthetic management of avian patients

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Birds are fairly recently domesticated and hide their illness unless they are decompensated. Birds presented for anaesthesia under clinical situation are seldom healthy. Thus, safe and reliable avian anaesthesia under the clinical situation may be highly demanding and complicated. The unique anatomic and physiologic differences between avian and mammalian patients complicate the anaesthetic risk. Rapid simultaneous cardiorespiratory arrest and difficulty of resuscitation highlight the fact that successful anaesthetic outcome in avian patients warrant thorough understanding of avian anatomy and physiology and its influences on anaesthesia. Birds have a high basal metabolic rate and this could largely interfere with maintenance of body temperature during anaesthesia. The tendency to develop hypo or hyperthermia following anaesthesia in avian patients could be fatal. Through understanding of the avian anatomy and physiology, pre-anaesthetic evaluation and stabilization of the patient, selection of appropriate anaesthetic protocol and monitoring are essential for the successful outcome in avian anaesthesia.

Birds are different from mammals from anaesthetic point of view

- ✓ Birds have high basal metabolic rate. Resting body temperature is higher than mammals. This rapidly provides energy and oxygen to cells and enables them to fly.
- ✓ Birds regulate body temperature by behavioural and physiological means. Plumage is used both for heat loss and conservation.
- ✓ Birds have high ratio of body surface area to body mass and this makes them prone for hypothermia during anaesthesia.
- ✓ Birds have poor hepatic glycogen storage and prolonged fasting before anaesthesia may result in hypoglycemia.
- ✓ Birds will not show signs of dyponea when they aspirate.
- ✓ The avian respiratory system is unique with two functional components: ventilation component (bellows system) comprising of air sacs; gas exchange component comprising of para bronchial lungs.
- ✓ Birds have efficient respiratory system with gas exchange occurring both during inspiration and expiration. The thin blood: gas barrier and cross current blood flow render avian lungs more efficient.
- ✓ Birds have a small functional residual capacity and continuous air flow is required for gas exchange and thus short periods of apnoea could be life threatening.
- ✓ Birds do not have diaphragm. The air flow through the respiratory system could be severely impaired by

the compression of lungs and airsacs by the weight of abdominal organs in dorsal recumbency during anaesthesia.

- ✓ The trachea of birds has complete cartilaginous rings and caution should be exercised in using endotracheal tubes.
- ✓ Birds have a large tracheal dead space and this is compensated by having a relatively low resting respiratory frequency. Both inspiration and expiration in birds are active and require active muscular activity which could be impaired by general anaesthesia.
- ✓ Birds have a unique group of intrapulmonary chemoreceptors that are acutely sensitive to CO2 and are insensitive to hypoxia

Preanaesthetic consideration

Birds with compromised health do not survive anaesthesia. Therefore, thorough preanaesthetic evaluation and stabilization of the patient is highly recommended. Fasting before anaesthesia is recommended to decrease the likelihood of regurgitation and aspiration of food. Fasting should not extend longer than the time needed to empty the crop, as birds have high BMR and low hepatic glycogen storage. It is often simple to palpate the crop before anaesthesia to ensure there is no remaining food or stasis.

The avian patients suffering from trauma or disease can be assumed to be at least 10% dehydrated and fluid therapy is recommended before anaesthesia. Fluid therapy in dehydrated avian patient is absolutely warranted and can be given through intravenous or intraosseous or subcutaneous route. The jugular vein, medial metatarsal veins or the basic veins can be used for IV drug administration. An intraosseous (IO) catheter can be placed in the distal ulna or the proximal tibia in birds. The IO catheter should be taped and bandaged in place using a Figure 8 wing wrap. Fluids can also be administered through subcutaneous route in either skin fold located where a leg meets the body or in the wing skinfold where the wings meet the body.

- ✓ Fluids should be warmed prior to administration and given at the dose rate of 10.125 ml per kg over 5 to 10 minutes.
- ✓ Lactated Ringer's solution or 0.9% sodium chloride are most commonly administered.
- ✓ Fluids with a dextrose concentration of more than 2.5 per cent should not be given by subcutaneous route.
- ✓ Maintenance fluid rate ranges from 40 to 70 ml per kg per day.
- ✓ Colloidal, Hetastarch, is administered at the dose rate of 10 to 15 ml per kg intravenously or intraosseously every 8 hours a day.

Preemptive analgesia will facilitate more stable anaesthesia during surgical intervention with lesser anaesthetic agent and will help for smooth recovery. Assessment of pain in avian patients is difficult as they hide their illness as well as signs of pain vary greatly between species. The total blood volume of a bird is approximately 10% of its body weight. Normal healthy bird can lose 1% of their blood volume without problems. Significant haemorrhage could be life threatening. Peripheral vascular perfusion is highly dependent on cardiac output and circulatory volume. It can be evaluated by ulnar vein filling time (after

occlusion). A filling time greater than 0.5 seconds is indicative of poor peripheral vascular perfusion. It can be addressed by fluid therapy and limitation of haemorrhage.

It is always recommended to anticipate problems and have all necessary equipment and emergency drugs readily available during avian anaesthesia.

Anaesthetic agents in avian patients - Injectables Vs Inhalants

Ease of use in the field, minimal need for technical equipment, availability, ease of administration and relatively low cost of injectables make them anaesthetic of choice under conditions where advanced facilities are not available. The large dose variation between species has to be considered while selecting injectable agents. It is advised to start with lower end of dosage range since injectable anaesthetic agents have narrow therapeutic index and wide varied individual dose response. Also, elimination depending on biotransformation and excretion, dose dependent cardiopulmonary depression, potentially difficult reversal of drug effects in an emergency situation and potentially prolonged and violent recoveries should be considered while selecting injectable anaesthetic agents in avian practice.

Ketamine is the commonly used injectable anesthetics in birds. It has a variable effect in different avian species. The somatic analgesia achieved is good but visceral analgesia and muscle relaxation is poor. Ketamine is often combined with xylazine to improve visceral analgesia, muscle relaxation and anaesthetic recovery. The duration of anaesthesia is dose dependent and drug dosage follows allometric scaling ie. lower dosage in birds with higher body weight and higher dosage in birds with lower body weight. The xylazine combination produce dose related respiratory depression effect and bradycardia. Combining diazepam with ketamine produces good muscle relaxation and negates cardio pulmonary depression. The dose of ketamine varies from 10 to 100 milligrams per kg body weight depending on the species. Ketamine is combined with xylazine or diazepam in the ratio of 10:1 on a milligram per kg basis.

Propofol can also be used for induction of anaesthesia in birds. Rapid onset of action, smooth induction and very short duration of action makes propofol anaesthetic of choice for short procedures. Propofol is preferred in patients with head trauma because it decreases cerebral blood flow and cerebral oxygen consumption. Apnea following rapid and intravenous bolus is a concern with propofol anaesthesia.

Inhalational agents have numerous advantages over injectable anaesthetics. Inhalants can be titrated to effect, have a more consistent therapeutic index, provide rapid induction and smooth rapid recoveries. Non rebreathing systems such as modified Jackson-Rees and Ayre's T-Piece are most commonly used in avian anaesthesia and rely on high oxygen flow rates to remove carbon dioxide. Oxygen flow rates should be two to three times the minute ventilation (200 ml per kg per minute) and if a mask is used in conjunction with these a total of 5 times

minute volume should be used. Isoflurane and sevoflurane are currently used inhalation agent. Sevoflurane has a lower blood: gas partition coefficient than isoflurane and provide rapid induction and recovery. Sevoflurane is reported to depress plasma ionized calcium levels, which may be a consideration in African grey parrots which are prone to hypocalcemia causing seizures. Isoflurane has reduced arrhythmogenic properties and has a longer time interval between apnea and cardiac arrest.

Monitoring anaesthesia

Attentive and proactive monitoring, rather than retrospective monitoring, employing ECG and capnography is advocated in avian anaesthesia. Relationship between apnoea and cardiac arrest (Rapid simultaneous cardiorespiratory arrest) and difficulty of resuscitation warrant continuous monitoring. Apnoea induced death in avian patients is common. An increase in partial pressure of arterial oxygen and high fractions of inspired oxygen (FiO2) may possibly contribute to ventilatory depression. Respiratory pauces longer than 10 to 15 seconds should be treated by lightening the plane of anaesthesia and increasing the rate of assisted ventilation. Loss of third eye reflex normally indicates a bird to be in an excessively, even dangerously deep plane of anaesthesia. Birds are less efficient in regulating the body temperature. Hypo or hyperthermia can occur in birds when thermoregulation centre in hypothalamus is deregulated by anaesthetics. A reduction in temperature can predispose the patient to cardiac arrhythmias. Saturation of oxygen measurements using and pulse oximeter can be used on the wing web, toe, tongue or the area over the tibiotarsal bone.

Pain management in birds

Assessment of pain in birds is difficult because the signs of pain vary from one species to another. Behavioural signs of pain may be cryptic or subtle but include crouching and immobility. Effective analgesia during and after surgery greatly reduces pain associated stress in birds and improve the surgical outcome.

K opioid receptors are found in more numbers in avians and K opioid receptor agonist, butorphanol, is preferred over Mu receptor agonist morphine in birds. Butorphanol is administered at the dose rate of 1 to 2 to milligram per kg body weight.

The most commonly used non-steroidal anti-inflammatory drugs in birds are carprofen and ketoprofen. Flunixin meglumine in birds is reported to cause renal ischemia and hence contraindicated or used with great caution.

Conclusion

Understanding the physio-anatomic differences, selection of appropriate anaesthetic protocol, planning, preanesthetic evaluation, stabilization of sick birds before anaesthesia, effective analgesia during and after surgery and proper post anaesthetic recovery could result in successful anaesthetic outcome in birds.

AVS 1

Surgical management of Slipped tendon in a duck

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A one and half year old female duck (*Anas platyrhynchos)* was presented with inability to bear its weight on limbs and the wings of both sides were blood stained. On clinical examination posterior side of both hocks were touching the ground. The webbed feet and lower limb were deviated laterally with toes pointing outward. The owner reported that the left hock had been ankylosed since one year but the duck was able to uplift and its bear weight with right limb. Since last ten days the right hock also flexed and body of the pet bird wad touching the ground. When it tried for movement it got its wigs injured and blood stained. Bird is anorectic since two days. On examination of right hock tendo-achilis had slipped to medial side of the hock joint. On extending the limb and with help of fingers it was able to be replaced at tibial talus. The history of the duck feed revealed that it contained manganese. So, the surgical treatment of the slipped tendon was planned. Under xylazine (@1mg/kg)-ketamine (@15mg/kg) anaesthesia given intramuscularly an incision was made near lateral epicondyle of tarsus. The tendo-achillis was replaced and held in normal location. The retinaculum was incised. With an18gauze subcutaneous needle a hole was made in lateral epicondyle of tarsus through which 3-0 PDS was passed followed by bite in tendo-achillis including half of its thickness. The retinaculum and skin were repaired routinely. '8' shape bandaging was done. Oral antibiotic and analgesics were given post-operatively. There was swelling in lower limb postoperatively but it subsided slowly. The bird was able to partially uplift its weight after five days with slight movement but no trauma to the wings.

AVS 2

Surgical management of ventral hernia in pouter pigeons: two case reports

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Two fancy pouter pigeons were presented to University Veterinary Hospital Mannuthy, Kerala Veterinary and Animal Sciences University with history of protruding of abdominal organs through ventral opening close to the vent. In one bird, the owner noticed the pouch near the vent region which resulted in vent pecking by the cage mate and evisceration of abdominal viscera exposing the intestinal loops with strangulation whereas the other pigeon had a large out pouching of closed sac of reducible intestinal loops. Both birds were anesthetised with Ketamine @ 40 mg/ kg bwt and Diazepam @ 0.2 mg/ kg bwt given intra muscularly and prepared for aseptic surgery. The hernia sac was carefully explored and the strangulated hernial contents in eviscerated pigeon was carefully lavaged and repositioned after kelotomy whereas hernia sac was carefully incised and intestinal loops were carefully repositioned in the second pigeon. Herniorrhaphy was performed using Polyglactin suture materials 1-0 in interlocking pattern. Post-operative cefixime oral drops and vitamin supplements were administered and both birds had uneventful recovery. This presentation focuses on various aspects of surgical management of ventral hernia in pigeons and their post-operative management.

AVS 3

Resection of a tumor using Diode LASER in a pigeon - A case report

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A domestic pigeon (*Columba livia*) weighing 320 gms was admitted at clinics of Department of Veterinary Surgery and Radiology, with the history of difficulty in walking due to a large sized growing mass on left limb. Clinical examination revealed hard mass at posterior aspect of hock region of left limb. The pigeon was anesthetized using xylazine@1mg/kg and ketamine @ 20mg/kg intramuscularly. Surgical removal of mass from the base was undertaken with Diode LASER, using contact mode with continuous wave output at power setting 10-12 W. Bandaging of limb was done after surgery. Post-operatively, Cephalexin @ 50 mg/kg and Meloxicam @ 0.2 mg/kg were given orally for 5 and 3 days respectively. The pigeon recovered uneventfully.

AVS 4

Surgical management of sub-conjuctival caseous abscess below eye in peacock – a case report

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A peacock was admitted to the TVCC, CVAS Bikaner with history of swelling below the eye since last 1 month. Palpation revealed hard mass .On aspiration of which some purulent flacks was seen. The growth was surgically opened by lancing. On squeezing the swelling caseated purulent material was released from the lanced opening .Cavity of sac was flushed with antiseptic solution and antibiotic & analgesic were administered as usual. On follow up there was found uneventful recovery of bird.

AVS 5

Surgical management of traumatic injuries in pigeon and aseel

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Seven Pigeons and three Aseel birds were presented to the clinics with a complaint of traumatic injuries in various parts of the body. Most of the presented birds were active, alert and with reduced intake of food. The sites of traumatic injuries were observed in the croup, wing, bone fractures (tibio-tarsal and carpo-metacarpal), neck and head regions of the body. The causes for the injuries were mainly cat bite, dog bite, ceiling fan, spur of male bird, accidents and falling from a height. The cases were diagnosed based on clinical and radiographic examination and prepared aseptically for surgical management. The birds were restrained with inj. xylazine and inj. ketamine as anesthetic agents. Reconstruction of traumatized croup, repair of fractured bone with intramedullary pinning, amputation of wing and bandage were the surgical technique performed as per the case requirement. Wounds were managed with trimming, debridement, lavaging and suturing as per the standard procedure. In this clinical study it was practically experienced that, use of suitable anaesthetic agents with effective management, proper selection of suture material, maintenance of asepsis during surgery, correctness of surgical technique, delicate handling of the tissue while dissection and proper post-operative care up to recovery helped in complete recovery from the traumatic injuries without out any complications.

AVS 6

Surgical management of traumatic crop injury in a cockatoo

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A one year male Cockatoo was bought to Small Animal Surgery Unit, Veterinary Clinical Complex, Veterinary College and Research Institute, Namakkal with the history of traumatic injury to its crop by metal fencing wire two days before which led to draining of food grains through the open wound and was not taking any feed since then. Clinical examination revealed that the Cockatoo was dull and able to stand and walk. Examination of crop revealed that there was a deep punctured wound which was contaminated and infected, through which the food grains were spilling out whenever the Cockatoo was moving. The wound was lavaged with normal saline and the food grains were removed. It was decided for surgical correction as the crop was extensively injured. The feathers around the crop were plucked and the area around the wound was prepared aseptically. Under isoflurane anaesthesia ingluviotomy procedure was performed and infant feeding tube was attached along with crop and sutured with poly glycolic acid size 2-0 by simple interrupted suture pattern. The skin was closed with silk size 2-0 by simple interrupted suture pattern. Post operatively tube feeding, oral antibiotics were advised for five days along with daily wound dressing for seven days. Cutaneous suture were removed on 10th post-operative day and the Cockatoo made uneventful recovery.

AVS 7

Fracture management in birds through C-arm guided intramedullary pinning technique using needle

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

AVS 8

A study on some gaseous and injectable general anaesthetics for avian surgeries

Ushma Patel, B. M. Gahlod, S. V. Upadhye, P. T. Jadhao, S.B. Akhare and Ninoska Pereira

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Total 32 birds of different species including wild and domestic suffering from various affections which required surgical interventions were presented at Nagpur veterinary College, Nagpur. The anesthetic protocol included the gaseous general anaesthesia using halothane or isoflurane and injectable anaesthesia using a combination of xylazine and ketamine. The quality of anaesthesia was evaluated by monitoring various physiological parameters, reflexes, muscle relaxation and complications at different intervals before, during and after the surgical procedure. Isoflurane was found superior to other anesthetic protocols.

AVS 9

Management of avian bone fractures using different methods

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Total 32 birds of different species presented with different fractures were subjected to various immobilization methods best suited for the case. The data recorded was divided into equal groups that were operated by intramedullary pinning alone, intramedullary pinning and polymethyl methacrylate, external coaptation or plating. The evaluation of fracture healing was assessed by external palpation of callus, weight bearing or usage of wing/part and radiographic examinations. Intramedullary pinning was useful but limitations like micro movements and rotational instability were noted in long bone fractures. The thin avian bone cortex made placement of pins difficult. However, IM pin with PMMA overcame this limitation, offered instant stability of fractured fragments and immobilized fractures earlier than IM pin alone in birds. Advantages and limitations of each method were assessed.

AVS 10

Polypropylene prosthetics in the avian Veterinary field

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Birds often lose their appendages to kite string entanglement, electrocution and other traumatic injuries. Four such cases are presented. A black kite with an amounted right leg was maintained at the local wildlife rescue shelter and being treated for pododermatitis in the contralateral leg. A prosthetic leg was designed to help the bird bear weight. The kite recovered after 2 months of treatment and started bearing weight. An amputee male golden pheasant in the city zoo was perpetually on sternal recumbency as it could not bear weight on one leg. A polypropylene prosthetic leg was designed. The bird started walking around on day 2 of application of the leg. A peacock with malunion of tibiotarsal fracture was presented with no weight bearing on the affected leg. A customized polypropylene splint designed as a support brace was fitted. The bird showed immediate signs of weight bearing. 3D printed leg has been customized and designed for a bird with chronic contracture at the hock joint. The scope of veterinary avian prosthetics is immeasurable and hence reported.

AVS 11

Detection of Metallic foreign body by Computed Tomography and its Surgical Retrieval in a Falcon (*Falco berigora*)

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A Falcon (*Falco berigora*) was brought by the BSF and Bikaner Zoo officials suspecting a chip inside the body of the falcon. On official request a survey radiograph was taken which revealed presence of a foreign body in the pectoral area. After the X-ray report the BSF official demanded for the retrieval of the foreign body. After proper permission from the Department of Forest and Wildlife, it was decided that a CT scan is to be carried out for the confirmation of the shape and size of the foreign body. The falcon was anaesthetized with Inj. Ketamine hydrochloride @ 30 mg/kg and intubated. The CT scan revealed presence of a cylindrical foreign body of about 11 mm length and 0.8 mm diameter. An incision was given directly over the palpable foreign body which was situated subcutaneously. The foreign body was then removed intact. It was a chip like thing encapsulated in a cylindrical glass which was handed over to the Zoo and BSF officials. The wound was sutured in routine manner. Post operatively antibiotics and analgesics administered for five days. The falcon recovered uneventfully.

AVS 12

Correction of an oblique proximal diaphyseal fracture in tibiotarsus of a pigeon by retrogade intramedullary pinning

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A pigeon was presented to the Teaching Veterinary Clinical Complex, Pookode with the history of lameness in the left hind limb. Physical examination revealed crepitus at the proximal diaphyseal region of the left tibio-tarsus. Orthogonal radiographic views of the tibio-tarsus confirmed complete oblique diaphyseal fracture. Surgical correction was resorted to. Anesthesia was induced with butorphanol, ketamine and midazolam @0.5mg/kg, 15mg/kg and 0.5 mg/kg respectively, intramuscularly, and maintained on isoflurane. Retrograde intra-medullary pinning was performed using a 0.8 mm k-wire. The limb was bandaged close to the body to prevent movement. Post-operative analgesics and antibiotics were administered for one week. The bird had an uneventful recovery.

AVS 13

Correction of transverse diaphyseal fracture of ulna in an african grey parrot (*psittacus erithacus*) using k- wire

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A 1.5 year old male African Grey Parrot (*Psittacus erithacus*), weighing 0.4kg was presented with a complaint of difficulty to fly. The owner reported that it had met with an accident 1 week ago. On radiographic examination transverse diaphyseal fracture of right ulna could be detected. The bird was anaesthetised using buprenorphine, midazolam and ketamine at the rate of 0.2mg/kg, 1mg/kg and 20mg/kg body weight, intramuscularly, respectively.

The bird was maintained under anaesthesia with isoflurane using Jackson-Rees breathing circuit. The site was approached through a medial skin incision. 1mm K-wire was introduced in retrograde manner. The gap between the fracture fragments was bridged using hydroxyapatite biomaterial and the muscle and skin incision was closed. The wing was immobilised and post-operatively the bird was administered with ceftriaxone and meloxicam at the rate of 25 mg/kg and 0.2 mg/kg orally, respectively for 5 days. The bird had an uneventful recovery.

AVS 14

A rare case of cavernous haemangioma in a duck and its surgical management

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A four year old female duck was presented to the Small Animal Surgery Unit, Madras Veterinary College Teaching Hospital with the history of a round mass on the head for the past two months. The mass was increasing in size and overhanging the right eye since a week. On clinical examination, the mass was reddish, round, non – ulcerated and non – painful. On fine needle aspiration, the aspirate from the mass had numerous red blood cells. The condition was tentatively diagnosed as cutaneous tumor and surgical excision of the mass was opted. Under general anaesthesia, the mass was excised. Subcutaneous and skin was sutured together using PGA 3-0. Histopathological examination of the excised mass confirmed the condition as cutaneous cavernous haemangioma. Bird had an uneventful recovery.

AVS 15

Successful surgical correction of crop fistula in a pigeon

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A pigeon with the history of traumatic injury at crop was presented to TVCC, COVAS, Parbhani. Clinical observations revealed large fistula at the crop. Feed and water when consumed was drained out from the fistula of the crop. It was decided to perform suturing of fistulous tract. The site of wound was prepared aseptically, local anaesthetic infiltration and debridement of wound was done. Continuous lock stitch sutures were taken at the crop using 3-0 polyglactin 910 suture. The skin was sutured separately with nylon in simple interrupted pattern. Post operatively the pigeon was treated with isotonic fluids, antibiotics and analgesics for 3 days. The pigeon started consuming soft feed from 4th day and recovered uneventfully.

Equine Surgery Session

Medical *vs.* surgical colic in equine - A practical approach

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The equine digestive tract is unique in its ability to digest cellulose and other structural carbohydrates. This process is known as fermentation, which requires a special and complicated digestive tract. Fermentation yields copious amounts of gas due to the microfauna (bacteria and yeasts) required for digestion. Abdominal disorders in horses can be caused by many different problems including that of gastrointestinal tract, kidneys, liver and reproductive tract. The gastrointestinal disease, in particular, continues to be a common and potentially life threatening condition in horses of all ages and breeds. Colic is the common presenting sign in different abdominal affections. The goal of every examination of a horse with colic is to diagnose the disease process that is responsible for the signs of abdominal pain. This is not always possible because there are numerous causes of abdominal pain and the clinical signs of colic vary widely. 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 paralumbar 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 if 60-65 feet long and last 18 inch of small intestine with mesenry on both ends is ileum. The ileum joins the large intestine (cecum) and is identified by ileocecal 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 paralumbar 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 or 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 caecocolic 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 (LDDDLC and RDDLC). The loose mesentry 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, mesentry, 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 Stronglyle 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 cyathostominosis 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.

Epiploic foramen entrapment: On rare occasions, a piece of small intestine can become trapped through the epiploic 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 (Peduculated 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 epiploic 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 pathophysi-ological 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 COLICY 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, Opoid derivatives eg butophanol, 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/isofluorane 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 lavage 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 up to 72 hours to facilitate drainage of peritoneal fluids. The abdominal cavity can be lavage 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 lignocaine to stimulate the motility of intestine is recommended. Exercise as walk should be started after 24 hours of surgery. Combination of B-complex, Vitamin C, Vitamin E, Zinc and blood thinners may be administered orally to boost immune response and prevent post-operative complications. A secure abdominal bandage is mandatory to prevent wound related complications. Ultrasound examination of abdomen for peritoneal fluid accumulation is recommended. Concentrates may be avoided during recovery, however greens preferably grass hay can be given. Major complications of equine colic surgery include peritonitis, recurrence, laminitis and complications related with wound and recovery of animal from anaesthesia.

Prevention

Colic is still the number one cause of death in horses. Domestic horses evolved from wild horses. Wild horses were constantly active over 100s of acres, moving, grazing, and eating small and frequent meals of coarse grass. The intestinal tract was designed for this lifestyle. Then humans came along. Horses may be confined to a stall and fed a couple of meals per day. This works against normal intestinal function.

Colic can occur in even the most well managed horses, but good care will help to minimize the occurrence of abdominal pain. All horse owners should provide the following:

- Slowly change management and feeding regimens.
- Utilize a consistent feeding and management routine.
- Provide turn out or frequent exercise.
- Split meals into smaller amounts, i.e. feed 4-6 small meals per day, rather than two big meals.
- Feed high quality hay.
- Minimize the amount of grain fed; only using it for horses in active work. Pasture feed horses do not need grain.
- Implement a parasite control program.
- Provide constant access to clean, fresh water.
- Monitor late gestation mares and those that have had previous episodes of colic.
- Avoid feeding wheat straw, wheat and wheat flour to horses.

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EQS 1

Clinical management of contracted tendon with joint ill in foal

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A 3 days old foal unable to get-up normally and also to bear body weight was presented to the OPD unit of Surgery at TVCC. The clinical examination revealed congenital flexion of both the forelimb with bilateral oozing of pus from open fetlock joints. No bony deformity was detected following radiography. The findings confirmed the foal to suffer from contracted tendon (Knuckling) with joint ill and was planned to manage it without operative intervention, which involved the restraining of foal in lateral recumbency under mild sedation with Xylazine @1.1mg/kg body wt intravenously and irrigation of fetlock wound with normal saline and 5% betadine prior to the local application of cephalexin and povidone iodine paste. The contracted tendon was corrected by application of shin guard splint over the fetlock joint after mild extension of limb. Antibiotic (Oxytetracycline@ 5mg/kg body weight, I/V) and anti-inflammatory drug (Melonex@ 0.5mg/kg body weight, I/V) were continued for three days. Regular dressing and application of shin guard splint was practiced for 10 days which resulted to uneventful recovery.

EQS 2

Clinical management of superficial flexor tendon injury in Marwari filly

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A 2 years old Marwari filly with traumatic injury at distal end of the right side tibia on its planter surface from 10 days was presented at the TVCC, Deesa. The filly was unable to bear the body weight normally on hoof and also showed over extension of fetlock joint, pus discharge from wound and mild swelling of affected area. On palpation, the deep digital flexor tendon was intact but surrounding muscles were damaged severely which exposed the cut ends of superficial digital flexor tendon. The conservative treatment was applied which included the sedation of filly with Xylazine @ 1.1 mg/kg body weight I/V and cleaning of wound with 5 % betadine prior to immobilization of affected limb with PVC splint of approximately 2 ft length prepared from 2.5 mm diameter pipe, but it did not result into satisfactory healing and also caused another wound exactly on fetlock joint due to pressure sore. Consequently, a new orthopedic assembly prepared from stainless steel pipes was applied upto the hock joint to immobilize the limb completely. The wound was dressed daily with betadine and cephalexin powder was sprinkled locally besides parenteral administration of antibiotic and anti-inflammatory drugs for 5 days to control the infection. It was followed by dressing with hide ash and honey paste to hasten the wound healing. The wound healed completely after 40 days without any complications and the filly started weight bearing on affected limb after removal of orthopedic assembly but the normal gait was resumed after 6 months.

EQS 3

Diagnostic features and successful surgical treatment of sub-solar abscess in a horse

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This case study reports diagnostic features and successful surgical management of subsolar abscess in a horse. An 11 year old horse was presented with right hindlimb Lameness since 10-15 days. There was a history of shoeing 1.5 months back and no clinical improvement was observed following shoe removal and rest. Horse was observed keeping its right hind foot flexed while standing. Hoof tester examination revealed pain sensation on medial aspect, near toe region, at the level of white line where a minor wound was also recorded. On walk, Grade 4 lameness was observed. Foot flight and caudal phase of stride of the affected limb were decreased. Haematology indicated absolute neutrophilia with marginal leucocytosis. Radiographs of left hind hoof revealed radiolucent area on the medial aspect of hoof wall near the toe region extending up to the distal phalanx. Abaxial nerve block demonstrated marked decrease in lameness. Sub-solar abscess was debrided using a hoof knife to drain pus under general anaesthesia. Haemorrhage was managed with $KMNO_4$ crystals and bandaging. Postoperatively complete rest, reduced concentrate diet, antibiotics and analgesics were prescribed. Wound was daily flushed using NSS and padded dressing with Dicrysticin powder. Sole was protected using leather boot having wheat bran as cushion and hygroscopic material. After 3 months, complete healing of abscess occurred and horse became sound at all gaits.

EQS 4

Diagnosis and clinicosurgical management of secondary laminitis due to ovarian tumor in a Kathiawari mare

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A ten year old Kathiawari mare was admitted with history of lameness having quadrilateral laminitis and not responding to the treatment given by local veterinarians. Incidentally, the owner of the mare requested for assessment of reproductive system as the animal infertile since last two years. Ultrasonography revealed left ovarian tumorous mass which was planned for surgery. After standard preoperative preparation, the mare was operated for laparotomy through left flank under right lateral recumbency using general anaesthesia (TIVA). Tumorous mass was excised out following transligation of ovarian pedicle. The wound was closed by routine standard procedure. Postoperative fluid therapy for five days as well as antibiotics (Amoxicillin and sulbactum- 10 mg/kg, Gentamicin-4 mg/kg), analgesic (Flumixin Meglumine-1.1 mg/kg) and local wound dressing for ten days were instituted. Animal showed uneventful recovery and the laminitis also showed progressive resumption of normally over a period of two months.

EQS 5

Surgical and chemotherapeutic management of penile and preputial neoplasm in equine

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A four year old mule was suffering from penile and preputial neoplasia, was presented at Teaching Veterinary clinic Complex, College of Veterinary and Animal Sciences, G. B. Pant Univ. of Agriculture and Technology, Pantnagar. Diagnosis of neoplasm was based on history of the case, clinical examination as well as histopathological evaluation. Animal was held off feed for 12 hrs preoperatively and amoxicillin and sulbactum (@10mg/kg b.wt.) was administered prior to general anesthesia. Anesthesia was induced and maintained by infusion of xylazine (@1.1 mg/kg b.wt. I.V.) and ketamine (@ 2.2 mg/kg b.wt. I.V.) in 1:1 ratio. The neoplasm was surgically excise, including 1-2 cm surrounding healthy tissue. Closure of the incision was accomplished by using Vicryl No. 2. The postoperative antibiotic and anti-inflammatory were continued for 5 days. Chemotherapeutic management of neoplasm was managed by Vincristine sulphate @ 0.025mg/kg b.wt. intravenously for four week. Wound dressing using povidone iodine was performed twice daily. Animal were confined to a stall without exercise for 5 days after surgery and recovered uneventfully after 15 days. No further complications were observed after 60 days.

EQS 6

Ocular squamous cell carcinoma and its surgical management in kathiawari horse

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A four year old Kathiawari stallion was reported to Veterinary Clinical Complex, Tirunelveli with a history of a mass in the lower eyelid for the past 6 months. Physical examination of the eye revealed a large pinkish ulcerated mass in the lower eyelid infested with maggots. Ophthalmic examinations revealed obscured vision of the affected eye. Under xylazine (1.1mg/kg) -butorphanol sedation (0.1mg/kg), ketamine induction (2.2mg/kg) and xylazine-ketamine maintenance; the tumour mass on the lower eyelid was resected. Auto vaccine was prepared from the resected mass and it was administered to the animal for 1 month at weekly interval. The recurrence of tumour in another location of the same eye was noticed after two months and the same was excised under the above anaesthetic regimen. Histology of the excised tumour revealed nest of neoplastic keratinocytic cells thus confirming ocular squamous cell carcinoma. The vision restored with mild abnormality in the eyelid structure.

EQS 7

Right Dorsal displacement of the large colon as a cause of surgical colic in six horses

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Six Horses with mild to moderate abdominal distension and pain not responding to medicinal treatment were subjected to exploratory celiotomy under general anesthesia using Xylazine Ketamine and isoflurane combination.

The pelvic flexure was replaced in correct orientation after removal of intestinal contents through pelvic flexure enterotomy and cecotomy. The abdominal contents were lavaged and positioned normally, followed by peritoneal lavage and routine closure of the abdomen. Postoperatively Fluid therapy, antibiotics and analgesics were done. Out of six horses four horses recovered with minor wound related complications and two horses died one week post-surgery.

EQS 8

Surgical management of secondary entropion in mule - a case report

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Entropion is defined as the inward rolling of the eyelid margin in which the eyelashes and eyelid hair rub the cornea. A 03years old, mule stallion was presented with the history of epiphora and photophobia. Diagnosis was done on the basis of history, clinical sign and physical examination. Mule was treated by using Xylazine HCl @1.1mg/kg bwt and Butorophanol tartarate @0.01mg/kgbwt, I/V. Supra orbital nerve block done with help of Lignocaine hydrochloride 2% solution. Hotz-Celsus procedure was performed. The predetermined amount of skin and strips of the orbicularis oculi muscle was excised using sharp, straight scissors. Skin closure was done with the help of catgut 3/0 absorbable suture material with Simple interrupted pattern. Post operatively with Inj.-Fortified penicillin @22000 IU/kg bwt for 5days, Inj.-Phenylebutazone @6.6mg/kg bwt for 2days and ointment Neosporin. The animal recovered uneventfully and the sutures were removed on the 12th post-operative day.

EQS 9

Management of Chronic Laminitis in Equines - A review of 12 cases

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Chronic laminitis cases treated by local veterinarians with NSAID, steroid and antibiotics for several times failed to yield and such horses were referred to surgery department. Total 12 equines were treated for laminitis and out of 12 cases 4 cases were of private owners and 8 cases belong to state police department. All affected hoof belongs to forelimb and amongst that 9 horses showed bilateral laminitis. Symptoms of severe pain noticed; when affected foot touched to the ground and in 3 equines had frequently lay down tendency observed. Radiological examination showed marked rotation of pedal bone in affected hoof. Corrective hoof trimming and therapeutic heart-bar shoe were applied in all horses. Therapeutic shoeing provided immediate improvement in weight bearing in all animals. Medicinal treatment includes 8-12 liters fluid therapy, Inj. Furosemide 0.1 mg/kg i/v, Inj. Ceftriaxone Tazobactam 10 mg/kg i/v, Inj. Phenylbutazone 4ml/50kg deep i/m, Inj. Neurobion forte 5 ml i/v, Pow. Equimin 100gm/ day, Tab. Isoxipurine hcl 0.6mg/kg BID for 7 days along with light exercise, and for next 15 days orally Pow. Equimin 100gm/ day, Tab. Isoxipurine hcl 0.6mg/kg BID and Tab. Aspirin 5mg/kg BID were continued. Nine horses were recovered from laminitis and three horses failed to recover due to worst hoof conditions, whereas two equines showed reoccurrence of laminitis after 1 year.

EQS 10

Successful surgical management of mandible fracture in four years old Marwari stallion - A case study

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Four year old Marwari stallion was presented to the Teaching Veterinary Clinical Complex, College of Veterinary Science & A.H., JAU, Junagadh with history of inappetance, dysphagia, halitosis, salivation, oral haemorrahges, crepitus, abnormal incisor occlusion and discharging-tracts. On oral palpation open bilateral fractured in the rostral mandible caudle to incisor teeth was noticed and confirmed by radiological examination. Soft tissue structures adjacent to the fracture site also damaged. Preoperative adequate quantity of intravenous fluid broad spectrum antibiotic and analgesic was administered for stabilization of the patient. Before surgical reduction of fracture contamination near fracture site was removed and then lavaged with copious amounts of isotonic fluids (NS). Surgery was performed under general anaesthesia. Xylazine was given intravenously @ 1.1 mg/kg b.wt. followed by ketamine @ 2.2 mg/kg b.wt two minutes later and maintained with same mixture. Fracture was reduced and stabilized with interdental wires looped around the incisors. Post operatively I/V fluids, antibiotics for seven days and pain killers for three days were given. Fracture was healed quickly without any complications with good cosmetic appearance. The interdental wires were removed after six months and the animal made an uneventful recovery.

EQS 11

Retrieval of eye worms in standing horses

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

Department of Veterinary Surgery and Radiology, College of Veterinary Science & A. H., Navsari Agricultural University, Navsari - 396 450 (Gujarat)

Twenty five horses with varying degrees of corneal opacity, corneal oedema, epiphora, ocular discomfort and partial loss of vision of either side eye since 7 to 10 days are included in the present study. Ocular examination of the affected eye revealed presence of moving worm/s in the anterior chamber. The retrieval of these worms was achieved under xylazine sedation and retrobulbar nerve block in standing position either through a stab incision or by needle aspiration at limbus anywhere between 3 to 9 O'clock positions. Post-operatively; moxifloxacin, 6% sodium chloride and flurbiprofen were applied topically for 15 days. All the animals showed uneventful recovery.

EQS 12

Surgical management of third degree perineal laceration in three mares by spiral suture technique

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

Department of Veterinary Surgery and Radiology, College of Veterinary Science & A. H., Navsari Agricultural University, Navsari - 396 450 (Gujarat)

Three mares, aged between 4 to 5 years, were presented with the history of repeat breeding and wind sucking from the external genitalia after foaling complications. Clinical examination revealed third degree perineal laceration leaving behind a cloaca formation. Animals were dewormed and infused with intra-uterine antibiotics for two days beside evacuation of GIT using nasal drenching of liquid paraffin and kept off-feed for 48 hours prior to surgery. The

defects were aseptically reconstructed by Spiral Suture Technique in standing position under caudal epidural analgesia. Post-operatively, the animals were maintained on fluid therapy, antibiotics and NSAIDs for five days followed by oral feeding with gradual increase of quantum. Sutures were removed on 14th day post-operative. All mares showed uneventful recovery.

EQS 13

Endophthalmitis in horse: clinical presentation and its management

V. D. Dodia, T. V. Sutaria and P. T. Sutaria

Department of Veterinary Surgery and Radiology, College of Veterinary Science and Animal Husbandry, Junagadh Agricultural University, Junagadh - 362 001

An 8 years old mare presented with history of blindness and yellowish eye. On basis of clinical examination and diagnostic tests, the case was diagnosed as endophthalmitis. Endophthalmitis is a rare but sight-threatening complication that can occur after ocular surgery or trauma or as a consequence of systemic infection. Traumatic injury was etiology for said mare. To optimize visual outcome, early diagnosis and treatment are essential. Over recent decades, advances in hygienic standards, improved microbiologic and surgical techniques, development of powerful antimicrobial drugs, and the introduction of intravitreal antibiotic therapy have led to a decreased incidence and improved management of endophthalmitis. The mare was successfully recovered with treatment with normal vision.

EQS 14

Surgical management of recto-vaginal fistula in mares

Satbir Sharma, Deepak Kumar Tiwari, R. N. Chaudhary, Neeraj Arora, Ribu Varghese Mathew and Priyanka

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

Rectovaginal injuries during parturition are common in mares as compared to other domestic animals. Three mares of different age groups and variable parturition status were brought to Veterinary Clinical Complex having rectovaginal fistula after obstetrical manipulation at the field level. Haemato-biochemical analysis revealed parameters within the normal limits, however slight neutrophilia was observed in two mares. After proper debridement and under aseptic conditions, reconstructive surgery was performed by six bite suture technique using polyester no 5 in standing position in the trevis to create separate rectal and vaginal openings in all the three mares. All the three mares recovered uneventfully without any complications.

EQS 15

A case of preputial squamous cell carcinoma in a grey stallion

Mohammed Arif Basha K., Mudasir Ahmad Shah, A. M. Pawde, Kumar K., Pawan Kumar, Naveen Kumar Verma, Shivaraju S., Asif Majeed, Swapna C.R. and Amarpal

Division of Veterinary Surgery, Indian Veterinary Research Instuitute-243122.

A four and a half year old Grey Stallion was presented with the history of cauliflower like growth on the preputial orifice since a month. Abnormal posture while micturition along with stranguria was present. Clinical examination

revealed hard, ulcerated mass with maggots on preputial orifice causing interference with the protrusion of the penis. Enbloc surgical resection of the mass was performed under general anaesthesia using Xylazine (1 mg/ kg b. wt IV) followed by induction with Ketamine (2.2 mg/kg b.wt. IV, till effect). Histopathological examination of the resected mass revealed Squamous Cell Carcinoma. Animal was followed for about six months postoperatively without any evidence of recurrence.

EQS 16

Surgical removal of bony growth over cannon bone in a mare

Shivangi Diwedi, Rajnish Kumar, Satveer Kumar, P. Bishnoi, S. K. Jhirwal, Pratikshit Sanel and Neeraj Kumar

Department of Veterinary Surgery and Radiology, Rajasthan University of Veterinary and Animal Sciences, Bikaner (Rajasthan)

A 6 year old mare was presented at TVCC, RAJUVAS with the history of trauma to the cannon bone of right forelimb while loading three month ago. It resulted in the formation of proud flesh. Survey Radiographs revealed bone outgrowth at the affected side so it was decided to remove the extra tissue growth surgically. Mare was anaesthetised using a combination of Xylazine and Ketamine. Surgical site prepared aseptically and soft tissue growth was removed by blunt dissection. Bony growth was removed using mallet and chisel. After controlling hemorrhage aseptic dressing was done with ZIPP ointment and pressure bandage applied. Post-operative antibiotics, NSAIDs and supportive therapy was given for 5 and 3 days respectively. Animal recovered uneventfully

EQS 17

Squamous cell carcinoma of penile sheath in a horse

P. T. Jadhao, B. M. Gahlod, S. B. Akhare, S. V. Upadhye and Mayur Kate

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

A nine year old male horse was reported to the Teaching Veterinary Clinical Complex, Nagpur Veterinary College, Nagpur with a small ulcerative mass on the penile sheath and was gradually increasing in size since 3 months. Clinical examination revealed large sized growth attached firmly to the sheath extending caudally, pressing on the glance of the penis and preventing the erection of glance penis. The growth bleeds occasionally. The growth was excised under dissociative anaesthesia, however the blunt dissection was done and bleeding points were cauterized with the help of electrocautery. Histopathology of the tumour revealed a squamous cell carcinoma of penile sheath. Successful surgical management of squamous cell carcinoma in a horse was reported.

EQS 18

Successful Surgical management of left recurrent laryngeal hemiplegia in nine thoroughbred horses

R. V. Suryawanshi, Omkar Gajarlwar, A. H. Ulemale and Phiroz Khambatta

Department of Veterinary Surgery & Radiology, KNP College of Veterinary Science, Shirwal, Dist-Satara, Maharashtra

The present clinical study was carried on sixteen cases of thoroughbred horses with chief complaint like abnormal respiratory noise during work; respiratory distress, fatigue and progressive decrease in racing track performance. All horses underwent routine collection about disease history, stabling system, racing record and other concurrent

health problems. Haematological and biochemical examination showed non-significant changes. All horses undergone resting endoscopy of upper respiratory tract under nostril twitch and revealed that, 7 horses had grade-2LRLH; 4 had grade-3LRLH and 5 hoses showed grade-4 LRLH. Grade-3 and Grade-4 recurrent laryngeal hemiplegia in nine horses were corrected with Prosthetic Laryngoplasty in lateral recumbency position followed by Ventriculocordectomy under trip drip general anaesthesia protocol and received antibiotic, anti-inflammatory therapy and surgical wound management. The present clinical study summarized that, early diagnosis of left laryngeal recurrent hemiplegia in performing horses were treated successfully with prosthetic laryngeoplasty and ventriculocordectomy procedure with uneventful recovery.

EQS 19

Surgical management of high flanker in a Kathiwari stallion

S. Senthil Kumar, P. Tamilmahan, M. Vijayakumar, S. Vigneshwaran, S. Kathirvel, D. Vishnugurubaran and S. Dharmaceelan

Veterinary Clinical Complex, VCRI, TANUVAS, Orathanadu, Thanjavur, Tamil Nadu – 614 625

A three year old Kathiawari stallion was presented to Veterinary Clinical Complex, Veterinary College and Research Institute, Orathandu for gelding. Clinical examination revealed presence of one normal sized testis [right testis] in the scrotum. The left testis could not be palpated in the scrotum. Ultrasonography employing 3.5 mHz transducer revealed undescended testis measuring 6.8x3.7 cm in the distal inguinal canal with peripheral vascularity. Based on the clinical and ultrasonographic examination the case was diagnosed as a high flanker with retention of testis in the distal left inguinal canal. The animal was prepared for anaesthesia by withholding feed and water for 12 and 6 hours, respectively. Anaesthesia was induced with xylazine - ketamine and maintained with triple drip. Left testis was located employing transscrotal ultrasonography and brought to surgical site and immobilized for surgical intervention. Surgical removal of testes was done through scrotal incisions. The spermatic cord was ligated and transfixed using No.2 catgut and severed employing emasculator. The scrotal incision was left open to facilitate drainage and healing by second intention. Routine wound care with antibiotic administration resulted in an uneventful recovery.

Ophthalmology Session

OPT 1

Fundus imaging for various ocular affections in dogs

Adrian A. C., S. P. Tyagi, Amit Kumar, Adarsh Kumar, Manisha Thakur and Murtaza K. C.

Department of Veterinary Surgery and Radiology, Dr GC Negi College of Veterinary and Animal Sciences, CSK Himachal Pradesh Agricultural University, Palampur 176 062

The study was performed on the clinical cases of dogs presented in the department for various purposes over a period of one year. After a routine clinical ophthalmic examination, the pupil of all the dogs were dilated using topical '1% Tropicamide' and ophthalmoscopy was performed using different types of ophthalmoscopes. The dogs showing abnormal fundus were subjected to fundus photography, ocular sonography and other diagnostic procedures as per the individual need to ascertain the aetiology and to guide the therapeutic approaches. Overall, 37 dogs showed abnormal fundus and the conditions were broadly classified in to 5 different categories for ease of description. These included: retinal detachment (10), retinal vascular attenuation (8), retinal degenerations (7), retinal haemorrhage (7) and optic disc atrophy (5). There were interrelationships as well as overlapping of such fundic signs in many cases but for categorization, the most prominent sign was considered for a separate category. The paper primarily describes and document the ophthalmoscopic appearances of these fundic affections along with some pertinent case detail.

OPT 2

Successful management of chronic extensive effusive retinal detachment in a dog

S.P. Tyagi, Adrian A. C., Amit Kumar, Adarsh Kumar, Ajay Katoch and S Bansal

Department of Veterinary Surgery and Radiology, Dr GC Negi College of Veterinary and Animal Sciences, CSK Himachal Pradesh Agricultural University, Palampur 176 062

A 5 year old intact male sheepdog was presented with history of blindness for over a month. The patient suffered from high fever about 10 days before appearance of blindness; the fever was successfully treated by a local vet using antibiotics but the blindness remained unresolved at his level. The clinical ophthalmic examination and ocular ultrasonography revealed blindness associated with bilateral extensive retinal detachments and multiple focal sub-retinal haemorrhages. The eyes were however, normotensive, anterior segment was clear and no ocular discharge was evident. The patient was afebrile at the time of presentation and the blood examination revealed severe anaemia and thrombocytopenia as well as mild azotaemia and neutrophilia with normal leukocytic count. A few ticks were detected over its body. The dog was successfully treated over the next few months resulting in complete reattachment of retina and restoration of vision with gradual improvement in blood parameters. The reattachment of retinal layers after sustaining such an extensive retinal detachments and where institution of primary therapy was undertaken after such a long delay is rare. The paper describes the relevant case details, its diagnostic and therapeutic approaches sequentially.

OPT 3

Ophthalmological diagnosis and surgical management of cataract in dogs

S. K. Jhirwal, P. Bishnoi, Munna Lal, T. K. Gahlot

Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Science, Rajasthan University of Veterinary and Animal Sciences, Bikaner – 334 001

The present study was done on 24 cataractous eyes of 24 dogs to establish ophthalmological protocol for diagnosis of diverse types of cataract, to carry out surgical treatment of cataract eye by phacoemulsification technique and to implant Intraocular Lens (IOL) in select cases. All the animals underwent standard ophthalmological diagnostic procedure and Phacoemulsification technique was used to remove the cataractous lens in all the animals. IOL was implanted in 18 eyes only and rest 6 eyes were left aphakic. Complete ophthalmic examination was done with the help of visual function tests, tonometry, direct and indirect ophthalmoscopy, ocular ultrasonography and electroretinography. Bimanual endocapsular phacoemulsification under general anaesthesia maintained with 1-2% isoflurane inhalant anaesthetic. Sex wise incidence was found more in male than in female dogs. The average age of affected dogs was 7.8 years. Breeds wise highest incidence was found in Labrador retrievers and lowest in Mongrels. 02 dogs had unilateral while 22 dogs had bilateral cataract which were classified as juvenile, senile, diabetic and traumatic. 12 eyes had mature cataract and immature and hypermature in 6 eyes each. Intraoperative and postoperative complications were recorded. Vision was restored more successfully in eyes with immature cataracts than in eyes with mature and hypermature cataracts.

OPT 4

Removal of harderian gland for treatment of chronic cherry eye disease

Pragya Prakash Mishra, Sonu Jaiswal, Ranjeet Kumar, Ravi Prakash Goel, Parvej Ahmad and Kh. Sangetha Devi

Teaching Veterinary Clinical Complex, C. V. Sc. & A. H., NDUAT, Kumarganj- 224229, Faizabad, UP

Three different cases of chronic Cherry Eye disease in three different breeds viz. Neopolitan mastiff, Pug and Spitz, of dogs were brought to the Teaching Veterinary Clinical Complex, C. V. Sc. & A. H., NDUAT, Kumarganj during last year. The ages of the dogs were between 3 to 5 months. In all cases there was a history of protrusion of a pink mass from the medial canthus from last one month which was not responded to the medical treatment. The cases were diagnosed as Cherry eye or Prolapse of Harderian Gland. Because of chronic nature, removal of the gland was decided as the remedy in all the cases. General anesthesia was achieved using atropine-xylazine-kitamine combination. After washing the eye with NSS, ciprofloxacin eye drop was instilled. The gland was grasped and resected after applying a hemostat at its base. Then the conjunctival defect was removed using vicryl 3-0 thread in Cushing pattern. Eye was again washed with NSS and site was pressed with adrenaline soaked gauze to check the minor bleeding. Then antibiotic eye ointment was applied. A postoperative course of topical antibiotic eye ointment and drops, methylcellulose eye drops and systemic antibiotic was given for a week. No postoperative complications were reported and cases were recovered un

eventfully.

OPT 5

Studies on surgical management of prolapse of third eyelid gland in canines

K. R. Karup, P. V. Parikh, A. S. Parmar, D. A. Ratnu and J. K. Mahla

Department of Veterinary Surgery and Radiology, College of Veterinary Science and Animal husbandry, Anand Agricultural University, Anand -388001

The present study was carried out in sixteen clinical cases of dogs with prolapsed third eyelid gland that were randomly divided into two groups of eight dogs each and in one group repositioning was performed with Morgan's pocket technique (n=8) whereas in the other group modified Morgan's pocket technique (n=8) was performed wherein simple continuous suture pattern was over sewed with continuous Cushing suture pattern and compared. Operation was performed under general anaesthesia using propofol (4mg/kg, IV) as induction agent; atropine (0.03mg/kg, SC) as well as butorphanol (0.2mg/kg, I/V) as preanaesthetic agent and maintenance was done with isoflurane. In addition, the data regarding the incidence of prolapsed third eyelid gland was recorded and the variables like breed, sex, age and eyes affected were noted during last five years to study the epidemiological status of the condition. Out of the1093 ocular cases, there were 39 dogs (3.57%) representing 50 nictitans gland prolapses with 90 per cent of the first prolapse occurring before one year of age. Unilateral nictitans gland prolapse was observed in 72 per cent of the cases. Breed wise incidence was maximum in Labrador retriever (15%) followed by Beagle (13%), Neapolitan Mastiff (13%) and Rottweiler breeds (13%) with overall predominance of males (82%). The parameters studied included Schirmer tear test, nasolacrimal duct patency and intraocular pressure pre-operatively and on the 1st, 7th, 15th and 30th post-operative days. Intra-operative and post-operative complications, if any were also observed. Postoperative STT values significantly increased gradually in both the groups and almost reached the normal level by 30th post-operative day. There was a significant reduction in the fluoroscein passage time during post-operative days when compared to pre-operative days. The preoperative assessment of IOP was done as a prerequisity for general anaesthesia in ocular surgery and it was within the normal range with above mentioned anaesthetic protocol. The postoperative assessment of the normal range of IOP done also stated a normal aqueous humor dynamics.

OPT 6

Surgical management of 'cherry eye' using different surgical techniques

Pradeep Kumar, Gulshan Kumar, Sanjay Purohit and R P Pandey

Department of Veterinary Surgery & Radiology, College of Veterinary Science & Animal Husbandry, DUVASU, Mathura, U.P.-281001

Two cases of 'Cherry eye' one unilateral and other bilateral were presented in Rottweiler dogs of age 3years & 2 years respectively at TVCC. Both the animals were apparently healthy with temperature, respiration & Heart rate within normal limits. Clinical signs manifested were ocular discharge, conjunctivitis & protrusion of bright red mass along the medial canthus of eye. Ophthalmic examinations included Schirmer's Tear Test and direct

ophthalmoscopic examination. Preoperatively animals were treated for 2-3 days with Tobramycin-Dexamethasone eye drops instilled b.i.d. to rule out ulcer and reduce inflammation of eye. Anaesthetic management included premedication with Atropine Sulphate @ 0.04 mg/kg BW i/m, followed by sedation with Xylazine® @ 1-2 mg/kg BW i/m and induction with Ketamine 5-10 mg/kg BW i/m. Animal with unilateral affection was managed by Morgan's Pocket technique and bilateral affection was managed using Excision method along with bipolar diathermy for cauterization. Post-operative management included instillation of 2-3 drops of Tobra-D eye drops b.i.d., cyclosporine ointment application and Tab. Carprofen @ 2.2 mg/kg BW PO s.i.d. for 3-5 days. Animals recovered uneventfully, however post-operative STT value increased in Morgan's Technique while it decreased in Excision method.

OPT 7

Therapeutic management of unilateral chronic conjunctivitis in a mare

Kuldeep, Anil Kumar, Gaurav, Pratikshit Sanel, S. K. Jhirwal

A 10 years old Marwari breed police horse was referred to teaching Veterinary Clinical Complex, CVAS, Bikaner, Rajasthan, with history of unilateral chronic conjunctivitis, blepharospasm, and temporary vision loss in the affected eye. The animal was referred with a recommendation of surgical removal of the inflamed conjunctiva considering it as a neoplastic growth. Eye was stuck shut with crusty stuff built up at palpebral fissure. On clinical examination it was found that the palpebral conjunctiva was severely inflamed with a superficial necrotic layer causing complete closure of the palpebral fissure resulting in temporary vision loss of the affected eye. Gentle debridement of necrosed layer of conjunctiva was done under local infiltration of 2% lignocaine HCL. Therapeutic management was planned using eye drops Moxiflaxacin-dexamethasone, eye drop Flurbiprofen, eye drop Visiotear topically and injection Gentamicine 1ml + injection dexamethasone hcl 1ml subconjunctivally, injection gentamicin and injection flunixin meglumine parenterally. The conjunctivitis regress within 15 day.

OPT 8

Salvage of Female Chinkara (*Gazella bennettii*) with traumatic proptosis

Anil Kumar, Kuldeep, Shivangi, Gaurav, S. K. Jhirwal

A female Chinkara was presented at Teaching Veterinary Clinical Complex, CVAS, Bikaner, Rajasthan with chronic unilateral proptosis of right eye after an automobile accident. Clinical examination revealed chronic unilateral proptosis along with crustation of the cornea and inflammation of the ocular muscles. Reposition of eye ball was not possible manually and furthermore, the cornea was dried, so enucleation of eyeball was planned under general anesthesia. Animal was fasted for 12 hours period and surgical procedure was performed in gaseous anesthesia using 2% isoflurane. The palpebral fissure was closed with interrupted sutures using braided silk no.1 thread. Post-operative antibiotics and analgesics were given for five days, and antiseptic dressing was done using 5% povidone iodine. Sutures were removed 12th post-operative days. Animal recovered uneventfully on 20th post- operative days.

OPT 9

Fish scale derived scaffold for the treatment of corneal injuries

Melvin V. Jacob, Makkena Sreenu, N. V. V. Harikrishna and Manda Srinivas

Department of veterinary Surgery & Radiology, NTR College of veterinary Science, Gannavaram, Sri Venkateswra Veterinary University

Objectives: - To find the compatibility of the fish scale derived scaffoldon healing of induced corneal injuries in rabbits and to treat corneal ulcers in dogs.

Methodology: -Decellularization and decalcification of the fish scales were done and loss of cellular contents was confirmed by Haematoxylin & Eosin staining. Six adult New Zealand White Albino rabbits were induced moderate to deep stromal ulcers using 50% ethanol and manual scraping and six dogs with corneal lesions were subjected to grafting with fish scale derived scaffold.

Results & Conclusion: Rabbits and dogs showed excellent visual function score. Histologically the sections of rabbit cornea showed inflammatory cells at the sub epithelial regionbut the leucocytes and neo capillaries not invaded the graft.Fish scale derived acellular scaffold were well accepted by the host tissue and are ideal for corneal reconstruction and the novel scaffold is a promising biomaterial for corneal tissue engineering in terms of easy availability, high transparency and better biomechanical properties.

OPT 10

Platelet rich plasma for the treatment of corneal injuries

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Department of veterinary Surgery & Radiology, NTR College of veterinary Science, Gannavaram, Sri venkateswra Veterinary University

Objectives: -To find the compatibility of the platelet rich plasma on healing of induced corneal injuries in rabbits and to treat corneal ulcers in dogs.

Methodology: -Autologous platelet rich plasma was prepared by single step centrifugation with average two-fold increase in platelet concentration than whole blood. Six adult New Zealand White Albino rabbits were induced moderate to deep stromal ulcers using 50% ethanol and manual scraping and six dogs with corneal lesions were subjected to platelet rich plasma therapy. Platelet rich plasma eye drops applied 4 times a day.

Results & Conclusion: Rabbits and dogs showed excellent visual function score. Histologically the sections of rabbit cornea showed inflammatory cells at the sub epithelial region. Autologous platelet rich plasma eye drops are effective for regeneration of cornea by enhancing the rate of healing. PRP has the advantage of being a nonsurgical procedure in addition to low cost and ease of access for practitioners by centrifugation of the blood.

OPT 11

Processed human amniotic membrane grafting for treatment of chronic corneal ulcer in a dog

Sooryadas S., Nagashree V., Jineshkumar N. S., Reji Varghese, Dinesh P. T., Umesh C. G. and John Martin K. D.

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Corneal ulcers are common in veterinary practice. Simple corneal ulcers may heal without any much veterinary attention. Some become chronic, refractive to medical therapy and presented to referrals. An eight-year-old male Spitz was presented with a history of one-month old corneal ulcer (OS) refractive to medical therapy. Clinical examination revealed central corneal opacity with oedema, and vascularization from all four quadrants. Fluorescein dye test was positive. Under general anaesthesia, surgical management was resorted to. The ulcer bed and the surroundings were debrided and a decellularised, freeze dried human amniotic membrane was transplanted as an onlay graft and secured in position with 10-0 polyamide suture. Topical ocular medications were followed, and an Elizabethan collar was applied. The sutures were removed following incorporation of the graft. The chronic corneal ulcer healed completely with remarkable corneal clarity. A four month follow up with photographs is presented here.

OPT 12

Multi–modal therapy for melting keratopathy in ruminants - a review of four cases

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Stromal malacia or corneal melting is the rapidly progressive corneal deterioration. It occurs as a result of collagenolysis caused by collagenase liberation from microorganisms, white blood cells, corneal epithelial cells and keratocytes. The result is loss of rigidity and structure of the corneal collagen with subsequent sagging or oozing of the stroma over the ventral cornea or eyelid. This paper presents review of four cases of melting keratopathy in ruminants [cow (n=1), goat (n=3)]. All the cases were managed medically with EDTA solution, autogenous serum fortified with amikacin and hypertonic saline as eye drops. There was complete resolution of corneal melting, without any complications, and remarkable return of corneal transparency in all the cases.

OPT 13

Clinical evaluation of the various techniques for treatment of prolapsed gland of the third eyelid in dogs

Das Babita, Shahi Apra, Jawre Shobha and Singh Randhir

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The current study was undertaken to evaluate the clinical outcome and complications of various techniques in practice for correction of prolapsed gland of third eyelid in dogs. Six clinical cases presented to TVCC, College of

Veterinary Science were included, out of which one was diagnosed with unilateral prolapse and other five with bilateral prolapse. Traditional medication based therapy, Excision technique and Modified Morgan pocket technique were employed for the treatment. Cases subjected to surgical procedures were observed for 90 days postoperatively. It was observed that in the case subjected to Modified Morgan pocket technique, KCS was not developed due to unaltered tear production through repositioned gland system. Traditional medication based treatment did not cause significant regression or reduction in the size and state of prolapsed gland. It was concluded that the Modified Morgan pocket technique is a reliable and comparatively effective procedure for the treatment of prolapsed gland of the third eyelid in dogs.

OPT 14

Creating cataract in cadaveric pig eye

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Department of Veterinary Surgery and Radiology, Nanaji Deshmukh Veterinary Science, University, Jabalpur (MP), India

Ophthalmic surgical techniques *in vivo* to undergraduate and postgraduate students has been a challenging task, primarily because of low incidence of cases and delicacy of techniques. Current study adopted and evaluated two simple techniques described by previous worker to induce lens hardening in cadaveric pig eyes. For the procedure cadaveric pig heads were obtained from 6 freshly slaughtered pigs and were subjected to different mixture of fixative agents. Twelve pig eyes from 6 cadaveric heads were divided into 2 groups. In one group Formalin, Ethanol, and 2-Propanol at a ratio of 4:3:3 and in other group Formaldehyde and Methanol at a ratio of 2:1 were used for hardening of Nucleus .Extracapsular cataract extraction was performed in all the eyes twenty minutes after administration of fixative agents .It was found that Formalin, Ethanol, and 2-Propanol is a provided better hardening of nucleus as compared to Formaldehyde and Methanol mixture.

OPT 15

Surgical Management of cherry eye in dogs

Reena Nathani, S.V. Upadhye, S.B. Akhare, G.S. Khante, S.P. Salvekar, Gurnoor Kaur and Kamaljit Singh

Nagpur Veterinary College, Maharashtra Animal & Fishery Sciences University, Nagpur

Six cases of cherry eye condition in dogs of various breeds viz. Pug (2), Rottweiler (2) Lhasa Apso (1) and Beagle (1) were presented with the clinical signs of epiphora, inflammation of the conjunctiva, prolapse of nictitating membrane along with the gland, drying of cornea in two. All the dogs were below one year age and the condition was bilateral in two dogs. The surgical corrections were done all cases. In three cases, the pocket method was adopted whereas in three cases, resection of the prolapsed gland was performed. All cases showed resolution of the clinical symptoms, however in two dogs, dry eye syndrome was noticed. Recurrence was noticed in one case for which re-surgery was performed.

OPT 16

Surgical management of mature cataract by phacoemulsification in a cat

Anjan Kour, S K Mahajan, N Umeshwori and Nishant Verma

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

A 3 year old female cat was presented to Institutional Small Animal Hospital with a history of bilateral cataract since 1 year. Physical and ophthalmological examination was done. A positive PLR and Menace reflex was found. Ultrasonography of eyes revealed mature cataract in both the eye lenses with thickening of anterior lens capsule and no retinal detachment. Intraocular Pressure was 27mm Hg. A-scan Pachymetry was done to determine the axial globe length which was found to be 20.21 + 0.48mm and anterior chamber depth was found to be 4.99mm. Surgery was performed on the right eye under general anaesthesia. Phacoemulsification was done and the cataractous lens was removed. A course of systemic and topical antibiotics and steroids were given for a period of 1 month. Follow up of the case was taken after two months which revealed partial aphakic vision with no corneal opacity.

OPT 17

Management of corneal ulcers with conjunctival pedicle grafting

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The present study was conducted on six animals which were brought to the Teaching Veterinary Clinics, GADVASU with a history of deep corneal ulcer which were non responsive to medicinal treatment. After following the routine neuro-ophthalmic examination such as menace reflex, pupillary light reflex, palpebral reflex, fluorescein dye test, slit lamp examination, ophthalmoscopy and ultrasonography, conjunctival pedicle grafting was performed under general anaesthesia. Conjunctival pedicle grafting was done followed by tarsorrhaphy for ten days. Topical antibiotics were used for postoperative management. Graft was kept for a period of six weeks after which it was removed from the base. The animals had an uneventful recovery and normal restoration of vision.

OPT 18

Ultrasonographic morphometery of canine and bovine eye

Nishant Verma, S. K. Mahajan, Arun Anand and J. Mohindroo

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The present study was conducted on 20 cows, 20 buffalos and 20 dogs (10 Pug and 10 Labrador breed) with apparently healthy eyes. The objective of the study was to standardize the normal ocular biometric parameters which are corneal thickness (CT), anterior chamber depth (ACD, lens thickness (LT), vitreous

chamber depth (VCD), scleroretinal rim thickness (SRRT) and axial globe length (AGL) in bovine and canine eye. Pachymetry was also done to obtain central corneal thickness and was compared with B-mode ultrasonographic measurement for corneal thickness. The morphometrical mean values of corneal thickness, anterior chamber depth, lens thickness, vitreous chamber depth, scleroretinal rim thickness and axial globe length were obtained and analysed. Transcorneal two-dimensional ultrasound with 5-18 MHz transducer in dogs and with 5-12 MHz transducer in bovines was effective for evaluating and measuring various morphometric indices of eye. No significant difference was seen between right and left eye for all the morphometric indices. Generally, the values of all the morphometric indices of eye in the present study increased with age and weight of the animals. Pachymetry value for corneal thickness was significantly higher than B-mode ultrasonographic value, however, B-mode ultrasonography was reliable for measurement of corneal thickness.

OPT 19

Restoration of vision in a kid by phacoemulsification

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Bilateral phacoemulsification surgery in a month old kid was performed in Ophthalmology Unit of Department of Veterinary Surgery and Radiology, Madras Veterinary College. The kid was blind since birth with complete loss of visual reflexes. Detailed ophthalmic examination was carried out which revealed bilateral congenital cataract. Intra-ocular pressure was 26.9 mm Hg on the right eye (OD) and 18.6 mm Hg on the left eye (OS) with indentation tonometer. Ocular ultra sound scan was performed using 18 megahertz linear probe, which aided in providing prognosis with regard to regaining vision after surgery. Phacoemulsification was carried out under general anaesthesia with on both the eyes in one sitting. Post operatively the kid gained its vision and started to see the world.

OPT 20

Surgical management of nictitating membrane gland prolapse: review of 27 dogs in 37 eyes

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Dogs which underwent surgery for correction of Nictitating Membrane (NM) gland prolapse in Small animal Ophthalmology theatre, Department of Veterinary Surgery and Radiology, Madras Veterinary College during the period of 2017-2018 were reviewed in this study. Of the 27 dogs, totally 37 eyes were operated i.e., by modified Morgan's Pocketing technique in 24 eyes and nictitating membrane gland excision in 6 eyes. More number of cases were observed in puppies less than 6 months of age 55.55% (15 puppies), followed by 33.33% (9 dogs) of dogs between 7-12 months, 7.40% (2 dogs) 13 to 24 months and 3.70% (1 dog) more than 24 months. There was recurrence only in two dogs, for which NM gland was excised. One dog had suture

dehiscence after two months however there was no prolapse of the NM gland. The details of histopathological results will be discussed.

OPT 21

Unilateral bullous spectaculopathy in a rat snake

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An eight year old rat snake (*Ptyas mucosa*) was presented to Ophthalmology Unit of Department of Veterinary Surgery and Radiology, Madras Veterinary College with the history of swelling left eye for the past one month. Ophthalmic examination revealed normal right eye and the left eye was buphthalmic with neovascularisation in the spectacle. Bullous spectaculopathy is accumulation of clear fluid in the sub-spectacular space between the spectacle and cornea that presents as a bulging of the spectacle. Ocular ultrasonography aided in confirming the bullous spectaculopathy and fluid was drained using 24 G needle and insulin syringe. Enrofloxacin and Prednisolone was administered at rate of 5 mg/Kg body weight PO and 1mg/Kg body weight PO for 7 days. Recurrence was noticed after 10 days and oral examination revealed tumour mass inside the upper jaw. The details of patency of nasolacrimal duct and histopathological results of the case will be discussed.

OPT 22

Electroretinography: a testimony to retinal functions in dogs

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Present study was conducted to evaluate the functional status of retina by pre and post cataract surgery electroretinography using HMsERG system in dogs. All the dogs (n=8) were examined for preoperative ophthalmic status with the help of visual function tests, tonometery, direct and indirect ophthalmoscopy, ocular ultrasonography and ERG as per the methods adopted from Gelatt and Wilkie (2011) and Ofri (2006). The ERG finding of cataractous eyes in terms of amplitude, implicit time, and the b/a-wave amplitude ratio were statistically evaluated with reference values of normal eyes ERG recorded with the same system and protocol in non cataractous eyes for the same species. Out of 8 eyes in which preoperative ERG was conducted, 4 eyes showed non-significant difference in all the protocols of ERG while in rest 4 eyes difference was highly significant. After evaluation of ERG results, it was assumed that the eyes with non-significant difference will result in good post-operative results while the eyes with significant difference in ERG will result in poor post-operative outcome. Even then, after taking consent of owner the cataract surgery was performed in all the eyes. As assumed, the 4 eyes with non-significant ERG gained vision while 4 other eyes with significant difference did not gained vision even after successful cataract surgery. Post-operative ERG was performed to confirm the findings of preoperative ERG. It was concluded that the preoperative ERG is a testimony to retinal functions when the optic system is not transparent due to cataract.

OPT 23

Comparison of extracapsular lens extraction and phacoemulsification techniques for treatment of cataract in dogs

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Eighteen adult dogs were subjected to the extracapsular and phacoemulsification techniques for treatment of cataract and randomly divided into two groups, Group A (Extracapsular cataract extraction) comprising of 6 dogs and Group B (Phacoemulsification technique), comprising of 9 dogs to surgically resolve cataract. Each case was subjected to a thorough clinical and ophthalmic examination and results of the study were documented with respect to ophthalmic examination, surgical procedure, tonometry, haematological and complications if any to evaluate the quality of vision pre- and post-operatively. The post- operative complications included of uveitis. Qualitatively, dogs belonging to group B showed better results as compared to group A. The present study concludes that, Phacoemulsification technique was found to be relatively superior as compared to extracapsular cataract extraction technique.

OPT 24

Surgical management of limbal dermoid in a belgian malinois pup – a case report

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A two month old Belgian Malinois pup was presented with limbal hair growth and central corneal ulcer. The congenital choristoma was surgically excised completely by superficial keratectomy post healing of the central stromal ulcer by cicatrical healing on medical management. Upon histopathological examination of the excised tissue, ectopic lacrimal glands, hair follicles, osseous tissue were evident. This coupled with clinical signs, the choristoma was diagnosed as a limbal or epibulbar osseous dermoid (Mann's II). The limbal dermoid predisposed the incidence of central stromal ulcer which was successfully managed with topical and systemic medications. As for the limbal dermoid, surgery was curative and healing was uneventful.

OPT 25

Emergency management of conjunctival foreign body in a mongrel: a case report

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A year old male mongrel dog referred for acute blepharitis of left eye was diagnosed with a foreign body lodged in his right conjunctival fornix. Emergency ophthalmic examination and intervention by ophthalmoscopic examination and digital palpation help elucidate the presence of a block of charcoal which was removed under general anaesthesia. The patient made an uneventful recovery in a period of forty-eight hours due to timely diagnosis and intervention.

OPT 26

Management of canine glaucoma by trabeculectomy and glaucoma shunts -four case reports

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A case of unilateral (left eye) congenital glaucoma along with lens subluxation in a two month old male mongrel pup, unilateral uveitic glaucoma (right eye) along with inciting co-morbidities of lens luxation and retinal detachment in a year old female German Shepherd dog and bilateral chronic or primary open angle glaucoma in an eight year old male Basset hound and a four year old neutered male Spitz were all surgically managed by trabeculectomy successfully. The younger dogs showed sustained improvement for a follow up of three months. The right of the Spitz and Left eye of the Basset hound were surgically managed successfully by trabeculectomy. Whereas, the left eye of the Spitz and the right eye of the Basset hound with the chronic open angle glaucoma were subjected to placement of Keiki Mehta BP Valve shunts primarily. The implants were successful in regulating the intraocular pressure for a period of four weeks following which they unfortunately gave away due to external factors. The Spitz was wrongly administered an antibiotic eyedrops with a steroid instead of a sole antibiotic eyedrops by for a week which led to erosion of the limbal and scleral margins surrounding the implanted shunt. The Basset hound had erosions and dehiscence due to his futile attempts to remove the Elizabethan collar. This led to inadvertent erosion and loss of limbal-scleral tissues along with the shunt. Hence, upon healing of the erosions, trabeculectomies were performed for both eyes which provided sustained and effective regulation of intraocular pressure. The mongrel pup also had an anterior lens luxation which was managed by ICCE and his posterior segment structures were normal upon B-scan. Thus, he regained aphakic vision on his left eye with his glaucoma regulated post -trabeculectomy. The German shepherd had unilateral uveitic glaucoma associated with anterior lens luxation which was also managed by an ICCE following a trabeculectomy. On indirect ophthalmoscopic examination, the lens was found luxated antero-medially and hence temporally, a retinal detachment could be made out. This was confirmed on B-scan pre-operatively. The Spitz had bilateral retinal degeneration and the Hound also had anterior lens luxation of his left lens diagnosed pre-operatively as co-morbidities and inciting factors. The luxated lenses were extracted intracapsular prior trabeculectomy in all the cases. All the cases made uneventful recovery within four weeks of trabeculectomy surgery and with aphakic vision in case of the pup alone. The Spitz and the Shepherd did not recoup from visual loss but the glaucoma was successfully managed with vision restored on their left eyes. The Basset Hound suffered vision loss in spite of successful management of glaucoma on both eyes. The techniques of surgery, complications and management of the four cases will be discussed.

OPT 27

Successful surgical management of KCS condition by parotid duct transposition in dogs

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Keratoconjunctivitis sicca is a very common problem in dogs and can lead to severe damage to the eye. Bilateral parotid duct transposition was attempted under sedation with Triflupromazine HCl, induction with propofol and isoflurane 2.5% for maintenance in 3 dogs. All the cases showed excellent recovery post-surgery and evidence of salivary discharge through eyes when dog ate was reported by owners. The Stenson's duct was identified with the help of 24G catheter and diluted Lugol's iodine flushing was done to colour the duct. The duct was separated by taking a linear incision above the masseter muscle and then by blunt dissection.

OPT 28

Conjunctival dermoid in a labrador and its surgical correction – a case report

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A dermoid is a benign congenital mass of ectodermal and mesodermal origin, usually affecting the lateral limbal region. It may also involve the cornea, sclera, conjunctiva and eyelid. A one-year-old male Labrador dog was presented with a history of hair growth on the conjunctiva, since birth. Clinical examination revealed dermoid on the conjunctiva. Following general anesthesia the conjunctival dermoid was excised. The incision edges were then apposed with PGA 5-0 suture. Post-operatively the patient was medicated with topical antibiotic and analgesic eye drops for 5 days and advised application of Elizabethan collar. The animal had an uneventful recovery.

OPT 29

Uberreiter's syndrome in German shepherd dogs and its management – Report of two cases

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Uberreiter's syndrome is a chronic immune-mediated keratoconjunctivitis syndrome affecting the cornea and conjunctiva in dogs. Two GSDs (6 yrs intact female and 10 yrs intact male) were presented with history of mucopurulant ocular discharge with corneal granulation (OU) from past one month and no history of any injury. Fleshy, vascularized lesion starting from nasal limbus extending to central cornea was noticed. Cobblestone appearance and crystalline white spots were seen over the corneal granulation. Corneal ulceration was ruled out. Based on signalment and clinical findings, the condition was diagnosed as chronic

immune-mediated superficial keratoconjunctivitis / Uberreiter's syndrome. Topical ocular medication with 1% prednisolone eye drops was initiated q.i.d. until adequate regression of the lesion was observed and was then followed by topical tacrolimus ophthalmic ointment which was then advised to be continued long. The characteristics of this immune mediated eye disease, and ocular changes following treatment is being presented here.

OPT 30

Uveodermatologic syndrome in a spitz and its management – a case report

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Uveodermatologic syndrome is an autoimmune allergic condition causing depigmentation of eye lids, mucocutaneous junctions and perioccular area in dogs. A 3 year old Spitz was presented with with history of red eye, ocular pain and reddish petechial lesion over nostrils and surrounding region. Clinical ophthalmic examination revealed anterior uveitis, depigmentation of eyelids, lips, nasal planum and vitiligo on face and footpads which grossly confirmed Uveodermatologic syndrome. The case was managed with systemic prednisolone tablets @ 2 mg/kg b.wt., initially and later in tapering doses as the clinical signs subsided. Oral antibiotics were also given for a period of ten days. Animal had an uneventful recovery.

OPT 31

Anterior chamber irrigation-aspiration in a dog with hyphema – a report

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Hyphema is the presence of blood in the anterior chamber of eye, commonly resulting from haemorrhage of the iris and ciliary body. An 8 years old female dog was referred with two-month old history hyphema (OD). Dog had cataract (OU) past one year. ECCE was performed (OS) three months before. Hyphema (OD) was reported few weeks post-ECCE (OS), and persisted throughout. Ocular ultrasonography (OD) did not reveal any abnormality, except for thickened iris. Under general anaesthesia, anterior chamber irrigation-aspiration was performed using a balanced salt solution, and the anterior chamber was cleared off the chronic hyphema. Post-op topical ocular medications with antibiotic, steroid and cycloplegic eye drops were followed for two weeks. The case in detail is presented here.

OPT 32

Extracapsular lens extraction for management of cataract and anterior lens luxation: a report of four cases

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Four geriatric dogs with impending signs of complete or partial blindness presented to University Veterinary Hospitals Mannuthy and Kokkalai were included in the study. Detailed ophthalmic examinations including visual function test, ocular tonometry, direct ophthalmoscopy, indirect ophthalmoscopy, slit-lamp biomicroscopy and ultrasonography were conducted in all the cases. Out of four cases, one was a capsular and another one was acortical hyper mature cataract. Slit-lamp examination revealed subluxation of lens into the anterior chamber in three cases. Extracapsular lens exatraction was performed in all the cases through a para-limbal corneal incision under general anaesthesia. Temporary tarsorrhaphy was performed to protect the surgical site. Post operatively, the animals were maintained on topical antibiotic, anti-inflammatory and homatropine eye drops and, systemic antibiotic therapy. All the animals showed positive visual function tests by seventh postoperative day and had an uneventful recovery, except in one which developed *pthisis bulbi* as a complication.

Orthopaedic Surgery Session

Challenges and advancement in orthopaedic procedures for long bone fracture fixation in farm animals

Dr. M. Raghunath

Professor of Surgery

Appendicular fractures are common in farm animals, and often occur following fall, trauma or during handling of a dystocia in calves. The most common bones involved in fractures of cattle are the metacarpus and metatarsus, followed by the tibia, radius and ulna, humerus, and femur. Each bovine patient with a fracture is unique and presents various challenges requiring careful judgment. Decision analysis is always part of clinical cases in any species, but economic factors are a particularly significant influence on decision analysis for cattle under consideration for treatment because of the requirement for economic returns in nearly every case. Every animal with a fracture is different. Every owner, farm manager, and rancher brings a different set of circumstances and expectations. In cattle, return to productivity after fracture repair should be of acceptable quality so as not to negatively impact growth for meat production, cause a decrease in milk production, or interfere with reproductive efficiency, including embryo or semen production and natural service breeding.

Most cattle are favorable patients for treatment of fractures because they have a calm demeanor, are capable of spending most of the time lying down during convalescence, have tremendous potential for bone healing because of vascular density and enhanced cambial layer to the periosteum, infrequently suffer permanent contralateral limb breakdown or stress laminitis in the unaffected limbs, and usually do not resist having orthopedic devices (eg, splints, casts, external skeletal fixators) on their limbs. Closed fractures are expected to heal in most cases, whereas open fractures are more likely to suffer complications such as sequestration of bone, delayed union, or nonunion. The temperament and behavior of the animal can improve or worsen prognosis. Proximal limbs injuries, such as humeral or femoral fractures, have greater soft tissue support and collateral blood supply, but are more difficult to stabilize than more distal fractures. External coaptation devices are more easily adjusted to forelimb injuries than hind limb injuries.

EMERGENCY TREATMENT:

Treatment of the patient and injured limb including temporary stabilization of the fractured limb often makes the difference between success and failure. Temporary stabilization of limb fractures should be attempted before moving the animal or if possible before attempting to get the animal to stand. Fractures distal to the level of the mid radius or mid tibia may be temporarily stabilized with full-limb splints or casts. In the authors' experience, field stabilization of fractures proximal to this level should not be attempted in adults because these efforts often result in the creation of a fulcrum effect at or near the fracture site, exacerbating soft tissue trauma and increasing the risk of neurovascular damage or creation of an open wound. Distal limb injuries are readily immobilized by the application of a rigid splint or a cast. Although these forms of external coaptation may be applied as a temporary means of immobilization of the limb, these appliances must be sufficiently strong to withstand the forces applied during rising, standing, and walking. Rigid splints are

constructed by application of a Robert Jones bandage and including 2 splints placed 90° apart (eg, caudal and lateral aspect of the limb).

METALLIC 'U' SPLINT WITH PLASTER OF PARIS CAST:

This external coaptation procedure is indicated for all distal radius ulna, metacarpus, metatarsus and digit fractures. The metallic U splint is indigenously designed and is made of cast iron in the shape of U that is placed in cranio caudal aspect of the limb pacing between the hooves in the inter digital space. The animal is placed in lateral recumbency with the affected limb up and after applying traction and counter traction, a double layer of cotton padding is done involving the joint above and below the fracture. A layer of roller bandage is used to stabilize the cotton followed by multiple layer of POP cast is applied. The metallic splint is then stabilised to the limb according to the contour with umbilical tape. Finally, another multiple layer of POP cast is applied which when dried provides an effective stabilization for distal bone fractures. At present this method is widely used for distal limb fractures of large animals at surgery ward of VCC, NTR CVSc, with high success rate.

CASTING:

Half-limb casts (also called low-limb casts or short casts) can be used for immobilization of phalangeal fractures and for distal metacarpal or metatarsal physis fractures. The cast is placed from a point immediately distal to the carpus or hock extending to the ground and encasing the foot. The dewclaws and the top of the cast are padded, but only stockinette or foam resin padding is placed on the remainder of the limb. Thick padding, placed along the entire limb, quickly becomes compressed, leaving room for the limb to move within the cast and displacement of the fracture to occur. Full-limb casts are used for fractures occurring at or proximal to the mid metacarpus or metatarsus, but distal to the mid radius or mid tibia. Full limb casts are placed similarly to half-limb casts, but the bony prominences of the accessory carpal bone, styloid process of the ulna, calcaneous, and medial and lateral maleolus of the tibia must be padded. Newer fiberglass casting materials are more resistant to breaking and do not weaken when wet if sufficient cast material is used. Casts may be maintained in calves for up to 6 weeks without being changed. Fractures in adult cattle may heal within 8 to 10 weeks, but often require 12 to 16 weeks for clinical union to occur.

TRANSFIXATION PINNING AND EXTERNAL SKELETAL FIXATION:

External skeletal fixation (ESF) refers to the stabilization of a debilitating musculoskeletal injury (typically fractures but also joint luxation or tendon rupture) using trans fixation pins (or trans cortical pins) and any external frame connecting the pins and spanning the region of instability. The goal of trans fixation pinning and casting (TPC) is to provide a sustainable, comfortable means to return the patient to weight bearing (or function) as soon as possible after surgery, to maintain normal joint mobility, if possible, and to provide an optimal environment for osteosynthesis and wound healing. Mechanical breakdowns of external skeletal fixators include failure of the implants (bending or breaking of the pins), sidebars, or clamps because of acute failure or cyclical fatigue. These potential problems have contributed to the slow and cautious adaptation of ESF in large animals. Use of ESF in ruminants has also been impeded by economic constraints.

ESF is being increasingly used in cattle, sheep, goats, llamas, and ratites.

IMPLANTS AND TECHNIQUES:

The materials used for fracture reduction and internal fixation include Rush pins, Intramedullary Steinmann nails, or interlocking nails and plates of various shapes and sizes. There are few implants designed specifically for cattle and few studies on implants for use specifically in cattle. Implants have been modified considerably over the years, and ones such as the clamp rod internal fixator are no longer readily available for large animals. New implants such as locking compression plates (LCP) or custom-made implant systems have been successfully introduced. No extensive studies have been published on the new locking plate system in cattle. A particularly strong plate developed for fractures in horses called the Equine 5.5 broad LCP can also be used in cattle.

Plates and Screws:

Plating provides the most rigid form of internal fixation in ruminant orthopedics. Conventional dynamic compression plates (DCP) and cortical and cancellous screws are being replaced with LCP with locking screws. LCP have combi holes and, therefore, are compatible with conventional as well as locking screws, which means that they can be used in dynamic compression and locking fashion. Dynamic compression plating can function well only when there is no or only minimal motion between the plate and bone. A DCP must be contoured precisely and attached firmly to the surface of the bone for ideal friction. When the plate is not contoured accurately, the fragments can move during cortical screw insertion, which leads to primary loss of reduction. With optimal reduction, cyclic loading forces encountered during standing and movement can lead to loosening, bending, or breakage of the (conventional) screws and resultant displacement of the plate and fragments. This process is called secondary loss of reduction. Locking plates and screws prevent primary as well as secondary loss of reduction. Primary dislocation of fragments is not possible, because the thread in the screw head is inserted in the thread of the plate and the bone is not pulled toward the plate. A strong unit is created after insertion of the screw head in the locking plate, which accounts for the lack of movement between the plate and screws, even under load. The fracture configuration, possible approach (es), and presumed tension side of the bone(s) are considered before application of the plate(s) to the bone surface. The fragments are repositioned and held in place with large pointed reduction forceps. Several 3.5-mm cortical screws are placed, usually in a lag screw fashion, to maintain the position of the fragments temporarily. The reduction forceps are removed so that they do not interfere with plate application. In cases in which the 3.5-mm positioning screws are not removed, the screw head must be recessed into the cortex so the plate can be applied over it. Otherwise, the positioning screws are removed once the larger (lag) screws in the plate have stabilized the bone. Multiple fragments are repositioned and held in place with lag screws to compose 2 main fragments and then adapted as described earlier.

Double plating is recommended for most long bone fractures in mature cattle; 1 plate is placed on the tension side of the bone and the second at a plane rotated by 90° relative to the first. This technique strengthens the torsional and bending strengths of the constructs considerably. To avoid stress concentration

in the diaphysis, where secondary fracture is more likely, the plates should begin and end in the metaphysis and be staggered in their relative proximal and distal orientation. Staggering prevents stress concentration at the plate ends and facilitates screw placement. Screws should be placed in all of the plate holes, because empty screw holes present a site of weakness that breaks under load. In cattle heavier than 200 kg, 5.5-mm cortical screws are recommended. Locking or locked plates act as rigid internal fixators, because of their proximity to the bone and fracture site. They are more resistant than compression plates, because they convert shear stress to compressive stress at the screw-bone interface. For these reasons, locking plates cannot be used as buttress plates; cyclic compressive loading with a fracture gap leads to plate fatigue and breakage. The LCP are particularly suited for osteopenic or osteoporotic bone. This feature should provide better stability in the long bones of newborn calves. A disadvantage of locked screws is that they cannot be inserted on an angle, for example, across a fracture line or to avoid a joint or the screws of another plate in double plating techniques.

Intramedullary interlocking nailing:

It is the widely used internal fixative technique in human long bone fracture repair, proved with good clinical outcome and minimum postoperative complications. The interlocking nail system (ILN) for fracture fixation consists of an intramedullary nail with holes distributed over its length to accept interlocking screws or bolts. The device utilizes a precision drill jig to aid the surgeon in accurate placement of the interlocking screws/bolts through the holes distributed in the nail without the need for intraoperative fluoroscopic guidance.

The interlocking nail can counteract not only bending, but also the rotational and axial forces and are biomechanically advantageous as the nail is situated along the central mechanical axis of the bone. The substantial benefits documented with the use of IL nail over the use of plates for similar fractures include reduced infection rates, reduced blood loss, reduced surgical time and shortened hospitalization. The IL nail overcomes many of the limitations associated with the IM pins including collapse of the comminuted fractures, rotational instability and pin migration. The function of IL nail is to stabilize the fracture fragments allowing the load transfer across the fracture site while maintaining anatomical alignment of the bone. The inherent mechanical strength of IL nails and bone screws that pass through the bone and nail help to control rotational and shear forces.

Implant equipment for large animals:

The design of the nail is same as described above with a difference in their diameters and lengths. The different diameter nails designed, the sizes of drill bits, taps and screws are given in Table 2. Bone reamers with diameters ranging from 10 to 15mm are used to ream the bone so that a maximum diameter nail can be used for fixation in large animals. The other accessories are same as described above. To drill holes in the bone for screw fixation, either battery operated drilling machines of 9.5v and 14.4 v or pneumatic orthopedic drill with high rpm which run with compressed air are used These power drills are chemically sterilized and help in quick and effortless drilling there by reduces the operating time.

Table 1: Diameter of nails with their corresponding drill bits, taps and screw diameters.

Nail diameter (mm)	Drill bit diameter (mm)	Tap diameter (mm)	Screw diameter (mm)
12	3.2	self tapping	4.9 self tapping interlocking bolts
14	3.2	self tapping	4.9 self tapping interlocking bolts
16	6.0	self tapping	7.5 self tapping interlocking bolts

Surgical Technique:

Open fracture reduction is done. After initially entering the medullary canal with a simple Steinmann pin of appropriate size using a Jacobs's chuck, the nail was inserted into the medullary cavity in a normograde fashion. The nail being attached to the right-angled aiming device by extension rod remained inside the medullary canal with the aiming device exactly parallel to the nail outside the bone. Fractured ends were reduced as close as possible to the normal anatomical reduction and nail was driven further into the distal fragment. Insertion handle was then removed and nail – aiming device complex was not disturbed there on. The distal fragment was locked first with the cortical screws of appropriate size after drilling and tapping the bone with appropriate size drill bit and tap according to the diameter of the nail. Similarly, the proximal fragment was locked. The number of proximal holes to be locked was determined intraoperatively depending upon the severity and instability of the fractured bone. Once the fixation was over, the aiming device was detached by loosening the extension rod. Ancillary support with full cerclage wires was provided to fractures that had comminution and fissures along the longitudinal axis.

ORS 1

Role of demineralized bone matrix (DBM) in healing of femur fracture in dogs

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The incidence of fractures in dogs from April 2017-May 2018 was recorded. A total number 500 cases of dogs were reported to the surgical unit of TVCC (Referral Hospital) out of which 52 cases (10.4%) suffered from fractures. Non-descripts and GSD breeds, male, and younger dogs of 6-8 months were more affected with fracture. Tibial fractures were more than femur and humerus fractures. Road traffic accident was the most common cause of fractures. Eight clinical cases of dogs brought to TVCC, having femur fracture, were divided into two groups, A and B with four dogs (n=4) in each group. Femur fractures were stabilized by intramedullary pinning (IM) alone and along with an allograft (DBM) in dogs of groups A and group B respectively. The efficiency of healing in dogs of both groups was studied on the basis of clinical signs, haemato-biochemical and radiographic parameters on the day of admission (day 0), followed by 7th, 15th, 30th, 45th and 60th post-operative days. The mean values of Hb, PCV, TLC and DLC showed a non-significant variation on subsequent post-operative days. The weight bearing was observed to be good in dogs of group A. The serum calcium showed a significant increase up to 30th post- operative day and thereafter, followed a decreasing trend. The serum alkaline phosphatase values increased significantly on 15th post-operative day, thereafter decreased significantly ($P<0.05$) on subsequent post- operative days. Swelling was completely absent after 15th post-operative day in dogs of both the groups. Radiographically, the dogs of group B showed better fracture healing than those of group A and better callus formation was observed in dogs of group A.

ORS 2

Comparative evaluation of veterinary cuttable plate and polypropelene mesh impregnated PMMA plate for fracture repair of tibia bone in goats

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The study was conducted in 12 goats with tibia fracture and these goats were randomly divided in two groups with six animals each. In group I, the fractures were immobilized by internal fixation with Veterinary Cuttable plate (VCP) and in group II, the fractures were immobilized by polypropelene mesh impregnated

PMMA plates and evaluated based on weight bearing and radiographic evaluation to study the healing of fracture with both plates.in group I, the animal showed mild to moderate weight bearing by 0 to 15th day and group II, the animals showed mild to moderate weight bearing by 7th to 15th day. Both the groups showed good to very good weight bearing by 30 to 60th day. Upon radiography, the group I showed minimal callus at the fracture site whereas, the group II showed more callus formation on the far cortex side. It could be concludedfrom study that The polypropelene mesh impregnated PMMA plates has sufficient strength to

provide stability of fracture site The veterinary cuttable plate provide slightly better stability at fracture site compared to polypropelene mesh PMMA plates as evidenced by radiographic study. Both the plates are very much economical and feasible for use in internal fixation in goats.

ORS 3

Mesoporous bioactive glass in combination with growth factor (IGF-1) for in vivo bone regeneration in animal model

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To understand bone regeneration efficacy of different Mesoporus bioactive Glass(MBGs) synthesized in different methods and standerrized in simulated body fluid with and without loading Insulin-like growth factors (IGF-1) in animal bone defect model.

MBG prepared from different surfactants, viz., CTAB (Cetyltrimethyl ammonium bromide), PEG(polyethylene glycol) and P123(Pluronic® P-123-Mn-5, 800) (samples renamed as M1, M2 and M3 ,respectively) in stimulated body fluid (SBF) study revealed decrement of Ca2+ and PO43- ions concentration in supernatant and formation of calcium carbonate (CaCO3) and hydroxyapatite (HAp) phase over 14 days of studies. Formation of apatite layer was further confirmed by Fourier transform infrared spectroscopy (FTIR), field emission scanning electron microscopy (FESEM) and energy dispersive X-ray (EDX) analyses. MBG granules were investigated for in vivo bone regeneration in animal bone defect model (rabbit) where standard S53P4 bioactive glass acted as control. Bone regeneration property was measured after 45 and 90 days post-implantation at distal epiphysis of rabbit femur by radiography, histology, fluorochrome labeling, micro-CT scanning and vital organ histology.

In comparison, M1 and M2 showed improved crystallinity with respect to time while M3 showed slightly decrease in crystalline peak of CaCO3 and enhanced HAp phase after SBF study. More Ca-P layer formed in M1 and M2 and this was related with in vivo experiments subsequently. Bone regeneration activity was most significant for MBGs. Degree of new bone formation for all MBGs was high, i.e., M1 (80.7 ± 2.9 %), M2 (74.4 ± 2.4 %) and M3 (70.1 ± 1.9 %) compared to BG (66.9 ± 1.8 %). In vivo results indicated that the materials were non-toxic, biodegradable and biocompatible and have the potential to be used as bone replacement materials. Thus, the present results indicated that IGF-1 loaded MBG can be used for bone replacement and is a promising candidate for bone tissue engineering application.

ORS 4

Preparation and in vivo biocompatibility studies of different mesoporous bioactive glasses

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Synthesis, development and characterization of nanostructured mesoporous bioactive glass (MBG) of melt-quench, hydrothermal (P123) , wet chemical (PEG) and surfactant Cetyltrimethyl ammonium bromide (CTAB) types for bone regeneration etc. by different routes and testing their suitability as osteogenic enhancer.

MBGs of size of 80-120 nm for MBG-CTAB (Cetyltrimethyl ammonium bromide), 50-70 nm for MBG-PEG (Polyethylene glycol) and 50-70 nm for MBG-P123 (Pluronic 123 fabricated) with surface area of 473.2, 52.2 and 169.3 m2/gm. Respectively having better texture and bioactivity were developed or fabricated by different methods of material sciences as told above and in vitro tested as mesoporous structures which corroborated with TEM analysis. In vivo testing was done elaborately from different technical angles in rabbits.

The clusters and grains developed during stimulated boby fluid (SBF) study of the glass surfaces are assigned to formation of phosphates and carbonates phases as hydroxy carbonate apatite phase which were confirmed from powder x-ray defraction (XRD) and other material science techniques viz. Fourier transform infrared spectroscopy (FTIR) and Energy dispersive X-ray (EDX) data for all the samples. Bone regeneration property of the MBG at rabbit femur was excellent as evidenced by radiography, histology, fluorochrome labelling, micro-CT scanning and vital organ histology and it was non-toxic to the body in vivo and in vitro study.

ORS 5

Managment of supracondylar fracture in four dogs

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Four dogs of different age were selected having supracondylar fracture of femur bone for fracture fixation using rush pin after radiographic examination with history of accidental trauma. All of them had non-weight bearing lameness. Blood parameters of all were in normal range. Stifle joints were prepared for aseptic surgery and all were premedicated with atropine sulphate and general anaesthesia was achieved using xylazine and ketamine. In all dogs fracture fixation was achieved using two rush pin. In three cases stifle joint was opened while in fourth case rush pins made to insert using minimum invasive technique, after making skin incision just near to medial and lateral epicondyles under C-arm. In first three cases joint capsules and were closed using vicryl and skin using silk, while in fourth case rush pins just buried subcutaneously and suture line was closed using adhesive glue. All dogs showed uneventful recovery and all start bearing partial weight after 2 weeks.

ORS 6

Surgical management of mandibular fracture in dog: 11 case reports

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Fractures of the mandible are common in dogs and cats following vehicular accidents, fighting and human violence. Horizontal ramus of the mandible is the most commonly affected part with bilateral fractures being the most common. Eleven dogs of different breeds were brought to Veterinary Clinical Complex during the study period for clinical examination suspected for mandibular fracture after an episode of trauma. History, physical and radiographic examinations revealed complete bilateral fracture of the horizontal ramus of the mandible in all the presented dogs. Surgical reduction and stabilisation of the fracture were performed in all the dogs by various fixation techniques like mandibular wiring, plating and pinning.

ORS 7

Type II external skeletal fixation for management of long bone open fracture in heifer calves- a review of five cases

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Five heifer calves presented with the history of automobile accident suffering fracture on distal limbs were selected for the study. Non-weight bearing lameness of the affected limb with open wound and protruding fractured fragments were noticed in all the animals. Radiological examination confirmed short oblique fracture of metacarpal in one case and metatarsal fractures in four animals. The metacarpal fractures in one animal and metatarsal fracture in four animals were stabilized with type II external skeletal fixation. The animals, with fractures immobilized by external skeletal fixators, started to bear weight on its affected limb 2nd post-operative day. It is concluded that application of type II external fixation for open fracture of distal limb fracture could result in effective immobilization and early ambulation.

ORS 8

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 clinically healthy New Zealand white rabbits of either sex were randomly divided into four equal groups A, B, C and D. 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. The bone gap defect of animals 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). The clinical signs 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 were made by using standard protocols and scoring system to assess the bone defect healing in different groups. On the basis of parameter observed in this study, it is concluded that diabetes can be produced experimentally by intraperitoneal administration of alloxan monohydrate at the dose rate of 60 mg/ kg body weight without any mortality in rabbits. A significantly ($P>0.05$) higher mean±SD total radiological, total gross morphological and total histological scores at different time interval and overall scores for the 90 days study period, better ultrastructural picture of the healing and higher calcification as revealed by tetracycline labelling study in animals of group D as compared to the animals of group A, B and C, indicates that 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.

ORS 9

Successful surgical management of femur fracture in cat by retrograde intramedullary pinning -11 cases

Sayed Mohammad Ali, S. D. Tripathi, G. S. Khandekar, D. U. Lokhande, Sayed Mohammad Danish Bukhari

Long bone fractures are common in felines and the femur is one of the most commonly fractured bones in cats following substantial trauma. The present study describes the outcome of the femur fracture management in 11 cases. The fractures were unilateral in 10 Cases and bilateral in cat. On the basis of fracture patient assessment score (FPAS), the cases were decided for internal fixation by an intramedullary pinning with cerclage wiring in a few cases. Cats were operated under triflupromazine sedation and Ketamine dissociative anaesthesia. Propofol was used for maintenance of anaesthesia. Mild weight bearing was observed in all the cases on the 7th postoperative (PO) with improved weight bearing by 3rd week. The details of the cases will be discussed during the conference.

ORS 10

Internal fixation of tibia, femoral and humeral fractures by intramedullary pinning in rabbits

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Objective: To stabilize tibia, femoral and humeral fractures of rabbits by internal fixation using intramedullary pinning.

Methodology: During period of January-2017 to October-2018, total 15 rabbits were admitted at clinics of TVCC, CVAS, Bikaner, with the complaint of limb bone fracture. In these cases, the fractured bones were tibia (9), femur (5), humerus (1) and radius-ulna (1). These long bone fractures were stabilized by intramedullary pinning using end-threaded K-wires of size 1.5 to 2.5 mm. Of total 16 long bone fractures, this intramedullary fixation was done in 9 cases: tibia (5), femur (3) and humerus (1). Intraoperatively, the fracture reduction and

pin placement was assessed using C-arm fluoroscopy. All the animals were operated under general anaesthesia with administration of Midazolam (1 mg/kg body weight, i.m.) as preanaesthetic, Ketamine (20 mg/kg body weight, i.m.) for induction and inhalant Isoflurane (2-3%) for maintenance. Post-operatively external support was provided by Robert Jones bandaging and antibiotic, NSAIDs, multivitamins and calcium-phosphorus preparation were administered.

Results: All the animals bear the internal and external immobilization very well and no complication related to implant was noted. The anaesthetic protocol was found very safe. Progress of limb function and fracture healing was found satisfactory in the operated cases.

Conclusion: K-wire internal fixation in long bone limb fractures provide good stability and is easy in application.

ORS 11

Evaluation of arthroscopic portals in bovine stifle arthropathies

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Present study was planned to establish a protocol for arthroscopic exploration and to diagnose and treatment of stifle arthropathies in bovine. Normal physiological placement of the arthroscope was performed in 3 cadaveric non-lame adult bovine limbs. The portals for evaluation of joint, articular surface of the bones, medial and lateral menisci, cruciate ligaments were standardized. The study was continued in clinical conditions in bovine for diagnosis and treatment of septic arthritis, joint effusion adult bovine stifle and cruciate ligament rupture in 20 days old buffalo calf were diagnosed and treated. Diagnostic strategies included pre and postoperative radiography, synovial fluid analysis and arthroscopic evaluation. Arthroscopically stifle joint was divided in femoropatellar, lateral and medial femorotibial joint. The approaches were created between the lateral, middle and medial patellar ligaments to investigate the cranial pouches of the stifle joint. The inter-condylar eminence, the proximal aspect of the medial femoral trochlear ridge and the lateral aspect of the lateral femoral condyle were used as starting points for systematic examination of the medial femorotibial, the femoropatellar and the lateral femorotibial joints, respectively. The observed structures were suprapatellar pouch, articular surfaces of patella, femoral trochlear ridges, cruciate ligaments, and menisci. Cranial approach was found safe to enter the joint because there is no neurovascular structures. Caudal approach was not done to avoid the chances of peroneal nerve damage. In the clinical case the joints were properly evaluated and the lesions were found and treated arthroscopically. The joint got sufficient lavage and periosteal reactions were removed with the help of shaver and other arthroscopic instruments.

ORS 12

Repair of multiple bones fracture in canine patients

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The present study involved repair, management and qualitative evaluation of the outcome of canine patients who underwent surgery for multiple bone fractures in ipsilateral or contralateral limbs. The present study included four animals having multiple bone fractures, treated in a single theatre session. The fractures were evaluated clinically and radiologically. Clinical evidence of fractures of bilateral femur and right radius in 1st dog, femur and tibia of the right limb in 2nd dog, femur and tibia of left limb along with radius ulna of right limb in 3rd dog and bilateral femur fracture in 4th dog. All the bones of one dog were repaired in a single theatre session using appropriate technique depending on the type and location of fracture. Static intramedullary interlocking nailing (SIMILN) in proximal third fracture of right femur and cross pinning in supracondylar fracture of left femur and simple cast bandaging with caudal splint in hairline fracture of right radius was done in the 1st dog. SIMILN in distal third fracture of left femur, simple intramedullary pinning in mid shaft fracture of left tibia and manipulative reduction and cast application in right radius ulna was done in 2nd dog. Locking compression plating in combination with intramedullary pinning in segmental fracture of left femur and simple intramedullary pinning in mid shaft fracture of left tibia was done in 3rd dog. Cross pinning was done in supracondylar fractures of both right and left femur of 4th dog. The time of partial weight bearing, satisfactory callus formation and complications were evaluated post operatively. This multiple fracture fixation using rigid fixation techniques in one theatre session prevented multiple operations at different stages leading to early recovery, lesser hospital stay, was economical and there was early rehabilitation of patients.

ORS 13

Evaluation of different biomaterials for fracture healing in dogs

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This study was conducted on 12 dogs of either sex ages between 1 to 8 years having long bone fractures with variable amount of bone loss. The animals were divided into three groups for internal fixation of fracture using a titanium pin in group I and along with internal fixation decellularised xenogenic cancellous bone graft and β-tricalcium phosphate were placed at fracture site in group II and III respectively. Radiographic and haemato-biochemical examinations were conducted at different time interval to evaluate the animal before internal fixation and to monitor fracture healing. On the basis of results, it was concluded that the internal fixation with the titanium pin along with the use of decellularised xenogeneic cancellous bone graft and β- tricalcium phosphate at fracture site promotes fracture healing in clinical cases of dogs.

ORS 14

Evaluation of hydroxyapatite and whole bone marrow composite graft in long bone fracture healing stabilized with intra-medullary stack pinning in dogs

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The present study was conducted to evaluate the efficacy of Hydroxyapatite-bone marrow composite bone graft in fracture healing in 6 dogs presented with femur fracture at the clinic of Department of Veterinary Surgery & Radiology. A detailed clinical, radiological and haematobiochemical examination was done to evaluate the nature of fracture and pre-operative status of the animal. In all the cases, fracture was immobilized with intramedullary stack pinning under general anaesthesia and Hydroxyapatite-Bone marrow composite graft paste was applied at the fracture site. Post-operative lameness was graded from 0 to 4 on the basis of weight bearing on the affected limb and radiographic healing was graded from 1 to 5 based on the amount of callus formation and visibility of fracture line. There was continuous reduction in lameness and increase in weight bearing score from 3rd to 60th post-operative day with lameness ranging from 0-2 (0.67 ± 0.33). Radiographically, there was obliteration of fracture line and radiographic healing grades ranged from 1-2 with a mean of 1.5 ± 0.31. Postoperative haematobiochemical values were within normal range. It was concluded that Hydroxyapatite-Bone marrow composite graft augment the osteoconductive and osteoinductive properties, thereby enhancing the fracture healing.

ORS 15

Use of physiotherapy in different surgical affections of animals

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Physiotherapy is recommended to enhance healing process, relieve chronic pain, reduce inflammation, treatment of muscle atrophy & to stimulate nerve impulses in paralytic cases. Following surgical conditions referred to surgery department were treated with specific physiotherapy gazettes. Two equines with post injection cellulites at neck region successfully treated with portable ultrasound therapy for 15 minutes two sessions/ day for 5 days. Paraplegic 4 canines were successfully treated with infrared unit 10 minutes session followed by portable tens therapy for 10 minutes, twice a day for 7 days. Two cattle were successfully treated for post-operative complication of radial nerve paresis with portable tens 10 minutes twice a day for 3 days along with support of animal hoist sling. Two cases of bowed tendon in equine were treated with portable ultrasound therapy 15 minutes two sessions/ day for 5 days and marked reduction in swelling was observed. Enhanced healing was noticed in chronic wound and in two cases of fracture repair by portable ultrasound therapy 15 minutes two sessions/ day for 5 days in canines. Hind limb lameness in hock (2) and scapula (1) were treated with distance laser therapy in equines 15 minutes two session / day for 5 days along with NSAID

treatment.

ORS 16

IITV guided closed intramedullary pinning for the stabilization of canine tibial fractures with the help of orthotic device

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The present clinical study was conducted on 10 dogs with tibial fractures which were stabilized using simple Steinmann pinning under C-arm guidance and external support with the help of orthotic device. Signalment, history of trauma, clinical examination. Lameness score and goniometric examination was done in fractured dog. Radiography of the affected limb was carried out in two views to determine type and site of the fracture. Treatment of all the fractures was attempted using simple Steinman and end threaded pinning under the C-arm guidance and subsequent application of Robert Jones bandage and orthotic device. Simple Steinmann pinning was better feasible in a closed manner with a high success rate. Orthotic device was feasible and completely immobilized upper and lower joints of fractured limb thus aligning fractured fragments in anatomical apposition enhancing healing.

ORS 17

Management of open fractures in large ruminants by application of external skeletal fixation techniques

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Two adult buffaloes weighing about 300 and 350 kg and a cow weighing 400 kg with midshaft oblique open fracture of left tibiae, and an adult cow weighing 300 kg with distal oblique open fracture of right radius were treated using four-ring circular fixators. Two cow heifers weighing about 100 and 150 kg with open fractures at distal left metatarsals and a 100 kg cow heifer with open fracture at distal left metacarpal bone were treated with multiplanar epoxy-pin fixation technique. Postoperatively, all the animals were given analgesics, anti-inflammatory drugs and antibiotics. The pin-bone interfaces and the open wounds were cleaned regularly with povidone-iodine solution. The animals were evaluated based on clinical and radiographic examinations. The animals with tibial fractures were recumbent before and after application of fixator; however, due to untiring efforts of animal owners they were made to stand, and they started bearing weight on the fractured limb after about a week's time. The animals with fracture of radius, metacarpal and metatarsal bones showed weight bearing in the immediate postoperative period. The fixators were well maintained and tolerated by all the animals. The fractures healed completely by 90-120 days in animals where circular fixators were applied and by 60-90 days in animals treated with epoxy-pin fixation technique.

ORS 18

Stabilization of juxta-articular Grade III open fractures by transarticular external skeletal fixation in dogs

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Objective: To stabilize grade III open limb bone fractures by linear external skeletal fixation technique.

Methodology: Four dogs with open fracture of limb bones, inflicted by automobile accident, were admitted to college clinics. Two dogs had dislocation with fracture of distal tibia and one dog each had severe proximal metatarsal and metacarpal fracture. After wound debridement, the fracture fragment ends were reduced and ESF applied. Bilateral-uniplanar ESF was applied in 3 cases while in one case unilateral-uniplanar ESF was applied. In all 4 cases transarticular fixation was done. In transarticular fixation, in 3 cases with hindlimb fracture, proximal pins were applied in tibia while distal in metatarsal bones and in forelimb, in the radius and metacarpals, respectively.

Results: Wound healing progress was found very good in all the cases while the fracture healing with arthrodesis resulted in 3 cases. In one case, though wound had healed completely, non-union occurred at fracture healing site.

Conclusion: With transarticular ESF, good wound care and immobilization of fracture ends is achieved.

ORS 19

Patellar groove prosthesis for patellar luxation in dogs

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Patellar luxation is a common orthopaedic ailment in dogs. Patellar groove prosthesis trochleoplasty is a modern approach for the treatment of grade IV patellar luxation in dogs. The present study was conducted in dogs that were reported to the Small Animal Orthopaedic Unit of Madras Veterinary College Teaching Hospital, Chennai with the history of hind-limb lameness. General clinical, orthopaedic, radiographic, ultrasonographic and haemato-biochemical examination were performed. Dogs which were nonresponsive to the conservative treatment were selected for surgical treatment with owners' acceptance. Based on the severity of conformational defects of femoro-patellar joint, depth of femoral-trochlear groove, tibial tuberosity deviation and osteoarthritic changes in femoral trochlear sulcus, the selected dogs were assigned into two groups (n=6) irrespective of breed, age, sex. In group I, animals were subjected to trochleoplasty and in group II, animals were subjected to trochleoplasty with patellar groove prosthesis. Additional surgical procedures such as tibial tuberosity transposition, quadriceps release and retinacular imbrication sutures were performed depending upon the severity of the condition. Postoperative wound care was provided for all the dogs and wound healed uneventfully. Minor complications such as gonitis, joint effusion, incisional

irritation, mild migration of fragment of anterior tibial tuberosity were observed and completely regressed on further follow up evaluation. The functional outcome was good to excellent in all the animals. Patellar groove prosthesis was found to be an effective and successful corrective procedure for dogs with chronic grade IV patellar luxation with severely damaged femoral trochlear groove where in the prognosis was said to be guarded.

ORS 20

Use of Epoxy-Pin external skeletal fixation technique for the management of open fractures of long bones in canines

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Four adult weight non-descript breed dogs of either sex presented with open fractures at bilateral distal radius-ulna, midshaft right radius-ulna, distal left tibiae were treated with multiplanar epoxy-pin fixation technique. A Pomeranian dog with proximal open fracture of left tibia at the level of tibial crest was treated with uniplanar-bilateral combined with uniplanar-unilateral epoxy-pin fixation technique. Postoperatively, all the animals were given analgesics, anti-inflammatory drugs and antibiotics. The pin-bone interfaces and the open wounds were cleaned regularly with povidone-iodine solution. The animals were evaluated based on clinical and radiographic examinations. All the animals showed weight bearing in the immediate postoperative period. The fixators were removed by 60-90 days in dogs with midshaft right radius-ulna and distal left tibiae fractures after complete healing. Dog with bilateral radius-ulna fracture and a Pomeranian dog with proximal open fracture of left tibia are under follow up.

ORS 21

Minimally invasive plate osteosynthesis (mipo) for radius and tibia fracture stabilisation using limited contact dynamic compression plate in dogs

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The present research was conducted on seven clinical cases with diaphyseal fractures of radius and tibia presented to the Dept. of Veterinary Surgery and Radiology, NTR College of Veterinary Science, Gannavaram. All the animals were subjected to thorough clinical and orthopaedic examination. Mediolateral and craniocaudal radiographs of the fractured bone and the contralateral limb taken were useful in confirmatory diagnosis, classification of fracture, selection of implants and pre-contouring of plates. The fractures were temporarily stabilised with MRJ till the day of surgery. All the fractures were stabilized by Minimally Invasive Plate Osteosynthesis with LC-DCP. A craniomedial approach was used for radius fractures and medial approach was used for tibia fractures. Following fracture stabilization with LCDCP post-operative clinical, radiographic and serum biochemical evaluation was carried out on the immediate post-operative, 15th, 30th and 60th POD s. The cases started bearing weight as early as 2nd POD and up to 10th POD. The dogs showed completely

normal gait by the 30th POD. Radiographic union was observed by the 30th POD in two cases and by 60th POD in the remaining five cases. Primary healing was observed in five cases whereas two healed by secondary healing. Limb usage was evaluated on the 60th POD and grouped as excellent in six cases and fair in one case. Serum values of calcium, phosphorus and alkaline phosphatase were in the normal range during the study period and showed nonsignificant difference between various intervals.

ORS 22

Surgical management of spinal fractures-luxation in dogs – a report of six cases

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Six dogs of different age and breeds were presented to the TVCC of Nagpur Veterinary College, Nagpur with the varied history of automobile accident, hind quarter paraplegia or various neurological deficits etc. The clinical, neurological and radiographic examinations revealed fracture-luxation of lumbar spinal segments with paraplegia, exaggerated spinal reflexes, loss of deep pain sensation and urinary and fecal incontinence. The dogs were operated under dissociative anesthesia for spinal fixation using titanium pedicle screw-rod fixation technique. The gradual improvement in the clinical condition and recovery from neurological deficits was noticed in four dogs within a period of two months and the dog gained ambulatory walk in about two-and half months postoperatively.

ORS 23

Evaluation of stem cells and stem cell conditioned media for treatment of experimentally induced osteoarthritis

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The present study was conducted to optimize the procedure for creation of chemical model of osteoarthritis in guinea pigs and to evaluate MSCs and MSC conditioned media for treatment of chemical induced osteoarthritis in guinea pigs. In phase I, intra-articular injection of 1 mg of monosodium iodoacetate was found better than papain for induction of osteoarthritis on the basis of clinical, radiological, histological and biochemical biomarker studies. In phase II, after intraarticular injection of MIA in the right knees of 54 Guinea pigs, were randomly classified into six groups based on the treatments given as PBS group, MSC group, SCCM group, MSC+HA group, SCCM +HA and HA group. Treatment was given at 7th day post induction and repeated after one week. Pain in MSC, SCCM, MSC+HA and SCCM+HA groups was lesser than PBS and HA groups. Joint diameter increased in all the groups from baseline values. It decreased in MSC and MSC+HA groups and reached close to baseline value on day 56. The radiographic changes were severe in groups PBS, SCCM, SCCM+HA and HA and negligible to mild towards the end of the observation period in groups MSC and MSC+ HA. Mankin's histopathological score increased in all groups from their respective day 28 values but scores

reached to maximum in PBS, SCCM and HA groups. PBS group showed significantly (P<0.05) higher Mankin's histological score values than MSC, SCCM and MSC+HA groups. MSC with HA had lowest histopathological scores with least cartilage loss and proteoglycan loss followed by MSC group. IL1- β levels showed a significant (P<0.05) increase in the animals of groups PBS and MSC, a very significant (P<0.05) increase in SCCM group and a non-significant (P<0.05) increase in group SCCM+HA and IL-6 levels raised in all the groups from the control levels with the exception of groups MSC and MSC+HA. Higher IL-8 levels were recorded in the animals of group PBS with respect to control. TGF-β levels were raised significantly on day 42 in animals of groups MSC, MSC+HA, SCCM and SCCM+HA. It was concluded that MIA was better than papain to induce experimental osteoarthritis in guinea pigs and bone marrow derived mesenchymal stem cells (MSCs) can be used effectively in controlling the osteoarthritic changes in guinea pigs.

ORS 24

Success fixing of prosthetic limbs after trans-redial, trans-metacarpal and trans-metatarsal amputations in equine, bovine and canine species : a review of 87 cases

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Rehabilitation of animals after amputation of limb is tedious task in field condition. Krishna Limb - artificial limb for animal developed during field practice is providing rehabilitation solution for these animals. Total 87 cases of equine, bovine and canine species have been successfully implanted Krishna limb in relation to the Trans redial, Trans metacarpal, Trans metatarsal amputations. All the described and analyzed cases in bovines (79 case of cow, calves, bull and 1 case of Buffalo) in various age group (range from 1 years to 10 years.) a mean age of 5 years, in equine (1 case) of 7 years age and canines (6 case) (range from 3 months to 5 years) age.

All the amputation were done following fracture due to trauma complications. After amputation of long bone, wound healing takes one month normally in field condition if secondary infection does not occur. If infection is present the wound takes 2 to 3 months to heal and requires more nursing care. The amputee animals under discussion had ability to stand and little walking without any assistance prior to prosthetic fitting was attempted. The short session of 20 to 25 days of physiotherapy including standing, moving, walking and running was achieved with prosthesis implantation. Animals are able to do normal grazing and feeding even in crowded area. Amputations were performed by local veterinarians at the level of Trans redial in 5, Trans metacarpal in 23 and Trans metatarsal in 59 cases. Krishna Prosthetic limb fitting was achieved in 92 per cent of cases, whereas the remainder cases failed due to high contracture of ligaments, a very short length of stump and older age of amputation and refusal of animal. Animal amputated at the Trans metacarpal or Trans metatarsal with more stump length did better than those amputated at the short stump. Among 87 cases after fixing of Krishna Limb animals kept in shelter house / Gaushalas / individual person most of the amputees were able to stand or walk. Based on the given field cases, 76 per cent success is achieved for outdoor walking capacity.

ORS 25

Successful surgical management of osteosarcoma in dogs

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4 dogs presented to the Dept. of Veterinary Surgery and Radiology, Bombay Veterinary College with extensive swelling either in the forelimb or the hindlimb were diagnosed to be osteosarcoma by characteristic radiographic sunburst appearance. The limbs were amputated so as to prevent further spread in all dogs. All dogs showed excellent recovery and are leading a healthy life till date. Histopathology confirmed the diagnosis of osteosarcoma.

ORS 26

Successful surgical repair of long bone fracture in young dogs: A review of 8 clinical cases

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Eight young dogs of various breeds viz. 04 Labradors and 04 mongrels (up to one year of age) were successfully treated surgically by application of intramedullary pins in 2 dogs, LCP in 04 dogs and DCP in 02 dogs. All the dogs were operated under Triflupromazine HCl sedation, propofol induction and isoflurane maintenance. The dogs showed excellent recovery with return to ambulation in a month after surgery.

ORS 27

Bone affections other than fractures in dogs – an incidence study

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The present study describes the incidence of bone disorders presented to University Veterinary Hospital, Mannuthy during October 2017 to September 2018. Out of the 472 number of cases presented with orthopaedic affections, 118 numbers (25%) of cases manifested bone disorders other than fractures. The bone disorders were diagnosed based on radiological assessment as well as laboratory analysis which included estimation of calcium and phosphorous. The disease diagnosed were hypertrophic osteodystrophy (56.15%), secondary nutritional hyperparathyroidism (31.85%), osteosarcoma (7.62%), core retention of ulnar cartilage (1.87%), hypertrophic osteoarthropathy (1.67%) and avascular necrosis of femoral head (0.84%). The treatments opted for the above conditions were surgical, medical or a combination of both keeping the prognosis as a criterion. Early diagnosis and treatment is essential to improve the quality of life of the animal.

Radiology and Imaging Session

Advancements in Small Animal Ultrasound

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Ultrasonography is coming up in a big way in the Indian subcontinent and more and more ultrasound clinics are coming up in both private and government sector. With the advancement in medical diagnostics newer techniques are being introduced to facilitate early and accurate diagnosis. Veterinary practitioners in India primarily use B-mode ultrasonography possibly due to financial constraints. However, newer techniques like 3D/4D ultrasonography, Doppler, echocardiography etc. are gaining importance in India and abroad.

B Mode Ultrasonography: This is the most frequently used method for evaluating the abdomen in small animals. Systematic ultrasonographic examination of the abdominal structures by using this mode of scanning can help to identify alterations in the size, shape, echogenicity, position, and internal architecture of abdominal structures. It provides information about the internal structure of most of the tissue-dense abdominal organs that cannot be obtained from the radiograph. Indications for general abdominal ultrasound include diseases of the specific abdominal organs viz. liver, spleen, gall bladder, urinary bladder, kidneys, GIT, Lymph nodes, adrenals, pancreas, prostate (in males) and uterus in (females) etc. Other important indications include primary or metastatic neoplasia, generalised lymphadenopathy, ascites, abdominal pain, trauma or animals with abnormal blood results. The abdominal vessels may be imaged where there is a suspected porto-systemic shunt, tumour invasion or thrombus formation. The large abdominal vessels often serve as land mark for other structures, such as lymph nodes or adrenal glands. In most cases, a full abdominal scan should be carried out even though a specific area is under evaluation. Ultrasound examination should be considered the imaging method of choice in animals with low body fat or ascites and young animals owing to the poor radiographic contrast. Choosing the right transducers is important for effective scanning. For example scanning the abdomen of a middle sized dog weighing about 25-30 kg would require a transducer with frequency ranging from 5 MHz to 7 MHz. Similarly small weight groups would need transducers with higher frequencies which may rage upto 12-14 MHz . Superficial structures like lymph nodes, mammary tissue, wounds etc. would need high frequency transducers while deeper structures would need a lower frequency.

Abdominal ultrasound may be performed with the patient in dorsal, right or left lateral recumbency and, for specific reasons, in the standing position as well. A thorough knowledge of cross-sectional and longitudinal anatomy of the abdominal organs is important for interpretation of the ultrasound images. The patient should be positioned with head towards the sonographers left. By doing this we ensure that on all scans the far side is the left side of patient and near side is the right side. The examination of the abdomen should be carried out in a systematic way. The order in which this is performed may be decided by the examiner but it is imperative that the same system is used each time. I prefer to do the scanning strictly in the following

order: Urinary Bladder S Prostate (For males) S Colon S Body and horns of uterus (For Female) S Left medial iliac lymph node S Left Kidney S left adrenal S spleen (head, body, tail) S Stomach (Fundus) S Liver lobe (all starting from left towards the right side) S Gall Bladder S Duodenum S Pancreas S Right kidney S Jejunum S Jejunal lymph nodes S Right medial iliac lymph node S Hypogastric lymph nodes (if visible). By following the above SOP we can know any subtle changes in the organs.

Diseases which can be identified on B Mode ultrasound:

Urinary Bladder: Cystitis, Transitional Cell carcinoma, Cystoliths, Ectopic ureters

Prostate: Benign Prostatic Hyperplasia, Prostatic abscess, Prostatic and Para-prostatic cysts, Prostatic carcinomas

Colon: Colitis, Pythiosis, Colo-rectal tumors

Abdominal lymph nodes (Medial Iliac, Jejunal, Hypogastric, renal, gastric, celiac, mesenteric etc.): Lymphoma, Lymphosarcoma, Metastasis, Lymphadenopathy, Local infections

Kidneys: Nephroliths, Nephrocalcinosis, Renal tumors, Hydronephrosis, Chronic renal disease / Failure, Polycystic kidneys, Pyelonephritis

Spleen: Splenomegaly, Splenic tumors, Infarcts, Splenic rupture, Torsion, Abscess and cysts, Nodular hyperplasia

Liver: Hepatomegaly, Hepatic congestion, microhepatia, cirrhosis, lipidosis, tumors, abscess, cysts,

Gall Bladder and Biliary System: Biliary calculi, cholecystitis, emphysematous cholecystitis, cholangiohepatitis, polyps.

Stomach: Foreign bodies, gastritis, pythiosis, polyps, gastric lymphomas, gastric tumors

Small and Large intestines: Intussusception, Foreign body, Intestinal lymphoma, Inflammatory bowel disease, tumours

Pancreas : chronic and acute pancreatitis, pancreatic tumors, pancreatic abscess

Reproductive Tract: Ovarian cysts and tumours, pregnancy diagnosis and assessment of fetal viability, pyometra, endometritis.

Adrenals: Pheochromocytomas and other adrenal tumors, cushing disease, addisons disease.

With the growing needs of the animal owners and increase in the pet population it is imperative that the practitioners should have thorough knowledge of the systematic scanning protocols for evaluating the small animal abdomen and thorax. Understanding the physics of ultrasound and application of knowledge about various disease processes / pathophysiology helps the sonologist in arriving at the correct diagnosis. Scanning the small animal abdomen and thorax poses a great challenge, because, despite doing the procedure correctly the subtle lesions may be missed on a routine scan. The small organs like adrenals, pancreas and lymph nodes need to be evaluated in great depth so that it becomes possible to estimate the damage caused by a disease or evaluate the spread of a particular disease. Performing a systematic scan opens up dimensions beyond the

routine disease diagnosis. Further, advancements in the ultrasonographic modalities include echocardiography, color Doppler ultrasound, 3D/4D, strain and shear wave elastography, contrast enhanced ultrasound etc. which have resulted in providing more accurate diagnosis. Therefore, the practitioners should be familiar with the indications, limitations and interpretation of various advanced ultrasonographic modalities as well.

Echocardiography: Ultrasound is now considered an important non- invasive technique for studying the heart of the dog. This harmless technique is particularly suitable when repeated and frequent measurements are required for clinical or research purposes. Three different types of imaging modalities are used based on instrumentation in echocardiography. These are the 2D or Two dimensional, M mode or the motion mode or the "ice-pick" view of the heart and Doppler echocardiography. Two dimensional echocardiography produces real-time, cross-sectional images of the heart and great vessels and allows differentiation of the blood-filled lumen from the soft tissue structures of the heart chambers, valves and vessels. M mode gives details about the cross section of the heart at a single line or point known as MD cursor. It allows quantitative analysis of the dimensions and motion of chambers and valves. Depth is given by Y-axis and time by X axis. It records change in wall and valve motion. It is used for accurate measurements of size. Various windows for echocardiography in canine have been well documented and include:

Right and left parasternal views in long and short axis, Apical view, subcostal view and suprasternal view. The short axis view is most commonly used view and allows visualization of Apex, Papillary muscle, Chordae tendinae, Mitral valve, Aorta, and Pulmonary artery. The apical view may be four chamber or five chamber view(4 chambers + Left ventricular outflow tract). This view allows visualization of mitral and tricuspid valves and flow across these valves. Using these windows and views we can measure the dimensions of various structures of the heart and assess the functioning of the various chambers, vessels and valves. We can also calculate the values of ejection fraction, fractional shortening, End point septal separation, volume flow and cardiac output. Colour Doppler studies during echocardiography help in semi quantitative estimation of any kind of regurgitation across the valves. It provides information on the dynamics of the blood flow through the heart chambers, along vessels and across the valves. There are two different forms of Doppler echocardiography: the continuous wave (CW) and pulsed wave Doppler (PW). Pulse wave can be used for knowing the change in pressure or pressure gradient across various valves, in various chambers, etc. Continuous wave Doppler can be used to know even high velocity differences upto 5m/s.

Doppler ultrasonography: Apart from its use in echocardiography use of Doppler helps in assessing the direction, velocity, and turbulence of blood flow. It has been extremely helpful in monitoring the fetal viability or assessing the carotid flow, and it is currently being used in most of the disciplines in human medicine. In human patients this technique has also been proved as a valuable tool for the diagnosis of deep vein thromobosis (DVT). However, in veterinary medicine, the use of Doppler is limited primarily to echocardiography. Many modes of Doppler are available in modern day machines viz Spectral flow Doppler, Color Flow Doppler, Power Doppler Imaging etc. Doppler can be used in continuous wave and pulsed wave forms. At GADVASU, Doppler techniques are being used to predict reducibility of intussusception in dogs and

to study the renal blood flow in dogs and assess kidneys in renal disease. It is also being used worldwide to evaluate the blood flow to kidneys, thrombosis, infarcts, portosystemc shunts, ectopic ureters, assisted venous and arterial cannulations, fetal blood supply, neoplasia versus benign lesions etc.

Strain Elastography: Strain elastography can be used for evaluating superficial structures like mammary glands, tendons, ligaments etc. Strain images are generated by using the transducer to apply repetitive minimal pressure to the tissues. The subsequent tissue displacement is tracked between pairs of RF echo frames and the strain calculated from the axial gradient of the displacements. Under an equal amount of stress, a stiff region experiences less strain (deformation) than surrounding softer tissue. Strain elastography is a qualitative technique in which relative stiffness differences in tissue are displayed as ratios.

Shear wave elastography (SWE): This is a relatively new technique to assess the stiffness of deep structures. This is a non invasive means to identify the degree of fibrosis or damage to a particular tissue and is an objective assessment tissues. Shear wave elastography is a quantitative method and provides an estimated value of the tissue stiffness that can be expressed in kPa. By this technique we can assess the stiffness of internal organs. In tumours, fibrosis and chronic conditions it is expected that stiffness of the tissue is increased. Shear wave elastography thus eliminates the need of biopsy and other invasive procedures. In humans, SWE and fibroscan are being used as valuable noninvasive method to evaluate hepatic fibrosis and damage.

3D/4D Ultrasonography: This modality is coming up in a big way for gynaecological and obstetrical work. 3D/4D scans are being used to evaluate the tissue structure and morphology and give more precise information about the lesions and real time 3D/4D images of lesions or organs can be reproduced with these modalities. These modalities are frequently used in human medicine to assess the development of fetus and evaluate fetal defects, pregnancy etc. However, these techniques are still in their infancy in veterinary practice and need further studies.

Contrast Enhanced Ultrasound: This is a new technique which is still in its testing phase. In this technique, a small amount of contrast agent made up of gas-filled microbubbles is injected intravenously before ultrasound imaging. These tiny microbubbles travel in the blood to the organs. The microbubbles improve the visualization of organs and blood vessels in our body These contrast agents work in the same fashion as those used in CT and MRI. The contrast agents highlight the area where there is excessive blood flow (more contrast is visible) or the parts which show faster draining of the contrast agent. This technique has been successfully documented for evaluating liver cirrhosis, kidney lesions, spleen, abdominal trauma, focal lesions in liver parenchyma etc.

RDI 1

Clinical studies on upper gastrointestinal endoscopy in dogs

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The present study was conducted to evaluate endoscopy for diagnosis and treatment of upper gastro-intestinal affections in dogs. Endoscopic evaluation of oesophagus, stomach and duodenum was conducted in twelve dogs of either sex, belonging to different breeds and age groups presented with the history of reduction in food intake, regurgitation or chronic vomiting and not responding to symptomatic treatment. Diagnosis was made on the basis of clinical symptoms, haemato-biochemical, radiographic, ultrasonographic, endoscopic and histopathologic evaluation and appropriate treatment was done as per need. The breeds of dogs reported with different gastro-intestinal problems which were subjected to endoscopy were Labrador retriever (8), German shepherd (2), Rottweiler (1) and Lhasa apso (1). There were seven males and five females among the animals investigated. The age of the dogs ranged from five months to ten years with an average value of 3.95 ± 0.87 (mean ± S.E.) years. The body weight of dogs ranged from 10 kg to 35 kg with average values of 20.65 ± 2.56 (mean ± S.E.) kg. Prominent clinical signs observed were chronic vomiting, regurgitation and anorexia. Different conditions diagnosed on endoscopy included gastric foreign body obstruction (2), oesophagitis (3), megaoesophagus (3), oesophageal diverticulum (1), extramural oesophageal mass and gastric ulcer (1), haemorrhagic gastritis (2) and gastric adenocarcinoma (1). Rradiographic (plain and contrast), ultrasonographic finding complemented the endoscopic examination. Endoscopy was found to be minimally invasive and efficient diagnostic tool to visualize precise location of the lesion and facilitated surgical manoeuvres to be undertaken in dogs.

RDI 2

Echocardiography in Indian mongrel dogs

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Twelve healthy mongrel dogs which included seven males and five female dogs, were selected for the present study to perform echocardiographic examinations. The animals were confirmed as healthy based on their clinico – physiological, radiographical, haematological and electrocardiographical examinations. Animals found with any deviation in the values of pre – echocardiographic evaluations were excluded from the study. 2D mode, M-mode and Doppler mode examinations were performed for each animal in order to fulfil the aim of this study which was to generate the reference values of echocardiographic parameters in mongrel dogs. The mean age of male and female animals included in the study was 2.92 ± 0.27 (mean ± S.E.) years and 2.70 ± 0.29 (mean ± S.E.) years, respectively. The selected male and female animals were with their mean body weight of 19.35 ± 1.19 (mean ± S.E.) kg and 14.10 ± 1.02 (mean ± S.E.) kg, respectively. 2D mode echocardiographic examinations of animals showed normal structural conformations of various cardiac structures. On M-mode echocardiographic examinations in present study, most of the parameters were found

to be non – significantly different between male and female animals, except posterior wall thickness percentage (PW%) value was found significantly higher in male animals than female animals. The values of right ventricular dimension in diastole (RVDd) of all animals, aortic root diameter (Ao) of female animals, ejection fraction (EF %) and cardiac output of male animals were found to be correlated negatively with body weight and body surface area of the animals, in M – mode echocardiography. Remaining all the parameters of M – mode echocardiographic examinations of the animals showed positive correlations with body weight and body surface area of the animals. In Doppler mode echocardiography, significantly higher values were recorded in the values of the A wave peak of mitral and tricuspid valves and aortic flow velocity in female animals than male animals. In male animals, all the Doppler mode measurements were found to be correlated negatively with body weight and body surface area. However, in female animals A peak of mitral valve (MVApeak) and aortic flow velocity (AV) showed positive correlation and remaining Doppler mode parameters correlated negatively with body weight and body surface area.

RDI 3

Occular echobiometery in cattle, buffalo, dogs and horses

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The purpose of this study was to describe the ultrasonographic appearance, to measure different intraocular echo-biometric indices in normal adult dogs, horses, cattle and buffaloes. B-mode transcorneal ultrasonographic scanning of left and right eyes of six adult healthy animals of each species viz. horse, cattle, and buffalo were performed. Additionally, six healthy adult dogs from three different breeds viz. German shepherd, Labrador retriever and Indian mongrels were also selected for the same purpose. Qualitative echo-biometric findings of the eyes were described and measurements of the intraocular structures were obtained. In present transcorneal intraocular echo-biometric study six parameter were measured i.e. aqueous chamber depth (ACD), lens depth (LDe), lens diameter (LDi), vitreous depth (VD), scleroretinal rim thickness (SRT), and globe axial length (GAL) by using high end ultrasound machine (Mylab30vet), with 2.5-7.5 MHz microconvex transducer and the depth of scanning was set at 5-9 cm with suitable gain without administration of any general/local anesthetic. Non-significant difference ($P<0.05$) was observed in all parameters when compared between left and right eye of different breeds and species of animals used in the study. The average values of LDi and GAL of both eye of German shepherd dog were significantly higher from Labrador retriever and Indian mongrel dogs. The average value of SRT of both eyes of German shepherd and Labrador were significantly higher than that of Indian Mongrel dogs. The average value of ACD of both eye of horse showed significant difference from buffalo. The average value of LDe of both eyes of horse were significantly different from cattle. The average value of LDi of both eyes of buffaloes and horses were significantly different from cattle. The average value of VD of both eyes of horse showed significant difference from cattle and buffaloes. The average value of SRT of both eyes of horse show significant difference with cattle. The average values of GAL of both eyes were significantly different in among three species.

RDI 4

Incidence and ultrasonographic findings of different ocular affections in different species of animals

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This paper describes the incidence and ultrasonographic findings in different ocular affections in different species of animals. Total 65 cases were presented with complaints of ocular affections during the study period. The study revealed that overall incidence of ocular affections in canine contributed (57%) of the ophthalmic cases, followed by buffalo (22%), bovine (12%) and equine (9%). Ocular affection recorded during this study period were corneal opacity (17 %), cataract (14%), neoplasm (9 %), dermoid (9 %), cherry eye (8%), trauma (8%), exophthalmos (5%) and eye worm (5%). The incidence of each affection viz. corneal ulcer, descemetocele, chemosis, traumatic lens expulsion and prolapse of iris was (3%) whereas, the incidence percentage of blindness, glaucoma, pigmentary keratopathy, vitreous heamorrhage, anterior uveitis and anophthalmia was 2% for each affections. In all the cases, where possible, ultrasonography was performed and sonographic appearance of different affections was recorded.

RDI 5

Radiographic occurrence of distal limb lameness in equine

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The objectives of this study was to evaluate the hospital occurrence of various radiographic lesions of the distal limb (bones and joints) lameness in equine. All the equine lameness cases (n=117), presented during the one year study period that were subjected to radiographic evaluation, were investigated. Out of 117, 78 equine (66.67%), were diagnosed with 124 radiographic lesions involving 101 limbs. The majority (62.8%) equine had single radiographic lesion, whereas the remaining animals were detected with multiple lesions involving one (15.4%) or more limbs (21.8%). Majority cases of equine lameness were recorded in winter season which might be associated with longer duration of winter season in north-west region of India. Highest per cent lesions were recorded in hoof region (25.81%) with more common involvement of fore feet (68.75%) and in mares (54.54%). Hock and fetlock regions were second (22.6%) and third (21.8%) most common regions for occurrence of equine lameness. Fetlock joint of hindlimb (63%) was more commonly affected than that of the forelimb. In conclusion, high prevalence of multiple lesions involving one or more limbs poses great diagnostic challenge. Forelimb hoof and the hock are most frequently involved in distal limb lameness in equine. Periostitis and arthritis are most prevalent lameness causing lesions in equine.

RDI 6

Ultrasonographic evaluation of healing process of teat fistula repair using polyglactin 910 suture material and iso – butyl cyanoacrylate tissue adhesive in bovines

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The study was conducted on 18 clinical cases of teat fistula in bovines with the objective of diagnosis of teat fistula severity in terms of tissue damage and evaluation of healing process through ultrasonographic examination. The study was conducted under three groups, and in all three groups mucosal layer was sutured with 3-0 Polyglactin 910 and in group A and B muscular layer was sutured with 3-0 Polyglactin 910 whereas skin was sutured with 2-0 silk and adhered with Iso- butyl cyanoacrylate in group A and B, respectively. In group C muscular and skin layer were adhered using Iso-butyl cyanoacrylate. Preoperatively on day 0, the teat fistula severity and tissue damage was diagnosed by ultrasonography examination (change in echogenicity pattern). Group B protocol found better in the treatment of teat fistula in terms of healing and aesthetic value of teat.

RDI 7

Ultrasonographic and contrast radiographic diagnosis of oesophageal obstruction and diverticula in buffalo: 4 case reports

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The occurrence of oesophageal disorders are relatively uncommon in large animals when compared to other surgical disorders. Esophageal obstruction and esophageal diverticula are the most frequently encountered esophageal disorders in large animals. Esophageal foreign body obstruction also known as choke occurs due to their rapid ingestion, incomplete mastication and indiscriminate feeding habits. Esophageal diverticula is a blind pouch that originates from main lumen secondary to esophageal obstruction, trauma or can be due to congenital weakness of the esophageal musculature. Early and proper diagnosis of such conditions are important to prevent secondary complications like esophageal fistula, esophageal perforation and death associated with ruminal tympany and asphyxia. Ultrasonography and contrast radiography of the esophagus are the best used imaging techniques for the diagnosis of esophageal disorders like obstruction and diverticula. The present article reports the imaging diagnosis of esophageal obstruction and diverticula in four buffaloes.

RDI 8

Radiography – an aid in diagnosis of abdominal disorders in dogs a review of 186 cases

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Abdominal disorders with usual signs of anorexia, vomiting, constipation, obstipation, drippling of urine, oliguria, anuria, vulval and vaginal discharge were left undiagnosed ain early stages under filed condition due to lack of diagnostic modalities. Survey radiography, a commonly available modality in almost all places, serves as an easiest method of diagnosis of abdominal disorders in field level. The present paper reports the significance of survey radiography in canine abdominal disorder. 186 dogs irrespective of breed, age and sex with clinical signs of abdominal pathology were subjected to abdominal survey radiography. 54 cases were diagnosed to suffer from abdominal disorders like gastrointestinal foreign body (n=11), intra-abdominal tumor (n=6), ascities (n=9), gastric dilatation (n=2), nephrolith (n=1), cystic and uretheral caliculi (n=11), prostrate involvement (n=2), megacolon (n=3), Pyometra (n=8) and mummified foetus (n=1). All the cases were correlated with clinical signs and other diagnostic modalities and treated surgically.

RDI 9

Thoracic radiographic imaging for evaluating pulmonary metastatic pattern in malignant skin and mammary neoplasms in dogs: a review of 24 cases

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Pulmonary metastatic pattern in twenty four cases of skin and mammary malignant neoplasms in dogs were evaluated by lateral/orthogonal thoracic radiographs. The lesions in the lungs were classified based on location as perihilar, midzone and periphery and extent as miliary nodules: <2 mm, pulmonary micronodule: 2-7 mm, pulmonary nodule: 7-30 mm and pulmonary mass: >30 mm. The animals also underwent a complete physical examination and careful palpation .Simultaneous fine needle aspiration cytology of sentinel lymph nodes were also carried out. Excisional biopsy samples were histopathologically analysed and correlated with thoracic radiographic findings. This presentation describes the interpretation principles and importance of canine thoracic radiographic imaging for evaluating pulmonary metastatic pattern and its utility in TNM staging and as a prognostic indicator in malignant skin and mammary neoplasms in dogs.

RDI 10

Clinical and ultrasonographic assessment of surgical affections of teat in cows and buffaloes in Udgir (ms)

Mane A. A., Badgujar C. L., Agivale S. M., Mugale R. R. and Pitlawar S. S

Present study was conducted in clinical cases of cows (10) and buffaloes (4) referred with the history of obstruction in teat while milking and referred to TVCC, COVAS, Udgir. The cases were thoroughly examined

clinically with appearance, palpation and siphoning the teat canal. The USG examination of teat was carried out by using 5 MHz convex array transducer. The cases diagnosed were teat fibrosis in 4 (cow), membranous obstruction in 3 (cow), thelitis in 2 (buffalo), nodular growth in 2 (buffalo) and 2 (cow) and obstruction in teat cistern in 1 (cow). The USG images and their features in affected cases are presented. The information was useful to plan the surgical treatment.

RDI 11

Ultrasonography of peridiaphragm structures for evaluation of foreign body syndrome in marathwadi buffaloes

Komulwar P. G., Badgujar C. L., Gahlod B. M., Bhikane A. U., Pitlawar S. S. and Patil A. D.

Fifteen buffaloes referred to TVCC, COVAS, Udgir (MS) suspected for rumen impaction and FBS on clinical examination were subjected to USG of the structures cranial and caudal to diaphragm for evaluation of the lesions and diagnosis. USG of the visceral structures was conducted at four predetermined sites using a 3.5 MHz convex transducer. The USG findings were studied retrospectively with the observations on rumenotomy in twelve cases and found positively correlated. USG provided the paramount information regarding the amplitude and nature of the reticular contractions, cardiac rhythm, diaphragm movements and abnormalities associated with FBS that couldnot be gained on x-ray. In the study, 9 cases were diagnosed of TRP, 2 cases of TP and 4 cases of DH, on the basis of clinical and ultrasound examination. Metallic foreign body was visualized in one case, which was found in the herniated reticular sac and confirmed by x ray.

RDI 12

USG of thoracic and peridiaphragm structures in healthy marathawadi buffaloes

Komulwar P. G., Badgujar C. L., Gahlod B. M. and Pitlawar S. S.

Twelve clinically healthy Marathwadi buffaloes of 5 to 7 year age and 300 to 360 kg body weight were scanned for USG, at four different predefined sites viz. i - Just behind xyphoid, ii - Intercostal spaces (ICS) on right side, iii - Intercostal spaces (ICS) on left side and iv- Cranial ventral abdomen, so as to standardize the most suitable and useful site for maximum gain. Thickness of the ruminal wall was ranging from 7.2-8.9 mm. The heart was positioned with an angle of 73O-75O between the interventricular septum and the sternum. Thickness of myocardium and intervertricular septum was 14.4-18.9 mm and 15-19.4 mm respectively. Area and volume of the heart was ranging from 168.80-268.12 cm2 and 1632.5-2192.2 cm3. The healthy lung tissue was not visualized on sonogram, except as a few reverberations. Thoracic wall was 2-3 cm thick and plura appeared as hyperechoic line which was moving in the vertical plane during respiration. Scanning from 6 to 7 ICS on left side for 3 min showed reticulum and biphasic contractions as half-moon shape echogenic curve. The spleen, liver and diaphragm were sufficiently viewed with regards to their size, shape and inter-relationship. The USG examination at the site from third to eight ICS has gathered optimum information from maximum visceral structures that would depict the lesions in case of FBS, hence it was the most suitable and satisfactory site.

RDI 13

Involvement of prostate in canine perineal hernia

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The objective of the study was to evaluate role of prostate in the occurrence of perineal hernia in dogs. The 30 male dogs presented with the problem of perineal hernia were included and the prostate was evaluated based on the radiographic (plain and contrast) and ultrasonographic findings. The average age and body weight of dogs were 7.73yrs and 21.92 Kgs respectively. German shepherd (30%) was the most common breed affected with perineal hernia followed by Pomeranian (23.33%) and mongrel dogs (30%). The 90% dogs presented had unilateral herniation. dogs. The 66.67% herniation was on the right side and rectum was herniated in 72.72% cases. Radiographically, prostate evaluation was possible in 80% dogs. The average length and height of prostate on lateral radiographs were 5.36 cm and 4.27 respectively. In 62.5% dogs the rectum was mildly or severely pressed dorsally due prostate. In 54.17% dogs the urinary bladder was pushed cranially or cranio-dorsally by the enlarged size of the prostate. In 45.83% dogs, the length and in 29.17% dogs the height of prostate was more than 70% of the length of sacro-pubic distance on lateral radiograph. Ultrasonographically, the average length and height of prostate was 4.85 and 3.18cm, respectively. Single or multiple cystic lesions in the prostatic parenchyma were seen in 40% dogs, with at least 2 dogs having large cysts that required percutaneous drainage. In conclusion, prostatic involvement (enlarged size with or without cyst) is commonly associated with perineal hernia in dogs.

RDI 14

Endoscopic evaluation of normal duodenum in 60 healthy dogs

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Diagnostic imaging allows visual evaluation of normal and abnormal morphology of the region and thus helps in pinpoint diagnosis of many diseases. But to identify the abnormality one has to be familiar with the normal anatomy of the system. Duodenoscopy of 60 clinically healthy dogs were performed by esogastrointestinal fiberscope and the appearance such as color of mucous membrane, presence of erythema, erosion and sub mucosal blood vessels on duodenal wall were evaluated. In procedure, the insertion tube was first passed directly into the duodenum through pylorus before actual examination of stomach. In order to pass the tip of scope in the pylorus, the pylorus was first fix carefully at the centre of endoscopic field and a gentle pressure was applied with rotation of both knobs simultaneously in counter clockwise direction. The color of mucosa of duodenum varied from pinkish red (38 cases) to yellowish red (22 cases) and it had velvety texture. Bile was noted in the duodenum in 16 cases, while sub mucosal blood vessels were visualized in two cases. However, erythema or erosion was not seen in any of the cases in this study.The mean distance of Junction of descending and ascending duodenum from upper incisor was measured as 69.15 ± 1.39, 100.85 ± 0.56 and 103.85 ±

0.51cm in small, medium and large sized dogs, respectively.

On the basis of observations it could be said that working length of 100 and 110 cm would be suitable for small and medium sized dogs, respectively. The use of esophagogastroduodenoscope with working length of 110 to 120 cm would be more appropriate for large sized dogs.

RDI 15

Endoscopic study of normal trachea and bronchus through tracheobronchoscope in 60 healthy dogs

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Diagnostic imaging enabled the surgeon for the visual evaluation of normal and abnormal anatomy of the region and thus helped 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 allows 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 diameterand 102 cm working length with 2.0 mm width instrument channel. The dog was placed in sternal recumbent position after proper anaesthesia and the neck was supported with the 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 glistering. The dorsal tracheal membrane was found tight in all the cases.The mean distance of epiglottis from upper incisors was found 9.77 ± 0.33, 15.05 ± 0.35 and 17.67 ± 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± 0.96, 40.65 ± 0.33 and 53.57± 0.90 cm in small, medium and large sized dog respectively.

RDI 16

Ultrasonographical assessment of post-operative wound healing in teat wounds

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Present study was conducted in 12 crossbred cows at the Department of veterinary Surgery and Radiology, Teaching veterinary clinical complex, Rajiv Gandhi Institute of Veterinary Education and Research, Pondicherry presented with a history of deep lacerated wounds with exposed teat cistern. A three layered suture pattern was done using polygalactin 910 of size 3/0. The skin edges were apposed by applying disposable stainless steel skin staples in six animals and simple interrupted suture pattern using braided and polybutilate coated polyester sutures of size 2/0 in remaining six. Postoperative assessment of the wound healing of the reconstructed teat was carried out by the morphological evaluation on 10th day and by ultrasonographical

examination after suture removal using diagnostic ultrasound scanner (B-mode) using 7.5 MHz linear probe with coupling medium by water bath method. The parameters like Echogenicity of the skin, teat wall and teat cistern were studied and documented to evaluate the healing process of the wound.

RDI 17

Diagnosis of spinal disorders in dogs using Computed Tomography (CT)

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The present study was conducted for the diagnosis of various spinal disorders in 22 dogs using computed radiography (CR) and computed tomography. Dogs of different breeds, age, sex and body weight, presented with different neurological signs. All the dogs were subjected for computed radiographic and CT examination. Computed tomography was performed under general anaesthesia on a 16 slice CT scan machine (Supria, Hitachi, Ltd.) using imaging protocol of 120 KVp, 200 mAs, collimation (0.625x16mm) 10mm, 5mm scan interval and 5mm slice thickness. Both the diagnostic modalities were assessed independently. CT scan images were evaluated on bony window using 2-D MPR (transverse, sagittal & dorsal plane) and 3-D reconstructive images. Fracture of vertebrae, congenital anomalies and different degenerative conditions involving vertebral column, inter-vertebral disc and/or spinal cord were diagnosed. CT examination was helpful in diagnosis of most of the disorders which were missing on the computed radiography. Based on our findings it was concluded that computed tomography (CT) is more accurate imaging modality for the diagnosis of different vertebral column disorders and provide more details of the lesions.

RDI 18

Radiographic diagnosis of multiple myeloma in a German Shepherd Dog

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A 3yr old German Shepherd, male dog was presented to the clinic of Department of Veterinary Surgery and Radiology with the history of pelvic limb lameness, yelping during walk, severe pain on palpation at proximal femur, pelvis and lumbo-sacral region. Digital radiograph (DV view) showed generalized radiolucency of right metaphyseal region of femur and pelvic bones. Animal was subjected to computed tomography (CT) in sternal recumbency with tail first orientation. CT images in different planes demonstrated the following findings viz. discrete punched out multiple foci of osteolysis in pelvic bones in dorsal plane, cortical thinning of femoral neck and trochanteric region with loss of trabecular pattern in sagittal plane, osteolytic changes in ilium bone and fractured bone piece of caudo-dorsal border of L7 vertebral body lying in the vertebral canal. Histopathological examination confirmed the lesions of multiple myeloma.

RDI 19

Ultrasound examination of partial teat obstruction before and after theloscopic electroresection and phonophoresis

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The present study was conducted in 12 cows presented with milk flow disorders and diagnosed to have partial teat obstruction by ultrasound scanning by water bath method.. Selected cows were randomly divided into two groups (I and II) of six animals each. Following pre-treatment evaluation, animals of group I were subjected to video-assisted Theloscopic electroresection and in that of group II, Phonophoresis was employed using Isoflupredone acetate (10mg %) gel as a coupling medium. Effectiveness of the procedures was evaluated by post treatment ultrasound scanning. Both the procedures were found to be effective in reducing the size of the obstructive lesions almost equally and improved the milkability of the affected teat. However, Theloscopic electroresection involved anaesthetic and surgical risk, postoperative complications like haemorrhage, pain and inflammation whereas being a non-invasive procedure, Phonophoresis could avoid such complications. Also, Theloscopic electroresection involved costly and delicate equipment which required much expertisation in handling whereas Phonophoresis could be performed with relatively simple and cost effective equipment.

RDI 20

Radiographic, electrocardiographic and echocardiographic studies in goats

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Present study was conducted on twelve apparently healthy goat free from cordio-thoracic diseases. The animals were divided into two groups each containing 6 animals to evaluate various the cardiothoracic parameters. Mean ± S.E values of body weight and age were measured 11.83 ± 0.70 (range 10 - 15) kg, 3.75 ± 0.31 (range 3 - 5) month and 25.67 ± 1.73 (range 16-30) kg, 8.58 ± 0.95 (range 6.5 - 12) month in animals of the group-I and II, respectively. The purpose of this study was to establish the standard values (range) for parameters of the heart and thorax. Most of the parameters were found to be non – significantly different between group-I and group-II animals, except VHS- (Buchanan and Buchler (1995) and Ljubica et al. (2007) method); Cardiosternal contact, Cardiac height/T3-T5, Cardiac height + cardiac width /T3-T5 and right side castophrenic angle. Significant positive correlation with age and body weight were observed in 2TD/3, while it was significant negative in cardiac width / T3-T5. Positive correlation with age and body weight were observed in tracheal angle, cardiac width /thoracic height, cardiac height / R3-R5, cardiac height + cardiac width/R3-R5, CVC/AO, CVC/T4, CVC/R4, AO/R4 and castophrenic angle. While with body weight Cardiac width/R3-R5 and AO/T4 while other parameters show negative correlation with age and body weight were observed. In electrocardiographic studies, the mean ± S.E. values of the heart rate were 153.83 ± 5.85 (range 133 - 166) bpm

and 142.17 ± 8.99 (113 - 166) bpm in the goats of the group I and II, respectively. Significant ($p < 0.05$) negative correlation was found in the value of heart rate with body weight and age of the goats. No significant difference was recorded in the mean values of electrographic amplitude and duration. Amplitude of P wave showed positive correlation with both age and body weight, R and T wave with only body weight while R wave was also showed the significant positive correlation with age while other parameter of amplitude are negative correlation with both age and body weight of the animal. Significant positive correlation with both age and body weight were observed in duration in QRS complex, R-R interval while P-R and S-T interval showed only with age while other parameter of duration are negative correlation with both age and body weight of the animal. In echocardioraphic studies, B- mode, M-mode and Doppler mode examinations were performed to generate the reference values of echocardiographic parameters in goats. In B-mode echocardiographic examinations of animals showed normal structural conformations of various cardiac structures. On M-mode echocardiography, most of the parameters were found to be non-significantly different between group-I and II of the animals, except RVDd, cardiac output, and mitral velocity of A peak (MVA) in M - mode and doppler echocardiography, respectively. Positive correlation with age and body weight were observed in M – mode echocardiographic measurements of EPSS, RVDd, LVDd, PWD, IVSs, LVDs, EF%, S%, LVM, LA/AO, EDV, ESV, and cardiac output (CO) while with age stroke volume and body weight with PWs. Significant positive correlation with body weight were observed in stroke volume while other parameter was negative correlation with age and body weight of the animals. Significant positive correlation with age were observed in of pulse wave doppler echocardiographic measurements of tricuspid E peak and tricuspid E/A ratio. Positive correlation with age and body weight were observed in of pulse wave doppler echocardiographic measurements of peak mitral velocity (E peak, A peak) and aortic velocity. While with age ME/A, tricuspid A peak and with body weight tricuspid E peak, TE/A. while other parameter was negative correlation with age and body weight of the animals.

RDI 21

Studies on Effect of renal diseases on cardiac function in dogs

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The study was conducted on 18 clinical cases in adult dogs of either sex, to evaluate the effects of renal dysfunction on cardiac function. The animals were divided into two groups, viz. AKI (acute kidney injury) and CKD (chronic kidney disease) on the basis of history, serum biochemistry and sonographic findings. The cardiac evaluation was done through auscultation, electrocardiography, radiography, blood pressure measurement, assessment of pulse rate and quality, echocardiographic examination and biomarkers estimation. It was observed that renal enlargement and increased cortical echogenicity were associated with AKI whereas; increased cortical thickness was a common finding in CKD. Cases with CKD showed more renal hemodynamic derangements as compared to AKI. It was also observed that renal structure and function had no correlation with cardiac structure. However, significant correlation was observed between some renal parameters and cardiac function.

RDI 22

Radiographic evaluation of forelimbs growth deformities in growing dogs

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Radiographic study of forelimb growth deformities was done in growing dogs and classified as rickets (n=6), nutritional secondary hyperparathyroidism (n=13), idiopathic osteodystrophy (n=18), hypertrophic osteodystrophy (n=3) and retained cartilage core (n=2). The radiographic parameters viz. cortical index, medullary cavity diameter, widening of distal metaphyses and growth plate thickness were recorded. The most common radiographic signs of different forelimb growth deformities were cupping, widening and flaring of distal metaphysis of radius-ulna in rickets; saucer shaped or flattening of distal metaphysis of radius and ulna with increased density in NSH; normal physis with increased radiodensity of distal metaphysis of radius-ulna with normal diaphysis in IOD; a radiolucent zone parallel to physis in distal metaphysis in case of hypertrophic osteodystrophy (HOD) and presence of an inverted radiolucent cone deep into distal metaphysis of ulna originating from the physis in case of the retained cartilage core. Width of distal metaphysis of radius-ulna, physeal thickness, widening of medullary cavity and thinning of cortices were more in rachitic dogs.

RDI 23

Comparative evaluation of radiography and c-arm imaging techniques for evaluation of 30th day callus of metacarpal, metatarsal and tibial bone fractures in goats

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Seven clinical cases with eight fractures (five metacarpal, one metatarsal and two tibial) in goats were presented. Six cases treated with plaster of Paris cast (metacarpal/metatarsal) and two tibial factures treated by IMP technique constituted the materials for the study. Two imaging techniques (radiography and C-arm imaging) were compared on 30th day of fracture healing in all the cases. The present study revealed that different zones of callus were visualised in C-arm based on the extent of calcification whereas callus sub zones were not observed in radiography. In high density callus cases both the techniques showed similar images.

RDI 24

Innovative method of developing a low cost endotrainer for acquiring hand eye coordination

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Just as operative experience with open surgical technique allows surgeons to develop open surgical skills, laparoscopic skill acquisition requires specific training and tremendous practice. The model “see one, do one, and teach one” does not apply to laparoscopy because of the spatial orientation which needs to be developed in a two-dimensional environment and need for dissection with longer instruments. Coordinating the movements of instruments whose working tips can only be seen in two dimensions on a monitor screen, takes

time to master. Commercially available simulators are expensive and therefore a quick ready to use simulator was constructed using readily available materials viz. translucent plastic box (25 x 30 x 40 cm), Logitech C270 HD Webcam, Packaging foam sheet (grey color), Adhesive etc. The simulator thus constructed may have visually appeared simpler than the commercially available simulator, it served the purpose well and was of immense help in improving the hand- eye coordinations, refining laparoscopic skills of the author as well as of the assistant surgeons during the study and reducing the surgical time during the actual procedures.

RDI 25

Ultrasonographic studies for diagnosis of clinical abdominal pathological conditions in dogs

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The present study was conducted for diagnosis of clinical abdominal pathological conditions in dogs to enhance the use of ultrasonography as a diagnostic tool in the effective management of abdominal disease conditions in dogs presented at Department of Veterinary Surgery & Radiology, COVS & AH, JAU, Junagadh. In present study 100 clinical cases were screened out of either sex or age out of which 25 cases were selected with their clinical signs and showing pathological condition of gastro-intestinal, hepatobilliary, urinary, genital system and spleen. In all the animals the symptoms were misleading. Confirmations of the pathological conditions were made with the help of ultrasonography as well as with haemato-biochemical status of animal. All the selected 25 animals underwent surgical operation. Ultrasonography of 25 case revealed pyometra in 10 cases, cystolith in 3 cases, cystic endometrial hyperplasia pyometra complex in 4 cases, intestinal obstruction in 2 cases, ventral hernia in 3 cases, intussusception in 1 case, benign prostate hyperplasia and cyst in 1 case and gall bladder stone with renomegaly in 1 case. The clinical and haematobiochemical findings observed in the animals were found in accordance to the pathology involved as reveled in USG findings. Routine USG is proposed to be a beneficial diagnostic procedure of abdominal disease condition in dogs.

RDI 26

Evaluation of Effects of cardiac diseases on renal function in dogs

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The study was done to assess the interrelationship between cardiac and renal function in dogs. Twenty, client owned adult dogs of either sex having confirmed cardiac dysfunction underwent complete cardiac and renal examination through radiography, electrocardiography, nephrosonography, echocardiography and biomarker estimation. For the sake of analysis, the animals were divided into three groups on the basis of cardiac structure and function viz. animals with good cardiac compliance but having structural changes (Group A; n=4); animals with very poor cardiac compliance and severe structural changes (Group B; n=5) and animals with reduced cardiac compliance without compensatory structural changes (Group C; n=11). It was observed that NT-proBNP was a better cardiac biomarker as compared to CK (MB). Renal and interlobar resistive index showed significant negative correlation with systolic function. It was concluded that all the dogs having cardiac

functional derangements should also go through a thorough renal examination.

RDI 27

Rare presentations of cystic lung and liver disease in the bovine hosts

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The present study was conducted on twelve female bovines (Buffalo=7 and Cattle=5) presented to Teaching Veterinary Hospital of GADVASU with clinical signs suggestive of cardiac insufficiency. The clinical examination followed by ultrasonography revealed presence of single or multiple lung and/or liver cysts in these patients. The common clinical signs were brisket edema (n=9), brisket+limb edema (n=2), jugular engorgement (n=3), dyspnoea (n=6), abducted elbows (n=3) and fever (n=3). Upon ultrasonography, single and multiple cystic densities in hepatic tissue (n=10) & lung parenchyma (n=11) were observed. A significant finding was compression of the heart (n=8) due to multiple cysts in the lungs that lead to cardiac tamponade i.e. inability of heart to pump to its full capacity which may have advanced to clinical signs mimicking that of cardiac insufficiency. The present study reports ultrasonographic diagnosis of lung or liver cysts with occurrence of atypical signs like ventral edema, dyspnoea and jugular distension.

RDI 28

A study of ultrasonographic findings in bovines with associated atypical signs

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The present study was conducted on eight female bovines (Buffalo, n=3 and Cattle, n=5) presented to Teaching Veterinary Hospital of GADVASU, with clinical signs indicative of cardiac insufficiency. The common clinical signs were brisket edema (n=3), brisket + limb + ventral edema (n=2) and bilateral jugular engorgement (n=7), thus these cases were suspected for some cardiac disease. Abdominal and thoracic ultrasonography revealed conditions other than any cardiac disease. The important ultrasonographic findings were diaphragmatic hernia (n=3), reticulo-peritonitis (n=3) and mild pleural effusions (n=2). An important finding was compression of heart by the reticular wall in all three cases diagnosed positive for diaphragmatic hernia that lead to decreased lumen of left ventricle and thus increased values of the contractility indices (FS% & EF%), whereas cardiac functioning was normal in remaining cases. The current study documents different ultrasonographic findings in cases suspected for cardiac insufficiency on the basis of cardinal signs.

RDI 29

Video- otoscopic examination of ear canal in mongrel dogs

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The study was conducted on clinical cases of ear affections in 23 Mongrel dogs. All the dogs were subjected to general anaesthesia using Inj. Atropine sulphate @ 0.04mg/ Kg B. Wt. SC as preanesthetic, Inj. Siquil @1 mg/ Kg IV as sedative followed by induction with Inj. Propofol @4 mg/ Kg B.Wt. IV and maintenance either by incremental doses of Inj. Propofol 10 % or with Isoflurane anaesthesia. Video otoscope was used to examine the ear canal which revealed clear and visible tympanic membrane in 16 dogs and opaque tympanic membrane was seen in 2 dogs. It was found difficult to pass the video otoscope in 2 dogs due to stenosis of ear canal and in three dogs tympanic membrane was not visualized. The ear canal was found patent in 17 dogs, whereas stenosis was noticed in 6 dogs. Further, different types of discharges in the ear canal were noticed as blackish (2 dogs), brownish (6 dogs), yellowish (5 dogs) and black wax (9 dogs), whereas no discharge was noticed in 1 dog.

RDI 30

Reliability of ultrasonography for determining the surgical management of urolithiasis in male buffalo

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The present study was conducted on twelve male buffalo animals suffering from obstructive urolithiasis. On the basis of ultrasonography, these cases were divided into two groups i.e. Group I (n=6, urethral concretions) and Group II (n=6, urethral calculi). The aim of the study was to evaluate the diagnostic method and surgical technique. The animals showed clinical signs of anorexia, depression, kicking at abdomen, tail twitching, urethral pulsation, dribbling of blood tinged urine and distended lower abdomen. B-mode ultrasonography was done using curvilinear 3.5-5.0 MHz and linear transducer of 6.0-8.0 MHz frequencies for urinary bladder and urethra, respectively. In Group I, small irregular concretions were present, whereas in group II, calculi were large, rough and firm. Tube cystotomy were performed in group I whereas group II were managed by urethrotomy. Post operatively, antibiotic Inj. Cetriaxone @ 10 mg/kg intramuscular for 5 days and anti-inflammatory and analgesic Inj. Meloxicam @ 0.2 mg/kg intramuscular for 3 days were given. Ammonium chloride was given @ 50 mg/kg orally for 30 days as urinary acidifier in group I. It was concluded that ultrasonography was reliable in locating the uroliths and thus determining the surgical technique.

RDI 31

Clinical and ultrasonographic assessment of surgical affections of teat in cows and buffaloes in udgir (ms)

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Present study was conducted in clinical cases of cows (10) and buffaloes (4) referred with the history of obstruction in teat while milking and referred to TVCC, COVAS, Udgir. The cases were thoroughly examined clinically with appearance, palpation and siphoning the teat canal. The USG examination of teat was carried out by using 5 MHz convex array transducer. The cases diagnosed were teat fibrosis in 4 (cow), membranous obstruction in 3 (cow), thelitis in 2 (buffalo), nodular growth in 2 (buffalo) and 2 (cow) and obstruction in teat cistern in 1 (cow). The USG images and their features in affected cases are presented. The information was useful to plan the surgical treatment.

RDI 32

Diagnosis of some affections using computed tomography and magnetic resonance imaging

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The use of computed tomography and magnetic resonance imaging in veterinary practice have provided boon to the veterinary surgeon in diagnosing various affections precisely. The paper presents six MRI and four CT studies conducted to diagnose various affections such as IVDD, syrinx, haemangiomatosis, pyometra etc. The precise diagnosis helped in undertaking the appropriate therapeutic management of the disorders.

RDI 33

Comparison of ultrasonographic features of abomasum in cattle and buffaloes suffering from various gastrointestinal tract disorders

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The present study was conducted on 40 clinical cases of bovine (10 cattle, 30 buffaloes) to ultrasonographically evaluate the position of abomasum in relation to anatomical landmarks in cattle and buffaloes suffering from various gastrointestinal tract (GIT) affections. Animals were divided into five groups viz. foreign body syndrome (n=14), faecolith (n=6), caecal impaction (n=5), reticular abscess (n=2) and diaphragmatic hernia (n=13) as per disease condition confirmed upon ultrasonography and surgical findings. Ultrasonographically, the distance from caudal most aspect of wither at dorsal spine to dorsal most aspect of abomasum, distance from xiphoid to cranial most aspect of abomasum, distance from mid of umblicus to caudal most aspect of abomasum and distance from ventral midline to ventral most aspect of abomasum was recorded to evaluate the size of abomasum. The ultrasonographic findings were correlated with intra-operative findings. It was concluded that the size of abomasum is significantly reduced in animals suffering from caecal impaction while the size of abomasum was significantly increased in animals suffering from faecolith and was comparable in animals suffering from diaphragmatic hernia, foreign body syndrome and reticular abscess. The location of

pylorus was not significantly altered in any disease condition.

RDI 34

Shear wave elastography as a non-invasive tool to evaluate liver in dogs – a preliminary study

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The present study was designed to assess the feasibility of elastography as a non-invasive method to evaluate liver in healthy and diseased dogs. The liver in 25 healthy and 15 diseased dogs were evaluated by using B-mode ultrasonography and shear wave ultrasonography. The most suitable acoustic windows for recording shear wave ultrasonography in dogs were established and documented. The range of stiffness values (kPa) of liver in clinically healthy dogs were established and used as reference values for evaluating disease conditions. The study describes the techniques, feasibility and prospective applications of shear wave elastography as a non-invasive tool to evaluate liver in dogs.

RDI 35

Effect of age on ultrasonographic features of adrenal glands in healthy dogs

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The present study was undertaken in apparently healthy mix breed dogs of either sex to standardize ultrasonographic examination protocol and generation of reference images of adrenal glands. The dogs were divided randomly into three age groups viz, Group I (from 01 month to 09 month), Group II (from 09 month to 6 years) and Group III (above 6 years) with six animals in each group. Ultrasonographic examination was done in lateral recumbency and images were recorded in sagital plane in all the dogs without using any sedative or anaesthetic agent. The left and right adrenals were best visualised by keeping transducer at left and right paralumbar fossas just behind the last rib, respectively. The ranges of left adrenal gland length, cranial pole diameter and caudal pole diameter were 1.61cm to 2.44cm, 0.32cm to 0.54cm and 0.35 cm to 0.52cm respectively. The ranges of right adrenal gland length, cranial pole diameter and caudal pole diameter were 1.57cm to 2.20 cm, 0.36cm to 0.61cm and 0.39cm to 0.56cm respectively. The adrenal glands appeared peanut shaped (left) and almost oval shaped (right) hypoechoic area, and were homogenous in all the groups. The outline of both the glands was clear without any difference in echotexture of cortex and medulla. The left adrenal gland was the first structure to appear in ultrasonogram beneath the skin with easily discernible cranial and caudal poles. Abdominal aorta appeared as an anechoic pulsating oblong structure below the left adrenal gland. The right adrenal gland appeared either dorsal to the caudal vena cava or at the level of caudal vena cava. It is concluded from the study that ultrasonography of adrenal glands in dogs does not require anaesthesia and subcostal approach by placing 7.5 MHz Linear transducer caudal to the last rib and ventral to the lumbar process is the best approach to scan left and right adrenals. Further, the studied dimensions and echotexture of the adrenal glands may assist in the diagnosis of adrenal and other organ pathologies.

RDI 36

Clinical use of endoscopy for diagnosis of upper respiratory tract disorders in horses

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The present clinical study was conducted on 128 thoroughbred horses reported with complaints of poor performance and exercise intolerance during the exercise. Out of 166 endoscopic examinations, 119 were indicative of respiratory tract disease. Among 119 horses, 49 (41.18%) indicated upper respiratory tract afflictions and 70 (58.82%) were of lower respiratory afflictions. Upper respiratory tract abnormalities were diagnosed on basis of endoscopic characters includes Arytenoid chondritis (1; 2.04%); Recurrent laryngeal neuropathy grade-2 (7; 14.28%); Recurrent laryngeal neuropathy grade-3 (4; 8.16%); Recurrent laryngeal neuropathy grade-4 (5; 10.20%); laryngitis (3; 6.12%); Pharyngeal lymphoid hyperplasia (4; 8.16%); Pharyngitis (3; 6.12%); Dorsal displacement of soft palate (9; 18.36%); Epiglottic entrapment (1; 2.04%); Sinusitis (4; 8.16%) and Guttural pouch affections (8; 16.32%). The present clinical study concludes that, early diagnosis of upper airway disease with resting endoscopy is an excellent tool for forecasting pathology of upper respiratory tract in performing horses.

RDI 37

Ultrasound guided nerve blocks in cattle

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The brachial plexus on sonography appeared as multiple hypoechoic structures surrounded by a hyperechoic rim or a relatively hyperechoic band characterized by multiple discontinuous hypoechoic strips separated by hypoechoic lines. Adequate blockade of brachial plexus was achieved by injecting 10 ml of 2% lignocaine and the puncture site was located immediately ventral to the seventh cervical vertebrae and cranial to the first rib. Ultrasound- guided precision precluded complications such as, intravascular injection, inappropriate diffusion to neurological structures (brachial plexus), intraneural injection. Ultrasound guidance for the identification of the sciatic nerve in calves and its subsequent blockade was found to be relatively simple technique. The proximal third of the femur was selected for the blockade of sciatic nerve as this area provides a satisfactory acoustic window to the nerve, moreover the nerve ran alone, away from any other major nerve or vessel. The blockade produced adduction of the limb and flexion of the fetlock. The anatomical areas innervated by the sciatic nerve were completely desensitized, excluding the medial subareas of the proximal metatarsus, tarsus and the tibia, and the cranial subarea of the tibia. Satisfactory analgesia was achieved in all the patients that received ultrasound-guided paravertebral anaesthesia prior to surgery by administering a volume of 10 ml 2% lignocaine per nerve. Slight pain was experienced by two of the patients while the peritoneum was being incised. An out-of-plane approach used for needle insertion proved to be more efficient in terms of needle

visualization, control on the needle while insertion as compared to in-plane approach

RDI 38

Morphometric study of thoraco-lumbar spine in large breed dogs by Computed Tomography (CT)

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Computed Tomographic morphometric evaluation of thoraco-lumbar spine was carried out on clinical cases of large breed dogs presented to Small Animal Orthopaedics Unit of Madras Veterinary College Teaching Hospital. A total of twelve large breed dogs were selected for the study and divided into two groups. Six dogs without any neurological signs were grouped under group I and the six dogs with neurological signs and suspected for thoraco-lumbar spinal diseases were grouped under group II. Detailed gait evaluation, neurological examination were performed in all the dogs to localise the spinal lesion on the particular spinal cord segment and graded. Radiography of thoracic and lumbar spine was taken in orthogonal views to find out the bony lesions. Under general anaesthesia, the computed tomographic scanning of thoraco-lumbar spine was done by using third generation 32 slice helical CT scanner. In group I, normal morphometry of vertebral body, intervertebral disc, spinal canal and spinal cord were studied and documented. In group II, spinal lesions includes intervertebral disc degeneration, Hansen type II disc herniation, pedicle fracture, intra-dural extra-medullary spinal tumour, myelomalacia and dural calcification were identified by CT and morphometric changes were observed. Different morphometric measurements in this group gave the worthwhile information regarding the extent of bony damage and spinal cord to spinal canal relationship at the trauma site. Hence CT morphometric values were helpful for spinal surgeons in selecting surgical plan, spinal implants and for giving accurate prognosis to the owner which were impossible by conventional radiography.

Ruminant Surgery Session

Trends in Bovine Surgery

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Cattle and buffaloes play a significant role in the economy of our country. The cost of productive cattle and buffaloes has increased significantly during the last decade or so, pri-marily 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 oper-ation. Bovine surgery has taken a massive leap in the last three decades. Combined with diagnostics and safer anaesthetic procedures, Indian Veterinary surgeons have taken lead in bovine surgery. Earlier books viz Dollar Surgery, Frank surgery have been replaced by many books by foreign and Indian authors. Ruminant surgery by Tyagi and Singh 1 deserves special mention. Commonly adopted diagnostic procedures and routinely performed abdominal sur-geries are practically done in all the institutions of India and even in the state Animal Hus-bandry polyclinics. However major surgeries under general anesthesia are performed only in well equipped institutions. The surgeons, radiologists, anesthetists and clinicians have intro-duced newer diagnostic methods, anesthetic protocols and surgical techniques for bovine ab-dominal diseases. This paper focuses on bovine abdominal surgery.

Diagnosis:

A. Beyond routine diagnostic procedures and laboratory tests, introduction of digi-tal/computerized radiography for precise diagnosis of rumino-reticular diseases has strengthened the diagnosis2. A major development in the diagnosis of diaphragmatic hernia, diffuse peritonitis, reticular abscess, reticular adhesions, impaction of omasum and abmasum has come with the use of diagnostic ultrasound3,4,5,6,7,8,9,10,11,12,13 . This is a creditable achievement by the scientists from India. Ultrasound guided biopsy of abdominal organs is now routinely done in some veterinary institutions in India12. 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.

Surgical Procedures:

A. Rumenotomy: Rumenotomy is performed routinely from left flank for traumatc retic-ulitis (hard ware disease, wire, metallic foreign bodies) removal of plastics, ropes etc., acute rumem 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.14,15,16,17,18. During the last decade or so, impaction of omasum and abomasums has emerged as a major problem in the northern states. Technique developed for drainage of impacted omasum and abomasums through rumen by hydrating the con-tents and kneading followed by slowly evacuating the contents into rumen are now routinely used7,9,19. Mineral

oil/vegetable oil and salt solutions (glauber's salt and com-mon salt) can be infused into omasum or abomasum. Biopsy of omasum leaves and wall has helped to determine prognosis of cases of omasal impaction17.

B. 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, omen-topexy are used1,14,16. In Indian conditions LDA and RDA are less commonly encoun-tered in cattle and buffaloes.

C. 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 approach20,21,22. Diaphragmatic herniorrhaphy in cattle and buffalo have been successfully performed under local anesthesia as well as in standing animal23,24,25. General anaesthesia remains the preferred choice for per-forming 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 developments in the recent past26. Use of halothane and isofluorane has not only facilitated smooth and early re-covery 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.

D. Intestinal Surgery: Small and large intestinal obstruction by fecoliths, intussuscep-tions, vovulus and torsion have been reported. Surgical resection and end to end or side to side anastomosis are routinely done in bovine1,14,16. Drainage of dilated and impacted caecum in cattle and buffaloes is also common14. Almost all surgical proce-dures in bovine are performed from right flank in standing animals. Although they can be done is lying animals as well. Bhardwaj and and colleagues have reported side to side anastomosis of small intestine in cases of intussusceptions without resecting the affected segment of intestine with fair amount of success27.

E. Repair of perineal laceration, recto-vaginal fistulae, rectal tears and resection of rectal prolapse have been carried out successfully in cattle and buffalo1,28.

F. Abdominal hernia: Ventral abdominal hernia, umbilical hernia and perineal henia are successfully treated surgically1,14,16. Synthetic non-absorbable mesh (polyprolene 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 hernia29.

G. Pre-pubic tendon rupture: Rupture of prepubic tendon is seen more commonly but not exclusively in buffaloes after calving. In fact prepubic tendon rupture can be viewed as massive ventral abdominal hernia. The repair of prepubic tendon is done under general anaesthesia in the dorsal recunbency30. Use of synthetic mesh has been successfully used to reinforce the suture line in prepubic tendon rupture repair in bo-vine. Bilateral rupture of prepubic tendon in buffaloes has a poor prognosis.

H. Caesarean section: Caesarean section for delivery of calf can be performed through flank in standing animal. Alternately, as is most commonly practiced in India, Caesar-ean 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.

I. Urinary system: Urethrotomy in bullock and buffalo bulls is performed through post scrotal, prescrotal or ischial approach1,14,16. 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 animals31,32. 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 management33.

J. Neonatal surgery: Atresi ani, atresi ani et recti, pervious urachus, rupture of urinary bladder, resection of infected naval cord and congenital hernia have been successfully treated surgically in newly born calves14,34.

K. Bovine foot lameness: Bovine foot lameness is a multifactorial problem affecting mainly cross bred cattle, though cases of foot lameness are seen in local breeds and buffaloes. Bovine foot lameness is one of the most serious disease complex of eco-nomic importance. Subclinical laminitis (SLS) is common in freshly calved, high yielders and young cows. SLS is also predisposing to sole ulcer, white line lesion, under-run sole. Other lesions include slurry heel, interdigital fibroma, hoof cracks, acute and chronic laminitis, overgrown hooves, scissor and slipper hooves are other common hoof lesions35. Risk factors include nutrition, housing, behavior, producton level, dis-ease condition like mastitis and metritis etc. Many books by foreign authors have been published. Liaju M. Phillip from Kerala Veterinary and Animal Sciences University has published a very good Colour Atlas of Hoof Care in Dairy Cattle36. Claw trimming using Dutch method and use of hoof blocks for treatment and functional claw trimming for prevention of foot lameness have been documented and are being used by veterinar-ians in India.

Conclusion:

Surgeons, anaesthetists and radiologists have contributed significantly towards development of newer diagnostic techniques, anesthetic protocols, and surgical procedures for precise diagnosis, safer general anesthesia techniques and successful surgeries for a large number of abdominal diseases in bovine. The high cost of productive animals and concerns of animal owners for early treatment has contributed towards these de-velopments. Cattle foot lameness is attracting attention of veterinarians and farmer. Prevention of foot lameness by adopting preventive claw trimming and other man-agement measures has helped to lower economic losses to farmers.

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RUS 1

Prevalence of intestinal obstruction due to intussusception in cattle of Jammu region

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Among various gastrointestinal tract affections, intussusception is being commonly reported from the plain areas of Jammu region of J & K state. The present study was carried out on cattle of Jammu region brought to the Large Animal OPD of Teaching Veterinary Clinical Complex, F.V.Sc. & A.H., SKUAST-J from May 2017 to April 2018. Diagnosis was done on the basis of history, clinical signs, and per-rectal and ultrasonographic examination in the cattle suffering from intestinal obstruction. Colic, anorexia and cessation of faeces was recorded in all the cases, and a sausage shaped mass was palpated per-rectally in the abdominal cavity in 50% of the cases suffering from intussusception. The ultrasonographic findings of distended intestinal loops, ileus, passive movement of fluid, hyper-echoic intestinal wall and presence of peritoneal fluid were consistent. 154 cases out of a total of 1050found to be suffering from intestinal obstruction were recorded in cattle. Out of which, 148 cases were found to be suffering from intussusception and 6 cases from other reasons, accounting to 14.09 percentile for intussusception and 0.57 percentile for other reasons. Month wise highest prevalence was recorded in the month of May. All the cases recorded were crossbred cattle. The results show that the intestinal obstruction due to intussusception has a significant prevalence among crossbred cattle in the plain areas of Jammu region.

RUS 2

A study on assessment of pain in cattle suffering from intestinal obstruction and undergoing right flank laparo-enterectomy

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The present study was conducted on clinical cases of cattle (n=18) diagnosed to be suffering from intestinal obstruction due to intussusception, based on history, clinical signs, and per-rectal and ultrasonographic examination. In all the cases, right flank laparo-enterectomy followed by end-to-end entero-anastomoses was done. Assessment of pain was done by measuring alterations in physiological and haemato-biochemical parameters, and scoring of pain specific behaviour. Colic, anorexia and cessation of faeces was recorded in all the cases, and a sausage shaped mass was palpated per-rectally in the abdominal cavity in 50% of the cases. The ultrasonographic findings of distended intestinal loops, ileus, passive movement of fluid, hyper-echoic intestinal wall and presence of peritoneal fluid were consistent. Changes in heart rate, respiratory rate, TLC, DLC, blood glucose and serum cortisol, along with pain scores, proved to be reliable indicators in the assessment of pain following laparo-enterectomy in cattle. Composite pain scale was found to be more reliable than Cow pain scale in the assessment of pain.

RUS 3

Comparative evaluation of the anti-nociceptive efficacy of flunixin meglumine and meloxicam for the management of post-operative pain in cattle undergoing right flank laparo-enterectomy

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The present study was conducted to evaluate the anti-nociceptive efficacy of flunixin meglumine and meloxicam for the management of post-operative pain following laparo-enterectomy in cattle. A total of 12 clinical cases diagnosed to be suffering from intestinal obstruction due to intussusception were studied. In all the cases, right flank laparo-enterectomy followed by end-to-end entero-anastomoses was done. Colic, anorexia and cessation of faeces was recorded in all the cases. Heart rate, respiratory rate, TLC, neutrophil count, serum cortisol and blood glucose were significantly ($p<0.05$) elevated, most of the time, up to 12 hours post-operatively in the cattle which received meloxicam, as compared to those given flunixin meglumine. However, a significant ($p<0.05$) decrease in their values was noticed at 24 hours in meloxicam group. Flunixin meglumine provided better analgesia than meloxicam post-operatively, up to 12 hours, whereas, meloxicam provided prolonged analgesia up to 24 hours.

RUS 4

Surgical management of acquired hernias in small ruminants and calves- -a report of six cases

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This abstract describes six hernia cases in small ruminants brought to Veterinary Clinical Complex in Tirunelveli. This included three goats, one lamb, one ram and one calf aged between 3 months to 4 years. Hernial confirmation was made by palpation of hernial ring, radiography and ultrasound. The hernia was in the left side of the abdomen in two goats (omentum with fat and incarcerated intestinal content) and in the right side of cranial abdomen in one goat (necrosed abomasum and intestine). Intercostal hernia on the right side occurred in ram (abomasum with duodenum) and lamb (abomasum). The calf had umbilical hernia (rumen and omentum). Hernioplasty with nylon mesh was performed in one goat and the calf. In other four cases herniorrhaphy was performed with synthetic non absorbable suture materials. All the surgical procedures were performed under general anaesthesia and field block. Proper fluid therapy antibiotic and analgesic care along with wound dressings were carried out except in one case which was followed up by a field vet. Minor complications were reported and managed accordingly. All animals recovered uneventfully. The types of hernia, anaesthetic techniques, and surgical procedures will be discussed.

RUS 5

Barbed fencing wire-a threat to animal population

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In India barbed fencing wires are mainly used to protect and surround agricultural field, barren land and unmanned land properties. These galvanized steel made fencing wire is so sharp such that they can easily cut through the skin when they come in contact. Many of the domestic animal populations including equines, buffaloes and canines sustains mild to severe degree of lacerated wounds involving the superficial skin and deep muscle layers and trauma to other vital structures in the body such that it may render the animal hospitalized for many months including the loss of function of the affected part and may even lead to loss of life. The present study conducted in the Veterinary Clinical Complex gives an insight into the serious threat caused to animal population due to these fencing wires, its surgical management and outcome.

RUS 6

Surgical management of teat fistula in goats

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The maintenance of good udder and teat health is important for quantitative and qualitative milk production. Teat fistulas are abnormal communications with the teat cistern due to trauma with sharp penetrating foreign objects or due to full thickness lacerations caused by barbed wire fencings. Such fistulas require immediate surgical attention as these can predispose the animal to mastitis, necrosis of teat and subsequent loss of the quarter. The present study was conducted for one year in Veterinary Clinical Complex during which 15 lactating goats were brought for surgical treatment of teat fistula. The most common reason involved in the occurrence of teat fistula under study was barbed fencing wire laceration followed by suckling activity of the kid. All the cases were successfully treated surgically by three layer suture technique. Hence the present article gives an insight into the surgical management of teat fistulas in goats by three layer suture technique.

RUS 7

Surgical management of congenital contracted flexor tendon deformity in bovine calves

Sandeep Saharan, Deepak Kumar Tiwari, Ribu Varghese Mathew and Tushar Jain

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Congenital abnormalities of the skeletal system are common in bovine calves. Among this, congenital contracted flexor tendon deformity characterised by knuckling of the affected limb is common. Mild to moderate cases are managed by splint bandaging whereas in severe cases tenotomy is performed. Nine

bovine calves were brought to Veterinary Clinical Complex with the complaint of inability to bear weight on the limbs since birth. History and clinical examination revealed congenital contracted flexor tendon deformity in all the calves. Forelimb was found to be affected more than the hindlimbs. The present article describes the surgical management of flexor tendon deformity in calves by splint bandaging and tenotomy.

RUS 8

Surgical management of obstructive urolithiasis in cow calves by tube cystostomy

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Obstructive urolithiasis due to formation of calculi in the urinary tract is a common problem among the bovine calves particularly during winter seasons. Male calves are affected more than the female calves. Surgical management by tube cystostomy using foleys catheter in conjunction with medicinal treatment and per oral feeding of ammonium chloride is treatment of choice. Fourteen cow calves were brought to Veterinary Clinical Complex with the history of reduced water intake, anuria, stranguria and distended abdomen. Clinical observations combined with ultrasonographic examination diagnosed the condition. All the calves were managed surgically by tube cystostomy. Owner was advised to feed ammonium chloride salt per orally and all the calves recovered uneventfully.

RUS 9

Surgical management of mandibular fractures in bovine calves: 5 case reports

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Fractures of the mandible are most commonly seen bovine neonatal calves mainly caused as a result of trauma during obstetrical intervention. Such conditions need to be attended immediately to avoid secondary complications like teeth loss, mal union and loss of function. Six calves of age group one day to six months was brought with the complaint of trauma to mandible following injury with barbed fencing wire, obstetrical snare and dog bite. Physical, clinical and radiographic examinations revealed complete fracture of horizontal ramus of the mandible in all the five calves. Depending on fracture location and fracture type, surgical reduction and anatomical alignment of the fracture segments were performed by bone plating or bone pinning. All the calves were brought for re-evaluation after one month which revealed satisfactory union of the fracture segments without any secondary complications.

RUS 10

Surgical management of mammary gland fibroadenoma in buffalo heifers: 6 case reports

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Tumours of the udder and teat are of infrequent occurrence in bovines and among the mammary gland tumours, fibroadenoma is the most common. Six buffalo heifers were brought to Veterinary Clinical Complex with the complaint of progressively increasing hard swelling in the udder region since months. Clinical examination revealed a fluctuating mass in the udder region apart from the normal udder tissue. Ultrasonographic examination revealed a hypoechoic mass within a hyperechoic wall suggesting a growth. Under sedation and local infiltration, surgical excision of the mass was performed in all the cases and the mass grossly appeared pale to white coloured and was nodular in nature. Histopathological examination diagnosed the mass to be fibroadenoma. The present article reports the surgical management of mammary gland fibroadenoma in six buffalo heifers.

RUS 11

Surgical management abdominal disorders in cattle – a review of six cases

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Six cattle were referred to large animal surgical unit of Veterinary Clinical Complex, VCRI, Orathanadu. Three kangayam jallikattu bulls with the history of not taking feed recurrent ruminal tympany and three cows with the history of not passing dung were selected for the study. Rectal examination revealed impacted rumen and palpable masses within the rumen suggestive of phytobezoars. Left thoracic radiography revealed intact diaphragm in all the three bulls. Based on the clinical and special diagnostic examination the cases were diagnosed to be ruminal impaction and exploratory lapro-rumenotomy was advocated. Under xylazine sedation and left paravertebral analgesia, rumenotomy was performed. Plastics, leather pieces, phytobezoar were removed. Three cows with signs of not voiding dung for three days were examined rectally and it revealed empty rectum with palpable mass in the right caudal ventral quadrant abdomen in one cow and right dorsal quadrant in two cows suggestive of intussucception. Ultrasonagraphic examination was carried out to visualize the intestinal involvement distended intestinal loops could be appreciated. Based on clinical and special diagnostic examination the cases were diagnosed to suffer intussusception. Under right paravertebral block and TIVA right flank laparotomy was performed. Peritoneal cavity was thoroughly explored and intestinal mass causing obstruction was identified and exteriorized. Enterectomy followed by end to end enteroanastomosis was performed. The routine post-operative follow-up and wound care with antibiotic therapy resulted in an uneventful recovery in all the animals. It is concluded that the anaesthesia and surgical protocol described were found suitable to manage surgical abdominal disorders in cattle.

RUS 12

Evaluation of two surgical procedures for interdigital hyperplasia in cattle

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The study was conducted on 12 clinical cases of cattle with interdigital hyperplasia. These cases were randomly divided in 2 groups irrespective of their age, sex and breed. Group 1 cases underwent conventional method excision and Group 2 cases underwent surgical excision by using electrocautery. Comparative evaluation of these two methods for removal of interdigital hyperplasia was done on the basis of qualitative assessment of technique and parameters studied were hematological, biochemical, Clinico-physiological and histopathological examination. Electro surgery proved to be superior than conventional excision as it can be used with ease in large masses where excessive exposure of surgical site is not possible and can be used without complications, minimal bleeding and moreover less damage to adjacent tissues. Duration of surgical intervention was shorter for excision using electrocautery.

RUS 13

Incidence of teat wounds in cross bred animals – a review of 12 cases

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The incidence of teat wounds with exposed teat sinus were studied in 12 crossbred cows in and around Puducherry region. All the animals presented were cross breds and were in their first stage of lactation with the healthy calves. the complete history was obtained from the farmer regarding the time of occurrence of wound and its duration, etiology and any treatment adopted were documented. Various parameters were studied viz., teat which was affected, shape of the affected teat (cylindrical/ pear/ bottle/ conical/ funnel), length of the teat. Characteristics of the wound viz., Location (Tip/ mid teat/ Base), Direction (circumferential/ vertical/ horizontal), Involvement of various tissue layers, Colour of the wound (Red/ Pale pink/ Purple/ Black-Brown/ Green/ White) and Nature of wound edges (Defined/Undefined, Non-adherent/loosely adherent/ firmly adherent, Fibrotic/ Callused/ Macerated, Soft/ Fleshy) were studied and reported. The affected teats were reconstructed surgically.

RUS 14

Application of disposable skin staples for external wounds on teat

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A clinical study was conducted on a total of 6 cows presented to Department of veterinary Surgery and Radiology, Teaching veterinary clinical complex, Rajiv Gandhi Institute of Veterinary Education and Research, Pondicherry with deep lacerated wounds on the teats exposing the teat cistern with dribbling of milk for the present study. Upon preoperative evaluation of the wound, the mucosal and muscular layers were sutured separately by simple continuous suture pattern using polyglactin 910. Disposable stainless steel skin staples was applied at a gap of 5 mm for apposing the wound edges. The patency of the teat was maintained by placing sterile prosthetic tube made up of modified polyvinyl chloride in-situ and fixed to the skin at the teat tip And was attached with a 2ml disposable syringe. Postoperative evaluation of the reconstructed teat was carried out by the morphological evaluation on 7th day and 10th day.

RUS 15

Theloresectoscopy for treatment of teat canal obstruction in six lal kandhari and deoni cows from Udgir

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Cows presented with obstructive disorder of milking at the TVCC, COVAS, Udgir were subjected for detail history and clinical examination. Six cases indicating internal affection of teat (teat canal) and not yielding to simple maneuvers were prepared and treated with theloresectoscopy (TRS) under intravenous general anaesthesia. GA was provided with double drip of ketamine-guaifenesin till effect. The various teat affections were fibrosis at the proximal third of teat (2), fibrosis of gland cistern (2), membranous obstruction (1) and nodular growth (1). The advanced modality of TRS depicted good and satisfactory images to evaluate the lesions of teat canal and provide quick and effective treatment to establish the milk flow. Insufflation of the teat canal, repeated flushing of the debris and cleaning the tip of theloscope (TS) were the difficulties observed. The experience and observations on TRS are narrated.

RUS 16

Diagnostic radio imaging and retrieval of unusual oropharangeal foreign body in six bovines

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The present study illustrates the removal of unusual foreign body from oropharyngeal region in six bovines (5 buffaloes and 1 cow calf). Diagnosis and description of the foreign bodies -type, size and location - were confirmed by critical radio-imaging of the oropharyngeal region. Most of the objects are metallic and retrieved manually through oral cavity under general anaesthesia with xylazine and ketamine. However, successful

surgical retrieval of metallic wire was performed in one case. Of the six animals studied five made an uneventful recovery with resumption of feeding immediately after recovery from anaesthesia, while one buffalo succumbed during intraoral retrieval.

RUS 17

Herniorrhaphy in various cases of cattle and buffalo

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Different types of cases of hernia in cattle and buffalo were brought to the Teaching Veterinary Clinical Complex, C. V. Sc. & A. H., NDUAT, Kumarganj during last year. These include two cases of exomphalos on in cow calf and one in buffalo calf, one case of omphalocele in a cow calf, one case of gastroschisis in a buffalo calf, two cases of traumatic lateral abdominal hernia one in cow one in buffalo heifer and one case of traumatic caudo-ventral abdominal hernia in a cow. The cases of exomphalos were repaired by replacing the protruded intestine after washing it with NSS and antibiotic solution and slightly increasing the defect. Omphalocele and gastroschesis were repaired in standard manner. Cases of traumatic lateral abdominal hernia were also repaired in standard manner after 72 hour fasting of the animals. The traumatic caudo-ventral abdominal hernia in a cow could not be repaired because of large size of rent and its location. In all the attempted cases recovery occurred.

RUS 18

Effects of knuckling pattern of milking on milkers

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The present study was conducted on 50 milkers in Pondicherry (UT) to acquire first hand information on age, sex, pattern of milking, number of years in milking profession, number of animals milked per day, average time taken for milking per animal and details of the lesions on their thumbs etc. It was recorded that all the professional milkers were male, all the female milkers were milking only their owned cows. All of them were apparently healthy and followed only knuckling pattern of milking. Number of years in milking profession ranged from 5 to 30 and total number of animals milked per day ranged from 3 to 50. Average time taken for milking per animal was 8 minutes. Milker's calluses of different size were seen on the distal inter-phalangeal joint on the back of their thumbs. The size of the lesion (from a digital photograph using Imagej software) on right thumb was bigger than that of the left thumb. While milking, pain in hands was noticed in all the milkers along with back/shoulder pain.

RUS 19

Management of milker's callus induced partial teat obstruction using isoflupredone phonophoresis in cows

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Phonophoresis is the migration of drug molecules through the skin under the influence of ultrasound. In present study, six cows diagnosed to have partial teat obstruction caused by milker's callus were selected. Following pre-treatment evaluation all the cows were subjected to Phonophoresis using Isoflupredone acetate (10mg %) gel and in standing position after tying the hindlimbs. 1 MHz ultrasound therapy equipment was used in continuous mode at 2W/cm² intensity using approximately 15 gms of Isoflupredone acetate gel as a coupling media. Ultrasound transducer was applied and moved over the affected area in slow circular motion for 10 minutes. All the affected teats were subjected to a total of 5 sessions each at 24 hours interval. Phonophoresis was effective in reducing the size of the proliferative lesions, managing pain and improving the teat sinus diameter of the affected teat. Since it is a non-invasive therapy, surgical risk and postoperative complications were avoided. Phonophoresis is easy, safe and cost-effective therapy which can be employed at field level for treatment of partial teat obstruction in cows.

RUS 20

Surgico-therapeutic management of obstructive urolithiasis in buck: Review of 10 cases

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Ten bucks presented with history of complete obstruction of urine at TVCC, Kothari Veterinary Hospital, DUVASU, Mathura. Unfruitful attempts were made by massaging or amputation of the urethral process to relieve the obstruction. Urinary bladder was found intact on abdominocentesis and USG examinations. Tube cystotomy was performed under epidural anaesthesia using 2% lignocaine hydrochloride in these cases to bypass the urine and further medicinal management of the calculi. The bucks were restrained in lateral recumbency. The laparotomy was performed at anterior aspect of the rudimentary teat and urinary bladder was located. A subcutaneous tunnel was made through which the Foleys catheter was passed with pointed end towards the incision. The tip of the Folys catheter was grasped in mosquito forceps and pierced into the bladder. The bulb of the catheter was filled with the sterile water and fixed inside the bladder. The wound was closed routinely. Antibiotic and analgesic were administered intramuscularly for 3 days. Norfloxacine (5 mg/kg Body weight) and ammonium chloride at 100 mg/Kg body weight, BID daily, per Os for 10 and 30 days, respectively. Owner was advised to block the catheter for 3 hr after 7 days to find out the status of normal urination. The Follys catheter was removed after complete dissolution of the calculi and normal natural urination. Tubecystotomy was clinically found suitable to treat the obstructive urolithiasis in buck.

RUS 21

Blood gas, ruminal fluid and heamatobiochemical analysis with rumenotomy for management of acute ruminal acidosis in goats

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The research was conducted in clinical cases of eighteen goats suffering from acute ruminal acidosis referred for treatment. The animals were randomly divided into three groups of six animals in each group. The treatment included administration of sodium bicarbonate and bufzone powder (G-I), sodium bicarbonate, ecotas bolus and rumenotomy (G-II), sodium bicarbonate, rumenotomy and cud transplantation (G-III). Therapeutic efficacy of each group was evaluated based on recovery from clinical illness, physicochemical changes in rumen fluid and blood on different intervals 0 hours (before treatment), 12, 24, 72 and 120 hours after the initiation of the treatment. The more frequent clinical signs observed were complete anorexia, distended abdomen with fluid flashing sound, diarrhea, dyspnoea and tachycardia in acidotic goats. The physico-chemical properties of ruminal fluid showed significant changes in almost all the parameters. The ruminal fluid showed milky white colour, watery consistency, sour odour, decreased pH, absence of ruminal protozoa, increased TVFA, increased MBRT, absence of SAT and more percentage of gram positive organisms were observed. Haematological, biochemical and blood gas analysis showed significant increased Hb, PCV, TEC, TLC, glucose, AST, H+ and base deficit values whereas, decreased VpH and HCO-3 values were seen. In this study rumen lavage with normal saline by rumenotomy in combination with transfaunation from a healthy animal yielded better results (G-III). Ancillary therapy with balanced electrolyte solutions, streptopencillin, thiamine hydrochloride, chlorphenaramine maleate and calboral augmented the recovery in all the three groups. Surgery is considered as emergency therapy to save the life of goats.

RUS 22

Surgical management of intestinal obstruction in pregnant cows – A review of 3 cases

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Obstruction of the intestinal lumen with subsequent impairment to the flow of luminal content is a relatively common occurrence in animals. Among the various causes of mechanical ileus, intussusception is an uncommon cause of intestinal obstruction in adult cattle. Intussusception is defined as the invagination of a portion of intestine (intussusceptum) into the lumen of the adjacent segment of bowel (the intussuscipiens). A total of 3 cross bred Holstein Friesian cows were presented to the Department of Veterinary Surgery and Radiology, College of Veterinary Science, Tirupati with a history of blood tinged mucoid faeces, colic, anorexia and reduced ruminal motility. Out of 3 animals two were in the last trimester of pregnancy and one was in the

2nd trimester with no obstetrical abnormalities. Exploratory laparorumenotomy was done in all the three animals and the conditions were confirmed as intussusception, volvulus, and foreign-body. The conditions were corrected by enterotomy and entero-anastomosis. Postoperatively the animals were maintained with parenteral fluid therapy for 5 days and antibiotic therapy for 7 days.

RUS 23

Surgical management of bovine urolithiasis - a review in three male calves

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Three male calves aged 5- 7 months old were presented to the clinics with a history of anorexia, not passing urine and discomfort since last 3 to 7 days. Clinically the calves found to be dull, depressed and dehydrated. Uro-abdomen was confirmed by Radiography and in one calf , the obstruction was relieved by urethrotomy under local infiltration with 2% lignocaine hydrochloride and the patency was checked by passing a suitable sized polyethylene tube into the bladder from incised urethra . In the other two calves the condition was relieved by cystotomy and urethrotomy. It was found that the urinary bladder was filled with 100-150 grams of sand type urolith crystals size varying from 1mm to 5 mm in size. Where in the patency of the urinary bladder is provided from bladder to the urethrotomy site by using feeding tube size no.10. The feeding tube removed after 7 days. The surgical wound healed without any complications after post-operative antibiotics and anti-inflammatory drugs for 7 days in the three cases, whereas the urine scalding marks on the urethrotomy site is a limitation.

RUS 24

Bubaline diaphragm matrix: Development and clinical assessment into cattle abdominal hernia repair

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The purpose of the study was to develop a xenogenic bubaline diaphragm matrix (BDM) for abdominal hernia repair. A fresh diaphragm was decellularized using aqueous SDS solutions over a period. Acellularity was confirmed histologically, and characterized by Masson's trichrome staining, scanning electron microscopy (SEM), DNA quantification, agarose gel electrophoresis and FTIR spectroscopy. BDM was used for clinical abdominal hernia repair in six cattle. Clinical, hemato-biochemical and antioxidant parameters were evaluated to assess their biocompatibility. Histologically, the diaphragm treated with 2% SDS for 48h showed complete acellularity and orderly arranged collagen fibres. SEM confirmed preservation of collagen structure and integrity. DNA content was significantly ($P<0.05$) reduced in BDM as compared to the native diaphragm. DNA extracts from BDM show considerable removal of DNA material, with absence of DNA band in agarose gel. FTIR spectrum of BDM shown all characteristic transmittance peaks of fresh diaphrahm collagen indicating preserved collagen structure. Cattle with BDM implant recovered uneventfully and remained sound at least

upto 6 months. Hemato-biochemical and antioxidant findings were unremarkable. BDM shows excellent repair efficiency and biocompatibility for abdominal wall repair in cattle without complications.

RUS 25

Bubaline aortic matrix: Histologic, imaging, Fourier transform infrared spectroscopic characterization and clinical assessment into cattle abdominal hernia repair

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The purpose of the study was to prepare and characterized bubaline aortic matrix (BAM) for abdominal hernia repair in cattle. The bubaline aorta was decellularized using established protocol. Native and decellularized aortae were examined for residual cells, and collagen structure and integrity by histologic examination and scanning electron microscopy (SEM). Masson's trichrome and Weigert's staining, DNA quantification, and Fourier transform infrared (FTIR) spectroscopy were used for further characterization of BAM. BAM was used for clinical abdominal hernia repair in six cattle. Clinical, hematobiochemical and antioxidant parameters were evaluated to assess biocompatibility of xenogenic BAM. Histologically, absence of cells and orderly arranged collagen fibers were observed in treated aorta. SEM confirmed preservation of collagen structure and integrity. DNA content was significantly ($P<0.001$) reduced in BAM as compared to the native aorta. DNA extracts from BAM show marked removal of DNA material, with absence of DNA band in agarose gel. FTIR spectrum of BAM shown all characteristic transmittance peaks of native aorta collagen indicating preserved collagen structure within decellularized aorta. Cattle with the BAM implant recovered uneventfully and remained sound. Hematobiochemical and antioxidant findings were unremarkable. Bubaline aortic matrix shows excellent repair efficiency and biocompatibility for abdominal hernia repair in cattle without complications.

RUS 26

Surgical management of bovine conjunctival squamous cell carcinomas- report of six cases

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The study reports successful surgical management of bovine conjunctival squamous cell carcinomas in five livestock. Three khillar bullocks, two Jersy crossbred cows and a Nagpuri buffalo, ranging between 6 to 11 years of age were presented during the three camps in adjoining districts of Nagpur. The chief complaints were blepharospasms and epiphora which were not responsive to the medical treatment since nearly four months along with drop in milk yeild in cows and buffalo and draught work in bullocks. Clinical examnation revealed conjunctival growth on membrana nictitans ranging from dorsal to ventral aspect of the medial canthus in five cases and papillomatus growth along the limbus near lateral canthus in one case. Surgical interventions were undertaken in all the cases asceptically for the surgical excision of the tumour under the Petersons nerve block analgesia in standing position. Five cases were subjected to tumour resection on third eyelid with an en block incision was taken on the healthy area of bulbar and palpebral conjunctiva. In one case enucleation of the

entire globe and lid margins was performed. In all the cases cauterization with 2% Silver Nitrate and no touch method was employed so that direct manipulation of tumour was avoided to prevent the spread of malignant cells in the surrounding area. The resection of squamous cell carcinoma of membrana nictitans with no touch technique followed by cauterization with 2% silver nitrate solution ensured complete removal of the tumour and decreased the chances of reccurrence for a year

RUS 27

Surgico-therapeutic management of hoof affections in goats

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The present study was conducted on 20 clinical cases of goats with hoof affections reported to TVCC, PGIVAS, Akola. Which were randomly selected and divided into two equal groups. Group T1 were subjected to hoof trimming and local application of Abrus precatorius ointment. Cases in T2 group were treated with hoof trimming, foot bath with 10% Zinc sulphate, parenteral administration of NSAID and Enrofloxacin. Clinico-physiological, Haemato-biochmical parameters showed non-significant variation in both the groups. Various hoof affections in goat can be clinically managed successfully with treatment T2 than T1. .Maintaining good shed hygiene and regular hoof trimming at least twice a year will help to prevent hoof affections in goat.

RUS 28

Outcome of Caesarian section in sheep with prolonged dystocia

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Eighteen mixed breed ewes with prolonged (average 48 hours) dystocia, most (14/18) of them unsuccessfully manipulated by farmers or field functionaries were subjected to standard flank laparohysterotomy under distal paravertebral nerve block using lignocaine hydrochloride. Two of the ewes found to have ruptured uterus died within six hours following surgery. The remaining sixteen (16/18, 88.9%) survived without complications. However, most (14/19, 74%) of the foetuses were found dead at the time of surgery. It was concluded that survival of the dams and particularly the foetuses could be increased considerably if the cases are presented for treatment without undue manipulations and delay. Thus, there is great scope for farmers awareness in this regard.

RUS 29

Surgical management of linear foreign body in cattle – A review of three cases

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Three crossbred cattle aged about six to eight years presented to Veterinary Clinical Complex, Veterinary College and Research Institute, Namakkal with history of abdominal distension after grazing with hyper salivation out of which one animal showed recurrent tympany. Clinical examination revealed a palpable mass felt on the cranial part of esophagus in animal (A), hanging of linear foreign body outside the oral cavity in animal (B) and no signs of palpable foreign body noticed in animal (C). Radiographic examination confirmed the presence of foreign body in the reticulum in animals B and C. Foreign body retrieved through orally in animal (A) under dexmedetomidine sedation at the dose rate of 1 µg per kg body weight. Rumenotomy was done in animals (B and C) under left flank paravertebral regional anaesthesia and linear foreign body was removed from the rumen and reticulum. Fluid therapy, antibiotics and analgesics were administered for five days with appropriate wound care. Recovery was uneventful in all the three animals.

RUS 30

Surgical Management of Congenital Umbilical Affections in Calves – A Review of three cases

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Three calves with the history of progressive swelling at umbilicus were presented to Veterinary Clinical Complex, Veterinary College and Research Institute, Namakkal. All the animals were subjected for clinical, radiological and ultrasonographic evaluation to confirm the type of swelling. On clinical examination, swelling was soft in consistency in abscess, hernial ring appreciated in one animal and umbilical cord thickening with dribbling of urine was noticed in one animal. Radiographic examination confirmed hernia and pervious urachus. Ultrasonography of abscess revealed homogenous mixture of echogenic and hypoechoic fluids within the hyperechogenic capsule, hernia revealed discontinuity of muscle layer and direct visualization of internal organ below the skin, pervious urachus revealed hypoechoic tubular structure between the bladder and the umbilicus. The abscess was lanced under local anaesthesia and seton placed inside the cavity. The hernia was repaired depending on the hernial ring size and location hernioraphy and hernioplasty were performed. Post operatively antibiotics and analgesics were administered. Skin sutures were removed on 10th post-operative day and all the animals made an uneventful recovery.

RUS 31

Surgical Management of Salivary Fistula in Three Camels (Camelus dromedarius)

Satveer Kumar, Rajnish Kumar, A. K. Bishnoi, Mahendra Tanwar, Sakar Palecha, P. Bishnoi, Shivangi Diwedi, Narendra Singh and Tushar Goyal

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Three camels of 6-10 years of age were presented at TVCC, CVAS, Bikaner suffering from salivary cum buccal fistula. Clinical examination revealed a small opening lodged with bundle of feed straws on the skin just below the lower eyelid at the lateral aspect of the cheek discharging saliva leading to wetting of hairs down below. Surgical procedure was done under Xylazine (0.4mg/kg I/V) sedation and local infiltration of 2% Lignocaine hydrochloride. The parotid salivary duct was identified as engorged duct and circumferentially double ligated with nylon suture after infusion of diluted Tincture Iodine into the duct towards the parotid gland. The buccal fistula was debrided and freshened followed by simple interrupted non-absorbable suture. Post-operative management was done as routine manner. All animals were recovered uneventfully.

RUS 32

Surgical management of caecal dilatation-torsion in bovines

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Caecal dilatation with torsion was diagnosed in two crossbred cows (7-8 years old) while simple caecal dilatation was observed in one buffalo. In all three animals clinical examination revealed reduced rumen motility, rest of the physiological parameters were within normal limits. Per- rectal examination revealed empty rectum with blood tinged mucus. On trans-abdominal right flank ultrasonographic examination, non-dilated small intestinal loops and gas filled caecum was visualized. Laparotomy confirmed caecal dilatation in the buffalo while caecal dilatation torsion was seen in both the cows. Typhlotomy was performed to relieve the distension, while in one of the cows with caecal torsion partial typhlectomy of strangulated portion was performed followed by enteroanastomosis. Post-operative care, wound dressing and feeding management continued for 12 days. All the animals made an uneventful recovery.

RUS 33

Management of open horn fracture in crossbred cows by suturing endosteum as an alternative to flap method of dehorning

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Cattle with open horn fractures at base are more prone for sinusitis since large sinus will be open for environment. Flap method of dehorning is indicated in such circumstances where frontal bone resection will be done to get skin flaps for closing sinuses. Crossbred cattle have relatively small sinus openings and horn core will be partitioned by many trabeculae. Horn contains a thin layer of highly vascular endosteum as an inner layer. Suturing endosteum leads to closure of the sinus. Hence in the present study a new technique of suturing endosteum for open horn fracture in cross bred cattle by poliglycolic acid suture no. 1-0 by simple interrupted pattern is attempted. The study was conducted on 12 clinical cases of horn fracture in crossbred cattle. 2 groups were made. In group 1, dehorning was done by flap method of dehorning under xylazine sedation and cornual nerve block. In group 2, suturing of endosteum was done under corneal nerve block. Post operatively antibiotics and anti inflamatories were given for 5 days. In both the groups, healing was good. In some cases of group 2 horn growth after 3 months was noticed. The study concludes that, suturing endosteum can be practiced in crossbred cattle as an alternative to flap method of dehorning. This new method is simple, less painful and prevents extensive surgery.

RUS 34

Surgical management of oesophageal obstruction in cattle – a review of three cases

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Oseophageal obstruction is a common surgical affection in cattle due to its indiscriminative feeding habit and lack of grazing grounds in urban areas. Three adult cattle of different breed, age and sex were presented with the history of salivation, acute cough, extended head and neck with severe boat. Clinical examination revealed all the three animals were suffered from cranial oesophageal obstruction. In one Holstein Friesian cow the oesophageal obstruction was relieved through oral examination and it was found to be a potato. In the other two cases cranial cervical oesophagotomy was performed and the obstruction was surgically relieved. The oesophagotomy incision was closed using absorbable suture material and post operative antibiotics and anti-inflammatory were administered along with fluid therapy. Feed restriction was practiced with regular wound care and the two animal recovered uneventfully without any complication.

RUS 35

Surgical management of pericarditis through ultrasound guided pericardiostomy technique in bovines

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The study was conducted in twelve bovines cases presented to the Veterinary College Hospitals Hassan, KVAFSU, over a period of three years, with the history of fever, decreased milk yield, depressed, exercise intolerance, coughing, recurrent bloat, dyspnea, jugular pulsation, brisket and submandibular edema. All the animals were subjected to clinical, haematological and ultrasonographic evaluation. Based on the clinical signs, haemato-biochemical and ultrasonographic findings diagnosed as Pericarditis. The serous and suppurative form of pericarditis cases were subjected for ultrasound guided pericardiostomy technique using Foleys catheter and artificial inseminating gun stilet. The pericardial fluid was drained with the help of suction pump and pericardial cavity flushed with warm 2 liters normal saline followed by 200 ml of Metris daily once for five days. The pericardial fluid was subjected for culture and sensitivity Post operatively parental antibiotic, supportive therapy was given for 5-7 days. Out of twelve animals four animals were died on 10th postoperative day, another five animals survived for 2 months and given birth to calf. Two animals survived nearly for a year and one animal after surgery given two calves and giving more than 15liters of milk till date. The minimally invasive ultrasound guided pericardiostomy technique will help in early recovery with minimal complications.

RUS 36

Laparoscopic cyst removal in small ruminants

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A total of seven adult sheep and goats were found to have intra-abdominal cysts (one per animal) on survey ultrasonography or reproductive laparoscopy. Sedation (Inj. Xylazine, 0.05mg/kg, IM) along with the lumbosacral epidural (Inj. 2% Lignocaine hydrochloride, 1ml/7kg) block produced satisfactory anaesthesia in all the animals. Two/three port laparoscopy was performed in dorsally recumbent animals restrained in Trenedlenburg posture in a cradle. The cysts were visualized, grasped, lifted closer to the abdominal wall and aspirated using laparoscopic artificial insemination gun or16-G hypodermic needle. Subsequently the empty cysts were recovered by enlarging the port for the grasping forceps. All the animals recovered without complications. Two of the seven cysts recovered were confirmed parasitic in origin. From the results of this trial, it can be concluded that laparoscopy is a minimally invasive and safe technique for confirmatory diagnosis as well as for retrieval of the intra-abdominal cysts in sheep and goats.

RUS 37

Surgical management of external abdominal hernias in bovines

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Total 14 cases of external abdominal hernias in bovines were surgically managed by herniorrhaphy and herniaoplasty. Among them 13 were cattle and one was buffalo calf. Diagnosis was made upon history, palpation and B-mode ultrasonography of hernial sac. Different hernial contents were recorded. Surgical method was decided upon value obtained by dividing hernial swelling's circumference with abdominal girth. Out of total 14 cases seven cases (Group-A) were surgically treated by herniorrhaphy using braided silk # 2 to suture hernial ring. Rests of seven cases (Group-B) were surgically treated by hernioplasty using polypropylene mesh in onlay fashion. Antibiotic, analgesic and antihistaminic drugs were administered in both the group of animal post operatively to control the infection for 5 days. Surgical site of all animals from both group were scanned by using B-mode USG. All animals from group A showed an uneventful recovery while in group B, one animal was found with recurrence of hernia and two animals were found with surgical site infection which was cured with post-operative management.

RUS 38

Obstructive urolithiasis in male buffalo calves - A review of 23 cases

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Twenty three cases of male buffalo calves were presented at State Veterinary Polyclinic, Jaipur, with the history of retention of urine, straining, abdominal enlargement, colic, anorexia at various months in a year. The cases were mostly reported in winter season with highest incidents in the month of December and January. Abdominocentesis was done to rule out the rupture of urinary bladder. In the cases of without rupture of urinary bladder attempt to relieve the calculi by massaging at site of the sigmoid flexor and urethral opening, we got success in 2 cases. In rest 21 cases tube cystostomy was performed as per standard operative process using Foley's catheter size 18. In cases of rupture urinary bladder, cystorrhaphy was done first followed by Foley's catheter placement. Broad-spectrum antibiotics and analgesic was given 5 and 3 days respectively. Ammonium Chloride at 100mg/kg body weight, BID was given orally for 21 to 30 days. The Foley's catheter was removed after 21 to 30 days of operation when normal urination and dissolution of urinary calculi occur. Out of 23 cases 18 male buffalo calves recovered uneventfully.

RUS 39

Studies on diagnostic and surgical corrections of different congenital malformations in young ruminants

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The clinical studies were conducted on different surgical affections of congenital malformation in young ruminants like cow calves, buffalo calves and kids with age ranged from 2 days to 3 months. The cases represented were atresia ani (5), hypospadias (2), pervious urachus (4), umbilical hernia (8) and recto-vaginal fistula (3) involving major malformation of gastro-intestinal tract and urinary tract. These cases were diagnosed based on case history, clinical examination, radiographic and ultrasonographic examination. The use of imaging techniques not only helped in the early diagnosis of the malformation but also assisted in performance of surgical treatment. In each case the surgical treatment was performed with standard procedure as per the case requirement i.e. reconstruction of atresia ani and recto-vaginal fistula, corrections of hypospadia, herniorraphy for umbilical hernia and resection of pervious urachus. In this study it was observed that, use of suitable anaesthetic agents, proper selection of suture material, maintenance of asepsis during the surgery, correctness of surgical technique, delicate handling of the tissue while dissection and through follow up of the case till recovery helped in the early recovery of the cases with least complications.

RUS 40

Comparative study between single and double stage diaphragmatic herniorrhaphy in buffaloes

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Present clinical study was conducted on 18 buffaloes suffering with diaphragmatic hernia, presented to Teaching Veterinary Clinical Complex of Krantisinh Nana Patil College of veterinary science, veterinary polyclinics, mini-polyclinics and dispensaries of State government. The aim of this study was to compare the conventional double stage diaphragmatic herniorrhaphy with the new operative technique naming single stage diaphragmatic herniorrhaphy. Buffaloes were divided in 2 groups as group A and group B, having 9 buffaloes in each group. Group A buffaloes were operated by single stage diaphragmatic herniorrhaphy while buffaloes in group B were operated by double stage diaphragmatic herniorrhaphy. Hematological and biochemical parameters viz. CBC, PCV, DLC, ESR, TLC and Serum Creatinine, Creatine kinase, Lactate dehydrogenase were also checked prior and after surgery.16 buffaloes (8 from each group) recovered uneventfully after surgery while 1 buffalo from each group was died during the surgical intervention due to respiratory collapse.

RUS 41

Surgical management of esophageal obstruction- a review of 26 cases

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25 cows and one buffalo were presented to Department of Surgery and Radiology, Veterinary College Hassan, with a history of salivation, retching, tympany were selected in the study. Based on clinical and ultrasonographic examination confirmed esophageal obstruction. Partially obstructed 11 cases were relived of obstruction by manual removal under sedation using mouth gag and 10 cases subjected for esophagotomy and five cases of thoracic esophageal obstruction cases were removed through rumenotomy. Out of 26 cases, three cases of wound dehiscence with esophageal fistula were observed. 23 cases were recovered without any complications. In conclusion, early diagnosis, proper application of manipulative or surgical interventions, and postoperative follow-up are the fundamental factors for successful outcomes of esophageal obstruction in cattle.

RUS 42

Tube cystotomy for the surgical management of obstructive urolithiasis in ruminants – A review of 8 cases

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Obstructive urolithiasis is the retention of urine subsequent to lodgment of calculi anywhere in the urinary tract from urinary bladder up to urethral orifice. The disease results in heavy economic losses to the livestock industry. Obstructive urolithiasis is a serious, potentially fatal condition as the condition is not treated before occurrence of systemic alkalosis. Many surgical approaches and techniques for the diagnosis and the treatment of the disease have been described in literature. In this review tube cystotomy using two way Foley's catheter followed by continuous per oral administration of ammonium chloride as urinary acidifier for the dissolution of the caliculi was performed and out of five cases two cases of small ruminants and out of three large animals two were recovered well. Early presentation, proper diagnosis and tube cystotomy using two way Foley's catheter followed by administration of urinary acidifier provides best results.

RUS 43

Correction of teat lacerations in cows a review of 13 cases

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Teat injuries are common in dairy cattle, and, compared with other frequently occurring diseases, these injuries often result in total loss of milk production and much complications even after the surgery. Teat injuries can be divided into two categories (external or internal injuries). 13 cases of teat lacerations presented to Department of Veterinary Surgery and Radiology, Veterinary College, Hassan, out of which only 3 cases of external injuries whereas other 10 are presented with the injuries extended upto mucosal layer of teat cistern. All the cases are sedated with Butrphanol (0.01mg/kg), Xylazine (0.02mg/kg) and Ketamine (0.04mg/kg) in 1:2:1 ratio. Then ring block for affected teat performed using 2% Lignocaine. The injured teat suturing performed using 2-0 Polyglactin 910 and skin with 2-0 Polyamide. Post-operative treatment performed by daily introducing the new infant baby feeding tube for the evacuation of milk and daily dressing with a course of antibiotic therapy. Out of which 2 cases recovered well and other 10 cases got complications like teat fistulation, mastitis and wound dehiscence.

RUS 44

Total Scrotal Ablation in Small Ruminants- a review of 4 cases

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Two goat and two sheep were presented to Department of Surgery and Radiology, with a alimentation of scrotum were selected in the study. Based on clinical and ultrasonographic examination and fine needle aspiration it was confirmed as hydrocele in two cases (a goat and a sheep), and bilateral cryptorchidism with congenital hypospadiasis and hydrocele in a case (goat) and fibrosed hard scrotum in a case (sheep). All four cases were subjected for scrotal ablation under ketamine (0.04mg/kg) and xylazine (0.02mg/kg) combination and local infiltration (ring block of scrotum) with 1% lignocaine. Out of four cases, for three were undergone only total scrotal ablation, for the goat with hydrocele, bilateral cryptorchidism and hypospadiasis, in addition to the total scrotal ablation with removal of cyptorchid testis, partial penile amputation and urethrostomy were performed. In conclusion, early presentation and diagnosis, proper surgical interventions, and postoperative follow-up are the fundamental factors for successful outcomes of total scrotal ablation in small ruminants.

Small Animal Surgery
Session

Image guided, robotic and keyhole surgical procedures in small animal patients

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Robotic surgery is a new and exciting emerging technology that is taking the surgical profession by storm. Robotic surgery is often signalled as the new revolution, and it is one of the most talked about subjects in surgery today. There is no doubt that it will become an important tool in the surgical armamentarium. It is a tool, like a 21st century scalpel.

Robotic surgery, computer-assisted surgery, and robotically-assisted surgery are terms for technological developments that use robotic systems to aid in surgical procedures. Robotically-assisted surgery was developed to overcome the limitations of pre-existing minimally-invasive surgical procedures and to enhance the capabilities of surgeons performing open surgery. A surgical robot is an obedient assistant to an accomplished surgeon that enhances his/her ability to get a magnified view, allowing manoeuvrability that far exceeds a human hand. Its benefits include minimally-invasive surgery, minimal blood loss, less pain, less chance of infection and tissue damage and faster recovery with minimal scars. Robotic surgery will use keyhole techniques and will be based entirely on image guidance, seamlessly integrating pre-operative data with intra-operative tissue morphology and function.

Present day minimal invasive surgery or laparoscopic surgery has many limitations. Some of the more prominent limitations involve the technical and mechanical nature of the equipment. Inherent in the current laparoscopic equipment there is a loss of haptic feedback (force and tactile), natural hand-eye coordination, and dexterity. Moving the laparoscopic instruments while watching a 2-dimensional video monitor is somewhat counterintuitive. One must move the instrument in the opposite direction from the desired target on the monitor to interact with the site of interest. Hand-eye coordination is therefore compromised. Some refer to this as the fulcrum effect. Current instruments have restricted degrees of motion, most have 4 degrees of motion, whereas the human wrist and hand have 7 degrees of motion. There is also a decreased sense of touch that makes tissue manipulation more heavily dependent on visualization. Finally, physiologic tremors in the surgeon are readily transmitted through the length of rigid instruments. These limitations make more delicate dissections and anastomoses difficult if not impossible. The motivation to develop surgical robots is rooted in the desire to overcome the limitations of current laparoscopic technologies and to expand the benefits of minimally invasive surgery.

A convincing illustration of how veterinary surgeons and robots can work together to improve surgery is that of retinal repair. Retinal surgery requires precise positioning of a laser, within 25microns of a target, in order to avoid damaging retinal blood vessels. If a retinal vessel is damaged, a retinal hematoma and subsequent blindness may occur. The unaided human hand cannot reliably direct a surgical instrument to within less than 100 microns of its target. Furthermore, as the surgeon becomes fatigued, an intention tremor develops that further decreases accuracy. Finally, the eye itself has a natural motion of 200 Hz and acts as a

moving target. The combination of these factors creates an operative situation that lacks the precision needed, but is well within the capabilities of current robotic technology. Robotic systems have been developed for this application to overcome human limitations. Using computer integration, the motion of the eye can be tracked and the eye made to appear stationary; the surgeon's tremor can be filtered. The end result is a system that can position a laser to within 10 microns of a target, thus making it ten times more accurate than an unaided human hand.

Types of robots used in surgery:

ARTEMIS- This system consists of 2 robotic arms that are controlled by a surgeon at a control console.

The da Vinci and Zeus systems are similar there are essentially 3 components: a vision cart that holds a dual light source and dual 3-chip cameras, a master console where the operating surgeon sits, and a moveable cart, where 2 instrument arms and the camera arm are mounted. The camera arm contains dual cameras and the image generated is 3-dimensional.

The Zeus system is composed of a surgeon control console and 3 table-mounted robotic arms. The right and left robotic arms replicate the arms of the surgeon, and the third arm is a voice-controlled robotic endoscope for visualization. In the Zeus system, the surgeon is seated comfortably upright with the video monitor and instrument handles positioned ergonomically to maximize dexterity and allow complete visualization of the operating field.

Compared with other minimally invasive surgery approaches, robot-assisted surgery gives the surgeon better control over the surgical instruments and a better view of the surgical site. In addition, surgeons no longer have to stand throughout surgery and do not tire as quickly. Naturally occurring hand tremors are filtered out by the robot's computer software.

The da Vinci robot includes a number of new surgeon-friendly features that make surgical procedures easier and more efficient than ever. These include:

a) 3-D high-definition vision. The da Vinci Si's two stereoscopic high-definition cameras provide the surgeon with a magnified view of the surgical site that combines superbly accurate depth perception with a 40 percent sharper image then previous models.

b) An additional arm. This additional arm, which can be used to hold a retractor or other surgical instrument, gives the surgeon 50 percent more operating capability.

c) Instant image referencing. This innovative feature lets the surgeon display up to two diagnostic images of the area being operated on (such as ultrasound or CT scans taken prior to surgery) inside the da Vinci's monitor, directly alongside the view of the real-time procedure—providing a critical extra reference where necessary.

d) Extra-mobile "wrist action." The da Vinci Si's patented mechanical wrists, which can hold a wide array of specialized instruments, function just like a human's but with even greater range of motion.

e) Scalability. This innovation lets the surgeon calibrate the robot's arm to move a fraction of an inch for

every inch the surgeon's hand moves—simplifying the most complex movements, including delicate resections as well as suturing and knot-tying.

Master controls that allow the surgeon to manipulate the instruments, translating the surgeon's natural hand and wrist movements into corresponding, precise and scaled movements. Robotic arms remain steady at all times and robotic wrists make it easier for surgeons to precisely manipulate tissue.

If robotic surgery is good and perfect will it replace humans as surgeons, the answer is NO. Surgery is not like a production line, where a machine can follow the same set of instructions and come up with the same outcome every time. Every patient for surgery is different, and even with the most advanced imaging technology we have available there are still things that you only see once the patient has been opened up. You need someone who can think, make decisions and weigh options, there is lot more to surgery than the cutting and suturing. There is the pre-operative preparation, the decision to operate at all, and the care afterwards including management of complications. A lot of those decisions are not clear cut, they involve careful consideration of the individual circumstances. So the man behind the machine is also important even in robotic surgery.

Robotic surgery has already proven itself to be of great value, particularly in areas inaccessible to conventional laparoscopic procedures. It remains to be seen, however, if robotic systems will replace conventional laparoscopic instruments in less technically demanding procedures. In any case, robotic technology is set to revolutionize surgery by improving and expanding laparoscopic procedures, advancing surgical technology, and bringing surgery into the digital age. Furthermore, it has the potential to expand surgical treatment modalities beyond the limits of human ability.

SAS 1

Isolation, expansion and characterization of bone marrow derived mesenchymal stem cells and their differentiation into hepatocytes in canines

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The study was based on canine bone marrow derived mesenchymal stem cells and their differentiation towards hepatic lineage in vitro. The mononuclear cells along with mesenchymal stem cells were harvested by density gradient centrifugation. The mesenchymal stem cells were isolated on the basis of their plastic adherence property. The fourth passage of these MSCs were made to differentiate into hepatocytes in stepwise manner including induction, differentiation and maturation steps. The differentiation was done by using growth factors HGF, bFGF and nicotinamide for induction, HGF, ITS and dexamethasone for differentiation and OSM, ITS and dexamethasone for maturation. The morphology of cells was characterized by PAS staining, ICG uptake, gene expression analysis and SEM. The cells demonstrated positive PAS staining by giving pink to purple red colour. The cells also affirmed the ICG uptake by manifestation of dark green colour nuclei. The RT-PCR analysis revealed the expressions of hepatocyte specific markers alfa fetoprotein (AFP), albumin (ALB), tyrosine aminotransferase (TAT) and alpha-1 antitrypsin (α1-AT) in differentiated cells. The cells when subjected to scanning electron microscopy also revealed hepatocyte like morphology. Thus, the exploitation of this in vitro harvested hepatocyte like cells may prove an effective therapy for liver diseases.

SAS 2

Isolation, propagation and characterization of bone marrow derived mesenchymal stem cells and their differentiation into neurocyte in dogs

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The aim of this study was differentiating cBM-MSCs into neurocytes *in vitro.* The bone marrow aspirate was processed in laboratory within 4 hours of its collection. Mesenchymal stem cells were isolated by density gradient centrifugation technique and cells were seeded in T-25 tissue culture flasks. After attainment of 80-90% confluence, first passage was performed by using Trypin-EDTA to expand the cell population. Cells were passaged till 4 passages and then grown in neurogenic differentiation media for 21 days in CO2 incubator at 37°C and 5% CO2. The morphology of cells was transitioned from spindle elongated shape to ring or net like shape. The cells were characterized at regular intervals by staining with the Nissl body stain after 21 days with positive result which coloured the nuclei blue-violet. The RT-PCR for the genes NSE and NFM revealed bands on days 21 confirming the differentiation process. The sample on gelatin scaffold and on pellet when subjected to scanning electron microscopy revealed net shape cells with cell aggregates. On the basis of this study it was concluded that MSCs possess potential to transdifferentiate to neurocytes when cultured in neurogenic media *in vitro* and the identification techniques are successful.

SAS 3

Incidence of mammary tumour and venereal granuloma in canine in durg district

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The present study was conducted to know the incidence of mammary tumour and venereal granuloma in canine from August 2017 to July 2018 and only clinically suspected cases of tumour were presented to Department of Veterinary Surgery and Radiology, College of Veterinary Science & A.H., Anjora, Durg (C.G.). Out of 25 cases, 18 cases of mammary tumours and venereal granuloma in male and female dogs of different age group and different breeds were selected for this study. The highest incidence of mammary tumour and venereal granuloma were observed in 4 to 7 years of age group. Higher incidence of tumour was observed in nondescript (38.88%) followed by Pomeranian (16.67) and Labrador (16.67%). All affected dogs were unspayed and uncastrated. Highest percent of tumour was observed on mammary gland (50%) followed by vagina (33.33%) and penis (16.66%).The occurrence of mammary tumour was more in 5th gland (16.66%) followed by 4th to 5th gland (11.11%), 4th gland (11.11%) and 3rd to 4th gland (11.11%). The occurrence of venereal granuloma was more in vagina/vulva (33.33%) followed by base of penis/glans penis (16.66%). The size of tumour between 3 to 8 cm and below 3 cm observed were more (44.44%) as compared to over 8 cm (11.11%). Mammary tumour and venereal granuloma were observed more in female as compared to male.

SAS 4

Comparison of different surgico-chemotherapeutic regimens for management of mammary tumour and venereal granuloma in canine

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The present investigation was made to compare the efficacy of different surgico-chemotherapeutic regimens for treatment of mammary tumour and venereal ganuloma in canine. The study was conducted on 18 clinical cases of different breeds irrespective of age and sex and was divided into three groups consisting of 6 animals in each group. Depending upon the size of tumour, they were subjected to either lumpectomy, mastectomy, episiotomy, surgical removal of tumour mass followed by chemotherapy. In Group I, only surgical excision of tumour was done whereas in animals of Group II and Group III, surgical excision of tumour mass followed by administration of Doxorubicin (30 mg/m2) BSA and Vincristine Sulphate (0.025mg/kg) intravenously alongwith DNS solution at weekly interval on 7th and 14th day respectively. Histopathological examination revealed venereal granuloma (TVT) (38.83%) was followed by adenocarcinoma (33.33%) and mixed carcinoma (27.27 %). Group I showed mild to moderate recurrence in two cases while group II showed minimum recurrence in one case whereas Group III showed no recurrence in any case during the study period of 60 days. The symptoms associated with chemotherapeutic drug administration were inappetence, vomition, anaemia and alopecia which were comparatively more in animals of Group II as compared to Group III. Surgical excision

combined with vincristine therapy was very effective leading to complete regression of tumour mass and metastases in canine as evident by minimum side effect on haematological and biochemical parameters.

SAS 5

Comparative studies on the efficacy of recombinant human epidermal growth factor and activated autologous platelets rich plasma on healing of avulsion wounds in dogs

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The present study was carried out in 12 dogs with clinical signs of avulsion wounds on skin of variable size and location without any systemic diseases. The data regarding the animal particulars, anamnesis, the type and nature of the lesion were noted. The wound was assessed on the day of presentation and during the post treatment period by objective evaluation, wound objective scoring, wound Planimetry, haematology and histopathological evaluation. The dogs were divided into 2 groups. Following wound bed preparation, the wounds in the animals of group I and II were treated with recombinant human epidermal growth factor and activated platelet rich plasma in gel form respectively. The healing process and complications if any were studied to compare the efficacy of the treatment protocols. The results proved that the topical application of recombinant human epidermal growth factor was superior to the activated autologous platelets rich plasma in favouring early healing process of avulsion wounds in dogs.

SAS 6

Comparison of the efficacy of Mesenchymal stem cells administration in full thickness cutaneous wound healing in guinea pigs

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The present study was conducted with the objective of comparing the efficacy of stem cells administration in full thickness cutaneous wound healing in guinea pigs with the control one. In the present study, one 2.5 X 2.5 cm square full-thickness skin (thoraco-lumbar region) wound was created on the dorsum of each of 12 guinea pigs of either sex and weighing 450- 700g, under standard anesthetic protocol. Animals were divided into 2 groups having 6 animals in each group. Bone marrow was collected from 5 guinea pigs for stem cell culture. The animals of group I received subcutaneous injection of PBS at wound margins on day 0 and group II received subcutaneous injection of 1×106 MSCs in PBS at wound margins on day 0 and again at day 3 followed with hydrogel dressing of wounds. Clinical, histopathological, histochemical and photographic parameters were recorded for each animal. Overall assessment of gross and histopathological evaluation suggested early wound closer, better granulation tissue, early and better orientation of fibrocytes and collagen fibers on histopathology, thus a better quality of wound healing in group II as compared to group I. From the above study it was concluded that application of MSCs by injection around the wound periphery leads to faster and

qualitatively better healing than the control one.

SAS 7

A study of pedicle graft (skin flap) for repair of extensive wounds in canines

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Repair of wounds by constructive surgery is not new. Various wounds have been treated with different methods but each method has its own advantages & disadvantages. Skin flaps or pedicle graft can be of different types i.e. transposition, advancement, rotation & islanded flaps. Skin flap gives more cosmetic appearance, less contracture and has less postoperative complications than skin graft. The study was conducted to evaluate the efficacy of different skin flaps constructions and wound healing on 9 clinical cases presented with extensive wounds on different parts of body and had a history of tumor underwent surgical excision. The reconstruction of the defect was carried out with different type of skin flaps depending upon its shape and availability of skin flap with good blood supply. The advancement flap was performed on rectangular defects whereas rotational flap and note flap were performed on circular and extensive circular defect respectively.

The mean time required for preparation of recipient bed for skin flap was 6.55±1.667 days. All dogs showed excellent wound healing with good cosmetic appearance from day 10-12th postoperatively except in one case where scar formation was observed. In two cases the dog mutilate the wound thus the sutures were cut through the skin but all the cases showed complete healing without any complications.

All the dogs showed normal skin healing with good hair growth in the direction same as to the surrounding skin except in one cases where the rotational flap was performed. The direction of hair was also rotated in the direction of the flap. Postoperatively all cases were dressed either with Bactigras wet or dry dressing material.

SAS 8

Comparative study on ventral midline and right flank laparotomy for ovariohysterectomy and their closure with routine and modified figure of eight sutures in dogs

Akashdeep Singh, R B Kushwaha, A K Gupta, Kartik Sharma and Sharad Kumar

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The study was conducted on sixteen female dogs for comparison of ventral midline and right flank approaches, each 8 dogs, for ovariohysterectomy and healing of two approaches following closure with routine sutures and modified figure of eight sutures pattern, each 4 dogs. Physiological and haematological parameters were recorded on day 0, 3, 5 and 7. Each subgroup was observed for intraoperative and postoperative parameters, and complications, if any. Most of the dogs were non-descript. Physiological and haematological values did not differ significantly ($P<0.05$) at different intervals within and between the groups. Length of incision (mm), time of exteriorization of uterine horn (min.), time of removal of ovaries and uterus, time of closure of laparotomy incision and total time of OVH were higher in ventral midline approach whereas time to perform laparotomy

was significantly higher in right flank approach. Right flank laparotomy heals faster than the midline approach for OVH. Post-operative complications seen in four dogs and included skin tearing, wound dehiscence and loosening of sutures.

SAS 9

Clinical study on diagnosis of canine urolithiasis

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Urolithiasis was diagnosed in the twenty dogs on the basis of history of retention of urine, clinical signs, haemato-biochemical parameters, radiography, ultrasonography, urine and stone analysis. Labrador and Pomeranian, male, 3-6 years age group were more affected and mostly brought in peak winter and summer season with partial obstruction. Calculi were mostly located at caudal to os-penis and in urinary bladder and found both as single and multiple in numbers. Hb, PCV, DLC were normal, whereas TLC count was significantly ($P<0.05$) higher. BUN, ALP and K were significantly ($P<0.05$) higher; creatinine, total protein, albumin, globulin were normal, whereas value of sodium and chloride were significantly ($P<0.05$) lower. Urine pH was acidic to alkaline, specific gravity was slightly higher than normal and had mild to moderate levels of protein, blood, leucocytes and urobilinogen. Stones were composed of calcium oxalate and struvite.

SAS 10

Clinical studies on surgical management of canine urolithiasis

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Twenty dogs with urolithiasis were managed surgically by urohydropropulsion (n=4), cystotomy (n=12), urethrotomy (n=1), urethrotomy and cystotomy (n=1), and scrotal urethrostomy (n=2). The mean volume of NSS for urohydropropulsion was 100 ml, required three attempt and stylet for catheterization. In cystotomy, bladder was intact, exteriorized easily, and had rough surface and required bidirectional flushing of urethra for complete removal of calculi. The mean time was 62.38 min. Calculi were easily removed from urethra and mean time of urethrotomy was 28.50 minutes. Haemorrhage from stoma was noticed for a week during urination following scrotal urethrostomy. Kinking, dislodgement and blockade were common complications post-operatively. Bladder suture dehiscence and incisional hernia was noticed in one dog each. Midline cystotomy with or without urohydropropulsion was effective for the surgical management of urolithiasis in canines.

SAS 11

Surgical evaluation of Diode LASER for excision of superficial growths in canine

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The present study was designed to evaluate and standardize the efficacy of diode laser for surgical excision of cutaneous masses/growths in canines. The study was conducted in two phases. In the first phase of study, the energy/power setting of laser machine was standardized for skin incision at various power setting in cadaver or tumor collected after surgery. In the second phase of study, 30 clinical cases of small growths/tumors in dogs were evaluated. Full thickness skin base of small growth/tumour was incised by using the diode LASER with ceramic tip and setting of appropriate power (Watt) in continuous wave mode. In first phase, the energy/power setting of laser were standardized at 12W and 14W for giving fine incisions. In the second phase of study these wattage setting were utilized in 30 clinical cases of superficial growth in canine. It was concluded that 12W- 14W power setting recommended for giving fine skin incision for removal of superficial growths and higher wattage i.e. 16W -18 W was required for cauterization of capillaries. In these settings skin incision could be achieved with minimal charring and bleeding.

SAS 12

Application of autologous platelet rich plasma in a wound management in animals

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Four dogs and two Goats were presented with wounds on limbs and body. Clinical examination of wounds revealed sever extensive damage of tissues and skin along with bone exposure. Ten ml of whole blood collected in EDTA vial aseptically and centrifuged for 3000 rpm for 10 minutes. After discarding supernatant Platelet Rich Plasma was collected in different sites on wounds. Improvement in wound seen and granulation was observed within two days of application on wound. Complete healing was observed in all cases. Platelet Rich Plasma help to manage the complicated wound in different wounds in animals.

SAS 13

Comparative study on laparoscopic sterilization techniques in dogs

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A comparative study on two different laparoscopic sterilization techniques was conducted on 12 appearantly healthy female dogs, divided in 2 equal groups and were subjected to laparoscopic ovariectomy and laparoscopic ovariohysterectomy in group I and II, respectively. The surgical parameters like surgical operating time, time to resect left and right organs and length of incision were studied. The mean surgical time duration

was longer in group I than in group II. The time for resection of right ovary was longer in laparoscopic ovariectomy (18.83 ± 2.42 minutes) than by laparoscopic ovariohysterectomy (14.33 ±2.71 mins). Ovarian pedicle bleeding and splenic puncture in one dog each were the intraoperative complications recorded in the study. Both the techniques were found equally feasible and safe for patients.

SAS 14

Clinical studies of dental tartar for diagnosis of mineral composition, micro flora and ABST in dogs

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The present study was conducted on 20 dogs suffering from periodontal diseases and present more or less amount of dental tartar presented to Department of Veterinary Surgery & Radiology, COVS & A.H., JAU, Junagadh for periodontal affections and routine dental scaling procedure, During dental scaling with help of sterile swab samples was collected from mineralized dental plaque of 20 dogs for diagnosis of chemical analysis, mineral analysis and ABST for further antibiotic treatment if required. The result of bacteriological culture revealed the presence of different types of bacterial colonies; viz. Streptococcus spp., Staphylococcus spp. and Escherichia spp. Levofloxacin had the highest in-vitro susceptibility followed by Amoxicillin, Gentamicin, Ceftriaxone, Oxytetracycline and Chloramphenicol as antimicrobial drug of choice. Analysis of dental tartar (20) composed of Calcium (Ca), Phosphorus (P), Magnesium (Mg), Potassium (K), Sulphur (S), Iron (Fe), Nickel (Ni) and Zink (Zn).

SAS 15

En-Bloc resection for caesarean section in dogs

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The study was conducted in pregnant dogs which were presented to Veterinary Clinical Complex, Namakkal with the history of impending whelping. All the dogs were aged between 3 to 6 years old and were pregnant for more than 63 days. Vaginal examination revealed primary partial uterine inertia. Ultrasound examination revealed strong foetal heart beats. Radiographic examination revealed well developed foetal skeletons. On the basis of clinical and physical examination it was observed that the dogs were apparently healthy and the decision of surgical intervention was made. All the dogs were premedicated with dexmedetomidine at the dose rate of 10 mcg per kg and induced with propofol at the dose rate of 2 mg per kg intravenously. The maintenance of anaesthesia was done by isoflurane. En-bloc resection was performed. APGAR score for neonates was evaluated from birth till 24 hours. Post-operative management was done. The skin sutures were removed on 10th and 12th day post operatively. All the dogs had uneventful recovery.

SAS 16

Clinical evaluation of staple suture technique for ovariohysterectomy in dogs

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Ten female dogs were presented for elective ovariohysterectomy and randomly assigned to Group I and Group II based on the method closure of skin incision with either staples or silk sutures following right flank ovariohysterectomy. The mean total duration for ovariohysterectomy recorded was 23.83±0.68 min. and 27.68±0.76 min, respectively for groups I and II. The clinical appearance of the skin was scored for the presence of swelling, erythema, dehiscence and discharge after 24 hrs, 5th and 10th post-operative day. The high incidence of dehiscence of staple suture recorded may be attributed to the tissue irritation on 10th day. Significant pain was experienced by patients on the removal of staples. Irrespective of the approach, 70% animals showed 'presence of pain' at the time of staple suture removal whereas, 90% animals showed 'no pain' where silk sutures are removed. Closure of skin incision is significantly faster with skin staples as compared to silk suture with overall time for stage IV (S-C) 440.8±14.82 and 660.8±8.34 sec in groups I and II respectively.

SAS 17

Histopathological examination of growths excised from the ear canal of dogs

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Six dogs (3 Labradors, 2 Mongrel and 1 Rottweiler) were subjected to excision of growths present on the ear under general anaesthesia. The histopathological examination of these growths revealed ceruminous adenocarcinoma in 3 dogs, papillary ceruminous adenocarcinoma in 2 dogs and fibromatous chronic inflammatory mass in on dog.

SAS 18

Clinical evaluation of surgical approaches for ovariohysterectomy in dogs

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Twenty female dogs were presented for elective ovariohysterectomy and randomly assigned to Group I – Right Flank and Group II – Ventral Midline Approach. Length of surgical incision, time (min) for successful surgical procedure and duration of stages of ovariohysterectomy were recorded. The stages were designated as: Stage I (I-P); Stage II (P-G); Stage III (G-S); Stage IV (S-C). The data were subjected to statistical analysis. The mean

lengths of surgical incision were 3.94±0.26 and 4.84±0.29 cm respectively for right flank and ventral midline approach. The total time taken from right flank is significantly less 25.77 ±0.98 min compared to ventral midline 31.50±0.79 min. The overall mean duration of stage I, II, III and IV in group I were 145.7±4.79, 53.3±16.5, 796.1±21.64 and 550.8±26.22 sec respectively for group I were significantly different than 118.7±2.88, 156.3 ± 5.86, 884.4±14.22 and 730±47.2 sec, respectively for stages I, II, III, IV in group II. Right flank approach provides an alternate to ventral midline for ovariohysterectomy in dogs.

SAS 19

Successful surgical management of ileo - ceaco- colic intussusception in pups – a report of four cases

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Four male pups aged less than four months of age were presented to the clinics of the College of Veterinary Science, Garividi, with a complaint of chronic diarrhoea and hanging reddish tubular mass from the anus. The condition was suspected for intussusception and all the pups were found positive for probe test and surgical repair was planned and executed. Lateral abdominal radiographs showed a radiopaque mass in the caudal abdomen in two cases; whereas, in the remaining cases, the radiographic findings were not conclusive. Haematological and serum biochemical analyses were performed and intravenous fluids and antibiotics were administered to stabilize the pups. The hanging masses were thoroughly cleaned with normal saline and packed with saline soaked gauzes till the time of surgery. Mid ventral Laparotomy was performed under general anaesthesia and the intussuscepted part was identified and exteriorized. The intussusception was reduced by applying gentle traction on the neck of the intussusceptum and milking the intussuscipiens out of it along with gentle push on the protruded part of the intestine from outside. Intussusception of ileum and caecum into the colon was found in all the four cases and the same was carefully reduced. The affected intestinal loops were thoroughly irrigated with normal saline and were carefully repositioned into the peritoneal cavity. The laparotomy wound was closed as per the standard procedure. Postoperatively antibiotics and analgesics were given. The clinical symptomology and outcome of the cases will be discussed.

SAS 20

Surgical management of caudal ventral hernia in three pups

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The present report describes about the successful repair of traumatic caudal ventral hernia in two female pups and congenital inguinal hernia in one male pup. Three pups of age varied between 2-3 months presented to TVCC, SKUAST-J, with history of road traffic accident in two cases and congenital progressive swelling in one case. Clinical examination revealed soft fluctuating, painless, reducible swelling around the caudal ventral abdomen. Difficulty in walking and standing alongwith altered gait observed. Ultrasonography revealed anechoic urine filled urinary bladder and motile intestinal loops in first case, motile intestinal loops in

remaining two cases. Accordingly herniorrhaphy was planned under general anesthesia. In all the three cases herniotomy was performed by incision over hernia sac, contents indentified and reduced .Then redundant sac was amputed in all three cases in one case the inguinal canal diameter was reduced using simple interrupted sutures. Then remaining subcutaneous tissues and skin sutured in routine manner. Post-operatively anti-infective and anti-inflammatory advised in all the cases. In one case recurrence occurred immediately after 1 week, which was reoperated.

SAS 21

Surgical and medical management of oesophageal foreign body in dogs: a review of three cases

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Three mix breed dogs of either sex were presented with the history of severe pain, dysphagia, dehydration and uneasiness. Radiographic examination revealed presence of esophageal foreign bodies like bone piece, needle and fish hook. Dog with large bone piece in esophagus was given general anesthesia and the bone was manually removed by elongated forceps. Dogs with fish hook and rusted needle in esophagus were subjected to endoscopic removal without any success and it was decided to attempt surgical removal. Surgery was performed under general anaestheisa and through mid-ventral neck incision approach foreign bodies were removed successfully. Animals which underwent surgery were maintained on intravenous fluids post operatively for one week followed by gradual change from liquid to solid diet. All the animals recovered successfully and uneventfully.

SAS 22

Management of obstructive urolithiasis and post-renal azotemia in dogs

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The investigation on obstructive urolithiasis and post renal azotemiawas carried out at the TVCC, Nagpur Veterinary College, Nagpur. In group I, urethrotomy while in group II, cystotomy was undertaken. The haemato-biochemical parameters indicated significant leucocytosis, neutrophilia, lymphoytopenia, erythrocytopenia and significant decrease in haemoglobin, PCV and increased BUN and serum creatininewhich decreased gradually in postoperative period. Serum Phosphorus showed significant difference between two groups. Peritoneal dialysis was performed in 4 cases showing post renal azotemia of high severity and non- responsiveness to surgery and intravenous fluids. Total 4 to 6 cycles were undertaken. The BUN, serum creatinine and serum electrolytes indicated significant reduction indicating success of dialysis. The urea nitrogen, creatinine and total protein levels in blood and dialysate were positively correlated. Thus, the peritoneal dialysis proved successful in combating azotemia in 3 dogs while one succumbed to death.Quantitative analysis of by using using XRD method was undertaken.

SAS 23

Conservative management of posterior paresis and hind quarter weakness in dogs

Khante Gauri, S. V. Upadhye, P. T. Jadhao, B. M. Gahlod, S. K. Sahatpure, N. V. Kurkure, S. B. Akhare and M. S. Patil

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Total 40 dogs suffering from spinal compressions either due to traumatic injury or due to intervertebral disc disease and reported at the Teaching Veterinary Clinical Complex were treated conservatively in two groups with administration of methyl prednisolone acetate or methyl prednisolone succinate@ 30 mg/kg body weight followed by 15 mg/kg body weight after 6 hours, along with other supportive medications and cage rest. The clinical, hematobiochemical, neurological and diagnostic imaging examinations were undertaken for diagnosis and assess efficacy of the treatment. The number of dogs recovered completely, improved ambulatory and did not recover in group I and group II were 15, 3 and 4 and 14, 0 and 4, respectively. Thus methyl prednisolone was found to be very useful in conservative management of posterior paresis and hind quarter weakness.

SAS 24

Surgical management of testicular tumours in dogs

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Three dogs of different breeds were presented with the swelling over the scrotum and inappetence. One dog had ulcerative wound over the scrotum. The clinical and ultrasound examinations revealed distorted structures of the testis. Surgical interventions were undertaken in all three cases. The histopathological examinations confirmed seminoma in two and sertolioma in one. The routine post-operative care resulted in complete cure and no complications were recorded.

SAS 25

Management of superficial cutaneous neoplasms by therapeutic management

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An extensive study on management of superficial cutaneous neoplasms was conducted over a period of five years 2013-2018 at TVCC, NVC, Nagpur. The various therapeutic modalities like intravenous chemotherapy, nano-particulate induced targeted intra-tumoral drug administration, adjunct chemotherapy and surgical management of superficial cutaneous neoplasms were undertaken in 72 dogs. The age, sex and breed wise incidence and clinical assessment of treatment modalities by clinical observations, haemato-biochemical indices, histopathological observations and quality of life were carried out. The efficacy of different treatment regimen is depicted in the results of the study.

SAS 26

Incidence of Neoplasms in Dogs - A Retrospective Study

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A retrospective study was conducted during January 2014-15 to 2016-17 on 369 neoplasm in dogs. The prevalence of canine tumours was categorized into skin and soft tissue tumours (31.17%); mammary tumours (29 %); tumours of reproductive tract(19.78 %); musculoskeletal tumours (7.6 %); digestive tumours (9.49 %); hematopoietic and lymphatic tumours (1.9 %) and urinary tumours (1.08 %). The most common skin and soft tissue tumours were mast cell tumours, whereas the others were basal cell tumours, perianal gland adenomas, melanomas, squamous cell carcinomas, sebaceous gland adenomas, canine cutaneous histiocytomas, dermatofibromas, lipomas and fibrosarcomas. The of 107 mammary tumours were adenocarcinomas (58.88 %, mean age 10 yrs),benign mixed mammary tumours (23.36%, mean age 9.04 yrs) and adenomas (14.01%, mean age 10.8 yrs). The overall percentage of occurrence of tumours was more in female than in males. Tumor recorded in non-descript breed of dogs was more. The common sites were skin and mammary tumor.

SAS 27

Efficacy and safety of iron oxide nano-particles Doxorubicin complex in comparison to intravenous administration along with oral antioxidant supplementation

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The clinical study on use of intravenous doxorubicin and intratumoural iron oxide nano-particles Doxorubicin complex along with oral antioxidants was conducted on 12 dogs suffering from superficial malignant tumours. Significant reduction in haematological parameters and adverse changes in biochemical parameters were observed in intravenous group while no significant changes were noted in any of the haemato-biochemical parameters in other group. Side effects like weakness, lack of energy and ability to perform physical work, vomiting and generalized alopecia were seen after every cycle. Histopathological features indicated reduction in mitotic figures, reduction in vessels and increased necrotic cells more pronounced in iron oxide nanoparticle- doxorubicin complex. The overall response of treatment protocol using iron oxide nanoparticles–doxorubicin complex intratumorally along with oral antioxidant supplementation indicated that it is an effective modality in skin and appendage tumour with minimum cytotoxic effect.

SAS 28

Efficacy of electrochemotherapy for management of superficial malignant tumours in dog

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Eighteen dogs with malignant superficial tumours were divided in three equal groups and were subjected to

three different treatment regimens. In group I were treated with doxorubicin hydrochloride @ 30 mg/m2 intravenously. In group II, along with doxorubicin hydrochloride, direct electric current of 8-12 V and 80-180 mA was passed into the tumour at different places for 30 minutes. The regression of the tumours was recorded on scheduled interval i.e. on 0, 7th, 14th and 21st days. In group III, radical surgery was undertaken. The electrochemotherapy resulted in drastic changes in the histopathological features with reduction in mitotic figures and vessels and increased necrotic cells indicating favorable results of chemotherapy. Electrochemotherapy with intravenous administration of doxorubicin proved to be superior therapy amongst three groups.

SAS 29

Comparative study of iron oxide nano-particle complex and intravenous administration of Doxorubicin

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A clinical study was conducted on 12 dogs suffering from superficial malignant tumours divided in two equal groups. In group A, two doses of doxorubicin @ 30mg/m2 were administered intravenously at the interval of 20 days. In group B, iron oxide nano-particles-doxorubicin complex was administered intratumorally on day 0, 7 and 20. In group A, significant reduction in haematological and significant adverse changes in biochemical parameters was observed. In group B, changes in haemato-biochemical parameters were non-significant. In group A, although significant regression of tumours was observed, severe side-effects were noted while in group B, local reaction at the site of injection followed by discolouration, necrosis, regression and detachment of the tumour tissue from muscle layers was observed. Overall response of treatment protocol using iron oxide nanoparticles – doxorubicin complex intratumorally indicated that it is an effective modality in tumours of skin, appendage and mammary gland.

SAS 30

Laparoscopic assisted diagnosis and herniorrhaphy of traumatic diaphragmatic hernia in 3 dogs

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3 dogs were presented to Dept. of Veterinary Surgery and Radiology, Bombay Veterinary College with a history of accident, severe dyspnea. On auscultation, heart sounds muffled, abnormal lung sounds. Plain and contrast radiography confirmed stomach, and segment of intestine herniated in thoracic cavity. Ultrasound examination - possibly liver & spleen in thorax. For confirmation thoracoscopy was advised. Under general anaesthesia and positive pressure ventilator, thoracoscopy was performed with subxiphoid port placement and thoracic cavity explored. Diaphragmatic and Mediastinal tear was noted along with liver, spleen, mesentery, stomach & small intestine in thorax. Laparotomy was performed and herniated organs replaced in abdomen through diaphragmatic tear, Herniorrhaphy performed and negative pressure restored. Surgical site

closed routinely. Dog weaned off ventilator and normal respiration restored. Thoracic tube placed. Dog recovered uneventfully from anaesthesia. Post-operative care followed routinely. Thoracic tube removed on 8th post-op day. Skin sutures removed on 12th post-op day.

SAS 31

Surgical management and fourier transform infra-red (ft-ir) spectroscopic study of obstructive urolithiasis in dogs: a report of nine cases

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Nine dogs with history of difficult urination for the past few days were presented to UVH, Kokkalai and Mannuthy. Survey radiographs confirmed the condition as obstructive urolithiasis. Ultrasonography revealed uroabdomen in one case. Haematobiology, blood gas analysis and urinalysis were conducted in all the cases. Surgical interventions like urethrotomy, cystotomy or a combination of both, depending upon the site of obstruction were done under general anaesthesia. Postoperative pH modulators, anti-spasmodics, antibiotic and anti-inflammatory therapywas employed depending upon the condition of patient. All the animals had an uneventful recovery except the one with bladder rupture. Stones retrieved through surgery were subjected to Fourier Transform Infra Red Spectroscopy (FT-IR) and microscopic analysis.On FT-IR five samples were found to be a combination of struvite, calcium oxalate dihydrate and calcium apatite crystals and four samples were a mixture of calcium oxalate monohydrate and calcium phosphate. FT-IR Spectroscopy was helpful in postoperative preventive management.

SAS 32

Foreign body obstruction of intestine and its surgical management in three dogs

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Three dogs were presented to UVH, Kokkali and Mannuthy with history of anorexia, vomiting and scanty faeces. Abdominal palpation revealed painful mass in two dogs. Contrast radiograph demarcated the foreign bodies in the intestinal lumen in all cases. Under general anaesthesia laparotomy was performed in all the dogs. Affected intestine segment was exteriorized and enterotomy was performed over the mass. Mango kernel from two and immature coconut from one were removed. The obstructed segment was devitalised in a one dog, enterectomy and end to end intestinal anastomosis was performed. Closure of enterotomy wound followed by omentalization was performed in the other dog and simple enterotomy in third. The laparotomy wound closed in usual pattern. Post-operatively food and water restricted for 72 hours. The dogs were supported with intravenous fluids and were treated with antibiotics and analgesics for five days. All the animal

had an uneventful recovery.

SAS 33

Surgical management of inguinal hernia in dogs: a report of eight cases

Laiju M. Philip, Prabhu kumar M. D., John Martin K. D., Sudheesh S. Nair, Dileepkumar K. M., Syam K. Venugopal, Thajunnisa A. S., Adarsh S. L., Anvitha Hansoge and Devanand C. B.

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Eight dogs were presented to University Veterinary Hospital, Mannuthy and Kokkalai of Kerala Veterinary and Animal Sciences University with the history of swelling at inguinal region. Seven dogs were female and one was male. The condition was diagnosed as inguinal hernia based on physical and radiographic examination. Under general anaesthesia, hernial sac was incised and explored. Spleen, intestine, uterus, omentum, urinary bladder and abdominal fat were found as hernial contents. The hernia contents were reduced and the hernial ring was closed with a series of simple interrupted sutures in all the cases. Reinforcement of suture line with polypropylene mesh as onlay graft was done in two cases. Ovariohysterectomy was performed in two animals in which uterus were the hernial content. Post-operatively antibiotics and analgesics were administered and all the animals had an uneventful recovery.

SAS 34

Comparative evaluation of various laparotomy approaches for ovariohysterectomy in bitches

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This study was carried out in eighteen adult bitches to compare the various laparotomy approaches to accomplish ovariohysterectomy. The animals were randomly divided into three equal groups that is Group I, II and III which consisted of six animals in each group. In Group I, animals were subjected to ventral midline laparotomy, Group II, right flank laparotomy and Group III, left flank laparotomy. Surgical parameters like length of surgical incision, operative haemorrhage, ease of exteriorization of uterus and ovaries, ease of ligation of uterus and ovaries, duration of procedure and cost of surgery (length of suture materials) were recorded. Further nature of wound, duration of healing, post-operative herniation/evisceration, clinico-physiological and haemato-biochemical parameters were assessed. There were transient changes in clinico-physiological and haemato-biochemical parameters which remained within normal physiological limit. Right flank approach required less surgical time and suture material along with quicker wound healing with minimum post-operative complications. Right flank approach appears to be good alternative for performing ovariohysterectomy in bitches as compared to left flank and ventral midline approach.

SAS 35

Comparative evaluation of gross observation, wound healing and re-epithelialization on infected wound healing in dogs with use of propolis and povidone iodine

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Non-healing wounds with multiple drug resistance are still a problem in veterinary practice. The study was conducted on 12 dogs with infected wounds divided into two groups having 6 dogs in each. The animals of group 1 were treated with 30% propolis ointment and animals of group 2, treated with povidone iodine for 7 consecutive days. Better findings was observed in colour of wounds, as the wound healed the colour changed to pink due to formation of new capillaries and fresh granulation tissue. Exudation, oedema, and pus were not observed as healing completed. Percentage of wound healing and re-epithelialization was higher at different time intervals in group 1 as compared to group 2, might be because of various polyphenols and flavonoids present in propolis. Therefore, clinically propolis can be advocated for faster wound healing as compared to povidone-iodine in dogs.

SAS 36

Comparative evaluation of haemato-biochemical changes during infected wound healing in dogs with the use of propolis and povidone iodine

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The study was conducted on 12 dogs with infected wounds irrespective of sex and breed, divided into two groups having 6 dogs in each. The animals of group 1 were treated with propolis ointment and the animals of group 2, treated with povidone iodine dressing for 7 consecutive days. Haemato-biochemical changes were recorded at different time intervals 0, 7, and 14th day in both the group. As wound healing progressed, non-significant changes were observed in Haematobiochemical parameters in both the groups. These finding suggested that use of propolis has not adversely affected healing of wound as compared to povidone iodine treated group, because of its better anti-inflammatory and anti-bacterial activity which promoted the wound healing faster as compared to the povidone-iodine. Therefore, clinical use of propolis dressing can be advocated for faster wound healing in dogs.

SAS 37

Comparative evaluation of histopathological changes during infected wound healing in dogs with the use of propolis and povidone iodine

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The study was undertaken in dogs with the objective to access healing response of propolis. The study was conducted on 12 dogs with infected wounds, divided into two groups having 6 dogs in each. The animals of group 1 were treated with propolis ointment and the animals of group 2, treated with povidone iodine dressing for 7 consecutive days. Better histopathological change was shown by group 1 with hyperplasic regenaration of stratum corneum, showed marked re-epithelialization, well organized granulation tissue, reduction in inflammatory cells infiltration and neovascularization as compared to povidone iodine. Therefore, propolis showed better healing response in infected wound healing in dogs as compared to povidone iodine.

SAS 38

Haemato-biochemical and histopathological changes during infected wound healing in dogs with the use of propolis

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The study was conducted on 6 dogs with infected wounds, irrespective of age and breed. The animals were treated with propolis ointment dressing for 7 consecutive days. Haemato-biochemical study did not show any alteration in values of total erythrocyte count, haemoglobin, total leukocyte count, packed cell volume, and differential leukocyte count, ALT, AST, total protein, fibrinogen and A:G ratio. Better histopathological changes shown by the propolis with hyperplasia of stratum corneum with considerable thickening of epidermis and large amount of well-organized granulation tissue with collagen deposition, well develop keratin layer reached almost upto dermis, highly vascularized area of wound with large amount of collagen deposition in mature granulation tissue were seen on day 14. Therefore, propolis can be clinically advocated for faster and better healing of infected wounds in dogs.

Wild and Zoo Animal Surgery

WZS 1

Rescue, treatment, rehabilitation and conservation of a rhino calf

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A month old female rhino calf weighing 96 Kg was rescued from flood in Kaziranga National Park, Assam and brought to the Centre for Wildlife Rehabilitation and Conservation (CWRC). Examination of the calf revealed a punctured wound in the left forelimb, which was suspected to be injury from predator. The calf was anaesthetized with intramuscular injection of Medetomidine (20 µg/kg) and Ketamine (2mg/kg) and placed on the operation table. Opening of the wound was enlarged and irrigated with povidone iodine solution. Ceftiofur 500mg i/m daily for 7 days and Ringers Solution was injected i/v to replace the dehydrated fluid. Normal gait of the calf was observed after 45 days. The rhino calf was maintained by feeding Lactogen-II formula. Concentrate feed was also supplied with grass to maintain nutritional status of the animal. The rhino calf has grown luxuriantly in the CWRC, Kaziranga and attained 600 kg body weight after 5 years of rescue. The rhino was sedated using Medetomidine – Azaperone and translocated to Manas National Park, which is 400 km away. It was released inside a BOMA of 4 square kilometer and maintained for 2 years. Boma is an electric fence covered area of grassland and water body ideal for rhino habitation. After adaptation, it was released into the Manas national Park but continuously monitored with the help of radio collaring. At the age of 11 years she gave birth of a calf. Thus a great step on conservation was placed under supervision of trained wildlife Vet.

WZS 2

Unshed molar tooth in an asiatic elephant (*elephas maximus*) and its surgical removal

S. Senthil Kumar, M. Vijayakumar, P. Tamil Mahan, S. Dharmaceelan, S. Kathirvel, D. Vishnugurubaran and S. Vigneshwaran

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

A 26 years old captive female Asiatic elephant weighing 3246 kg was presented to Veterinary College and Research Institute, Orathanadu with a history of reluctance to take feed for two days. Right lower molar tooth was observed to be protruding and shaking from its position. Clinical examination revealed a wobbly right lower molar tooth with sore gum and pain on palpation. It was diagnosed as a case of molar tooth retention and associated gingivitis. Radiography was attempted and it revealed displaced molar tooth from alveolar socket. As it was an unshed tooth retained *in situ*, surgical extraction of the tooth was planned. The elephant was sedated with acepromazine @ 0.004 mg/kg body weight with xylazine @ 0.04 mg/kg body weight intramuscularly. Elephant was restrained on left lateral recumbency to facilitate access to the affected tooth and gum. Mental nerve block employing 10 ml of 2% lidocaine injection was achieved. The attached gum margin was separated from the tooth edge. Using dental elevators and forceps a gentle rocking action was applied to the tooth to loosen up the tooth in the alveolus and to breakdown the periodontal attachments. Once sufficiently loose, the entire tooth segment was firmly elevated out of the tooth socket by hand. Boric

acid glycerin paste was applied on the alveolar socket for three days postoperatively. The elephant recovered uneventfully after tooth extraction and started to take greens normally. A review after 30 days revealed uneventful recovery with normal feeding behaviour.

WZS 3

Surgical management of cloacal prolapse in turtles: a report of five clinical cases

Priyanka Pandey, R. Jain and B.P. Shukla

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Five female turtles aged approximately between 2-3 years old who were brought to the Teaching Veterinary Clinical Complex with the history of straining during defecation, red colored swollen mass with attached small sized eggs below the tail region since last 2-3 days of cloacal prolapse. It was confirmed that the condition was cloacal prolapsed with the X- ray of abdomen region for pregnancy diagnosis. Prolapsed mass rinsed with normal saline solution after that apply cold fomentation. Carefully pushed back the prolapsed mass but next day cloaca was came out again in four female turtles. The cloaca were amputated in four females around the base of the prolapsed part. Mattress suture was placed at the base of the cloaca to control haemorrhage. Syrup Amoxicillin and clavulanic potassium 5 mg/kg b.wt. BID orally for seven days, drop meloxicam 2 drops BID for 3 days along with daily antiseptic dressing for 7 days. Sutures were remove on 8th post-operative day from the cloacal area. The all the female turtles recovered completely on 10th post-operative day.

WZS 4

Surgical management of rectal prolapse in turtles: a report of seven clinical cases

B. P. Shukla, P. Pandey, A. Shahi, R. Jain, A. Jaiswal, B. Das, S. Jawre, R. Singh

Nanaji Deshmukh Veterinary Science University, Jabalpur (MP)

Seven male turtles aged approximately between 4-5 years old who were brought to the Teaching Veterinary Clinical Complex with the history of continuous straining and difficulty during defecation, red colored rectal mass protruded below the tail region since last 4-5 days in all the turtles. After confirmation Prolapsed mass rinsed with fresh water after that apply cold fomentation. Carefully pushed back the prolapsed mass and apply purse-string sutures around the rectal wall with 2/0 black braded silk. Syrup Amoxicillin and clavulanic potassium 5 mg/kg b.wt. BID orally for seven days, drop meloxicam 2 drops BID for 3 days along with daily antiseptic dressing for 7 days. Sutures were remove on 10th post-operative day. All the turtles recovered completely on 10th post-operative day.

WZS 5

Management of Olecranon process fracture by fiberglass cast application in a lion (*Panthera Leo*): A case report

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A male lion aged 15 months old was brought to the Teaching Veterinary Clinical Complex, with the history of lameness and unable to take wait on the right fore limb because of injury due to fighting with lion before 2 days. Clinical signs showing swelling on whole affected limb. After radiographic examination confirmed that it was complet avulsion fracture of olecranon process. After giving general anaesthesia Roberts Jones bandaging apply with bamboo splint for three days. Inj. meloxicam @ 0.5 mg/kg body weight for 3 days. Complete reduction of swelling was observed after three days then fiber glass cast apply for 50 days. After 50 days remove fiber glass cast. Animal was completely cure and taking wait properly on affected limb.

WZS 6

Management of uterine prolapse in a turtle

Rajnish Kumar, Shivangi Diwedi, Satveer Kumar, P. Bishnoi, A. K. Bishnoi and Peer Rayees Aziz

Department of Veterinary Surgery & Radiology, CVAS, RAJUVAS, Bikaner

A sexually mature, female, turtle weighing about 400 gms was presented to the clinic of Department of Veterinary Surgery & Radiology, Bikaner for correction of uterine prolapse which had developed since 2 days. The chelonian was constantly straining and was dull, depressed and anorectic. Vital parameters *viz* temperature (82°F), respiration rate (5 per minute) and heart rate (26 per minute) were within normal clinical range. Prolapsed mass was edematous and inflamed, involving vagina and uterus soiled with dirt and dust and showing violent tenesmus. The prolapse mass was washed with Metronidazole solution and sugar was applied topically to reduce the congestion and edema of the prolapsed mass. The prolapsed mass was pushed manually after applying lignocaine jelly. Purse string sutures were applied with TruglydeTM on cloaca. The straining reduced gradually within 3 days and prolapse was not reported further.

WZS 7

Successful management of carapace fracture in a star tortoise and turtle: a case studies

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Veterinary Clinical Complex, College of Veterinary Science and Animal Husbandry, Anand Agricultural University, Anand (Gujarat)

Three Star tortoise and one turtles were presented at Veterinary Clinical Complex, Anand with history of automobile accident. Clinical examination revealed fracture of carapace in all tortious and turtle. The fracture site were properly cleaned with diluted betadine with normal saline. After application of lignocaine spray topically alligment of carapace were made and fixed with adhesive applied and cover with sterile guaze and

waterproof adhesive tape was applied. All tortois and turtle were given Inj. Meloxicam @ 0.1mg/kg and Inj. Dexomethasone @4mg/kg intramuscularly followed by syrup Clavum one ml and Drop Melonex one ml twice a day for seven days. The fractured carapace were healed within two and half months of time.

WZS 8

Critical size deep lacerated wound in an Indian Rock Python (*Python Molurus*) and its surgical management

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A five and half foot long Indian rock python weighing 10.5 kg was rescued by forest labourers and brought to Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences, Mannuthy , KVASU with critical injury on distal third of body occured by grass cutting blade of lawn mower. The reptile was with ketamine hydrochloride @ 10 mg/ kg bwt IM for detailed clinical examination and it revealed 15 cm long and 2 inch deep lacerated wound involving skin and lumbar musculature.Terminal coelomic cavity was having minor trauma with no involvement of visceral organs. A dorso ventral radiograph of traumatised part revealed fracture of few ribs and soft tissue damage. Irrigated the wound thoroughly with normal saline followed by metronidazole solution under anaesthesia with 4 per cent sevoflurane administered by endotracheal intubation.The traumatised tissues were debrided and torn edges of longissimus dorsi,spinalis and semispinalis apposed using polyglactin 910 (No 1-0) sutures in interrupted pattern followed by skin sutures using nylon (No 1-0) in interrupted pattern. Administered long acting enrofloxacin @ 4 mg / kg bwt and meloxicam @ 0.2 mg/ kg BW IM post-operatively and repeated after 72 hours. The snake recoverd uneventfully from anaesthesia, showed remarkable improvement in habits by 5thpost operative day and later released back to wild by 10thpost operative day.This case report focuses on various aspecst of surgical management of lacerated wound in python under sevoflurane anaesthesia.

WZS 9

Surgical management of certain emergency conditions in turtles (Lissemys punctate and Geochelone elegans)

P. Ravi Kumar, Ch. Mallikarjunarao, V Devi Prasad, D Srikala, M Sreenu and K Lavanya

Dept. of Veterinary Surgery and Radiology, Veterinary Hospital, Visakhapatnam, Sri Venkateswara Veterinary University, Tirupati

Four turtles presented to the Veterinary Hospital, Visakhapatnam (affiliated to Sri Venkateswara Veterinary University, Tirupati) with various affections warranting the surgery were included in the present study. Among four turtles, one had oesophageal obstruction with a metallic foreign body (Fish hook) and the remaining were presented with fractures of shell. In two turtles, the viscera were exposed through the fractured shells. Radiography aided in diagnosing the oesophageal obstruction in the first case; whereas, in the remaining cases the clinical examination played a sufficient role in diagnosis. Surgical repair of the condition under general anaesthesia was planned in all the turtles and all of them were prepared for aseptic surgery. In first case, an

attempt to retrieve the oesophageal foreign body from the buccal cavity was not successful. Oesopahagotomy was performed carefully at the site of obstruction and the obstructing metallic foreign body (Fish hook) was removed. The esophagotmy wound was closed as per the standard procedure. The turtles with shell fractures were positioned such that the fractured area faces the surgeon. Interfragmentary wiring was applied carefully after proper replacement of eventrated viscera. The repaired areas of the shell were supported and protected with application of adhesive tape for six months. Postoperative antibiotics and analgesics were given to all the turtles. The clinical symptomology, surgical procedure and outcome of the case will be discussed.

WZS 10

Lacerated wound due to automobile injury in a Russell 's viper (*Daboia russelii*)

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A Russell's viper (*Daboia russelii*) was presented with a history of automobile accident on a highway passing through a protected area nearby. On clinical examination, an elongated laceration along the right side of the cranial ribs was observed along with tear of lavator costa muscle. The surgical intervention for repair of injury was undertaken with local infiltration with lignocaine 2% was done to numb the area. The tear and laceration were sutured by simple interrupted pattern using absorbable material. A course of antibiotic and analgesic was given. The reptile recovered completely within 10 days and was released back into the wild with full restore of normal activities of the snake.

WZS 11

Surgical management of peribulbar abscess in indian star turtle

Vinny Anna Varghese, S. K. Mahajan, Vandana Sangwan, Kuldip Gupta

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

A male Indian star turtle was presented to Veterinary Hospital, GADVASU, Ludhiana with a complaint of asymmetric swelling of eye (that is one eye was puffed up but the other was normal). The swelling was present from last one month and was progressively increasing in size. The treatment by local veterinarian for the condition was unsuccessful. As no improvement was observed after medical management with vitamin A supplementation and enrofloxacin, surgical removal of the swelling under general anesthesia was planned. Surgery was performed under ketamine (20-60mg/kg) as intramuscular. Induction and maintained with isoflurane 2.5%. The mass was surgically removed. The extracted mass was hard and was about 7 mm in size. The sample was sent for histopathological exam which revealed necrosed mass with organized type of pus. The animal had an uneventful recovery with no recurrence one month post-surgery.

WZS 12

Successful surgical management of fracture of left metatarsal in a Chinkara

Komulwar P. G. and Ingole D. K.

A Chinkara (Gazella Bennettii) of approx age 2 year was presented to Veterinary Polyclinic, Dhule with the history of complete fracture of proximal end of left metatarsal. The distal fractured limb was hanging with the attachment of skin. The wound was soiled and bleeding at the time examination. The wound was cleaned with the chlorhexidine solution and bleeding was checked by applying tourniquet proximal to fractured site. The surgery was planned to ampute the limb at Tibial mid shaft, once the patient become stable the surgery was carried out. Post-operatively antibiotics and anti-inflammatory was administered for 5 days. Chinkara showed successful recovery after twenty days.

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48.	Diagnosis and management of tracheal rupture due to dog bite in small ruminants. *Karan H., Bhagavantappa B., Jahangir D., Dilipkumar D., Shivaprakash B. V., Vinit Doijode, Kumarswamy, Venkatgiri and Tokappa G.*
49.	Surgical management of metallic foreign body of reticulum in goat. *Anil Singh, Mamta Mishra, Amolak Sharma, Pradeep Kumar, G. Kumar and S. Purohit*
50.	Extra luminal small intestinal obstruction in cow a case report. *Venkatgiri., Dilipkumar D., Shivaprakash B.V., Bhagvanthappa B., Jahangir D., Sagar P., Kumarswamy., Tokappa G., Swaroop G. and Karan H.*
51.	Successful surgical management of orophayrngeal metallic foreign body in advance pregnant buffalo. *A. H. Kawhale, R. V. Suryawanshi, P. Chougale, S. Lotlikar and A. H. Ulemale*
52.	Management of Cervico-vaginal Prolapse along with Urinary Bladder due to follicular cyst: A Surgical Approach by Ovariectomy. *S. D. Lotlikar , R. V. Suryawanshi, A. H. Kawhale ,P. Chougale and A. H. Ulemale*
53.	Surgical management of traumatic abdominal hernia and rupture of gravid uterus in a goat. *Komulwar P.G. and Thakur Nilsh*
54.	Successful surgical management of rare case of omaso-abomasal obstruction in advance pregnant HF cow. *P. B. Chougale, R. V. Suryawanshi, S. D. Lotlikar, A. H. Kawhale and Y. B. Jadhav*

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55.	Management of prepucial stenosis in a buck. *Manjunath S. P.*
56.	Cosmetic surgery for correction of excessive skin fold at the base of horn causing skin irritation and consequent non-healing wound in a Gir bull. *Reji Verghese, Anikshit Verma, Gisha G. Nair, Anees R. and Vipin Prakash J. S.*
57.	Surgical resection of teat neoplasia in a murrah buffalo. *Priyanka, Neeraj Arora, Deepak Kumar Tiwari and Satbir Sharma*
58.	Surgical Management of Traumatic Evisceration in Sheep- a case report. *Rakesh T, Manjunatha, D. R., B. R. Balappanavar, and N. Nagaraju*
59.	Manual Removal of Calculi from Urethral Process of a Ram – A Case Report *Ramya. M N, Manjunatha, D. R., B. R. Balappanavar, and N.Nagaraju*
60.	Surgical Management of Congenital Aplasia ani and Rectovaginal Fistula in a Lamb – a case report *Nagabhushana., H V, N. Nagaraju, Manjunatha, D. R. and B. R. Balappanavar*
61.	Surgical Management of Congenital Hypospadiasis, Bilateral Cryptorchidism in a Lamb- A case report. *Nagabhushana., H. V., B. R. Balappanavar, Manjunatha, D. R. and N. Nagaraju*
62.	Successful surgical repair of Achilles tendon rupture in cow heifers. *C. A. Avhad, V. D. Aher, B. K. Bhadane, G. P. Dhage and S. A. Jadhav*
63.	Surgical management of cryptorchidism in a bull. *S. A. Jadhav, V. D. Aher, G. P. Dhage and C. A. Avhad*
64.	Surgical management of oesophageal affections in three buffaloes. *V. S. Dabas, S. K. Jhala, D. N. Suthar, S. K. Tyagi and R. H. Bhatt*

Poster Session Small Animal Surgery

Sr. No.	Title with author
1.	Successful Surgical Management of Olecranon Bursitis in a Saint Bernard Dog: A Case Report. *Dakhane P. S., Tripathi S. D., Lokhande D. U. and Khandekar G. S.*
2.	Ultrasonographic features and surgical correction of double layer intussusceptioin of terminal large intestine in a 2.5 month old German Shephard dog associated with chronic rectal prolapse. *Jyotsana Bhatt, N.S. Jadon, Manjul Kandpal , Rashmi Saini, Prachi, Bharti Negi, Abhishek, M.S. and Arun Kumar*
3.	Unusual ventro-caudal hernia in a 2 month old mogrel male dog associated with urinary incontinence. *Rashmi Saini, N.S. Jadon, Manjul Kandpal, Deepti Bodh, Bharti Negi, Jyotsana Bhatt and Rohit Prabhat*
4.	Diagnosis and management of intestinal obstruction in dog - A Case Report. *Rashmi Saini, N.S. Jadon, Manjul Kandpal, Deepti Bodh, Rohit Prabhat and Arun Kumar*
5.	Examination and surgical correction of epulis in a 4 year old Pitbull dog. *Arun Kumar, N. S. Jadon, Deepti bodh, Abhishek, M. S., Jyotsana Bhatt, Rashmi Saini and Akanksha Godiyal*
6.	Surgical management of intestinal fish hook in a cat. *S. Dharmaceelan, S. Kokila, D. Vishnugurubaran, A.R. Ninu and M. Bharathidasan*
7.	Surgical management of sertoli cell tumour in a dog. *N. R. Padaliya, J. V. Vadaliya, K. S. Gameti, R. H. Bhatt, and V. D. Dodia*
8.	Diagnosis and management of hysterocoele in a queen. *K. S. Gameti, J. V. Vadaliya, N. R. Padaliya, F. A. Asodiya and K. P. Katara*
9.	Ultrasonographic diagnosis and surgical management of traumatic inguinal hernia (Enterocele) in a female dog: a case report. *Ruchi Patwa, A.K. Bishnoi, Shivangi Jorwal, Mohan Patel and P. Bishnoi*
10.	Surgical management of inguinal hernia in a pup. *Y. P. Singh, M. C. Parashar and Nazneen Atwa*
11.	Scrotal urethrostomy in dogs- A report of 3 cases. *Y. P. Singh, M. C. Parashar, R. K. Mishra, Lenin Bhatt, Himani, Amandeep Kaur, Vimlesh Kumar and Kalpana Jaiswal*
12.	Stabilization of bilateral femoral diaphyseal fracture by closed method of stack intramedullary pinning in a dog: A case report. *Hemant Kumar, Mahendra Tanwar, Mohan Lal, A.K. Bishnoi, Anil Kumar and Kuldeep*
13.	Treatment of Perineal hernia by internal obturator transposition herniorraphy in a dog. *P. V. Parikh, I. A. Pal, J. K. Mahla and P. B. Dhabhi*

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14.	Intramedullary pinning of right tibia in a rabbit (*Oryctolagus cuniculus*). *R B Kushwaha, Mehreen Basheer, Zaid Bashir Tragwal, Upasana Sharma and Anmol Watal*
15.	Surgical management of fibrocystocytoma in a dog. *Premsairam, C., Vani, G., Veena.P. and Suresh Kumar, R. V.*
16.	Surgical management of junctional melanocytoma in a dog. *Vani, G., Premsairam, C., Veena, P. and Suresh Kumar, R. V*
17.	Surgical management of inguinal hysterocele in a bitch *Vani. G, Veena. P, Prem Sai Ram, R. V. Suresh Kumar*
18.	Surgical management of proximal tibial physeal fracture in a dog. *Priyanka Duggal, Tarunbir Singh, Pallavi Verma, J Mohindroo and Rahul Udheiya*
19.	Tumor resection in rat using diode laser - a case report. *Shivangi Jorwal, A.K Bishnoi, Mahendra Tanwar and P. Bishnoi*
20.	Successful surgical management of intestinal foreign body in a Labrador dog. *J. J. Parmar, Neha Rao, P. B. Dabhi, A. I. Shah and D. M. Patel*
21.	Successful surgical management of sebaceous gland tumours in two dogs. *J. J. Parmar, Neha Rao, A. I. Shah and D. M. Patel*
22.	Surgical management of cutaneous fibroma in a two Pomeranian dogs. *J. J. Parmar, Neha Rao, A. I. Shah, D. M. Patel and D. J. Godasara*
23.	Rehabilitation of a dog with bilateral forelimb amputation using a customized forelimb cart. *Pai T. P., S. D. Pai, A. C. Gulvady, R. M. Athale, J. R. Arora, M. S. Vishwasrao. G. S. Khandekar, D. U. Lokhande, S. D. Tripathi and K. S. Chaudhari*
24.	Successful surgical management of intestinal faecoliths in two years old female Beagle dog - A case study. *Talekar S. H., Soni Manish., Kalavadiya P. and Katara K. P.*
25.	Management of generalised subcutaneous emphysema in a dog: a case report. *Dwijen Kalita, Arup Das, Anjali Padhan and Evakordor Hynniewta*
26.	Surgical management of evisceration of omentum through umbilical hernia in a cat- A case report. *Jodumoni Kachari, Parsha Jyoti Nath, Anjali Padhan, Sarahna Taufiq and Monalisa Ahmed*
27.	Surgical management of unusual massive lipoma in a dog. *S. Kathirvel, K. Jayakumar, S. Vigneshwaran, P. Sankar, A. Kumaresan, M. Sasikala and M. Vigneswari*
28.	Management of chronic otitis externa in two dogs. *Narendra Singh, Mahendra Tanwar, Arvinder, Pratikshit Sanel, P. Bishnoi, Sakar Palecha, Shivangi Diwedi and Rajnish Kumar*

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29.	Renal spindle cell carcinoma in a dog – a case report. *Melvin V. Jacob, Makkena Sreenu, V Devi Prasad and NVV Hari Krishna*
30.	Concurrent surgical correction of bladder fibroma and regional mastectomy in a Pomeranian dog : A case report *T. Rakesh, N.Nagaraju, D. R. Manjunatha, B. R. Balappanavar and L. Ranganath*
31.	Intramedullary pinning with osteotomy to repair over-riding supracondylar fracture in Pomeranian cross breed dog – A case report. *T. Rakesh , N.Nagaraju, D. R. Manjunatha, B. R. Balappanavar and L. Ranganath*
32.	Surgical management of a splenomegaly in a Great Dane. *Pratyush Dinesan, S.V. Upadhye, G. R. Bhojne, Ushma Patel and Reena Nathani*
33.	Successful surgical management of thoracic esophageal obstruction in a poodle dog *Manjunatha, D. R., Nagaraju, N., Basavarju B Balappanavar, Pampapathi and Ranganath, L.*
34.	Surgical management of hip dislocation in canines: a review of three cases *Rohit Kumar, Mohammed Arif Basha, Mudasir Ahmad Shah, Asif Majeed, Prakash Kinjavdekar, Amarpal and A. C. Saxena*
35.	Idiopathic pericardial effusion and its management with USG guided pericardiocentesis in a dog: A case report. *S. M. Parmar, M. D. Patel, D. N. Suthar, S. A. Mehta, J. A. Vala and S. V. Mavadiya*
36.	Surgical correction of othaematoma in an adult pet rabbit- A case report. *Rajnish Kumar, Kuldeep, Tushar Goyal, Shivangi Diwedi, A. K. Bishnoi and P. Bishnoi*
37.	Unilateral nephroureterectomy in case of renal carcinoma in a dog. *P. Bishnoi, Satyaveer Singh, Mahendra Tanwar, Shivangi Diwedi, Rajnish Kumar, Satveer kumar, Himanshu Vyas*
38.	Surgical management of othaematoma in a large white yorkshire pig. *Rukmani Dewangan, M. O. Kalim, Raju Sharda, Shiv Kumar Sidar, Nutan Panchkhande and Dhlaeshwari Sahu*
39.	Surgical management of gastric impaction in a dog. *M. O. Kalim, Rukmani Dewangan, Raju Sharda, Shiv Kumar Sidar and Nutan Panchkhande*
40.	Successful management of post-hysterectomy ovario-uterine stumps in a Spitz. *Upadhye S. V., S. B. Akhare, B. M. Gahlod, G. S. Khante, S. P. Salvekar and Reena Nathani*
41.	Retrieval of ureteric calculi in a dog *B. M. Gahlod, S. V. Upadhye, S. B. Akhare, and A. M. Kshirsagar*

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42.	Spermatic cord torsion of intra-abdominal testis associated with testicular cavernous hemangioma in a dog. *Deepti Sharma, Arun Anand, Vandana Sangwan, Sidhartha Deshmukh, Harmanjit Singh Banga*
43.	Management of urinary obstruction in a cat by perineal urethrostomy. *Anjan Kour, Arun Anand, S K Mahajan, Vandana Sangwan*
44.	Inguinal hysterocele and its surgical management in a female Labrador dog. *Pallavi Verma, Beenish Qureshi, Vandana Sangwan, Tarunbir Singh, Rahul Udehiya*
45.	Diagnosis and successful surgical management of corn cob as foreign body in three dogs. *Kuldeep Singh, J. Mohindroo, S K Mahajan, Tarunbir Singh, Pallavi Verma*
46.	Successful management of spinal compression due to L3 fracture in a male boxer by cell therapy alongwith conventional therapy *Abas Rashid Bhat, Amarpal, Bilal Peer and Sharma G. Taru*
47.	Stabilization of tibial fracture using c-arm guided closed intramedullary pinning. *Pradeep Kumar, Mamta Mishra, Anil Singh, Amolak Sharma, Sanjay Purohit, Gulshan Kumar and Vivek Malik*
48.	Repair of acquired tracheal deffect in dog using split ring technique. *Pai T. P., S. D. Pai, K. S. Chaudhari, G. S. Khandekar and S. D. Tripathi*
49.	Surgical management of osteosarcoma in dogs. *Mamta Mishra, Amolak Sharma, Anil Singh, Pradeep Kumar, Prabha Sharma, Chetan Sharma and R. P. Pandey*
50.	Surgical management of vaginal band in bitch. *Amolak Sharma, Pradeep Kumar, Prabha Sharma, Raveendra Tadagani, S. Purohit and RP Pandey*
51.	Successful Management of evisceration in the female Pit bull Dog. *Komulwar P. G. and Pawra M. V.*
52.	Surgical correction of diaphragmatic hernia in a cat. *K. S. Chaudhari, A. A. Datir, S. V. Gaikwad, D. U. Lokhande, G. S Khandekar, S. D. Tripathi, Eunice G. Thomas, Silveira Maria Sera*
53.	Reconstructive surgery to manage the fracture of premaxilla with incised injury of upper cheek in dog: a case report. *Reshma Jain, B. P. Shukla, Rahul chouhan, Neha Arya, Sunil Goyal and Nishant shukla*
54.	Successful use of fiber-reinforced nanocomposite graft for the treatment of humerus non-union in a maltese dog-a case report. *Sooryadas S., Archana G., Dinesh P.T., Manitha B. Nair and John Martin K. D.*
55.	Correction of a mandibular symphyseal fracture in a cat by orthopedic wiring. *Jinesh Kumar N. S., Anikshit Verma, Archana G., Naagshree V. and Gisha G. Nair*

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56.	Correction of urinary obstruction in a dog by cystotomy and urethrotomy. *Dinesh P. T., Anikshit Verma, Reji Verghese, Naagshree V. and Souljai Jayakumar Sindhu*
57.	Vertebral body plating with dorsal laminectomy for the management of l4 compression fracture in a dog. *George Chandy, Anikshit Verma, Koundinya U., Anees R. and John Martin K. D.*
58.	An unusually large cranial mediastinal mass extending to ventral neck in a dog and its surgical removal – an experience sharing. *Sooryadas S., Gisha G.Nair, Dinesh P. T., Reji Varghese, Jinesh kumar N. S., Hamza P.,*
59.	*Anoopraj R. and John Martin K. D.* Cystotomy in a dog suffering from extensive urethral calculi. *Jaimini R. Arora, Akshata C. Gulvady, Rasika M. Athale, Madhura S. Vishwasrao*
60.	Repair of mandibular fracture by platting and wire reinforced acrylic splint in two different dogs. *Jaimini R. Arora, Akshata C. Gulvady, Rasika M. Athale, Madhura S. Vishwasrao*
61.	Successful surgical management of Sertoli cell tumour in a monorchid dog: Case report. *Tripathi. S. D., G. S. Khandekar, K. S. Chaudhari, Mohammad Ali; T. P. Pai, S. D. Pai, R. M. Athale, M. S. Vishwasrao, J. R. Arora and A. C. Gulvady*
62.	Successful surgical excision of leiomyosarcoma from the urinary bladder of dog: Case report. *G. S. Khandekar; Tripathi S., K. S. Chaudhari, S. V. Gaikwad; A. C. Gulvady, J. R. Arora, M. S. Vishwasrao and R. M. Athale*
63.	Surgical management of diaphragmatic hernia in a cat with manual maintenance of respiration. *Jaimini R. Arora, Akshata C. Gulvady, Rasika M. Athale, Madhura S. Vishwasrao, Shahir Gaikwad, Danish Bukhari*
64.	Surgical management of oesophageal foreign body in a cat. *Lokhande D. U., G. S. Khandekar, G. U. Yadav, R. M. Athale, A. C. Gulvady, J. R. Arora and M. S. Vishwasrao*
65.	Toggle Plate Fixation for Management of CoxoFemoral Luxation in Cat. *Chaudhari K. S., S. D. Tripathi, S. V. Gaikwad, G. S. Khandekar, R. M. Athale, A. C. Gulvady, M. S. Vishwasrao, J. R. Arora*
66.	Surgical management of adenocarcinoma of ceruminous gland in ear canal of a persian cat by vertical canal ablation. *Reji verghese, Gisha G. Nair, Hamza P., Nagashree V., Anikshit verma and Souljai Jayakumar Sindhu*

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67.	Tension band wiring for avulsion fracture of cranial tibial tuberosity in a dog. *Dinesh P. T., Nagashree V., Jineshkumar N. S., Nekha Krishnan P., Anikshit Verma and Archana G.*
68.	Surgical correction of ventral hernia in a spitz. *Dinesh P.T., Nagashree V., Reji Varghese, Gisha G. Nair and Anikshit Verma*
69.	Surgical management of intestinal obstruction caused by stone in a Daschund dog- a case report. *Nagabhushana, H. V., Rakesh T., Manjunatha, D. R., B. R. Balappanavar and N. Nagaraju*
70.	Urethral reconstructon and tube cystostomy in a non-descript dog. *Dileep Kumar K. M., Adarsh S. L., Laiju M. Philip, John Martin K. D., Syam K. Venugopal, Thajunnisa A. S., Prabhu kumar M. D. and Devanand C. B.*
71.	Surgical excision of seminoma in a cryptorchid rottweiler dog: a case report. *Laiju M. Philip, Prabhukumar M. D., Syam K. Venugopal, Karthikaa T., Jayakrishnan A. and Devanand C. B.*
72.	Surgical management of mandibular fracture in two cats. *Sudheesh S. Nair, Karthikaa T., Soumya Ramankutty, Devanand C. B., Prabhu kumar M. D., Adarsh S. L, Anvitha Hansoge and Thajunisa A. S.*
73.	Bilateral perineal hernia repair using internal obturator muscle transposition in a dog. *L. N. Nagarajan, Krishnaveni.N, Vijay. A and Gokulakrishnan. M, Vaishnavi mohan*
74.	Successful surgical management of vaginal hyperplasia in a bitch. *L. C. Modi, D. N. Suthar, R. H. Bhatt, N. F. Chaudhari, S. K. Jhala, H. C. Sharma and C. F. Chaudhari*
75.	Management of dystocia in non-descript female dog by caesarean section *N.F. Chaudhari, H.C. Sharma, L.C. Modi, C.F. Chaudhari, R.V. Baldaniya and C.M. Patel*

Award Session

Dr. M.R. PATEL BEST FIELD VETERINARIAN AWARD

Sr. No.	Title of Paper with author
1	Successful management of lower limb fracture of bovines in field conditions by epoxy pin fixation method Sarit Kumar Patra

YOUNG SURGEON AWARD

Sr. No.	Title of Paper with author
1	Tumors of cattle in Hassan District of Karnataka and their management Manjunath S. P.
2	Comparative evaluation of modified and standard surgical techniques for amputation of horn in Mehsana buffaloes Jignesh B. Patel
	Surgical management of abdominal disorders in pregnant cattle under dexmedetomidine premedication and isoflurane anaesthesia – A review of 10 cases S. Vigneshwaran

BEST CLINICIAN AWARD

Sr. No.	Title of Paper with author
1	Successful surgical correction of splenic hemangiosarcoma in two dogs D. U. Lokhande
2	Successful surgical management of foreign body in tortoise Amol Yamgar