Thesis Ref. No._____

ADDIS ABABA UNIVERSITY

COLLEGE OF VETERINARY MEDICINE AND AGRICULTURE

DEPARTMENT OF CLINICAL STUDIES

COMPILED SURGICAL CASE REPORTS: PROCEDURE, TECHNIQUE AND ITS OUTCOME IN VARIOUS DOMESTIC ANIMALS IN AND AROUND BISHOFTU TOWN, ADA'A DISTRICT, EAST SHOA ZONE, OROMIA, ETHIOPIA

BY

SHIFERAW MOLTUMO ERGANO

JULY, 2021

BISHOFTU, ETHIOPIA

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A Thesis Submitted to the College of Veterinary Medicine and Agriculture of Addis Ababa University in Partial Fulfillment of the Requirements for the Degree of Master of Veterinary Science in Veterinary Surgery

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Approval sheet

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As MVSc research advisor, I hereby certify that I have read and evaluated this Thesis prepared under our guidance by Shiferaw Moltumo entitled **"COMPILED SURGICAL CASE REPORTS: PROCEDURE, TECHNIQUE AND ITS OUTCOME IN VARIOUS DOMESTIC ANIMALS IN AND AROUND BISHOFTU TOWN, ADA'A DISTRICT, EAST SHOA ZONE, OROMIA, ETHIOPIA",** and I approved for submittal to dissertation assessment committee.

Submitted by: Shiferaw Moltumo  12/08/2021

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As member of the examining board of the final MVSc open defense, we certify that we have read and evaluated the thesis prepared by Shiferaw Moltumo entitled **"COMPILED SURGICAL CASE REPORTS: PROCEDURE, TECHNIQUE AND ITS OUTCOME IN VARIOUS DOMESTIC ANIMALS IN AND AROUND BISHOFTU TOWN, ADA'A DISTRICT, EAST SHOA ZONE, OROMIA, ETHIOPIA",** and recommended that it be accepted as fulfilling the thesis requirements for the degree of Masters of Veterinary science (MVSc) in Veterinary Surgery

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Date of submission: 12/08/2021

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ACKNOWLEDGEMENTS

First of all, I would like to acknowledge God who supports and keeps me up to now. I also extend my thanks to my advisor, Dr. Jiregna Dugassa who contributed valuable advice and materials support when I was preparing this MVSc thesis. Moreover, I would like to thank AAU for the financial support.

It is my pleasure to express special gratitude to my beloved family particularly to my parents (Moltumo and Ayelech), my brothers (Getahun and Jabamo) for their greatest sacrifices to my success. Finally, I am extremely grateful to my lovely friend, Tekabe Gebre for his practical love as mother during my campus life.

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LIST OF ABBREVIATIONS

AAU	Addis Ababa University
bid	Twice a day
cm	Centimeter
CRT	Capillary Refill Time
CVMA	College of Veterinary Medicine and Agriculture
DNA	Deoxyribonucleic Acid
E	East
GDP	Gross Domestic Product
HCl	Hydrochloride
HR	Heart Rate
IM	Intramuscularly
IU	International Unit
IV	Intravenous
Kg	Kilogram
Km	Kilometer
Mg	Milligram
Ml	Milliliter
Mm	Millimeter
N	North
NMA	National Meterology Agency
PO	Per Os or Orally
PR	Pulse Rate
Pvt Ltd	Private Limited Company
q 24 h	Every 24 Hours
RR	Respiratory Rate
SC	Subcutaneous
SCC	Squamous Cell Carcinoma
Stat	At Once
UK	United Kingdom
UV	Ultraviolet
VTH	Veterinary Teaching Hospital
w/v	Weight Per Volume
° ' "	Degrees, Minutes and Seconds
°C	Degree Celsius
®	Registered Trademark
^{O}F	Degree Fahrenheit
µg	Microgram
%	Percent
@	At Sign
#	Number Sign

ABSTRACT

Ethiopia is home for Africa's largest livestock population. A number of infectious and non-infectious diseases affect this economically important sector including pets in the country. In recent times, an increasing awareness of the importance of individual animal treatment in both the rural and urban communities, and a growing trend of keeping exotic breeds as companion pets in urban areas contribute to the increased demand in the veterinary services. These stimuli may hasten veterinary surgical treatments. The current descriptive study was carried out from November 2020 to June 2021 at Veterinary Teaching Hospital, College of Veterinary Medicine and Agriculture, Addis Ababa University to compile different surgical affections along with procedures, techniques and their outcomes in various domestic animals. The domestic animals of different species, breeds and ages with both sex category, that were originated from different raising systems in and around Bishoftu town, Ada'a district, East Shoa zone, Oromia, Ethiopia, were sampled purposively from cases admitted to VTH for various surgical treatments. During the study period, a total of twenty three surgical cases were diagnosed, undergone surgical interventions and followed up. Among these, seven cases were *Bos taurus*, four cases were *ovis aries*, one case was a *Capra hircus*, four cases were *Canis familiaris*, three cases were *Felis catus*, two cases were *Equus asinus*, one case was an *Equus caballus* and one case was a *Camelus dromedarius*. Except wound dehiscence after performing single mastectomy in a bitch, all the animals recovered with minor complications. The surgeons should be highly equipped with knowledge and skill to get successful outcome. Creating client awareness could reduce the occurrence of postoperative complications in outpatient settings.

Key words*: Bishoftu, domestic animal, outcome, procedure, surgical affection, technique*

1. INTRODUCTION

Livestock make crucial contributions to human well-being interms of proteinaceous food supply (Afsaneh *et al*., 2020; Murcia *et al*., 2009), income to livelihood, asset of saving for wealth, transportation and draught services, manure for crop production or soil fertility (Shapiro *et al*., 2017), and skin or fur for further processing (Anderson, 2016). Camelus *dromedarius* is the most capable animal species for producing better than other livestock species under harsh environmental conditions (Yosef *et al*., 2014). The camel is not only the main source of meat, milk, tourism, packing and transportation services but also alternative way of generating foreign currency from the export of live animals and meat in Ethiopia. Domestic dogs and cats are often considered as faithful friends or close companions of humans, and enjoy life together with humans daily. This bond can provide significant positive benefits regarding emotional development and socialization (Gebremedhin *et al*., 2020). Recently, there is an emerging evidence of benefits from pets regarding physical and psychological effects. Owning them is associated with reduced stress, improved self-esteem, lower salivary cortisol and blood pressure. Pets are usually chosen on the basis of their ability to respond in an affiliative manner (Dinis and Martins, 2016).

Ethiopia is endowed with the largest livestock population in Africa (Getachew *et al*., 2018), approximately 70.3 million cattle, 43 million sheep, 52.5 million goats, 2.15 million horses, 10.8 million donkeys, 383 thausand mules, 8.15 million camels, 57 million poultry (CSA, 2021). The dog and cat population data is generally uncommon in developing countries due to absence of surveys. In Ethiopia, much of the emphasis is on livestock population and well-documented data on dog and cat population are unavailable (Gebremedhin *et al*., 2020). The livestock sector add up to 40 percent to agricultural GDP, nearly 20 percent of total GDP, and 20 percent of national foreign exchange earnings (PMM, 2020).

In spite of having large number of livestock in Ethiopia, the livestock sector is characterized by low productivity and production. Consequently, income generated from this sector could not impart significant role in the development of the country's economy. High incidence of diseases and parasites burden (Gebremedhin, 2007), reduced genetic potential of indigenous cattle, shortage of feed in quantity and quality, inadequate health care and management measures are the main contributors (Getachew *et al*., 2018). Generally, diseases of domestic animals affect both animal production systems and trade. Besides, they cause zoonotic diseases in humans (Murcia *et al*., 2009). In Ethiopia, stray dogs and cats are reservoirs and

transmitters of many zoonotic diseases like rabies (Gebremedhin *et al*., 2020). Novel diseases may emerge due to world trade, animal translocation, ecological disruption, climate change, pathogen adaptation and trend of farming (Bender *et al*., 2006).

Individually ill animal had gotten less attention in Ethiopia since the government prioritized preventive treatment. Consequently, this has led to low level of infrastructure for proper management of surgical diseases in domestic animals (Tiruneh *et al*., 2014). However, there has recently been an increase in demand for better veterinarian services due to a growing recognition of the benefit of treating individual animal in both rural and urban areas. In addition, a growing trend of keeping exotic animals as companion pets in urban areas contributes to the increased demand in the veterinary care of individual animal. These stimuli may hasten veterinary surgical treatments.

Therefore, the objectives of this study are to:

- compile different surgical affections of various domestic animals with more emphasis on their procedures, techniques and outcomes in the study areas
- acquire in-depth knowledges and skills in the management procedures and techniques of surgical patients.

2. MATERIALS AND METHODS

2.1. Study Area

The study was conducted from November 2020 to June 2021 in and around Bishoftu town, Ada'a district, East Shoa zone, Oromia, Ethiopia. Bishoftu is found approximately 47 km south east of Addis Ababa. Geographically, it is located at 8° 44' 4.7400" N latitude and 39° 0' 30.7188" E longitude, and an altitude of 1870 meters above sea level in the central highlands of Ethiopia. The average maximum and minimum temperature of the area is 34.7 °C and 8.5 °C respectively, and the average relative humidity is 61.3%. The rainfall is bimodal. The town receives an annual rainfall of 1151.6 mm of which 84% is received during the long rainy season covering June to September and the rest in the short rainy season extending from March to May (NMA, 2020).

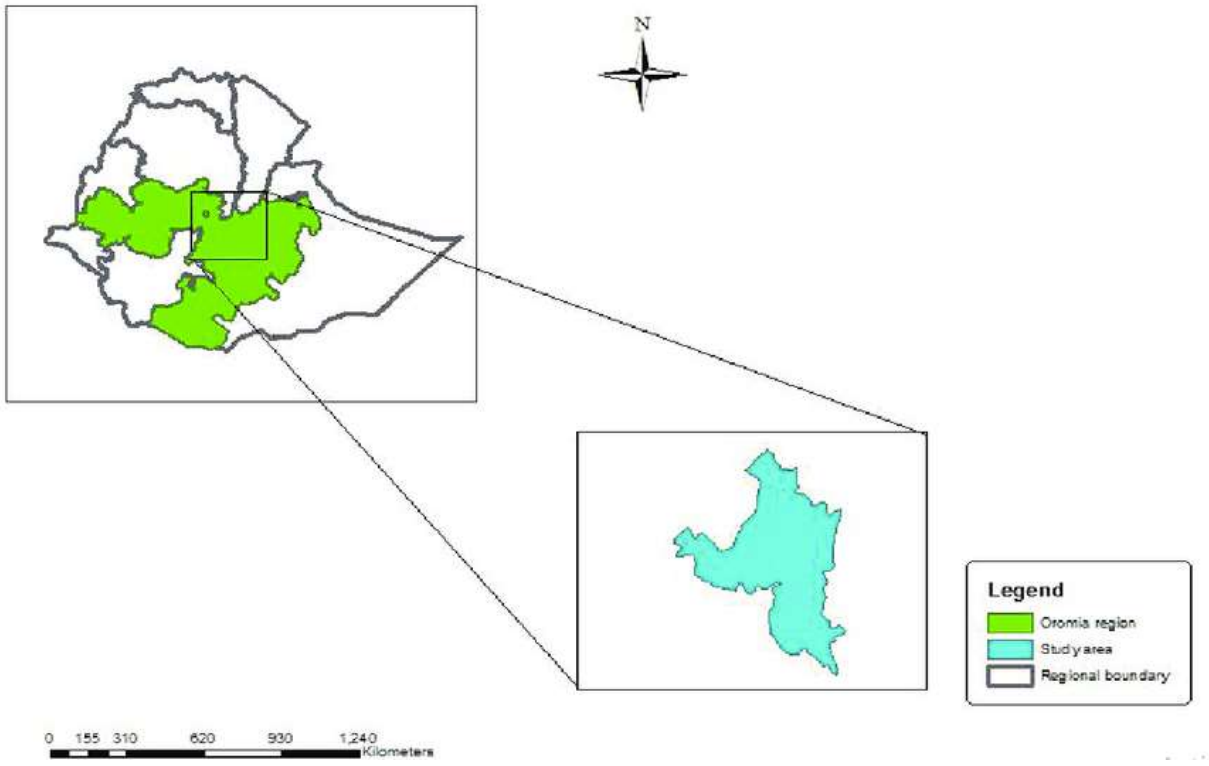

Figure 1: Geographical location of the Bishoftu, East Shewa, Oromia, Ethiopia (Yonas *et al*., 2020)

2.2. Study Population

The study animals, that were originated from different raising systems in and around Bishoftu town, Ada'a district, East Shoa zone, Oromia, Ethiopia, sampled subjectively (by purposive sampling) from cases admitted to VTH, CVMA, AAU for various surgical treatments. They were domestic animals of different species, breeds and ages with both sex category. The livestock in the area were managed under mixed crop-livestock production and intensive system. However, pets were kept as companion animals being fed with offals and human left over food.

2.3. Study Design

Descriptive study was conducted to compile different surgical affections, correction procedures, techniques and their outcomes in various domestic animals from November 2020 to June 2021 by using case history, clinical examination, pre-operative preparation, anesthesia and control, surgical procedures and techniques, follow-up and management.

2.4. Study Method

Different surgical cases brought to Veterinary Teaching Hospital were handled first with recording clients' names, addresses, phone numbers, patient signalment (species, breed, sex, age, body weight).

Available past and present history of every cases of domestic animals were gathered and recorded. Furthermore, vital signs: rectal temperature, respiratory rate, heart rate, color of visible mucus membrane, capillary refill time, and status of accessible superficial lymph nodes were assessed and recorded for each case. Exploratory puncture was performed to inspect the nature of the existed contents in the examined mass to support differential diagnosis. General and specific clinical findings were documented to support case history and devise the management plan. Subject to the availability of reagents and facilities, stains were conducted. Finally, all relevant information to every case were arranged, interpreted and final diagnosis for each surgical case and intervention plan for each case set before carrying out appropriate surgical procedure or technique.

The domestic animals were managed by using surgical procedures and techniques under aseptic condition, physical restrait and anesthetic protocol. The anesthetics or analgesics used

were based on animal species. The follow-up was undertaken through phone call communication and face to face contact after carrying the operation and information regarding post-operative complications like bleeding, wound dehiscence, swelling and recurrences were recorded for each case. Finally, available information were entitled by merging similar surgical procedures and techniques within species and interspecies, and then organised under regional anatomy.

3. INDIVIDUAL SURGICAL AFFECTION ALONG WITH ITS MANAGEMENT AND OUTCOME

3.1. Head Region

3.1.1. Dehorning in cattle

Abstract

Dehorning is the process of removing horns in adult cattle to prevent injury to the animal and the people that work with them. Two animals (ox and cow) were brought to the VTH, CVMA, AAU with history of horn fracture and skin injury due to fighting and misdirected horn respectively. Upon physical examination, unpleasant purulent discharge was oozing out through fracture opening at the base of caudo-dorsal part of right horn in the ox while the misdirection of cow's horn had injured the skin ventral to ear. In both cases, vital signs were within the normal range. After controlling, desensitizing and aseptic preparation of the surgical site, an elliptical skin incision with a distance of 1cm away from the base of the horn was made, and the horn was amputated by embryotomy wire. Bleeding was controlled by ligation of the cornual artery, then gauze compression of the bony stump. The cavity was packed with gauze soaked in povidine iodine and properly bandaged with gauze bandages and elastic bandages then properly secured with normal horn in ox, while the skin closure was performed with a silk in one layer continuous ford interlocking suture pattern. Pen-Strep @1ml/20kg & Flunixin Meglumine @2.2 mg/kg were given IM q 24 h for 3 days. With regular bandaging and lavaging of the wound, the ox was recovered after a month while the suture was removed after 3 weeks of surgical operation in cow.

Key words*: cattle, dehorning, horn fracture, misdirected horn*

Introduction

Horns, are a pair of permanent pointed projections from a unique area of head in various animals (Nasoori, 2020), which grow throughout the life of the animal (Zhou and Chinamasa, 2020). Approximately two months of age when the horn grows and becomes attached to the frontal bone of the skull, concurrently a frontal sinus which lies within the skull beneath the horn bud joins the adjacent portion of the horn (Neil, 2010). In cattle, the major blood supply to the horn is through the cornual artery, which is found rostro-ventrally at the base of horn, is

a superficial branch of temporal artery (Sharma *et al*., 2014). The horns are innervated by a cornual branch of the zygomatico-temporal nerve which ascends from the superior maxillary branch of the trigeminal nerves. It is found along the temporal ridge, roughly halfway between the base of the horn and lateral canthus of the eye (Valverde and Doherty, 2008).

Dehorning is the process of removing horns to reduce injuries and carcass damage after they have formed from the bud (Jesse *et al.*, 2016). It is done by several instruments, such as embryotomy wire, dehorning saws and guillotine shears (Aubry, 2005). When cattle have large horns, they are occasionally "tipped" (AVMA, 2014). Dehorning can be best accomplished by destroying the corium, which is found between horn base and skin, consists of the cells that facilitate regrowth of new horn. During the removal of the horns, the entire corium must be removed along with a small amount of adjacent skin to ensure complete dehorning (Frandson *et al*., 2009). If not, a scur (partial horn regrowth) may form at the poll after cosmetic dehorning. Cosmetic dehorning permits closure of the skin over a normal defect created by the amputation of the horn at its base, and it leads to primary intention healing, a lower incidence of frontal sinusitis and less hemorrhage (Hendrickson and Baird, 2013).

Post-operative complications including bleeding, bacterial infections and fly infestation are faced unless the animals are closely supervised. Bleeding can be controlled through clamps or electric cauterizing. Besides, fly repellent should be provided for prevention of fly contamination (Jiregna and Abebe, 2019). The objective of the cases report was to describe the horn amputation in cattle due to horn injury and misdirected horn.

Case 1

Case description: An eight years old local breed 258 kg body weight ox was presented to the Veterinary Teaching Hospital, College of Veterinary Medicine and Agriculture, Addis Ababa University with history of bleeding, pus discharge from the injuried right horn following fighting against with a bull at the manger of client's house three days ago.

On physical examination, unpleasant purulent discharge was observed oozing out through a fracture at the base of caudo-dorsal part of the right horn (Figure 2A), with a mucopurulent nasal discharge from the right nose (Figure 2B). The fracture was oblique, and the horn moved when applying pressure. Upon palpation of the horn region, there was pain, head shaking and bruxism. The rectal temperature (38.3^{o}C), respiratory (15 breaths/min) and heart

(49 beats/min) rates were within the normal range. The mucous membrane was pinkish with less than two seconds capillary refill time. Hence, a unilateral cornuectomy was done to remove the fractured horn.

Case 2

Case description*:* A five years old local breed cow with 220 kg body weight was brought to VTH, CVMA, AAU with a misdirected left horn. The misdirected right horn was previously tipped by client using a sickle that he use for cutting grass, but the left one was not for tipping with sickle was fatigue and caused pain. Thus, the owner complained of skin injuries caused by the remaining misdirected left horn.

Upon physical examination, the misdirected left horn injured the skin ventral to left ear (Figure 3A). The rectal temperature (38.7^{o}C), respiratory (13 breaths/min) and heart (52 beats/min) rates were within the normal range. The mucous membrane was pinkish with less than two seconds capillary refill time. Therefore, unilateral cosmetic dehorning was performed to remove the misdirected horn.

Preoperative preparation, anesthesia and control: The animals were restrained in a crush and secured with heads by a halter and client-assisted nose lead. Xylazine 2% (Xyla®, Interchemie Veterinary manufacturer, Netherlands) was administered at a dosage of 0.05 mg/kg intramuscularly. The skin around the base of the horn was washed with water and soap, shaved and cleansed with diluted Chlorhexidine Gluconate 0.3% w/v and Cetrimide 3.0% w/v (Figure 2B).

Lidocaine HCL 2% (Makcur Laboratory Limited, Gujarat, India) was administered at the temporal ridge (midway between the lateral canthus of the eye and the base of horn) (Figure 2B) after preparing the area with 70% denatured alcohol. A 5ml of the drug were injected in a fan-like manner at a point midway between the lateral canthus of the eye and the base of the horn (Figure 3C), and another 2 ml were deposited under the skin as the needle was withdrawn. Then, an additional 3 ml of it were deposited below the skin after directing needle subcutaneously toward the base of the horn. The injection site was massaged to disperse the local anesthetic and anticipated to effect for 10 minutes. The surgical site was finally scrubbed by povidone iodine 5% solution and awaited to dry before commencing surgery.

***Surgical technique**:* Two full-thickness skin incisions (anterior and posterior sides of the horn), beginning near the pole and extending in an elliptical fashion around the base and ending ventral to the horn was made at a distance of approximately 1 cm apart from the horn base. The skin was detached bluntly using a scissor and retracted towards the horn base to get the skin flap for removing the horn easily. The horn was cut by embryotomy wire, and the hanging subcutaneous tissue was removed. Bleeding was controlled by torsion and ligation of the cornual artery, then gauze compression of the bony stump (Figures 2C and 3D). The horn stump was rinsed with normal saline to remove bone fragments and blood clots. Using a scalpel, the skin to be preserved was undermined 2cm from the cut edges, which allowed skin suture over the horn stump of the cow. Finally, because of difficulty to approximate the skin edges on the stump, the area was packed with gauze soaked in povidine iodine 5% and bandaged with elastic bandages then properly secured with normal horn in ox (Figure 2D), while the skin closure of resulting wound was performed with a silk in one layer continuous interlocking ford suture pattern in cow (Figure 3E).

Postoperative management and outcome: In both animals, Procaine penicillin G, 200000 IU/ml + Dihydrostreptomycin sulphate, 200 mg/ml (Penstrep-400®, Interchemie Veterinary Manufacturer, Netherlands), 1ml/20kg body weight was administered intramuscularly q 24 h for 3 days. Flunixin Meglumine(Megludyne®, Virbac Animal Health Care Pvt Ltd, India), 2.2 mg/kg body weight was given intramuscularly q 24 h for 3 days. Terramycin wound spray was applied around the wound. Bandages were changed at 3 days interval for two weeks (Figure 2F). The owners were advised to monitor bleeding. With regular bandaging and lavaging of the wound, the ox recovered after a month (Figure 2G). The suture was removed on 21th postoperative day after complete healing in cow (Figure 3F).

Figure 2: Unilateral horn amputation in ox

A) Unpleasant purulent discharge and flies swarm at the base of fractured horn (B) Circumferential hair shaving from the base of the horn, and arrow shows unilateral muco-purulent nasal discharge from right nose (C) Direct pressure on the wound with a clean gauze to cease bleeding (D) Bandaging the stump (E) Close observation of stump hemorrhage (F) Changing of gauze bandages (G) Final outcome (i.e. the dehorned animal was healed completely and the mucopurulent nasal discharge was disappeared after a month)

Figure 3: Unilateral cosmetic dehornig in cow

A) Presentation of a cow with injury by misdirected horn (B) Measuring midway between lateral canthus of the eye and the base of horn by stanley tape measure (C) Administration of local anesthetic drug (lidocaine hydrochloride 2%) to block Cornual nerve (D) Controlling of bleeding by torsion and ligation of the cornual artery (E) Skin closure with one layer continuous interlocking suture pattern (F) Suture removal after 21 days

Discussion

Disbudding is the removal of the horn buds in calves less than two months of age (Faraz, 2017) whereas dehorning refers to the removal of the horns from elder animals (Maassen, 2018). Although disbudding of the calves is suggested as the routine management in developed countries (Shilkin, 1961), dehorning is often performed in adult cattle to reduce injuries and carcass damage due to bruising during fighting in cattle herd (Gottardo *et al.*, 2011), to reduce the risk of injury to the people who work with the cattle (Aubry, 2005), prevent cattle getting their horns caught in fences, and allow cattle to be moved through chutes more easily (Hoffsis, 1995). On the other hand, amputation of the horn is one of the treatment methods for fracture of horn (Kamalakar *et al.*, 2016). Adult cow dehorning, however, is linked to risks of frontal sinusitis, bleeding, delayed wound healing, and infection (AVMA, 2014). In the first case (ox) because of the amputated stump communicated to the external environment, it took prolonged post-operative management (regular changing of gauze bandages of the wound and lavaging of the wound until healing) but only closure of the stump and removal of the suture were performed in the cow.

During dehorning, the exposed portion of the horn stump discharges blood, the bleeding may occur from the mesh-like surface between the inner sinus and the outer horny layer in addition to cornual artery. If not controlled, the hemorrhage after dehorning leads to loss of weight and death in the cattle. In addition to these, the cattle horn stump are subjected to fly contamination and disease, further contribute to carcass condemnation (McKinney, 1957). When the dehorning wound is left open, second intention healing occurs, encompassing inflammation, scab formation, development of granulation tissue in the bed of the wound, regeneration of epithelium and wound contraction (Kihurani *et al.*, 1989). Surgical dehorning, frequently referred to as cosmetic dehorning, does not necessarily achieve a more desirable cosmetic outcome. Rather, the cosmetic effect is independent of the dehorning method used, so the preferred term is surgical dehorning (Hoffsis, 1995).

Behaviors of avoidance, for example tail wagging, head movement, tripping and rearing were observed during dehorning which were reported by (Jiregna and Abebe, 2019). Indicators of postoperative pain include head rubbing, head shaking, neck extension, ear flicking, tail flicking, increased numbers of transitions between lying and rising and reduced rumination were noticed which were formerly reported (AVMA, 2014).

Physical restraint, sedation, and local or regional anesthesia can be used to perform surgery on cattle, such as dehorning in a humane manner. A simple, low-cost local anesthetic approach can produce a reversible loss of sensation in a well-defined area of the body (Edmondson, 2008). Continuous Lock Stitch (Ford Interlocking Suture pattern) is a modification of the simple continuous suture which is commonly used in the thick skin of cattle for good approximation of the skin edges (Hendrickson and Baird, 2013).

Because polledness is a dominant feature and horns are an autosomal recessive gene, a producer can cross a herd of horned cows with a polled bull (homozygous for the polled condition) to produce an entire calf crop of polled calves. Therefore, Selection and breeding of polled cattle is a non-invasive genetic tool to replace the practice of dehorning because it eliminates both animal pain and production expenses associated with dehorning (Buitrago, 2016).

In general, dehorning of adult cattle may be fatiguing for the operator and give rise to complications (bleeding, sinusitis), so disbudding of calves is advisable. Even though horn amputation is painful surgical procedure, it is important to manage misdirected and horn fracture by a combination of local analgesia and sedation of the animal depending the temperament of the animals.

3.1.2. Eye enucleation in cow

Abstract

Eye enucleation is one of the most popular orbital surgical treatment used to halt the progression of ocular squamous cell carcinoma in cattle. A seven years old cross Holstein Frensian cow was presented to the VTH, CVMA, AAU with history of an extensive growth on the eye. Upon physical examination, the growth covered eyeball including the third eyelid, and was bloody, ulcerating, friable, foul smelling with cauliflower-like appearance. Xylazine 2% @0.05 mg/kg was given IM. The four-point retrobulbar nerve block was conducted, after restraining and aseptically preparing a region, by injecting 10 ml of 2 percent Lidocaine HCl at each of the dorsal, ventral, medial, and lateral canthi. Circumferential skin incision was made around the orbit including about 1 cm from the margin of the eyelid. All muscles, adipose tissue, the lacrimal gland, and fascia were removed, along with the eyelids' margin and eyeball. Haemorrhage was controlled by ligating optic artery and blunt dissection around the globe. Skin was apposed with silk 2-0 in a continuous interlocking suture pattern.

Pen-Strep @1ml/20kg q 24 h for 5 days & Flunixin Meglumine @2.2 mg/kg q 24 h for 3 days were given IM. The suture was removed on 14th postoperative day after complete healing.

Key words*: cow, eye enucleation, retrobulbar block, squamous cell carcinoma*

Introduction

Bovine ocular squamous cell carcinoma, is one of the most common neoplasms of the cattle eye, which occurs in ocular and periocular tissues including the palpebral skin, epithelial surfaces of the cornea and conjunctiva, third eyelid, and limbus *(*Fornazari *et al*., 2017). It is a malignant tumour that originates from stratum spinosum cells of stratified squamous epithelium (Yakan *et al*., 2017), and causes significant economic losses (Pugliese *et al*., 2014). Etiology of ocular squamous cell carcinoma is still poorly understood. However, genetic susceptibility, age, UV light, circumocular apigmentation and viruses are predisposing factors (Reddy *et al*., 2017). Although it has been reported in many different breeds, this invasive, chronically progressive neoplasm predominantly affects Hereford, Hereford cross and Holstein cattle (Tsujita and Plummer, 2010).

Enucleation of eye is one of the most common orbital surgical procedures performed in cattle (Gautam *et al*., 2016). It is indicated in severe cases of irreversible trauma, squamous cell carcinoma, lymphangioma, proptosis (Reddy *et al*., 2017). All tissues should be removed if the indication is SCC (Hendrickson and Baird, 2013). There are two techniques for retrobulbar nerve block in cattle, Peterson technique and four points block, which are used for surgery of the eye and its associated structures (Muir *et al*., 2013). In both techniques, the anesthetic is injected into the retrobulbar space behind the globe to provide akinesia of the extra ocular muscles by blocking cranial nerves (II, III & VI). Thus, these, in turn, will prevent eye movement and provides analgesia of the uvea, cornea and conjunctiva by blocking ciliary nerves (Pearce *et al*., 2003). It is possible to perform an enucleation with the animal standing, using either a four-point injection which is a technique of inserting a needle with a large curve in four points around the eye toward foramen orbitorototundum to desensitize all the ocular muscles and the optic nerve (Fubini and Ducharme, 2004), or a Peterson block when the needle is inserted in the angle between zygomatic arch and process of the frontal bone behind the globe toward foramen orbitorototundum to anesthetize the nerves as they exit the skull (Valverde and Doherty, 2008). The purpose of this case was to

describe the eye enucleation in cross Holstein Friesian cow which was affected by ocular squamous cell carcinoma.

Case description: The seven years old 370kg body weight cross Holstein Frensian cow was presented to the VTH, CVMA, AAU with history of an extensive growth on the eye. The client also complained that lesion began as small raised white growth.

Upon physical examination, the growth covered eyeball including the third eyelid. It was bloody, ulcerating, friable, foul smelling mass of having a cauliflower-like appearance. Thus, the whole eye was destroyed accompanied by massive local swelling. The recorded rectal temperature (38.4^{o}C), respiratory (13 breaths/min) and heart (56 beats/min) rates were within the normal range. The mucous membrane was pinkish with less than two seconds capillary refill time. Henceforth, eye enucleation was applied to remove the affected eye.

Preoperative preparation, anesthesia and control: The cow was restrained in a standing position using a rope halter and client-assisted nose lead (Figure 4A). Xylazine 2%, 0.05 mg/kg body weight was given intramuscularly. The skin around the eye was shaved (Figure 4B), and the surgical site was prepared aseptically. A four-point retrobulbar nerve block (3-6-9-12 o'clock) were done with 40 ml Lidocaine HCL 2% divided into 10 ml per site through the eyelids, both dorsally and ventrally and at the medial and lateral canthi (Figure 4C). The injection sites were massaged to disperse the local anesthetic and anticipated to effect for 10 minutes. The surgical area was scrubbed with povidone iodine 5% solution and awaited to dry prior to commence surgery.

Surgical technique: The eyelids were sutured together and left the suture ends long (Figure 4D) for putting traction on the eye throughout surgery. A circumferential skin incision of about 1 cm from the margin of the eyelids was made (Figure 4E). The Incision and subsequent dissection were initially done on the ventral part. The medial and lateral canthal ligaments were cut to access the caudal side of the orbit. The eyeball, eyelids along with muscles, adipose tissue, lacrimal gland and fascia were removed. Excisional biopsy: part of a removed growth was excised using a scalpel and sent to veterinary clinical pathology laboratory to be diagnosed by a specially trained pathologist. The optic nerve was transected, and the cavity was lavaged with normal saline solution. The optic artery was ligated to control bleeding. Procaine penicillin G powder (PPF®, EPHARM, Ethiopia) was applied and

the eyelid margins were apposed with a continuous interlocking suture pattern using silk 2-0 by leaving a gap near the medial canthus for gauze (Figure 4F).

Postoperative management and outcome: Procaine penicillin G, 200000 IU/ml + Dihydrostreptomycin sulphate, 200 mg/ml, 1ml/20kg body weight intramuscularly for 5 days. Flunixin meglumine, 2.2 mg/kg was given intramuscularly for 3 days. The gauze was removed after 48 hours. The suture was removed on 14th postoperative day after complete healing (Figure 4G).

Figure 4: Progression of eye enucleation in cow

A) Restraining of head by a halter of rope and client-assisted nose lead (B) surgical site preparation (C) The four-point retrobulbar block (D) Placement of temporary tarsorrhaphy (E) Elliptical trans-palpebral incision around the orbit (F) Closure of incised wound by using a layer of continuous interlocking silk suture pattern and an arrow shows a gap at the medial canthus for gauze packing (G) After suture removal on 14^{th} days of surgical intervention

Discussion

Squamous cell carcinoma is the most commonly occurring neoplasm afflicting the bovine eye (Gautam *et al*., 2016). The prevalence of SCC is higher in the lower altitudes due to intense solar radiation for long periods of time. Thus, UV radiation is thought to cause DNA damage and the formation of pyrimidine dimers. Failure or delay in DNA repair may lead to somatic mutations and the development of cancerous cells (Pugliese *et al*., 2014). Viruses, bovine papillomavirus and herpes virus, may also play role in the sequential development of benign precursors as well as neoplastic transformation to Squamous cell carcinoma (Fornazari *et al*., 2017). Eyelid and conjunctival pigmentation are highly heritable and can reduce the frequency of lid squamous cell carcinoma, but they have limited effect on the development of tumors of the conjunctiva and nictitating membrane (Gelatt, 2013). This tumor generally develops in cattle over the age of seven years and rarely in cattle less than three years (Al-Asadi, 2012).

Cattle breeds, such as Hereford, Holstein and Simmental are commonly affected by ocular squamous cell carcinoma even though the case is reported in other breeds. Hence, it is an economically important disease because it causes weight loss and decrease in milk yield in beef and dairy cattle, respectively, and increase in treatment costs (Yakan *et al*., 2017).

Enucleation is an achievable and simple option for management of many types of severe ocular pathologic conditions. It has the potential to resolve chronic pain, infection and neoplastic disease, and can be performed with routine restraint and surgical equipment at minimal cost to the client. Postoperative infection of the operative site is common, but most require minimal medical therapy (Reddy *et al*., 2017). Complications associated with retrobulbar anesthesia and enucleation in cow were rupture of the globe during manipulation and excessive orbital hemorrhage which were reported early (Schulz and Anderson, 2010).

3.1.3. En bloc resection of Epulis in bitch

Abstract

Epulis is the most common benign tumor of the mouth in dogs. An eleven years old bitch was brought to the VTH, CVMA, AAU with history of mass regrowth in oral cavity. Upon physical examination, a pink, pedunculated, ulcerated and large raised growth was found attached on the lower corner of mandibular arcade infront of incisors teeth. All vital signs

were within the normal range. After anesthesia (Atropine sulphate @0.04mg/kg, Xylazine @1 mg/kg and Ketamine @10 mg/kg IM), the bitch was controlled in sternal recumbency. The mass was excised along with adjacent normal soft tissue. The bleeding was controlled by gauze pressure. After successful surgical excision, the bitch was adminstered Ceftriaxone @50 mg/kg & Tramadol @10 mg/kg IM q 24 h for 3 days. Up to a month follow-up, no recurrence was observed.

Key words*: bitch, en bloc resection, Epulis*

Introduction

Epulides (singular: Epulis) are the most common non-specific oral tumors and tumor-like irregular gingival masses observed on either side of the dental arcade in dogs (Maji *et al*., 2015). They are benign tumors that do not spread to other areas of the body. However, they tend to regrow after incomplete excision and can be locally invasive (Intile, 2019). There is no identified cause of epulis.

Epulides must be surgically removed because they are local tumors. An incision with a wide margin (including a portion of healthy tissue around the tumor) is necessary to prevent recurrence. Epulides cannot be prevented (Petcoach, 2021), and chemotherapy is generally not effective (Matthew, 2006). The objective of this case report was to describe the surgical management of epulis in bitch.

Case description: Eleven years old 10kg body weight Spitz bitch was brought to the VTH, CVMA, AAU with history of growth in the oral cavity, deformity of the muzzle, inappetite and chewing difficulty. The bitch was treated surgically a year ago.

Upon physical examination, drooling, halitosis, asymmetric jaws, and a pink, pedunculated, ulcerated and large raised growth was found attached on the lower corner of mandibular arcade behind incisors (Figure 5A). Local lymph nodes were not palpable. The growth was the same color as the gum tissue and had a peduncle that connects it to the gum. The incisors were mis-aligned and displaced. The rectal temperature (38.9^0C), respiratory (16 breaths/min) and heart (98 beats/min) rates were within the normal range. The mucous membrane was pinkish with less than two seconds capillary refill time. Hereafter, en bloc resection was recommended to remove the Epulis in bitch.

Preoperative preparation, anesthesia and control: After Atropine sulphate (Reyoung Pharmaceutical Co. Ltd., China), 40 µg/kg (0.04mg/kg), Xylazine, 1 mg/kg and Ketamine (TRITTAU, Germany), 10 mg/kg were administered intramuscularly at an interval of 5 and 10 minutes, respectively. Then, the dog was restrained under sternal recumbency. An 18 gauge IV catheter was inserted at cephalic vein to administer lactated ringers solution at rate of standard fluid administration set (10ml/kg/hr). The oral cavity's foreign bodies were cleaned and washed with physiological saline.

Surgical technique*:* The mass was excised along with adjacent normal soft tissue by scissor. Gauze pressure and ice were used to control the bleeding (Figure 5C), and the excised area was checked for tumor mass remnants. Biopsy was sent to veterinary clinical pathology laboratory for histopathological examination.

Postoperative management and outcome*:* Ceftriaxone Sodium (Ceftron-Vet®, Square Pharmaceuticals Ltd., Dhaka, Bangladesh), 50 mg/kg was given intramuscularly q 24 h for 3 days. Tramadol (Temad Co. APIs, Iran), 2 mg/kg was administered intramuscularly for 3 days. In addition, the owner was advised to give soft feeds. The dog regained its normal appetite and mastication within a week of surgery. Up to a month follow-up no recurrence was observed.

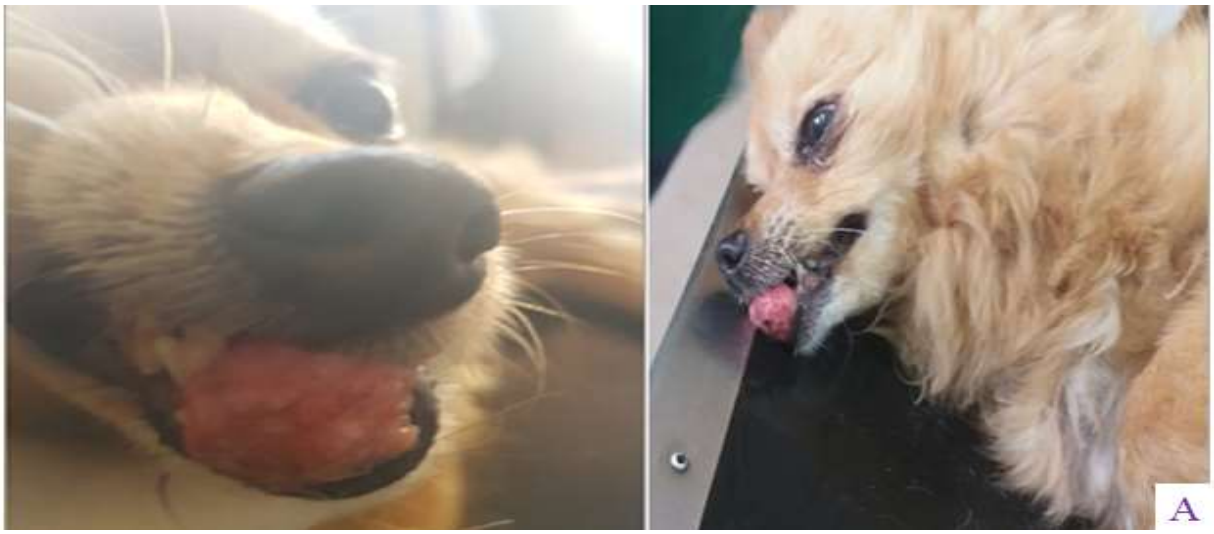

Figure 5: En bloc resection of Epulis in bitch

A) Epulis at lower jaw before surgical intervention (B) A bitch soon after surgical intervention (C) Controlling bleeding by gauze and ice (D) Giving therapy after surgery E) mouth comformation after surgery (symmetrical arrangement of the arcades).

Discussion

The oral cavity is one of the most common sites for neoplasia in dogs. The epulides are the most common oral neoplasms (Woodward, 2002). Some breeds, particularly the brachycephalic breeds (Boxers and English Bulldogs) are more commonly affected by epulides, but the reason for this is unknown. Brachycephalic breeds are those that have a very short snouts and muzzle (Ruaux, 2011). Epulis more often affects middle aged and elder dogs (Hilary, 2019).

According to histopathologic evaluation, there are three types of epulides. Fibromatous epulis is a benign, pedunculated, noninvasive growth in which the periodontal ligament stroma is the

predominant cell type (Verstraete *et al*., 1992). Although histopathologically ossifying epulis has an osteoid component, it has a similar biologic behavior to fibromatous epulis. Acanthomatous epulis is the most aggressive epulis that is found in the rostral jaw with extensive bony invasion into the alveolar bone. It may become quite large but does not metastasize (Matthew, 2006).

3.2. Neck Region

3.2.1. Surgical drainage of abscess in ox

Abstract

A subcutaneous abscess is a collection of pus surrounded by fibrous tissue beneath the skin that is treated with drainage to remove the pus and begin the healing process. Seven years old local ox was brought to the VTH, CVMA, AAU with history of swelling in the neck. Upon palpation, round, large and tense swelling under the skin of the ventral neck inside dewlap, and the swelling was hot, soft in consistency and painful to touch. After sedating and preparing the incision area, abscess pocket on the ventral aspect was incised and drained with causing destruction to the abscess wall. The cavity was irrigated with 0.5% dilute povidone iodine. The cavity was packed with gauze soaked in 5% povidone iodine with a seton protruding out. Pen-Strep @1ml/20kg q 24 h for 5 days & Flunixin Meglumine @2.2mg/kg q 24 h for 3days were given IM & IV respectively. Eventually, the ox was successfully recovered after 2 weeks.

Key words*: dewlap, drain, ox, subcutaneous abscess, Staphylococcus aureus*

Introduction

An abscess, is a localized collection of pus in a cavity (Dinulos and Pace, 2008), which is formed when the body tries to protect itself from the spread an infection by creating a wall around it (Baiu and Melendez, 2018). The most common causes are pathogenic bacteria although other pathogens can cause similar signs (Rothstein, 2011). The bacteria that cause abscesses are *Staphylococcus aureus, Staphylococcus epidermidis, Staphylococcus hycus, Arcanobacterium pyogenes, Corynebacterium pseudotuberculosis, Streptococcus pyogenes, Streptococcus milleri, Streptococcus intermedius, Pasteurella multocida, Escherichia coli* and other gram-negative rods in ruminants (AL-Tuffyli and Shekhan, 2012).

An abscess may be differentiated from hernia, tumor, hematoma and cyst. Abscess, tumor and cyst develop slowly whereas hernia occurs suddenly, and in developing abscess, there are symptoms of local inflammation and it does not fluctuate under the skin. In hematoma, the blood accumulation may feel free fluid and a slight crepitating sound on palpation. A cyst fluctuates uniformly, and has no eye point and pain or functional signs are absent. It is confirmed by exploratory puncture of the swelling and demonstration of contents or adiography (Dese *et al*., 2019).

Not all abscesses need treatment, but large abscesses and those deep in the tissue, such as subcutaneous abscess, require lancing, irrigation and antibiotics. The incision should be at ventral area of the abscess to achieve good drainage of the pocket. In addition, very large or deep abscesses can require more than one access opening to proper irrigation and drainage (McDonald, 2013). In this particular case report the surgical management of the abscess was decribed.

Case description*:* Seven years old local breed ox weighing 240kg was brought to the VTH, CVMA, AAU with history of swelling in the neck. Upon palpation, round, large and tense swelling under the skin of the ventral neck inside dewlap, and the swelling was hot and painful to touch. Centesis of the swelling with sterile needle on the dependent part was also conducted to check its content and then the contents that filled the cavity was pus (Figure 6A). Animal was feverish (39.7^0C) while all the other vital signs, such as heart (52 beats/min) and respiratory (14 breaths/min) rates were within the normal range. The mucous membrane was pinkish with less than two seconds capillary refill time.

A pus sample was taken with sterile swabs after the area was prepped with 70% denatured alcohol and aspirating swelling with a sterile needle (Figure 6C). The sample was placed into sterile tubes containing Peptone water medium. Then, it was cultured in blood agar plates. Finally, the media were incubated at 37 °C for 24 hours in aerobic and anaerobic conditions. After incubation, the appeared colonies were identified by gram staining and mannitol salt agar**.** Violet color cocci resembling bunches of grapes in gram stain was observed through light microscope (Annex 8A) and this bacterial spp (*Staphylococcus aureus*) then fermented mannitol and the medium turned to yellow as shown in (Annex 8B). Ichthammol 20% Ointment (Neogen Corp., Lexington, USA) was applied to the area for soothing and softening areas of skin irritation. The case was diagnosed as subcutaneous abscess caused by *Staphylococcus aureus* and decided for surgical drainage.

Preoperative preparation, anesthesia and control: The ox was restrained in a standing by securing its head by a halter of rope with client-assisted nose lead. Xylazine 2%, 0.05 mg/kg body weight was administered intramuscularly. Then, the ventral aspect of the ox's dewlap was washed with soap and water. Hairs from the area of swelling were clipped and shaved. The surgical area was aseptically prepared. Lidocaine HCL 2%, (manufactured by Makcur Laboratory Limited, Gujarat, India), 10ml was infiltirated along incision line. The injection sites were massaged to disperse the local anesthetic and anticipated to effect for 10 minutes. The surgical area was finally scrubbed by povidone iodine 5% solution and awaited to dry prior to commencing surgery.

Drainage of subcutaneous abscess*:* After aseptic preparation and control of the animal, an incision with a disposable sterile scalpel tip was made on the ventral aspect of the abscess. Draining of a subcutaneous abscess was done by making an incision at the ventral side of enlarged dewlap with destruction to the abscess wall by forceps (Figure 6B). Cavity was irrigated with 0.5% diluted povidone iodine. The cavity was packed with gauze soaked in 5% povidone iodine with a seton protruding out of the incision to allow pus drainage. The incision site is left unsutured to heal as a scar.

Postoperative management and outcome: The animal was given Procaine penicillin G, 200000 IU/ml + Dihydrostreptomycin sulphate, 200 mg/ml 1ml/20kg body weight was administered intramuscularly q 24 h for 5 days, and Flunixin Meglumine, 1.1mg/kg, intravenously, q 24 h for 3 days to prevent pyrexia and inflammation associated with endotoxaemia. Gauze soaked in 5% povidone iodine with a seton protruding out of the incision was regularly changed daily for 2 weeks. The owner was advised to give rest from any work for patient until complete healing. Finally, the ox was successfully recovered after 14 days without any complication (Figure 6D).

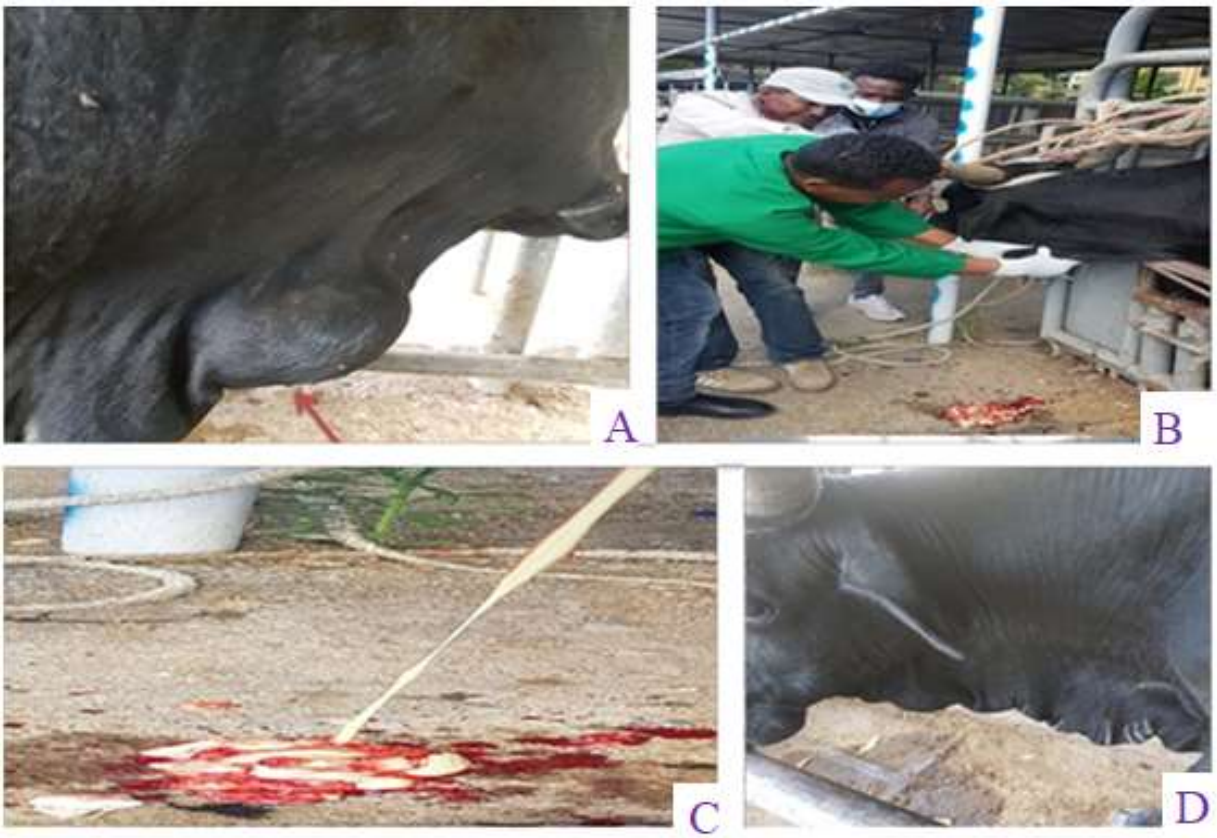

Figure 6: Evacuation of subcutaneous abscess in ox

A) Aspirating swelling with a needle to differentiate abscess from any other confusing symptoms (i.e, tumor, cyst, hematoma) (B) Evacuation of large quantity of pus (C) Thick thread like pus from subcutaneous tissue space of dewlap (D) Complete healing was grossly observed after 14 days of operation

Discussion

Subcutaneous abscess may result from traumatic wounds, oral foreign bodies, upper respiratory tract, urinary tract infections and bacteremia secondary to tooth root. Soft to firm swellings that gradually grow over several days are typical of an abscess. Although the abscess commonly develops on the head and limbs, it may be found anywhere in the body. It is usually not frequently immovable and minimally inflamed, and often contains thick, caseous exudate. Subcutaneous abscess may be confined to the subcutaneous space, or it may extend to underlying dermis and bone (Hess, 2004). It can happen at vaccination sites when immunization is done in sub-optimal conditions (wet, dirty). Most cattle are vaccinated on the near side, hence most vaccination site abscesses in cattle are on the near side of the neck. In

the early stages, abscesses may be accompanied by pain, heat and swelling, but later they become cold and surrounded by a fibrous capsule (ALEC and MLA, 2021).

Streptococcus pyogenes, *Staphylococcus epidermidis*, and *Escherichia coli* are the most commonly isolated bacteria from subcutaneous abscesses in cattle, sheep, and goats, in addition to the species isolated in this case (i.e. *Staphylococcus aureus*) (Tavassoli *et al*., 2010). The bacteria can inter into the deeper tissues through an injury or puncture wound created due to sharp-pointed material in the forage, then the tissues become colonized by pathogenic bacteria, which leads to abscess formation (Rothstein, 2011) because immune system sends fighters of white blood cells to the localized area. As the leukocytes attack the bacteria, some adjacent tissues die and creating a hole that fills with pus to form an abscess. This pus may consist of a combination of dead tissue, leukocytes and bacteria. The abscess may be hot, red, swollen, tender and fluctuant indicating pus ripening. Abscesses can occur in any part of the body, and often take between two to five days to develop but sometimes can develop instantaneously (SAHARA, 2012).

The abscess is diagnosed by aspirating swelling with a needle to obtain sample for further confirmatory examination (Hess, 2004). Gram staining is a technique used to classify bacteria into two categories (Gram positive and Gram negative) based on coloring their cell wall constituents. Gram positive bacteria retains the crystal violet during the decoloring process due to the presence of a thick layer of peptidoglycan in their cell walls. On the other hand,

Gram negative bacteria stain red, which is due to a thinner peptidoglycan wall, which does not retain the crystal violet (Becerra *et al*., 2016). Mannitol Salt Agar is a frequently used selective and differential growth medium. It contains high concentration of salt which is selected for the genus Staphylococcus since they can tolerate high saline level. It also include the sugar mannitol and the pH indicator phenol red. Pathogenic staphylococci, such as Staphylococcus aureus can ferment mannitol, thus, a formed acidic byproduct cause the phenol red in the agar to turn yellow (Kateete *et al*., 2010). Although smaller abscesses may disappear spontaneously, large abscess requires extensive incision and irrigation. If the abscess is extremely large, one can use Yankauer to suction out drainage.

3.3. Trunk

3.3.1. Ventro-lateral herniarrphy in ewe

Abstract

A ventro-lateral abdominal hernia is a prolapse of abdominal contents through the abdominal wall at ventral side other than natural openings. Two years old pregnant ewe was presented to the VTH, CVMA, AAU with a history of progressive swelling on abdomen since a month because the ewe was gored by horned bull before creation of the mass. Upon palpation, the reducible swelling was found on the left side slightly dorsal to the udder but below the paralumbar fossa when the animal restrained in dorsal recumbency. Vital signs were within normal range. After tranquilizing with Diazepam @0.1 mg/kg IV, the ewe was restrained in the table ventro-laterally. The surgical site was routinely prepared for aseptic surgery, and ring block was done using 2% lidocaine hydrochloride. An elliptical skin incision was accomplished around swelling margins. The skin was detached from the subcutaneous tissue through blunt dissection. The incision was made through the subcutaneous tissues, abdominal muscle and peritoneum. Refreshment of the edges of the ring was made. The hernia ring was sutured by polyglycolic acid suture 2-0 in overlapping mattress fashion. The subcutaneous tissue and skin were closed with a horizontal interrupted mattress using silk 2-0. The ewe was kept on 5% Dextrose solution. The ewe was given pen-strep @1ml/20kg IM q 24 h for 5 days & Meloxicam @0.5 mg/kg IV stat. After 14 days, the wound was healed completely.

Key words*: ewe, herniorrhaphy, overlapping mattress, ventrolateral hernia*

Introduction

Hernia is the protrusion of an organ or tissue through an opening created by a mechanical damage in the abdominal wall or natural openings (Jettennavar *et al*., 2010). Most hernia cases in sheep are caused by trauma due to manual beating, horn thrust, automobile accident or violent contact with blunt object (Sagar *et al*., 2010), an abscess leading to weakening of the abdominal muscles, an abdominal distension due to pregnancy and violent straining during parturition (Das *et al*., 2012). Anatomically, hernia consists of three parts that include hernia ring, sac and contents (Farman *et al*., 2018). The hernia sac contains the layers of tissues that cover the hernia contents. The contents of the hernia are the organs or tissues that have moved to the abnormal location. Although mobile structures such as omentum and parts

of the intestine may be found in most sites, the type of the contents can usually be predicted from the site of herniation (Amare and Haben, 2020).

Hernias can be divided on the basis of etiology either congenital or acquired hernia (Parvez *et al*., 2016). In addition, hernias are classified according to their anatomical locations into umbilical, inguinal, scrotal, femoral, perineal and ventral hernias (Haben and Friat, 2020). According to nature of reduction, hernia is classified into reducible and irreducible. Reducible hernia can be returned manually or automatically into the abdominal cavity (Farman *et al*., 2018). On the other hand, irreducible hernia cannot be easily reduced due to the adhesion between the content and peritoneum. It can cause strangulation when the hernia ring evert pressure on the mesentery and obstruct the blood vessels to the contents (Abdalameer, 2017). Then, this leads to cutting blood supplying and ischemia in the part of viscera that entering through the hernial ring in order to result in necrosis and gangrene (Dese *et al*., 2019).

A ventral or ventro-lateral abdominal hernia is a prolapse of abdominal contents through the abdominal wall at ventral side other than natural openings. This hernia is acquired when an animal is kicked or struck by a car or thrusted by horns of large animals. It has been described as a false hernia because it does not occur through natural body openings. It usually develop some weeks following the original injury. Its most common location is in the flank near the pelvis due to the assumption that abdominal muscles have greater elasticity at their costral attachments at the linea alba and the prepubic tendon (Haben and Friat, 2020).

Hernias have several detriments, such as lowering the productivity and reproductivity of the affected animals (Abdin-Bey and Ramadan, 2001). Most hernias enlarge over time if it is not repaired early surgically. Then, they may cause pain, anorexia, weight loss and dystocia when a gravid horn is found in the hernial sac. Moreover, Incarceration and strangulation of the intestines are the most dangerous life threatening sequel of herniation (Yasin, 2017).

Diagnosis of hernia can be made from the history and by palpation of the hernial region to check the reducibility of contents after placing an animal in appropriate position. The hernial ring is visible when the contents of a reducible hernia return to the abdominal cavity (Amith, 2020). Herniorrhaphy is the most effective correction procedure of hernia to restore the integrity of the abdominal wall, and to prevent incarceration and strangulation of herniated abdominal contents (Kumar *et al*., 2014). It is done by using tension sutures, such as horizontal mattress, overlapping suture patterns, to prevent recurrence of hernia (Dey *et al*.,

2018). The purpose of this case was to describe the successful surgical management of ventrolateral hernia in ewe.

Case description: A two year old local breed pregnant ewe weighing 34 kg was presented to the VTH, CVMA, AAU with a history of swelling on the abdomen, decreased appetite, and swelling that had been gradually rising in size for the past month. The owner complained that the ewe was gored by a horned bull before the bulge formed.

The ewe appeared dull and depressed on physical examination, with asymmetry of the abdomen region. Figure 7A showed a reversible swelling towards the left ventrolateral side of the belly (i.e., slightly dorsal to the udder but below the paralumbar fossa), with a soft consistency and no pain when palpated. The swelling was decreased in size when the animal restrained in dorsal recumbency. The rectal temperature ($39^{O}C$), respiratory (14 breaths/min) and heart (78 beats/min) rates were within the normal range. The mucous membrane was pinkish with less than two seconds capillary refill time. Based on history and physical examination, the case was diagnosed as ventro-lateral hernia that needs to be corrected by herniorrhaphy.

Preoperative preparation, anesthesia and control: Food and water were withheld for 24 hours and 12 hours prior to surgery, respectively. The ewe was restrained in the table ventro-laterally after being tranquilized with Diazepam (Hameln Pharmaceuticals, UK) at a dose rate of 0.1 mg/kg body weight intravenously. Hairs from the area of protrusion were clipped and shaved. The surgical area was aseptically prepared (Figure 7B). Then, local analgesia was done by ring block using lidocaine hydrochloride 2% with the dose rate 1 ml/cm area (Figure 7C) to desensitize the abdominal muscle and alleviate pain during surgical procedure. The injection sites were massaged to disperse the local anesthetic and anticipated to effect for 10 minutes. The surgical area was finally scrubbed by povidone iodine 5% solution and awaited to dry prior to commencing surgery.

Surgical technique: Around the swelling, an elliptical skin incision was made. The skin and the subcutaneous tissue were separated through blunt dissection. The incision was made through the subcutaneous tissues. The muscle and skin were then grasped with forceps to expose the hernial ring (Figure 7D). The inner hernia sac was opened to break slight adhesion of some section of the small intestine with the abdominal wall after surplus tissue was removed and the hernial ring was found. The small intestine was softly detached after

insertion of a finger, and it was properly replaced in the abdominal cavity. The edges of the ring were then refreshed with a scalpel to aid in the healing process.

Sutures of synthetic sterile absorbable polyglycolic acid suture size 2-0 were used to stitch the hernia ring in an overlapping mattress fashion (Figure 7D). Furthermore, the sac's excess skin was excised, and the subcutaneous tissue and skin were closed with silk 2-0, and the surgical site was appropriately cleaned and dressed with a 5% povidone-iodine solution.

***Postoperative management and outcome**:* Fluid therapy was continued for the ewe (5 percent Dextrose solution, 1000 ml was given intravenously). Meloxicam (dechra pharmaceuticals plc, Northwich, United Kingdom), 0.5 mg/kg, was given once intravenously and Procaine penicillin G, 20000 IU/ml + Dihydrostreptomycin sulphate, 200 mg/ml was given intramuscularly q 24 h for five days. To aid wound healing, the owner was recommended to give the ewe some exercise and provide her with excellent nourishment. In addition, the client was informed about the reason for the cause (i.e refraining shoats from horned cattle unless dehorning of cattle was possible).

The wound had entirely healed after 14 days (Figure 7E), and the ewe was in good health. After 42 days, the sheep gave birth (Figure 7F).

Figure 7: Surgical correction of ventrolateral hernia in ewe

A) Checking reducibility of the hernia by decreasing through the ring (B) Elliptical clipping and shaving of an intended area (C) Administering of Lidocaine Hydrochloride 2% around margins of the swelling (D) Muscular layers and skin were grasped by forceps to expose hernia ring and using overlappingl mattress for hernia ring (E) Removal of suture material after complete healing (F) The ewe had given a lamb after a month

Discussion

Hernias, have several congenital and acquired causes, that lead to lowering the productivity and reproductivity of the animals. Ventrolateral hernias are commonly seen in the abdominal wall near the midline, and the size of the hernial opening varies in diameter and the nature of hernia contents depends on the site of the herniation (Haben and Friat, 2020). The incidence of ventral hernia in bovines and ovines accounts for 32.3%. It is a common condition; however, it is generally overlooked by most rural farmers unless it results in some serious symptoms (Jettennavar *et al*., 2010).

Trauma due to gore injury from other animals, seemed to be the most common cause of abdominal hernias, which leads to rupture of the ventral abdominal muscles caudal to the umbilicus in sheep. In ruminants, rupture can cause the gravid uterus to be displaced, which commonly happens on the right side of the abdominal floor. In this condition, a severe blow to the abdominal wall is the cause, although it may occur without trauma, resulting in

weakening of the abdominal musculature so that the gravid uterus cannot be supported. The success rates of surgical treatment for all types of hernias were very high in both sheep and goats (Al-Sobayil and Ahmed, 2007).

Absorbable sutures, such as polyglycolic acid, are recommended to close abdominal hernial rings by simple interrupted, simple continuous or interrupted cruciate patterns; tension-relieving sutures such as near-far-far-near is used to close large abdominal hernial openings (Haben and Friat, 2020). Therefore, herniorrhaphy in this ewe was done using synthetic sterile absorbable polyglycolic acid sutures size no. 2-0 in overlapping mattress fashion. Slight inflammatory swelling appeared next day postoperatively since the accumulated fluid in the dead space but this disappeared spontaneously within 5 days which was supported by (Kumar *et al*., 2017).

Eventually, hernias, are common surgical problems in different farm animals, which are generally overlooked by most rural farmers unless they result in some serious symptoms. Thus, the hernias should be diagnosed and treated early to minimize the risk of the problem and production loss. Careful handling of unusual contents of hernias, proper surgical technique as well as suitable mesh-type help reduce the recurrence rate and avoid damage to some of internal structures. In addition, horned cattle should not be kept together with other small ruminants otherwise disbudding or dehorning is advisable.

3.3.2. Umbilical hernia repair in cross Holstein Friesian calf

Abstract

An umbilical hernia is a protrusion of the abdominal lining, abdominal fat, or a part of an abdominal organ through the area around the umbilicus. Despite frequent treatment with pen-strep and 10% oxytetracycline, the VTH, CVMA, AAU welcomed a two-month-old cross Holstein Friesian calf with a history of swelling at the umbilicus from birth. The calf was placed in dorsal recumbency during the physical examination, and the hernial ring was detected with the findex ringer, and the contents were forced back into the abdomen. Tramadol @4 mg/kg IV was given to the calf, and Lidocaine hydrochloride 2% was used to block the ring. The umbilical area, which was the surgical site for this operation was prepared. An elliptical incision was made around the skin of the umbilicus. Through blunt dissection, the skin was separated from the subcutaneous tissue, and the incision was extended through the abdominal muscle and peritoneum. Upon insertion of a finger, slight adhesion of some

part of the small intestine with the lower abdominal wall was found, and it was gently detached and repositioned back in the abdominal cavity manually. Hernia ring was sutured by horizontal mattress fashion using polyglycolic acid suture 2-0. The subcutaneous tissue was sutured with simple continuous suture pattern using catgut 2-0, and skin was closed with continuous interlocking ford suture pattern using silk 2-0. The calf was given Pen-Strep @1ml/20kg, IM q 24 h for five days & Meloxicam, 0.5 mg/kg SC stat. Finally, the skin suture was removed on the 14th day post-operatively.

Key words*: calf, herniorrhaphy, horizontal mattress, umbilical hernia*

Introduction

The umbilicus is the external remnant of the fetal-maternal connection. It provides fetus with oxygen and nutrients, and get rid of waste materials via contact with maternal blood in the placenta and drainage into the allantois. Rupture of the umbilical cord during parturition causes regression of the structures and the formation of vestigial structures as the animal ages (Kiliç *et al*., 2005). Branches of the umbilical arteries and veins run through the connective tissue between the allantois and chorion. They are important parts of the fetal circulation. The paired umbilical arteries which carry deoxygenated blood from the fetus to the placenta, whereas the umbilical vein which carries oxygenated blood and nutrients from the placenta to the fetus (Frandson *et al*., 2009). The umbilical arteries are found on either side of the bladder and run cranially to join the umbilical cord. They retract and eventually form the lateral ligaments of the bladder because the umbilical cord is stretched at birth. The urachus runs from the bladder apex to the umbilicus and connects the fetal bladder to the allantoic sac, and it runs cranially from the umbilicus to the liver and finally regresses to become the round ligament of the liver following birth (Beasley, 2017).

Umbilical hernia, is displacement of part of organs or complete organs through a defect in the abdominal wall at the region of umbilicus with skin intact, which allows the formation of a peritoneum lined hernia sac containing omentum, abomasum or intestines (Doijode, 2019). The hernia is common in foal, piglet, calf and pup. It can be congenital or acquired (Dese *et al*., 2019). Multiple pregnancy and short gestation length are two major risk factors for congenital umbilical hernia in calf (Herrmann *et al*., 2001). Predisposing factors, such as inappropriate handling of the animal at birth with improper manual cutting of cord rather than to break it on its own, breaking the cord too close to the body wall, forceful traction of fetus

during parturition predisposes for acquired hernia. Besides, diarrhea and constipation may increase abdominal pressure, which in turn leads to weakening of abdominal muscles then the hernia results (Steenholdt and Hernandez, 2004). Umbilical infections as a result of environmental contamination are associated with risk of umbilical hernia in calves during the first 2 months of life (Doijode, 2019). Arcanobacterium pyogenes and Escherichia coli are frequent isolates from umbilical infections in calves (Haile *et al*., 2017). Though many umbilical hernias are secondary to umbilical sepsis, it is the most common form of congenital hernia in calves (Haben, 2020).

Surgical repair is the treatment of choice for umbilical hernia (ACVS, 2021). Many different techniques have been described for hernia repair and all are intended at securing the same result (i.e a firm union of the opposing edges of the hernial ring) (Wheat, 1952). Although open herniorrhaphy is the most common method of veterinary treatment, ligation of the hernial sac, use of clamps, suturing of the hernial sac and radical operation are normally performed to correct the umbilical hernia. Despite its common use, open method of herniorrhaphy has a disadvantage especially bacterial infection that might cause recurrence of hernia. Closed herniorrhaphy can minimize this postoperative complication is unclear so an irreducible umbilical hernia has no other choices than open herniorrhaphy (Hashim *et al*., 2015). This case report was to describe the successful management of umbilical hernia by herniorrhaphy in cross Holstein Friesian calf.

Case description: Two months old cross Holstein Friesian calf weighing 45 kg body weight with a history of progressive swelling at the umbilical region since birth, was presented to the VTH, CVMA, AAU.

Upon physical examination, the calf was placed in dorsal recumbency and the contents were pushed back into the abdomen with the fingers through ring. Thus, it was reducible swelling that swings around the umbilicus. The size of the hernia ring was three fingers in breadth. The rectal temperature (39^{o}C), respiratory (33 breaths/min) and heart (103 beats/min) rates were within the normal range. The mucous membrane was pinkish with less than two seconds capillary refill time. Based on history and physical/clinical examination, the case was diagnosed as umbilical hernia to be corrected by herniorrhaphy.

Preoperative preparation, anesthesia & control: Food and water were withheld for 24 hours and 12 hours, respectively, prior to surgery. The calf was administered Tramadol, 4 mg/kg

intravenously, and the calf was positioned in dorsal recumbency. The umbilical area was washed with water and soap. Hairs from the area of umblicus were clipped and shaved (Figure 8A). The surgical area was aseptically prepared. Then, local analgesia was done by ring block using lidocaine hydrochloride 2% (manufactured by Makcur Laboratory Limited, Gujarat, India). The injection sites were massaged to disperse the local anesthetic and anticipated to effect for 10 minutes. The surgical area was finally scrubbed by povidone iodine 5% solution and awaited to dry prior to commencing surgery.

Surgical technique: An elliptical skin incision was done around swelling margins. Detaching the skin from the subcutaneous tissue was performed by blunt dissection. Then, the incision was continued through the and peritoneum. Upon insertion of an index finger, slight adhesion of some part of the small intestine with the lower abdominal wall was found and it was gently detached and the herniated viscera (small intestine) were repositioned back in the abdominal cavity. Then, approximately 1 mm radius dissection was performed around the edge of the hernial ring to make fresh wound that helps facilitate the healing process (Figure 8B).

Hernia ring was sutured by horizontal mattress fashion using polyglycolic acid sutures 2-0 (manufactured by Shanghai Pudong Jinhuan Medical Produces Co., Ltd, Shanghai, China). Then, the subcutaneous tissue was sutured with simple continuous suture pattern by using catgut 2-0. The excess of folded skin was left because it would shrink to its original anatomic

dimensions and position post-operatively. The skin was closed with continuous interlocking ford suture pattern using silk 2-0 size (Figure 8C). Finally, the surgical site was properly cleaned and dressed with 1% povidone iodine solution.

Postoperative management and outcome: Post-operatively, the dressing of the wound was done using a 1% Povidone-iodine solution at second and third days post-operation. Besides, the calf was given Procaine penicillin G, 200000 IU/ml + Dihydrostreptomycin sulphate, 200 mg/ml, 1ml/20kg, intramuscularly q 24 h for five days, and Meloxicam, 0.5 mg/kg intravenously stat. Furthermore, the owner was also advised to closely monitor the calf and advised to allow some exercise and supply with good nutrition to facilitate wound healing. Finally, the skin suture was removed on the 14^{th} day post-operatively (Figure 8E).

Figure 8: Surgical correction of umbilical hernia in calf

A) Shaving and scrubbing of umbilical area of calf (B) Dissection of tissues around the edge of the hernial ring (C) Skin suturing with continuous interlocking ford pattern (D) A calf soon after herniorrphy (E) Suture removal after complete healing (F) The calf after 2 months of surgical intervention

Discussion

Umbilical hernia, is the most common form of hernia in calves, which can occur in any breed, and is more common in female than male. The occurrence of congenital hernia was 1.8%. The umbilical hernia frequently occurs about 5-7 weeks of age after birth in calves.The incidence of hernia was 20.84% highest at 5 weeks of age. The prevalence of an umbilical hernia in the first week of life can lies between 18 and 24%. The umbilical hernia is usually manifested by a varying shape and size of external swelling and must be differentially diagnosed from other masses such as abscess, heamatoma, cyst and tumor. The hernial sac is formed by the skin, fibrous tissue and peritoneum. The contents are often fat and omentum, but the larger hernia sac may also contain loops of small intestine, a part of the abomasum, or greater omentum (Doijode, 2019).

A surgical repair of simple hernia is done with incision of a straight line in the abdomen. Most hernias are best advanced by elliptical incision over the sac. Adequate surgical exposure, access to the hernia contents and gentle handling are essential. To have proper access, it may be required to expand the hernia ring. The hernial ring is closed in an overlapping suture or a horizontal mattress with good tissue approximation (Dese *et al*., 2019).

In conclusion, umbilical hernias occur at the point where the calf was previously joined to the placenta by the umbilical cord. In more severe cases, it may include intestinal loops. Most veterinary surgeons should be equiped with necessary surgical anatomy and skills to undertake surgery of umbilical hernias because achieving high success rates is based on how to tackle post operative complications that are present otherwise referring to skilled surgeons rather than attempting field surgery is important.

3.3.3 Single mastectomy in bitch

Abstract

Canine mammary tumor is the most common neoplasm in intact female dogs. A nine years old intact Spitz bitch was brought to the VTH, CVMA, AAU with history of hard mass on the ventral abdomen. Upon palpation, a hard, non-painful, moveable mass on the left inguinal mammary gland. The vital signs were within normal range. Atropine sulphate @0.04mg/kg, Xylazine @1 mg/kg were injected IM. The surgical area was routinely prepared. Induction was done by ketamine @10 mg/kg. The dog was slowly infused with lactated ringer's

solution. Elliptical incision was made through the skin around the gland. The medial subcutaneous tissues were incised. Subcutaneous tissue dissection and transections were continued cranially. Blood vessels were clamped and ligated. The subcutaneous tissues along the lateral margins of the gland were incised. At the cranial aspect, junction between the affected mammary tissues and the adjacent gland were separated, and associated blood vessels between the gland were ligated and transected. External abdominal fascial sheath was dissected whereas the mammary gland was dissected caudally. Anastomosing vessels were ligated and transected. The caudal superficial epigastric artery and vein were ligated and transected before completing the mastectomy, and the subcutaneous dead space was reduced by walking sutures. Closure of skin was performed by intradermal continuous suture pattern. Pen-Strep @2ml/25kg, IM, was given q 24 h for 5 days & Meloxicam @0.2 mg/kg was administered q 24 h PO initially and repeated @0.1mg/kg q 24 h PO. The dog was brought to VTH on 5th day of surgery with wound dehiscence and bending and drying skin. After an excision of dried skin and refreshing of the wound, intradermal closure of the wound and wearing collar, follow-up was devised with Ceftriaxone @50 mg/kg was given IM q 24 h for 3 days, and then the success was observed after 3 weeks.

Key words*: bitch, mammary tumor, mastectomy*

Introduction

The mammary gland is a compound tubuloalveolar gland which is separated into lobules by interlobular connective tissue. The mammary gland consists of parenchyma, stroma, ducts, vessels and nerves. Bitches usually have five pairs of glands. The cranial and caudal thoracic mammary glands are denoted as the cranial two pairs, the middle two pairs are called as cranial and caudal abdominal mammary glands and the inguinal mammary glands is named as the caudal pair (*Petrov et al.*, 2014). The cranial two pairs receive blood supply from perforating cranial branches of the internal thoracic arteries and also recieve from the intercostal and lateral thoracic arteries. The abdominal glands are supplied by mammary branches of the cranial superficial epigastric artery, which anastamose with the caudal superficial epigastric artery that supplies the inguinal mammary gland. Venous drainage is more extensive than the arterial supply and follows the arterial vessels, and the abdominal and inguinal glands drain into the caudal superficial epigastric veins. The thoracic glands drain into the cranial superficial epigastric vein as well as directly into the internal thoracic veins (Anderson, 2014a). Lymphatic system in dog has a considerable importance in sketching the

possible spread of tumour cells. Each gland has a network of lymph vessels in the teat which connects similar networks in the subcutis and parenchyma. Thus, these networks link up by larger channels either to the networks of adjacent glands or directly to the local lymph node. The cranial two pairs and the cranial abdominal glands always drain to the axillary lymph node of their own side. The drainage of the last two glands frequently overlaps. The caudal abdominal glands and the caudal pair drain via a common network to the ipselateral superficial inguinal node. However, if there is sometimes a connection between the lymphatics of the cranial and caudal pairs of abdominal glands, it allows the possibility of retrograde lymphatic spread of tumour tissue from thoracic to inguinal glands and vice versa (Silver, 1966).

Mammary gland, next to the skin, is the second most common site for tumour development in dogs (Petrov *et al*., 2014). Canine mammary tumor, is a neoplasm originating from the mammary gland and its associated lymph nodes, which is the most common neoplasm in intact female dogs, predominantly in elder animals (Lamsal and Giri, 2019). Male dog may suffer from mammary tumor, with an estimated risk of less than 1 percent compared with that of female dogs (Rajesh and Jyothi, 2018).

Based on invasiveness of neoplasia, there are several surgical options of mammary gland. Lumpectomy (incising the skin over the nodule and separating bluntly from the surrounding parenchyma) is indicated to remove of benign, small, firm and non-adherent to the skin or underlying tissues nodules. Simple or single mastectomy is the removal of a single mammary gland by an elliptical skin incision including 2cm margins of normal tissue around the gland. It is indicated for large tumors having a central location within the gland and fixed to the overlying skin or the underlying tissues. Regional mastectomy is recommended when large mammary tumors are located in consecutive glands, or is located between two glands. Unilateral mastectomy is prescribed for tumors occurring in multiple glands of a chain. When multiple tumors are located in both chains a simultaneous bilateral mastectomy may be performed (Papazoglou *et al*., 2014). The aim of this case report was to describe single mastectomy.

Case description*:* A nine years old never bred intact Spitz bitch weighing 14kg was brought to the VTH, CVMA, AAU with history of progressive enlargement of left inguinal mammary gland **(**Figure 9A). The client also complained that the small firm protuberance was noticed 2 months ago, but the dog had normal appetite.

Upon palpation, a hard, non-painful, moveable mass on mammary region without enlargement of lymph nodes. Needle aspiration with aseptic technique was employed to differentiate it from cyst, hematoma, hernia and abscess (Figure 9B). Moreover, dog was bright, alert and responsive with pinkish mucus membrane. Rectal temperature (39.4^0C), heart (72 beats/min) and respiratory (15 breaths/min) rates were under normal physiological range. Capillary refill time (CRT) was less than 2 seconds. Finally, a single large tumor having a central location within the gland and fixed to the overlying skin (Figure 9C) was diagnosed to perform single mastectomy.

Preoperative preparation, anesthesia and control*:* Food was withheld for 24 hours and water for 12 hours prior to surgery. Atropine sulphate, 40 µg/kg, Xylazine, 1 mg/kg were injected intramuscularly at an interval of 5 minutes. After clipping, scrubbing around the abdominal region from xyphoid to pubis after restraining the dog under dorsal recumbency were done, and followed by povidone iodine 1% of the mammary gland surrounded by the tumor. Then, the dog was provided with slow infusion of constant intravenous fluid therapy using lactated ringer's solution. Ketamine, 5 mg/kg was given to proceed surgery.

Surgical technique: Elliptical incision was made through the skin around the left inguinal gland. The medial subcutaneous tissues were incised with a blade. Subcutaneous tissue dissection and transections by scissor were continued cranially. Blood vessels were clamped and ligated. Then, the subcutaneous tissues along the lateral margins of the gland were incised. At the cranial extent of the incision, junction between the affected mammary tissues and the adjacent gland were identified and separated. Confluent tissue and associated blood vessels between the gland were transfixed and double ligated with 2-0 chromic catgut, and then the tissue junction was transected. External abdominal fascial sheath was dissected whereas the mammary gland was dissected caudally. Anastomosing vessels or confluent glandular tissue were ligated and transected. The caudal superficial epigastric artery and vein in the inguinal fat pad identified to remove caudal mammary gland, and then were ligated and transected before completing the mastectomy. Procaine pencillin G powder was dispersed, and the subcutaneous dead space was reduced by placing walking catgut sutures. Eventually, closure of skin was performed by intradermal continuous suture pattern with catgut 2-0 (Figure 9D).

Postoperative management, complications and outcome*:* Procaine penicillin G, 200000 IU/ml + Dihydrostreptomycin sulphate, 250 mg/ml, 2ml/25kg body weight was given

intramuscularly q 24 h for 5 days. Meloxicam, 0.2 mg/kg PO initially and followed by 0.1mg/kg q 24 h PO to reduce pain and inflammation. The owner was ordered to restrict exercise to reduce the risk of swelling and wear collar that was made from locally available material to control self-mutilation or self-trauma. The dog was brought to VTH on 5th day of surgery with wound dehiscence and bending and drying skin. After a great effort such as excision of dried skin and refreshing of the wound, intradermal closure of the wound and The owner was ordered to wear collar that was made from locally available material to control self-mutilation or self-trauma (Figure 9E). Follow-up was advised with ceftriaxone, 50mg/kg, intramuscularly daily for 3 days to secondary bacterial infection and Meloxicam, 0.2mg/kg SC at once to clinical management of pain was administered, and then the success was observed after 3 weeks.

Figure 9: Surgical excision of a single mammary gland containing tumor in bitch

A) History taking was undertaken in VTH (B) Needle aspiration with aseptic technique was employed to differentiate it from cyst, hernia, hematoma and abscess (C) Large tumors having a central location within the gland and fixed to the overlying skin (D) Intradermal suture pattern was applied for skin closure to prevent self-trauma (E) After postoperative complication, the bitch was worn collar to prevent self-trauma from scratching

Discussion

Post-operative complications after mastectomy may include dehiscence of the incision, seroma formation, wound infection, ischemic necrosis, self-mutilation, hemorrhage, hind limb edema and tumor recurrence. Seroma or hematoma formation is common complications due to inadequate dead space elimination or problematic drainage. Drains may provoke fluid formation depending on the size of drain and created wound size. Postoperative hemorrhage was also described in dogs after active drain placement (Papazoglou *et al*., 2014).

Incidence of mammary tumor in bitch depends on the regional frequency of ovariohysterectomy. Mammary neoplasia predisposition is 0.5% and 8% for dogs spayed before the first and second estrus cycles, respectively. The risk of mammary gland is 26% for dogs spayed or left intact thereafter. Spaying cats before 6 months, 12 months, and 24 months of age results in 91%, 86%, and 11% risk reduction in mammary tumor development, respectively (Tobias, 2010).

In conclusion, mastectomy is one of the most important treatment strategies for mammary gland tumors in dogs. The survival is depends on age, tumor size, tumor stage, tumor histopathological type, tumor grade, clinical behavior of the tumor, lymph node involvement, hormonal expressions. Ovariohysterectomy at an early age can significantly reduce the risk of developing the tumors. In addition, feeding a well-balanced diet, avoiding obesity and the administration of hormones may reduce the incidence of them.

3.3.4. Cesarean section in ewe and doe

Abstract

Dystocia is a term used to describe delivery difficulties that necessitate human intervention. Both ewe and doe were brought to the VTH, CVMA, AAU with history of difficulty in giving birth. In ewe, index finger was inserted through vagina, there was no enough cervical opening, but cervix was fully dilated and the fetus' bilateral shoulders locked with pelvis in doe. They were sedated with diazepam @0.1 mg/ kg IV, and were placed in the right lateral recumbency. The left flank was prepped and infiltrated in inverted L block using Lidocaine hydrochloride 2%. Skin incision was made on the left paralumbar fossa. The musculature were carefully incised. The parietal peritoneal layers were held raised to do a stab incision. In ewe, fetal limb within the uterus is drawn to the incision site and uterus is incised over the limb. The fetus and the placenta from right uterine horn were removed, and another fetus from contralateral uterine horn was grasped through caudal to the septum and dragged towards the incision site. In doe, an incision was made in the greater curvature of the right uterine horn in an area devoid of cotyledons. Loosely attached fetal membranes was removed. The uterine body in ewe and right uterine horn in doe were closed in double-layer sutures with a vicryl 2-0. The peritoneum and transverse abdominis, internal and external obliques, and subcutaneous tissues were sutured with catgut 2-0 in a simple continuous pattern. Skin incisions were closed with silk 2-0. In doe and ewe, Pen-Strep @1ml/20kg were administered IM q 24 h for 5 days. Meloxicam @0.5 mg/kg stat. was also given SC. Skin sutures were removed after 2 weeks.

Key words*: cesarean section, doe, dystocia, ewe, Fetopelvic disproportion, ringwomb*

Introduction

Small ruminants are the common fertile domestic animals. Although several reproductive diseases are constraints in shoat production farms, dystocia is the most common condition that

causes death in both kids/lambs and the dams (Purohit, 2006). Dystocia refers to difficulty in birth up to the point of requiring human intervention. Generally, it may be of fetal or maternal origin. Fetal causes of dystocia are oversize, mal-disposition and monsters (Mostefai *et al.*, 2019). Maternal causes of dystocia include incomplete cervical dilatation (ringwomb), narrow pelvis, uterine inertia, uterine torsion, uterine rupture (Purohit, 2006). The feto-pelvic disproportion may occur in young animals when bred early because of small pelvis with normal size fetus. It can also occur if the size of the fetus is big when compared to the normal pelvis of the animal. This condition may commonly happen in adult ewes or does carrying single fetus (Sharun and Erdoğan, 2019). Dystocia is considered when lambing/kidding takes more than one hour after rupture of the foetal membrane (Ahmed *et al*., 2017).

The management of dystocia depends upon correct diagnosis of cause of dystocia and management technique (Hussain and Zaid, 2010). Dystocia can be relieved by several methods, including the caesarean section and fetotomy. Cesarean section is a safe and successful procedure for treatment of dystocia if performed as early as possible. It is less exhausting, faster, and safer than fetotomy, and it has a high maternal and foetal survival rate (Ajeel *et al*., 2019). On the other hand, ineffective manual traction after correction and hormonal treatment reduce success rate. The procedure may be performed via paralumbar fossa, low flank or ventrolateral incision, lateral oblique or ventral midline laparotomy. Flank procedures are performed after local anesthesia but ventral midline procedures are best done under general anesthesia (Anderson, 2014b). Uterine closure must be done in two layers in spite of single layer closure in order to prevent uterine leakage. Systemic administration of antibiotics and non-steroidal anti-inflammatory drugs are useful for minimizing postoperative complications (Iqbal *et al*., 2020). The purpose of these two cases report was to describe successful emergency cesarean section in ewe and doe due to ringwomb and absolute fetal oversize (fetal giantism), respectively.

Case 1

Case description: A 14 months old local breed 31kg body weight ewe was presented to the VTH, CVMA, AAU with history of difficulty in giving birth. The owner also complained that his ewe's labor had begun six hours before presentation to the hospital.

Tachycardia (90 beats per minute), slight dehydration, pale mucous membrane, dilated vulva, and swollen udder and teats were all seen on physical examination. The ewe was weak but not

comatose. There was a large perineal edema with scant discharge from vulva. The fetuses were alive and there was fetal reflex when the abdomen was palpated. To remove dung and debris, the area around the ewe's vulva was cleansed with soap and a mild disinfectant, and then a vaginal inspection was performed using correct obstetrical preparation by cleaning and lubricating the vulva, but no delivery progress was made. As a result, the index finger was entered through the vaginal entrance since there was insufficient cervical openness and dilatation. Respiratory rate (14 breaths/min) rates was within normal range, but had lower rectal temperature (37.9^0C).

Case 2

Case description: A 13 months old local breed 29kg body weight doe was presented to the VTH, CVMA, AAU with a history of difficulty in birth. The client also complained that his goat had straining, vaginal discharge, distended abdomen, anorexia. Upon vaginal examination following epidural anesthesia with 2% lidocaine hydrochloride revealed that cervix was fully dilated and the fetus was presented in anterior longitudinal presentation, the doe suffered from dystocia because of absolute fetal oversize with bilateral shoulder flexion. The rectal temperature (39.6^oC), respiratory (14 breaths/min) and heart (79 breaths/min) rates were within the normal range. The mucous membrane was pinkish with less than two seconds capillary refill time. Based on history and physical examination, the doe was diagnosed as dystocia due to fetal oversize to be managed by cesarean section.

Preoperative preparation, anesthesia and control: The ewe and doe were sedated with an intravenous injection of diazepam at the dose rate of 0.1 mg/kg body weight. The animals were placed in the surgical table at right lateral recumbency. The left flank of both animals was clipped, shaved and aseptically prepped for aseptic surgery, and then it was infiltrated in a line block using Lidocaine hydrochloride 2%. Intravenous fluid therapy using crystalloid balanced electrolyte solutions with 5% dextrose was administered to overcome signs of cardiovascular compromise and dehydration. To proceed incisions, the intended surgical areas were finally scrubbed starting from center to margin with povidone iodine 5%.

Surgical technique: In both animals, skin incisions of about 8 cm in length was made vertically down on the left paralumbar fossa (midway between the last rib and iliac crest) extending from 10 cm below the transverse proceses to 3 cm above the mammary vein. Minor haemorrhages were controlled through clamping and ligation. The fascia was separated by

digital manipulation. Thin musculature were carefully incised vertically. The parietal peritoneal layers were held raised and a stab incisions made on them, and then were extended along the incision line. The rumens were moved forward to expose the gravid uterus. The wombs of both animals were identified, carefully lifted towards the incision site and exteriorized. Palpation of uterus in both animals revealed the presence of twin lambs, but one dead kid. In ewe, fetal limb within the uterus is then drawn to the incision site and uterus is incised over the limb. First, the fetus and the placenta from right uterine horn were removed, and then another fetus from contralateral uterine horn was grasped through caudal to the septum and dragged towards the incision site. Umbilicus of both lambs was clamped using artery forcep and transected caudal to clamp. In doe, an incision was made in the greater curvature of the right uterine horn in an area devoid of cotyledons was used to deliver dead fetus. The dead large fetus was removed (Figure 11A). After delivery, loosely attached fetal membranes was removed and uterine fluid was drained externally. Procaine penicillin G powder was dusted inside the uterus (Figure 11B) before commencing closure.

The uterine body in ewe and right uterine horn in doe (double-layer closure) were closed first with a continuous inverting pattern (a Cushing pattern), using a vicryl 2-0, and then closed second with a layer of Lambert (inverting) suture pattern using 2-0 vicryl (Figures 10C&D and 11E&F) to prevent leakage of uterine contents into the peritoneal cavity. Then, the uterus and horn were lavaged externally with saline solution to remove all blood clots that form adhesion. Both animals, the peritoneum and transverse abdominis, internal and external obliques, and then subcutaneous tissues were sutured using catgut 2-0, in a simple continuous pattern. Finally, skin incisions were closed using silk 2-0 in interrupted horizontal mattress fashion (Figures 10G) and simple interrupted suture pattern in ewe and doe, respectively.

Postoperative management and outcome: The lamb's navel was disinfected to prevent infection. The two lambs were brought to ewe (Figure 10H) because this activity led to remove membranes from the lamb’s nose and excess fluid from the face of the lamb and then stimulated the lamb to start breathing normally. In addition, it helped to the mutual recognition process, and each weak lamb from a protracted delivery was given about 250 ml of colostrum intake. In doe and ewe, procaine penicillin G, 200000 IU/ml + Dihydrostreptomycin sulphate, 200 mg/ml, 1ml per 20 kg body weight were administered intramuscularly q 24 h for 5 days. Meloxicam, 0.5 mg/kg was also give subcutaneously. Skin sutures were removed after 14 days postoperatively (complete healing) (Figures 10I & 11G).

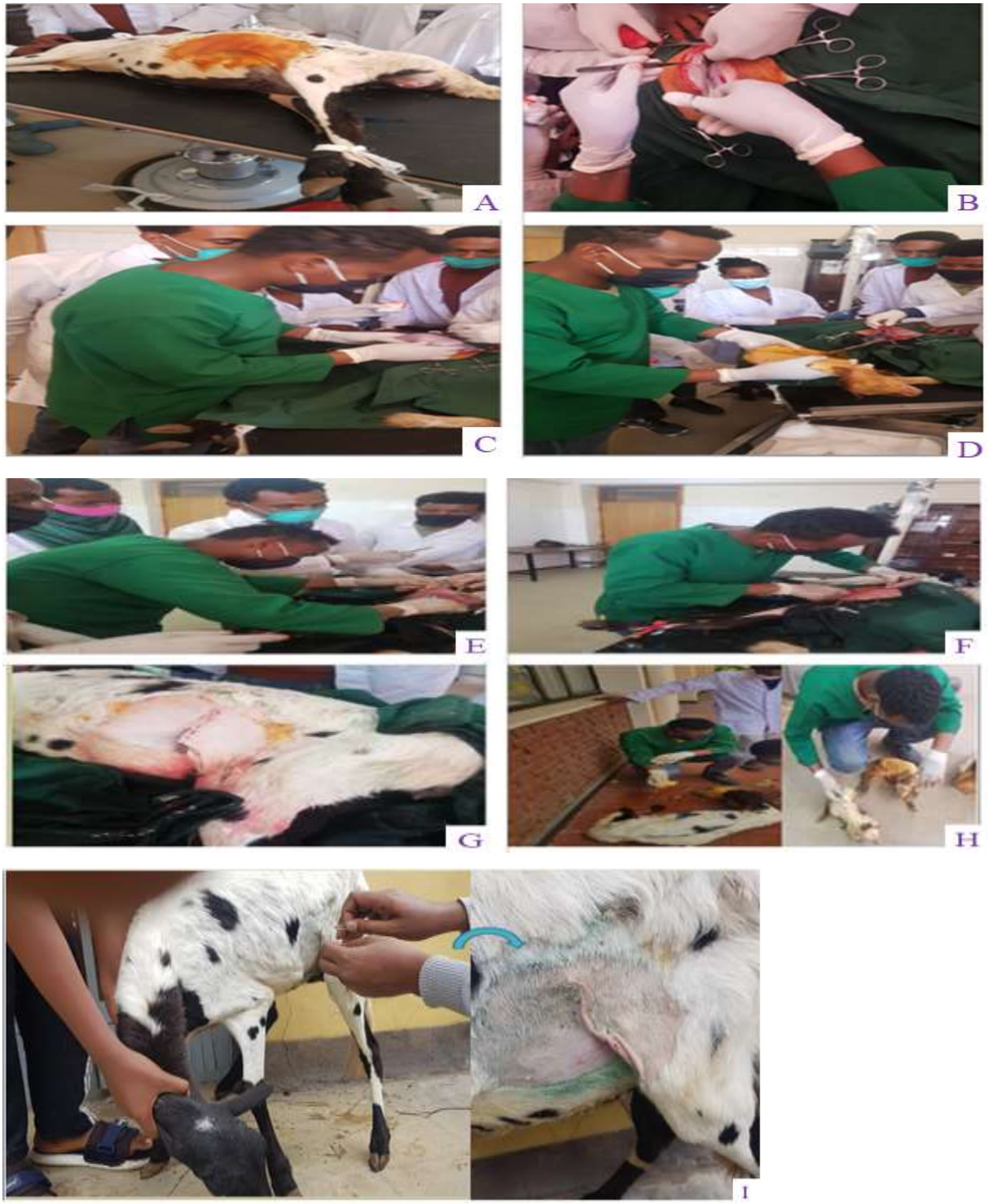

Figure 10: Cesarean section in ewe

(A) Scrubbed area ready for operation (B) The intended area were incised layer by layer (C) Palpation of uterine horns to chek the number of fetuses (D) Delivery of fetus through cesarean section (E) Suturing of uterine incision (F) Apposition of musculature (G) Closure of Skin in horzontal mattress (H) Bringing back her lambs to her (I) Removal of suture after 14 days

Figure 11: Cesarean section in doe

(A) Delivery of dead fetus through incision (B) Dispersion of procaine pencillin into lumen (C) Cushing suture (D) Lambert suture (E) Suturing of abdominal musculature in two layers (F) Dextrose 5% was given immediately after operation (G) Removal of suture at 15 days of operation

Discussion

An average gestation period of small ruminants is 148 days (Thompson, 2006). Most healthy sheep and goats (*Capra hircus*) can labor and deliver its fetuses in the normal presentation (spine upwards, forefeet with the head between them pointing toward the cervix). A normal kidding and lambing process usually takes five hours from the start of cervical dilation to the delivery of the fetuses, four hours for the dilation of the cervix and an hour for the actual delivery. The labour (normal birth) in these animals is controlled by changes to the animal hormone balance and the uterine contents that, in turn, cause the uterus to contract, pushing the fetus into the dilating cervix and expel it (Hucal, 2011). In a normal lambing/kidding, there are three distinct stages. Dilation of the cervix: as the uterine contractions start, a thick creamy white mucous is passed from the vulva. In the second stage, increased uterine contractions leads dam to spend more time lying down on its side with its head turned in the air, and a large water bag appears, breaks and expels the water. Now, the tip of the nose and front feet of the fetus can be felt. The fetus is expelled. As animals often have multiple births, the same sequence of the rupture of the water bag and expulsion of the fetus will be repeated for the delivery of each fetus (Martin, 2010). The last stage of lambing/kidding (the expulsion of the placenta) takes 30 to 60 mintues after the delivery of the last fetus. If the placenta is not expelled after 24 hours, there may be a problem (Menzies, 2007).

Most ewes normally lamb without need for assistance. The gestation length and parturition process in both species appear to be similar with the stage of labour lasting hours. However, vocalization is seen only in the goat during parturition and drop in rectal temperature recorded in sheep (Chapman and Smith, 2015).

In ringwomb, early intervention by cesarean section without clients' attempts can result in the delivery of live lambs and much healthier ewe. Ringwomb is a problem that can occur during lambing when the cervix does not relax and expand fully to allow the passage of the lamb, so the lamb cannot get out and then straining leads to prolapse of the cervix. Thus, the waterbag has appeared and ruptured, but has no more lambing progress. On vaginal examination, the cervix feels like a tight rubber band, allowing only the tip of one finger to pass through (Winter and Hill, 2013). Ringwomb is caused by failure of secretion of the hormones that control labor or of the tissue response to hormonal secretions. It causes sporadic dystocia, mainly in multiparous ewes bearing multiple fetuses, but has no predisposition associated with breed, age, body condition score but is associated with a significantly higher lambing

percentage. The condition has been reported to be responsible for 15 to 32% of ovine dystocia (Kerr and Dailey, 1999). Therefore, in ringwomb, the cervix cannot be distended and there is no treatment other than a caesarean section to save the ewe and lambs. It is usually successful (Marjorie, 2020).

Fetal oversize (Fetopelvic disproportion) occurs most commonly in ewes or does carrying single fetuses. A prolonged gestation results in large sized lambs/kids with resultant dystocia. Following the fetus' death in the birth canal, fetal emphysema can cause the fetus' size to increase. Fetal monsters can have relative oversize and result in dystocia. Less common causes of fetal oversize include fetal anasarca and fetal hydrops. Dead emphysematous fetuses require partial subcutaneous fetotomy especially of the limbs. Oversized fetuses, emphysematous fetuses and fetal monsters require caesarean section for dystocia correction in goats (Purohit, 2006).

Generally, dystocia leads to economic losses either due to death of new born and/or dam or lessening dam fertility. Management of dystocia depends on diagnosis of the causes of dystocia. Then, it should be treated quickly to save the lives of the dam and the fetus. Selection of animal for breeding purpose should be done based on optimum mating age to prevent feto-pelvic disproportion.

3.3.6. Surgical correction of paraphimosis in ram and bull

Abstract

Paraphimosis is the inability of the exteriorized penis to return to its normal anatomic location inside the preputial cavity. Both animals, ram and bull, were presented to the VTH, CVMA, AAU with history of persistent penile protrusion since coitus. Upon physical examination, soiled edematous glans penis were observed. Vital signs were within the normal range. The cases were diagnosed as paraphimosis due to coitus to be managed surgically. Both animals were sedated with Xylazine hydrochloride 2% @0.05mg/kg IM. They were restrained in the ventrolateral position. Local analgesia of the the exposed glans penis was performed with Lidocaine hydrochloride 2%. The stored urine was evacuated by inserting the urinary catheter through the penile orifice in ram. The hairs surrounding the prepuce at the site of swelling was clipped, shaved and eventually prepped. The further removal of penis was performed to clean the debris. The protruded penis was washed with a saline solution. A circular incision at the junction of glans penis and preputial orifice was made in ram. The glans penis was

repositioned and retained by applying purse string suture to the preputial orifice. Pen-Strep @1ml/20kg was administered IM q 24 h for 3 days. Flunixin Meglumine @2.2 mg/kg were given IM q 24 h for 3 days. The area was properly cleaned and dressed with 5% povidone-iodine solution. On the 14th postoperative day, the purse string suture was removed, and the animals were healed.

Key words*: bull, paraphimosis, purse sting, ram*

Introduction

Paraphimosis is failure to completely retract the penis into the preputial cavity due to either the constriction of penis behind the glans penis or swelling of glans penis. These, in turn, lead to impossible to draw the organ back through the naturally small preputial orifice. It usually occurs in ruminants after erection of the penis due to injury while copulation or semen collection (Mahesh *et al*., 2016). Both congenital and acquired causes can be responsible for paraphimosis. Congenital causes include narrowing of the preputial orifice and abnormal shortening of prepuce (Ali and Davoud, 2011) while physical trauma to the genital area, having an infection, priapism (persistent erection without sexual stimulation), penile hematoma, neoplasia, foreign bodies around penis, mild phimosis, onanism, masturbation, swelling, paralysis and injury of the penis, chronic balanoposthitis and excessive sexual activity are amongst the acquired causes (Chutia *et al.*, 2020). These cases report described surgical management of paraphimosis in ram and bull.

Case 1

Case description: The VTH, CVMA, AAU received a one year old local breed ram weighing 26kg with a history of persistent penile protrusion, loss of appetite, and urine dribbling since coitus five days ago. Edematous glans penis, dried painful mucosa, adhesions between preputial skin and gland penis, and urine accumulation behind the preputial orifice were all found on physical examination. The rectal temperature (38.5^{0}C), respiratory (15 breaths/min) and heart (74 beats/min) rates were within the normal range. The mucous membrane was pinkish with less than two seconds capillary refill time. Therefore, based on history and clinical symptoms the case was diagnosed as paraphimosis due to coitus to be managed surgically.

Case 2

Case description: A Four years old local breed bull weighing 250kg with a good body condition was presented to the VTH, CVMA, AAU with a history of anuria, anorexia and persistent penile protrusion. The client also complained that the bull attempted mounting over a local cow in estrus multiple times four days ago. Upon physical examination, after the bull was restrained on right lateral recumbency, the soiled with dirt, oedematous glans penis was observed (Figure 13A). The prepuce was found everted at the opening end where mucous membrane was detected as pale and dry. After withdrawal of remaining unexposed penis penis from preputial cavity for cleansing, edematous, dessicated and painful penis and accumulated pus and fetid odour were seen. The rectal temperature (39^{o}C), respiratory (14 breaths/min) and heart (58 beats/min) rates were within the normal range. The mucous membrane was pinkish with less than two seconds capillary refill time. Therefore, based on history and clinical symptoms the case was diagnosed as paraphimosis due to coitus to be managed surgically.

Preoperative preparation, anesthesia and control: Both animals were sedated with Xylazine hydrochloride 2%, 0.05mg/kg intramuscularly. Then, they were restrained in the ventrolateral position. Local analgesia of the the exposed glans penis was performed with Lidocaine hydrochloride 2%, then waited for ten minutes for taking into effect. The stored urine was evacuated by inserting the urinary catheter through the penile orifice for the ram. The hairs surrounding the prepuce at the site of swelling was clipped, shaved and eventually prepped (Figure 12A).

Surgical technique: The further removal of penis was performed to clean the debris. Then, The protruded penis was washed with a saline solution to remove the dirt, dung and dust, and to decrease the edema. After removing of debris and gentle cleansing, a circular incision at the junction of glans penis and preputial orifice was made to detach adhesion between the preputial skin and glans penis. After the edema was reduced, the glans penis was repositioned by sliding it into the preputial cavity (Figure 13B) and retained by applying purse string suture to the preputial orifice (Figure 12B). Finally, the area was properly cleaned and dressed with a 1% povidone-iodine solution and admitted home.

Postoperative management and outcome: Procaine penicillin G, 200000 IU/ml + Dihydrostreptomycin sulphate, 200 mg/ml, 1ml per 20kg body weight intramuscularly q 24 h

for 3 days. Flunixin Meglumine, 2.2 mg/kg body weight was administered intramuscularly q 24 h for 3 days to reduce swelling of the glans penis. The area was properly cleaned and dressed with a 5% povidone-iodine solution. Finally, tetracycline wound spray was also applied around the wound (Figure 12C). Purse string suture was removed on 14th postoperative day and the animals were recovered (Figure 12D).

Figure 12: Surgical management of paraphimosis in ram

(A) Removing of debris and gentle cleansing (B) Applying purse string suture to the preputial orifice (C) Applying wound spray (D) Purse string suture

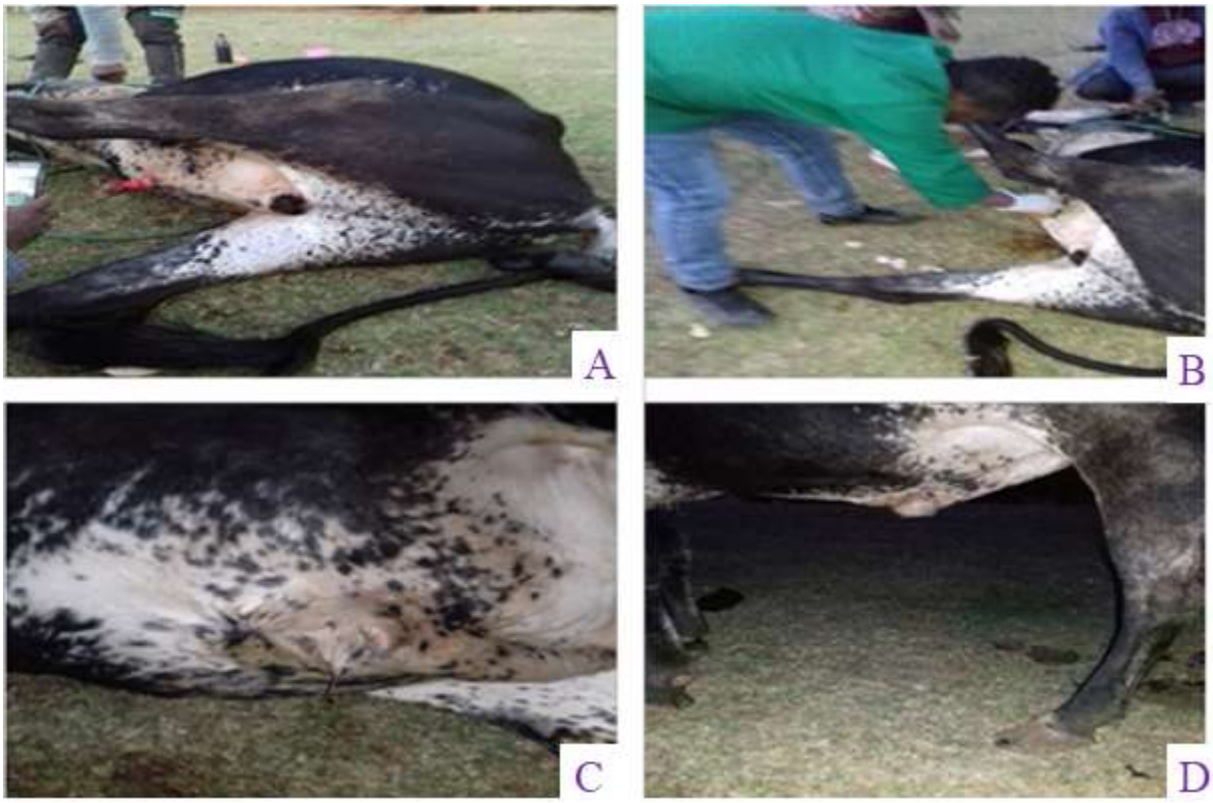

Figure 13: Surgical management of paraphimosis in bull

(A) Cleaning of extruded, contaminated edematous penis (B) Replacing the protruded penis (C) Purse string suture was applied (D) A bull after completing surgical management

Discussion

The male reproductive system is essential for domestic animals' species propagation and survival. Problems affecting the male reproductive system, in turn affect the function of the system that leads to the development of infertility or sterility in farm animals due to the ram with genital abnormalities could be sources of poor fertility (Dechasa and Amare, 2015).

Paraphimosis is a condition where the protruded penis is unable to return into the prepuce following trauma, semen collection, coitus (i.e. after penile erection). The other causes are priapism, foreign objects around the penis and constricting band of hair at prepuce orifice that it may be either due to the constriction of prepuce behind the glans penis or swelling of glans penis, creating it impossible to draw the organ back through the natural preputial orifice (Paul *et al*., 2020).

Generally, trauma to the penis and prepuce, inflammation of the penis, neoplasia of the penis, inflammation of the prepuce, and infection of the prepuce are considered as the most common predisposing factors for paraphimosis in most domestic animals. In addition, the breed, excessive amounts of parietal preputial epithelium and absence or lack of development of the caudal prepuce muscle are also the predisposing factors for paraphimosis. There are three main causes and mechanisms for the pathogenesis of paraphimosis in bulls. First, preputial edema that is due to penile injury, preputial trauma, lacerations, and diseases. Second, damage to the penile innervation caused due to spinal cord injury, a consequence of a penile laceration or hematoma. Lastly, penile paralysis caused by paralysis of the penis, consequence of priapism, use of acepromazine or phenothiazine tranquilizer (Fesseha, 2020).

Summing up, the clinical signs of paraphimosis may vary depending on the extent of constriction of the penis and the duration of occurrence. Paraphimosis due to trauma during coitus or erection of penis results in an emergency urological problem because of obstruction of urine flow, and aggravates further damage or necrosis of the penis unless managed by evacuating the accumulated urine and repositioning and retention of the penis into the preputial cavity as early as possible. Therefore, good prognosis of paraphimosis depends on early diagnosis, cleaning and reposition of glans penis surgical intervention along with the medicinal therapy. In paraphimosis case, the exposed penis becomes edematous because its venous drainage is compromised. With prolonged exposure to sunlight and external environment, the mucosa becomes dry and painful. Therefore, paraphimosis warrants veterinary intervention if not resolved quickly.

3.3.8. Ovario-hysterectomy in queen

Abstract

Ovariohysterectomy is the surgical removal of a queen's ovaries, fallopian tubes, and uterus in order to eliminate the heat cycle and breeding instinct. The six months old local queen was presented to the VTH, CVMA, AAU with a history of experiencing escape from home in order to search tom for mating. The vital signs were within the normal range. After preoperative drugs (Atropine sulphate @0.02 mg/kg & Xylazine @0.26 mg/kg) then Ketamine @11 mg/kg were administered IM. A ventral midline incision along the linea alba from the xiphoid to the level of the pubis was aseptically prepared. A midline abdominal incision was made, slightly distal to the umbilicus. An index finger was used to locate the left

uterine horn. The pedicle was triple clamped and ligated with encircling catgut 2-0, with one ligature placed below the bottom clamp and one ligature in the bottom clamp's crush, and transected. The uterine body was ligated with two encircling ligatures, one encircling and one transfixing encircling ligature, and transected. Vicryl polyglactin 910 was used to close the abdominal wall in a simple continuous pattern. Using 2-0 Monocryl, the subcutaneous tissues were closed in a simple continuous pattern. Nylon 3-0 was used to close the skin. Procaine pencillin G @22,000 IU/kg was administered IM q 24 h for 3 days. Tramadol @10 mg/kg was given PO. The cat was healed after 14 days of operation.

Key words*: cat, spay*

Introduction

Ovariohysterectomy, is one of the most common surgical procedures in small animals (Mulat and Samrawit, 2018), which is the surgical removal of the female reproductive organs, such as the two ovaries, the uterine horns and the uterus body through an abdominal incision (Ajadi *et al.*, 2018). It is carried out either through a midline coeliotomy or through a flank laparotomy (Coe *et al*., 2006). At about 5 to 6 months, the queen is old enough to be spayed. The purpose of this case report was to describe ovariohsterectomy in 6 months old queen.

Case description: The six-month-old local queen weighing 2kg, was brought to the VTH, CVMA, AAU with a history of straying from home in search of a tom to mate with. Therefore, the owner wanted his cat to be spayed. The rectal temperature (102.4^0F), respiratory (22 breaths/min) and heart (138 beats/min) rates were within the normal range. The mucous membrane was pinkish with less than two seconds capillary refill time. Based on history and clinical examination, the queen was ordered to elective spaying surgery.

Preoperative preparation, anesthesia and control: The queen was fasted for 12 hours and kept off water for six hours before surgery. After Atropine sulphate, 0.02 mg/kg, Xylazine, 0.26 mg/kg, and Ketamine, 11 mg/kg were administered intramuscularly at an interval of 5 and 10 minutes, respectively. A ventral midline incision along the linea alba from the xiphoid to the level of the pubis was clipped and aseptically prepared. A 22 gauge IV catheter was inserted at cephalic vein to administer lactated ringers solution at rate of standard fluid administration set (10ml/kg/hr).

Surgical technique: A midline abdominal incision was made, slightly distal to the umbilicus. Subcutaneous bleeding vessels were clamped and ligated. The blade was then used to continue the incision through the subcutaneous layer. To avoid tissue trauma, the linea alba was exposed using scissors. Once exposed, the linea alba was tented by pulling it up with thumb forceps along the incision's caudal end, and a stab incision was made along the midline with a blade cutting edge facing up. A Mayo scissor blade was put into the stab incision to check for adhesions, and the incision was extended cranially, adjusting the orientation as needed to stay on the linea alba. An index finger was used to locate the left uterine horn. With the tips of mosquito hemostatic forceps, the proper ligament was clamped. To expose the ovary, the proper ligament was retracted caudally on the clamp. The pedicle was triple clamped and ligated with encircling catgut 2-0, with one ligature placed below the bottom clamp and one ligature in the bottom clamp's crush. The pedicle was transected after ligation. The broad ligament between the round ligaments and the uterine vessels was opened with a hemostat. The uterus's round ligament was torn with thumb and index finger. Approximately 1 cm below the uterine bifurcation, the uterine body was ligated with two encircling ligatures, one encircling and one transfixing encircling ligature. Then, the uterus was transected and checked for bleeding. Vicryl polyglactin 910 was used to close the abdominal wall in a simple continuous pattern. Using 2-0 Monocryl, the subcutaneous tissues were closed in a simple continuous pattern. Nylon 3-0 was used to close the skin.

Postoperative management and outcome: Procaine pencillin G, 22,000 IU/kg was administered intramuscularly q 24 h for 3 days. Tramadol**,** 10 mg/kg was given orally**.** The cat was healed after 14 days of operation.

Figure 14: Spaying in queen

(A) Preparation of surgical pack (B) Administration of preanesthetic agent (C) Shaving of the skin from the xiphoid to the level of the pubis (D) After giving lactated ringers solution, a midline abdominal incision slightly distal to umbilicus was made. (E) Ligation of the pedicle (F) Dressing of towel to protect the spayed cat from cold

Discussion

Spaying is one of the population controlling methods in domestic cats (Babu *et al*., 2018). It also has several advantages:- Prevention of heat or estrus, uterine infection (pyometra), breast cancer, difficult pregnancy and delivery, and Uterine and ovarian cancer are no longer a threat. When in heat, the female experiences an urge to escape in order to find a mate. This unwanted and dangerous behavior is eliminated. Hormone imbalances that cause false pregnancy are eliminated after the heat cycle. Dogs spayed before their first heat have less chance of developing breast cancer (Bencharif *et al*., 2010). It is expected that about 75% to 97% of cats in a population need to be desexed to balance ecosystem because the onset of puberty in females can be as early as 12 weeks and a single female cat can produce 40 queens per a year (Roberts *et al*., 2015). *Closing,* spaying is permanent and the spayed cat no longer comes to heat. If the ovaries are not removed, the bothersome heat periods still occur even though pregnancy is no longer possible. Prevention of pregnancy and heat periods is the main indication for the surgery, but the procedure is also performed in treating severe uterine infections, ovarian and uterine cancer. The cat also tend to be behaved better (more desirable companions) after the procedure.

3.3.9. Surgical management of rectal prolapse in jack

Abstract

Rectal prolapse is the protrusion of the rectum through the anal opening. A four-year-old local jack was brought to the VTH, CVMA, and AAU with history of rectus prolapse. An elongated, cylindrical mass protruding from the anal orifice was detected as a diagnostic evidence of rectal prolapse, and after a thorough examination, it was established that it was type one rectal prolapse with spasmodic colic and tenesmus. The vital signs were within the normal range. Xylazine @ 2mg/kg was administered IM, and caudal epidural anaesthesia was performed by lidocaine 2% at a dose rate of 0.2 mg/kg. After cleaning, cold packs were applied to the prolapsed mass for 30 minutes. The prolapsed mass was greased with liquid paraffin and gently pushed back into position through the anus. A purse string suture with black braided silk was placed around the anal opening. Pen-Strep @1ml/20kg IM & Flunixine Meglumine @ 1.1 mg/kg IV were administered q 24 h for 3 days. Ivermectin 1% @1ml/50kg was given SC stat. Repositioning of the rectum to its original position with normal defecation was observed on the 10^{th} postoperative day.

Key words*: jack, prolapse, purse-string, rectum*

Introduction

Rectal prolapse is a protrusion of the rectal mucous membrane through the anal orifice (Indra *et al*., 2019). It is common in younger than older animals (El-Karim, 1995) and may be a sequel to diseases that cause tenesmus including diarrhea, rectal neoplasia, severe enteritis and parasitism, or may occur following elevations in intra-abdominal pressure during parturition or episodes of coughing (Patel *et al*., 2016).

Rectal prolapses are classified according to the structures involved (Abubakar *et al*., 2010). It has been categorized into four types. In a type one rectal prolapse, only the rectal mucosa and submucosa project through the anus. A type two denotes a complete prolapse of the full thickness of all or part of the rectal ampulla. In a type three prolapse, a variable amount of small colon intussuscepts into the rectum in addition to a type II prolapse. In a type IV prolapse, the peritoneal rectum and a variable length of the small colon form intussusceptions through the anus. Type I and II prolapses are the most common rectal prolapse in animals (Jena *et al*., 2013).

An extended cylindrical mass protruding from the anal orifice can be used to diagnose and classify rectal prolapse. However, it must be differentiated from prolapsedileo ceco colic intussusceptions by passing a finger between prolapsed mass and the inner rectal wall. Due to the presence of a fornix in rectal prolapse, the device cannot be introduced (Abubakar *et al*., 2010). The most straightforward treatment for rectal prolapse is gentle massage followed by the placement of a purse-string suture pattern with umbilical tape. At a distance of 2 to 4 cm from the anus, the suture is passed in and out through the skin around the anal opening. When tying the purse string, leave an opening so that defecation is possible. Typically, the suture is left in place for 5 to 10 days. Only suture the rectal mucosa if it is viable and there is no laceration visible on close inspection. To avoid subsequent prolapse, the primary cause of the prolapse must be treated as soon as possible (Anderson and Miesner, 2008). The aim of this case was to describe successful surgical management of rectal prolapse in four years old jack.

Case description: A four year old local jack weighing 120 kg was brought to the VTH, CVMA, and AAU with history of rectus prolapse (Figure 15A). The mucous membranes were congested, the intestinal motility was increased, the animal was passing a small amount of feces often, and the animal was gazing to the flank, indicating stomach pain, upon physical examination. An elongated, cylindrical mass protruding from the anal orifice was detected as

a diagnostic evidence of rectal prolapse (Figure 15B), and after a thorough examination, it was established that it was Type one rectal prolapse with spasmodic colic and tenesmus. The rectal temperature (38^0C), respiratory (10 breaths/min) and heart (55 beats/min) rates were within the normal range.

Preoperative preparation, anesthesia and control: Before initiation of surgical intervention, xylazine 2%, 2mg/kg body weight was administered intramuscularly, and caudal epidural anaesthesia was performed by lidocaine 2% at a dose rate of 0.2 mg/kg to reduce straining.

Surgical technique: To minimize swelling, cold packs and sugar were applied to the prolapsed mass for 30 minutes after proper cleaning (Figure 15C). The prolapsed mass was greased with liquid paraffin and gently pushed back into position through the anus. To retension the prolapsed mass, a purse string suture with black braided silk was placed around the anal opening (Figure 15D).

Postoperative management and outcome: Procaine penicillin G, 200000 IU/ml + Dihydrostreptomycin sulphate, 200 mg/ml, 1ml per 20 kg body weight was administered intramuscularly q 24 h for 3 days and Flunixine Meglumine was administered at the dose rate of 1.1 mg/kg body weight intravenously q 24 h for 3 days followed by daily dressing with povidone iodine. Ivermectin 1% **(**Hebei Veyong Animal Pharmaceutical Co. Ltd, Shijiazhuang, Hebei, China), 0.2mg/kg was given subcutaneously stat. On the third postoperative day, the suture was relaxed because there was no tendency of the replaced rectum to protrude. However, the suture was kept for another 7 days to prevent recurence. Repositioning of the rectum to its original position with normal defecation was observed on the 10^{th} postoperative day.

Figure 15: Surgical management of rectal prolapse in jack

A) Taking history from client (B) The animal presented to SPANA with rectal prolapse (C) Preparation of prolapsed mucosa before replacement (D) Purse-string suture replacement around anus (E) The jack after intervention

Discussion

Rectal prolapse is a protrusion of one or more layers of the rectum through the anus which may be due to a result of prolonged tenesmus or increased intra-abdominal pressure *(Patel et al*., 2018). Gasterophilus species larvae are common obligate parasites in the gastrointestinal

tract of equids. They produce damage in the gastric and duodenal mucosa, intermittent tenesmus; no diarrhoea and no other lesions; and the donkeys are not at pack load before they develop rectal prolapse. However, the absence of Gasterophilus larvae and the associated lesions with rectal prolapse believed to be associated with diarrhoea and overloading indicates that gasterophilosis is not the only cause of rectal prolapse in working donkeys. Gasterophilosis caused by *Gastrophilus nasalis* is the major cause of rectal prolapse in working donkeys under the mid-lowland tropical weather condition of Ethiopia (Getachew *et al*., 2012).

3.4. Extremities (Limbs)

3.4.1. Surgical management of wound in jenny

Abstract

Wounds are common in equine patients. Three years old local jenny was presented to the VTH, CVMA, AAU with a history of intentional wound on the leg of Jenny. During physical examination, wound involved skin as well as deeper structures such as muscles. Vital signs were within the normal range. Any visible foreign matters were removed from the wound. Hairs along the wound's edges were shaved thoroughly. A sterile saline solution was used to irrigate the wound. The wound margins were cleaned with a mild antiseptic and then diluted povidine iodine. To aid healing, the wound margins were surgically removed. The wound was closed by suturing major muscle tissues with walking sutures. A vertical mattress was used to close the skin. Pen-Strep @1ml/20kg IM and Flunixin meglumine @1.1mg/kg IV were administered for 5 & 3 days respectively. The skin sutures were removed after 14 days of operation.

Key words*: jenny, wound, pole, primary closure*

Introduction

A wound is a break in the continuity of a body tissue when the integrity of it is compromised. It is commonly faced in equine, and may come in different shapes and sizes (Bosco, 2012). The wounds are categorised into two types: open and closed. Closed wounds are caused by crushing or contusion injuries that do not cause skin loss at the moment of injury but disrupt the blood flow, resulting in substantial skin loss and a long recovery time. Open wounds are

classified by the type of trauma: abrasions, avulsions, incisions and partial or full thickness lacerations (Anderson, 2016). Wounds are categorised based on the degree of contamination and the length of time that occurs between injury and treatment. Surgical wounds created under aseptic conditions are known as clean wounds. Clean-contaminated wounds are generated when a nonsterile organ (the respiratory or genitourinary tract) is punctured with little or no leaking of contents, or when a minor break in aseptic technique occurs while treating a clean wound (Hendrickson and Baird, 2013). A wound less than 6 hours old is generally considered in this group. Contaminated wounds can be caused by spilling organ contents into the incision, a significant breach in aseptic procedure, or the presence of foreign material. A wound greater than 6 hours old is generally considered in this group. Dirty wounds are those that are old or infected with greater than 10^5 organisms per gram of tissue. A wound greater than 12 hours old is generally considered in this category (Jaeger, 2020).

There are several types of wounds. Puncture wounds are penetrating wounds that cause significant trauma beneath the skin by causing small skin tears or holes. Because contamination is introduced deep into the wound, infection worsens most puncture wounds (Kožár *et al*., 2018). Frequently, the skin heals before the underlying tissue. Incised wounds, which are often slicing-type wounds with smooth and clean edges produced by sharp instruments, should be washed, lavaged, and allowed to drain and heal without sutures. After thorough cleaning, these wounds are usually best suited for primary closure (suturing, stapling, or gluing); Lacerations-generally traumatic injuries that leave rough, jagged edges of skin and possibly underlying soft tissue damage. Because these wounds are more likely to develop infections as a result of contamination, debridement is frequently required. Second intention healing or open wound management may be the best option depending on the severity and location of the wound. Abrasions, non-penetrating wounds of the skin, are generally minor, and other that cleaning, require minimal treatment (Anderson, 2016). Wound care is an important part of patient management in veterinary medicine, and it can make a massive impact in how quickly an animal recovers after surgery or a traumatic injury (Bosco, 2012). The purpose of this case was to describe surgical wound management in 3 years old jenny.

Case description: Three years old local 200kg body weight jenny was presented to the VTH, CVMA, AAU with a history of intentional wound on the leg of Jenny (a cruel guy cutting the jenny's leg off with a pole (Amharic-Gajara)).

During physical examination, the jenny had a wound contaminated by debris and foreign objects (Figure 16A), was lame and refused to bear weight on the affected limb, and had solidified blood on the skin around the lesion. The wound included both superficial and deeper structures such as muscles. The rectal temperature (38.6^0C), respiratory (10 breaths/min) and heart (48 beats/min) rates were within the normal range. The mucous membrane was pinkish with less than two seconds capillary refill time. Based on history and physical examination, the case was diagnosed as dirty lacerated wounds to be managed by primary closure.

Preoperative preparation, anesthesia and control: Caudal epidural analgesia was utilized to start the procedure (Figure 16B). The wound was cleaned to remove any obvious foreign bodies or crusty debris (Figure 16C). Prior to cleaning, hairs at the wound edges were removed completely. To wash out visible and microscopic debris and germs, the wound was irrigated with sterile saline. The wound margins were cleansed and scrubbed with Savlon antiseptic liquid containing Chlorhexidine Gluconate 0.3 percent w/v and Cetrimide 3.0 percent w/v solution, followed with povidine iodine (Figure 16E).

Surgical technique: Devitalized and necrotic tissues from the wound edges was removed surgically in order to facilitate healing (Figure 16D). After removal (debridement) of damaged or contaminated tissue of the wound, the wound closure has been done by closure of large muscle tissues with 2-0 chromic catgut and then simple continous sutures was added to minimize dead tissues (Figure 16F). The skin was closed with silk 1 by vertical mattress (Figure 16G).

Postoperative management and outcome: Procaine penicillin G, 200000 IU/ml + Dihydrostreptomycin sulphate, 200 mg, 1ml/20kg was given intramuscularly q 24 h for five days. Flunixin meglumine, 1.1mg/kg body weight was administered intravenously once daily for 3 days. After 14 days of recovery, the skin sutures were removed (complete healing) (Figure 16H).

Figure 16: Wound management on jenny

A) The animal was presented with dirty lacerated wound (B) Caudal epidural analgesia was applied (C) Debriding of the contaminated wound (D) Refreshing the skin around the wound by incising the small skin (E) Cleaning of the wound with diluted iodine (F) Suturing of the refreshed musculature (G) Suturing of the incised skin with vertical mattress (H) Complete healing after 14 days

Discussion

Primary closure, delayed primary closure, and second intention healing are the three main ways of wound management and healing. Primary closure describes the initial closure of wounds. Delayed primary closure entails a period of open wound management to establish a healthy wound bed until the wound edges can be approximated. Second-intention healing describes wounds that are left to heal without surgical correction via wound contraction and epithelialization (Hendrickson and Baird, 2013).

The wound healing process in horses differs from that in other species, and it frequently leads to delayed healing and significant scarring, as well as impaired functional and aesthetic effects. Healing with a second intention in horses is frequently fraught with complications. These complications mostly affect wounds on the distal limb where healing is characterized by a weak acute inflammatory response followed by chronic inflammation, commonly leading to the development of Exuberant Granulation Tissue and a subsequent delay in epithelialization, contraction and wound closure. Excessive environmental contamination in the horse's environment and the proximity of the wound to the ground are considered contributing factors (Kamus *et al*., 2019).

The first phase of wound healing starts right after an injury and lasts for a few hours, focusing on hemostasis and the creation of a provisional wound matrix. During the hemostasis/coagulation phase, the inflammatory phase of the wound healing cascade (also known clinically as the debridement phase) is triggered. It can be divided into two phases: an early phase marked by neutrophil recruitment, and a late phase marked by the presence and transformation of monocytes. The major goal of the proliferative phase (also known as the repair phase in clinical terms) is to protect the wound's surface by forming granulation tissue and a new epithelial cover, as well as to rebuild the vascular network to nourish the new tissues. As the inflammation subsides, the proliferative phase of repair begins, characterized by the formation of red, fleshy granulation tissue that eventually fills the defect. Microvascular endothelial cells play an important part in the proliferative phase of repair, in addition to initiating the inflammatory response through contacts with leukocytes. Angiogenesis (the development of new capillaries from preexisting ones) is essential to restore oxygenation and deliver nutrients to the newly created granulation tissue within the wound. Epithelialization is the process of covering denuded epithelial surfaces and is essential for wound closure to be successful. The residual epithelium behind the clot moves

centripetally to help close the wound, in addition to the aforementioned hemostatic processes that provide a temporary barrier (Theoret, 2016).

Finally, understanding of the basic physiological processes involved in wound healing aids the veterinarian in developing the best treatment regimen for traumatic wounds.

3.4.2. Laceration repair in heifer

Abstract

A laceration is a linear incision that causes varying degrees of damage to the underlying tissues. Two years cross heifer was presented to the VTH, CVMA, AAU with history of cut by corrugated iron. A linear cut on the lateral side of the left forelimb were detected on physical examination, exposing muscle through all layers of the skin. After administering Xylazine, the hiefer was restrained in lateral recumbency and an inverted L block was applied dorsally and palmar to the lacerated site. Preparation of the skin around the lacerated area is done on a regular basis. The musculature was sutured with 2-0 catgut in a simple continuous suture pattern, and the skin cut was apposed with silk 1 in a simple interrupted suture pattern. Pen-Strep @1ml/20kg & Flunixin Meglumine @2.2 mg/kg were given IM q 24 h for 3 days. Skin sutures were removed after two weeks.

Key words*: corrugated iron, heifer, laceration, suture*

Introduction

Laceration is a tearing-induced irregular open wound that causes superficial and deep tissue damage (Bosco, 2012). It may happen due to trauma from a sharp object such as corrugated iron, barbed wire, clippers, scissors, knives or sticks. A full thickness laceration occurs when the skin is cut through all layers, exposing muscle, tendons, even bone. Moreover, it may have bleeding (Smith, 2019).

Superficial lacerations often do not require suture. However, they can potentially still be infected. Wound cleansing with or without anesthesia is required for minor cases, and antibiotics should be prescribed if an infection is a problem. More extensive or severe wounds may necessitate sedation or general anesthesia for wound cleaning and repair. Wound management, in moderate to severe cases, may require debridement or trimming of non-viable tissues and thorough flushing of the wound with saline. Repairing deep lacerations may

demand numerous layers of stitches (Garzotto, 2009). The objective of this case was to describe the surgical treatment of a laceration in a heifer that had been injured by corrugated iron.

Case description: Two years cross breed 230kg body weight heifer was brought to the VTH, CVMA, AAU with history of cut by corrugated iron (Amharic-korkoro) three hours ago. Upon clinical examination, there were blood clots, linear laceration on lateral side of left fore limb from area of shaft of scapula to head of femor, thickness of the cut included all layers of the skin exposing muscle. The rectal temperature (39.0^0C), respiratory (14 breaths/min) and heart (60 beaths/min) rates were within the normal range. The mucous membrane was pinkish with less than two seconds capillary refill time. Based on history and clinical examination, the case was diagnosed as laceration to be managed by first intention healing.

Preoperative preparation, anesthesia and control: After administering Xylazine 2%, 0.2 mg/kg body weight intramuscularly, the hiefer was restrained in a standing position (Figure 17A), and an inverted L block was done with lidocaine HCL 2% dorsally and palmar to the lacerated region. The hairs surrounding the laceration were shaved (Figure 17C) after packing gauze on the open cut to prevent hair droppings into the wound (Figure 17B). The skin around the lacerated area was routinely prepared, and apparent blood clots and microscopic particles were lavaged with saline solution.

Surgical technique: Non-viable tissues were removed, and the skin was trimmed to create a more uniform appearance (Figure 17D). The musculature was sutured with 2-0 catgut in a simple continuous suture pattern, and the skin cut was apposed with silk in a simple interrupted suture pattern (Figure 17E).

Postoperative management and outcome: Tetracycline wound spray was also applied around the wound. Procaine penicillin G, 200000 IU/ml + Dihydrostreptomycin sulphate, 200 mg, 1ml/20kg body weight was administered intramuscularly q 24 h for 3 days. Flunixin Meglumine, 2.2 mg/kg body weight was given intramuscularly q 24 h for 3 days to reduce swelling of the trauma. Finally, the wound spray was pplied around closure (Figure 16F). Skin sutures were removed after two weeks (complete healing).

Figure 17: Laceration repair in heifer

A) Restraining of the animal in the crush (B) Clean gauze pack into cavity (C) Shaving of hairs from lacerated area (D) Trimming of skin to make uniform (E) Retension of simple interrupted suture (F) Application of spray around the wound

Discussion

Lacerations are cuts or tears in the skin that can cause damage to the muscles and other structures beneath it. Despite the fact that superficial lacerations rarely require closure, they can nevertheless become infected. Infected wounds will not be sewn up because this might spread the infection and can cause an abscess. Otherwise, drains could be installed to allow fluid/discharge. In addition, antibiotics and pain relievers will be given, as well as a clean dressing and bandage may be applied. Bandage changes may be required one to several times daily at first in wounds that are very extensive and heavily discharging (Garzotto, 2009).

The longer the time between injury and repair, the more likely it is that the tissues may become contaminated, causing healing to be delayed. To avoid bacteria becoming trapped under the skin and producing an abscess, infections must be treated before the laceration is healed (a localized area of pus and inflammation). The skin may contract and form scar tissue over time, making it more difficult to bring the tissue margins together. If the cut is small, it can be repaired with minor surgery; however, if the laceration is large, deep, or infected, it will require major surgery (Vetstreet, 2011).

Generally, very small lacerations or punctures do not require surgical repair, but large ones warrant sutures. Lacerations should be repaired as soon as possible after an injury to obtain healing.

3.4.3. External splints coaptation in ewe

Abstract

The most common orthopaedic problem in domestic animals is long bone fracture. A one year old local ewe was brought to the VTH, CVMA, AAU with a history of fracture due to motorcycle accident. The sheep had lameness; an open transverse fracture on the left side of metatarsus, and no weight bearing ability. Vital signs were within normal range. Xylazine @0.4 mg/kg was administered IM. The area was prepped and infiltrated with Lidocaine hydrochloride. A tourniquet was tied above the operation site. The fractured site was prepared for operation. After controlling the ewe in lateral recumbency with affected side up, major artery and vein were ligated. Overriding fractures were handled and the two ends of the fractured limb were kept in proper apposition. Muscle and fascia were sutured, and skin was closed with nylon in simple interrupted pattern. Four splints, after covering apposition with

gauze, were placed around the fractured part. Elastic bandages were applied. Pen-Strep @1ml/20 kg body weight was administered IM q 24 h for five days, and Meloxicam @0.5 mg/kg was given SC stat. The ewe restored the weight bearing capacity after 2 months.

Key words*: ewe, external coaptation, metatarsal fracture, splint*

Introduction

Long bone fracture is the most common orthopaedic problems in domestic animals. Trauma is the most common cause of fractures, which can be inflicted by the mother or another animal while sleeping or during transportation as well as traffic accidents and other activities. Because they have less muscular covering, tibia, metatarsal and metacarpal fractures are the most common (Hasan *et al*., 2018).

The history and physical examination are used to diagnose fractures. Many fractures and dislocations, particularly those of the unmuscled parts of the limbs, are easy to diagnose. Clinicians tend to depend too heavily on diagnostic imaging because it is so evident. Radiograph are important for surgical planning. Even though radiograph shows the bone abnormalities, it doesn't show the amount of the hematoma, severe vascular damage, associated ligamentous, tendonous, joint capsule tears, and any accompanying neurologic deficit. When selecting a management plan for a particular orthopedic injury, the clinician must deliberately think about these components, make comparative observations of symmetry and form, perform careful palpation and manipulation (including rectal palpation in the case of proximal hindquarter injuries), and have a high threshold of awareness about the relative importance of these components (Fessler and Adams, 1996).

The goal of fracture management is to restore function and physical integrity while minimizing bone deformation. The most popular management approaches include splints, plaster of Paris, wire suture, a combination of wire suture and bone pinning or bone plating casting, and an external fixator. In small ruminants, external skeletal fixation can be a successful, cost-effective alternative to internal fixation. The external fixation can be employed in open or closed, simple or comminuted fractures with minimal invasiveness, and it provides much stability by preventing fracture forces. In all types and sizes of ruminants, casts and splints are used independently or in combination. External fixation becomes the most effective strategy for success when the injury is more distal (Hasan *et al*., 2018).

Therefore, the aim of this case was to describe reduction and external coaptation that was used to open metatarsal fracture in ewe.

Case description: A one year old 24kg body weight local ewe was presented to the VTH, CVMA, AAU with a complaining of fracture due to motorcycle accident. The sheep had lameness, was difficult to walk, was unable to bear weight, had an open oblique break, and fresh bleeding around the fractured area on the left side metatarsus thorough physical examination. The rectal temperature (39^{o}C), respiratory (13 breaths/min) and heart (60 beats/min) rates were within the normal range. The mucous membrane was pinkish with less than two seconds capillary refill time. Based on history and physical examination, the ewe was diagnosed as fractured left hind leg to be managed by external coaptation.

Preoperative preparation, anesthesia and control: Xylazine hydrochloride 2%, 0.4 mg/kg body weight was administered intravenously to sedate the animal. The area was aseptically prepped and washed with povidone iodine solution after clipping and shaving. Lidocaine hydrochloride 2% was used to infiltrate local anaesthesia. Above the surgical site, a tourniquet was tied. Tissue debris, blood clots, necrosed muscle, bone fragments, and exudates were all removed before being rinsed with normal saline (0.9 percent NaCl).

Surgical techinique: The major artery and vein were ligated with chromic catgut 1-0 after the ewe was controlled in lateral recumbency with the affected side up. Extension, counter extension (traction), and manipulation were used to manage the fractured area of the left hindleg (overriding fractures) and keep the two ends of the fractured limb in proper apposition. Catgut 2-0 was used to suture muscle and fascia. The procaine pencillin G powder was dispersed at fracture site, and the skin was closed with nylon in a simple interrupted pattern.

Four splints, made of light dried wooden sticks, were placed around the broken limb after gauze was wrapped around it from hock to pastern to protect it from splint injury (Figure 18A). After rolling with gauze, the first splint was placed on the fracture site to protect the injured area from motion, and then three more splints were placed on the other three sides in the same manner (Figure 18B). Splints were eventually tightened by applying elastic bandages over them (Figure 18C).

Postoperative management and outcome: For 5 days, Procaine penicillin G, 200000 IU/ml + Dihydrostreptomycin sulphate, 200 mg, 1ml/20 kg body weight were given intramuscularly.

Meloxicam was given intramuscularly every day for three days at a dose rate of 0.5 mg/kg body weight. Two months of restricted activity were advised.

The sheep was constantly observed for the presence of fever, the severity of pain, their tolerance to the fixators as measured by their degree of weight bearing and lameness, and the range of motion of the neighboring joints during the postoperative period. The owner was advised to massage the operated limb to accelerate blood circulation and nerve function. Client was advised to restrict the movement of the animal for two weeks after surgery and then to allow on leash walking. The cast was checked after 2 weeks and removed after observing the weight bearing capacity of ewe.

Figure 18: Application of external splints in ewe

A) Applying Gauze (B) Light dried sticks was applied (C) Application of elastic bandages

Discussion

Trauma causes limb fractures, which are especially common in young domestic animals. The most common bones affected with fracture in food animals are metacarpus and metatarsus, the tibia-fibula, radius and ulna followed by humerus. Fractures of the femur and pelvis are

also occur, however they are not frequent. Phalangeal fractures are uncommon (Anderson and Jean, 2008). The majority of fractures are oblique and transverse in nature and occur in the middle of a bone's shaft. The hind limb is found to be more vulnerable to fractures than the fore limb. Animals with fractures in their left limbs are more likely than those with fractures in their right limbs (Singh *et al*., 2017).

Metacarpal, metatarsal, and phalangeal fractures in sheep and goats, which can often be detected by careful and thorough palpation that have proven to be tremendous choices for conservative therapy (Kofler *et al.*, 2017). Farm animals are excellent orthopaedic patients because they spend the majority of their time lying down, have a high potential for bone healing, are more resistant to contralateral limb breakdown and stress laminitis than other animals, and usually do not resist to have orthopedic devices on their limbs (Anderson and Jean, 2008). *Concluding*, most clients select cheap treatment for fractures with a good prognosis. The decision to treat a fracture in a food animal depends on the cost of the treatment, the success rate of the treatment, genetic value of the animal, and the location and type of fracture.

3.5. Castration in domestic animals

3.5.1.Castration in toms

Abstract

Neutering of toms remains the most useful tool to prevent unwanted behavior and reduce overpopulation. Two local toms were presented to the VTH, CVMA, AAU with history of straying farther from the house at night, and fight with other cats for territorial dominance. Upon palpation, all their testicles were descended. Vital signs were within the normal range. Food was withheld for 12 hours prior surgery. Xylazine @1.0 mg/kg was given IM. Induction of anesthesia was achieved with combination of Diazepam @0.5mg/kg & Ketamine @5mg/kg IM. After preparation of the scrotum, both toms were positioned in lateral recumbency to be castrated bilateral scrotal incisions. In closed castration, the spermatic cord were tied over itself to form square knots. In open castration, a longitudinal incision through tunic, and placement of square knots of the vascular part with the avascular part of each spermatic cord were performed. A second scrotal incisions over the remaining testicle was made and steps were repeated. The skin incisions finally left unsutured. Penstrep @2ml/20kg

q 24 h IM & Tramadol @4mg/kg bid PO were administered for 3 days. Both toms were healed after 14 days.

Key words*: closed castration, open castration, tom*

Introduction

Feline orchiectomy is surgical removal of the testicles from tom cats (Bright, 2011). In most cases, it is recommended to neuter cats before the onset of puberty. Puberty usually begins between the ages of six and 10 months (Ward, 2005).

Castration techniques for cats are described in a variety of ways. Conventional (closed) castration comprises separate longitudinal incisions across each testis, occlusion (tying square knots with the spermatic cord over itself), transection of spermatic cords, and removal of testicles (El-sherif, 2017). Open castration, on the other hand, involves tying the ductus deferens and vessels together with four throws to form two square knots (i.e placement of square knots of the vascular part with the avascular part of each spermatic cord) (Tobias, 2010). The objective of these cases was to describe both techniques, open and closed type, that were done to manage their behaviors.

Case 1

Case description: A six months old 3.5kg body weight local tom was presented to the VTH, CVMA, AAU with history of straying farther from the house at night, and fight with other cats for territorial dominance by widening the size of its territory. The client also complained that her tom had roaming behavior at night (Figure 9A). Therefore, she wanted her tom to be neutered.

Upon palpation, both testicles in a tom were descended in the scrotum. The rectal temperature (39^0C), respiratory (22 breaths/min) and heart (105 beats/min) rates were within the normal range. The mucous membrane was pinkish with less than two seconds capillary refill time.

Case 2

Case description: A seven months of age 4kg body weight local tom was presented to the VTH, CVMA, AAU with history of straying farther from the house at night, and fight with other cats for territorial dominance by widening the size of its territory. The owner also

complained that his tom had roaming behaviors at night. Therefore, he wanted his tom cat to be neutered.

Upon palpation, both testicles in a tom were descended in the scrotum. The rectal temperature (39.1^0c), respiratory (26 breaths/min) and heart (112 beats/min) rates were within the normal range. The mucous membrane was pinkish with less than two seconds capillary refill time.

Preoperative preparation, anesthesia and control: Food was withheld for 12 hours prior surgery. Xylazine, 1.0 mg/kg was administered intramuscularly. The area of cephalic vein was shaved and prepared then catheterized then induction was achieved intravenously with a combination of (Diazepam, 0.5mg/kg + Ketamine, 5mg/kg).

After cleaning of scrotal area and perineum, scrotal hairs were removed by gentle plucking (Figure 20A). The toms were positioned in lateral recumbency to be castrated bilateral scrotal incisions with the rear legs and tails pulled cranially. After surgical preparation, the area was draped with a glove wrapper.

Surgical technique: With thumb and forefinger, the base of the scrotum was compressed to force the testicle against the skin. A longitudinal incision through skin and sub-cutis (Figure 19B), leaving the tunics intact. To allow the testicle to pop out of the incision, a small web of subcutaneous fascia was incised deeper. The testicle in one hand was grasped and pulled it away from the cat while using a gauze to simultaneously strip away the scrotal attachment. Using slow steady traction, the testicle was pulled with one hand while pushing against the cat's perineum with a gauze in the other. The cord was stretched until the cremaster muscle breaks.

In former tom, a curved hemostat under, around, and over the cord, was inserted keeping the tips pointed downward and toward the cat (Figure 19C). The hemostats were palmed to maneuver them around the cord more easily. To facilitate knot tying, the position of the cord was adjusted so that it was wrapped around the hemostat close to the tips and to the cat (slide the hemostat perpendicular to the cord to reposition). The cord 2 mm distal to the clamp was transected to remove the testicle. To form a knot, the rolled cord was pushed off of the hemostat with a sponge and fingers. The hemostat tips were held parallel to the cord to facilitate knot formation. Before releasing the hemostat, the throw in the cord was tighten. Thumb nail was placed between the hemostat and the cord was thrown and slided toward the cat.

In later tom to conduct open castration, incision was done longitudinally through the parietal vaginal tunic to expose the glistening surface of the testicle and epididymis (Figure 20B). The parietal tunic incision was extended and the testicle was pulled out to expose cord. The parietal tunic from the testicle was separated. Then, the tunic with scissors was excised. The ductus deferens from the testicular vessels was separated and detached from the testicle (Figure 20C). With the ductus deferens and vessels, four square throws were tied to make two knots. The throws were watched as they lower toward the scrotal incision to confirm that tension was evenly distributed and the throws were not hitching. The ductus deferens was transected distal to the knots.

In both cats, a second scrotal incisions over the remaining testicle was made and steps were repeated accordingly. The scrotum between thumb and first two fingers was grasped and it was pulled caudally to help approximate the incision edges. The skin incision finally left unsutured to heal as scar (Figure 19D).

Postoperative management and outcome: Penicillin & streptomycin 200,000IU: 250mg/ml (Penstrep 20/20®, Anupco Ltd, England), 2ml/20kg was administered intramuscularly q 24 h for 3 days. Tramadol, 4mg/kg body weight was given twice per day orally for 3 days. The owners were advised to keep their toms inside in a clean and dry environment until the incisions heal. Because scrotal incisions were left open, paper litters were recommended for 7 days. Minimizing caloric intake was ordered since castrated cats were more prone to obesity. No postoperative complications were observed on them, but open castration took longer time than closed castration to complete the surgical procedure. The skin incisions finally left unsutured to heal as scar. Both toms were healed after 14 days.

Figure 19: Closed castration in tom

A) History taking before surgical intervention (B) A longitudinal incision through skin and sub-cutis (C) The tying of cord with hemostat tip (D) Approximating the incision edges between thumb and first two fingers and cleaning the area (E) A tom after two months

Figure 20: Open castration in tom

A) Plucking of long scrotal hairs (B) Incision of testicular skin to expose vaginal tunic (C) Incision of vaginal tunic to separate vascular from avascular cords which aid in knot tying (D) The tom after a month

Discussion

Castration of tom cat is used to reduce overpopulation and unwanted cats, as well as to reduce male aggressiveness, fighting with other toms, and roaming behavior, as well as to avoid testicular and scrotal cancers. repairing traumatic wounds where surgery might not be able to save the scrotum or testes; control some endocrine (hormonal) disorders (Bright, 2011). Moreover, castrated male cats are usually preferred over intact toms as companion animals because they are more affectionate toward people. Castration also helps reduce toileting issues and marking behavior (urination and defecation outside of the litter box). Because roaming behavior is decreased, neutered male cats live longer and have less exposure to intestinal parasites and other diseases (Tobias, 2010).

Other occluding methods of the spermatic cords are application of titanium clips over the course of spermatic cord, double ligation of spermatic cord with appropriate absorbable suture material or coagulation with bipolar forceps (El-sherif, 2017). Finalizing, neutering is an important technique to prevent accidental or indiscriminate breeding, reduce aggressiveness and unwanted behavior. The intact tom is likely to roam, fight with other males, and spray, and strongly attracted to seek out and mate with intact female. Tomcat urine is particularly malodorous. Overall, an intact male cat can be a very unpleasant household companion. Consequently, toms kept for companionship should be neutered unless they are meant for breeding stock.

3.5.2. Castration in dogs

Abstract

Castration is a common surgical procedure on dogs to eliminate sexual activities, aggressiveness and roaming. Two local male dogs were presented to the VTH, CVMA, AAU with history of aggressiveness and straying for unwanted breeding. Upon palpation of scrotum, both dogs had all their testicles descended in the scrotum. Vital signs were within the normal range. Atropine sulphate @40µg/kg, Xylazine @1mg/kg and Ketamine @5mg/kg were administered IM. The dogs were restrained in dorsal recumbency. The dogs were provided lactated ringer's solution. Pre-scrotal region was prepared and scrubbed. After pushing the testicle cranially, the prescrotal skin, subcutaneous tissue and spermatic fascia were incised on the top of the mobilized testis. In closed castration, vaginal tunic was not incised, so ligatures were placed directly around the cord. In open castration, the testicular tunic was incised and reflected to place ligatures directly on to the vascular cord and ductus deferens. The three edges of subcutaneous tissues (left, middle and right) were apposed with catgut 3-0 in simple interrupted pattern, and the skin was closed with an intradermal pattern using a cutting needle. Procaine penicillin G+ Dihydrostreptomycin sulphate @1ml/20kg IM q 24 h & Tramadol @5mg/kg PO bid were administered for 3 days. The dogs were healed after 14 days.

Key words*: closed castration, dog, open castration, pre-scrotal incision*

Introduction

Castration of a dog entails the removal of both testicles through a single incision in front of the scrotum. The scrotum is not eliminated after surgery, as it will gradually shrink over time (Molecare pet vets, 2017). Castration may begin as early as six months of age. However, in other circumstances, delayed surgery until the dog is older may be a smart option. The timing of castration will be determined by the circumstances of each individual. Early castration is generally recommended if unwanted behaviours such as excessive mounting behaviour or urine marking are expected. It may also be appropriate if an entire bitch lives in the household. Dogs should always be castrated if their testicles are more prone to cancer (Howe, 2015). Castration can be performed by open or closed technique. Although young puppies and dogs with very small testicles can be castrated through scrotal incisions, dogs with larger testicles are performed prescrotal midline skin incision (Tobias, 2010). The purpose of these cases report was to describe castration that was done to manage their behaviours.

Case 1

Case description: A year old 21kg body weight local dog was presented to the VTH, CVMA, AAU with history of aggression towards other dogs and people. The owner wanted his dog to be castrated in order to lessen the risk of straying and road traffic accidents.

Upon palpation of scrotum, the dog had its testicles descended in the scrotum. Vital signs such as rectal temperature (38.8^0C), heart (56 beats/min) and respiratory (15 breaths/min) rates were within the normal range. The mucous membrane was pinkish with less than two seconds capillary refill time. Therefore, it was decided to perform closed castration on the dog.

Case 2

Case description: A two years old 23kg body weight local dog was presented to the VTH, CVMA, AAU with history of aggressiveness and straying for unwanted breeding. Upon palpation of scrotum, the dog had its testicles descended in the scrotum. Vital signs such as rectal temperature (39.1^0C), heart (58 beats/min) and respiratory (16 breaths/min) rates were within the normal range. The mucous membrane was pinkish with less than two seconds capillary refill time. Therefore, it was decided to perform open castration on the dog.

Preoperative preparation, anesthesia and control: Prior to surgery, food and water was withheld for 24 hours and 12 hours respectively. The pre-scrotal region was clipped, shaved (Figure 21A), prepared for aseptic surgery, that were preceded by injecting of atropine sulphate, 40 µg/kg, xylazine, 1 mg/kg and ketamine, 5 mg/kg intramuscularly at an interval of 5 and 10 minutes, respectively. Then, the dog was provided with slow infusion of constant intravenous fluid therapy using lactated ringer's solution. Eventually, two dogs were restrained in dorsal recumbency, the prepped areas were draped covering the unclipped scrotum with glove cover (Figure 21B) before starting midline pre-scrotal incisions.

Surgical technique: *In both dogs,* the first testicle from the scrotum towards the prescrotal region was moved through the drape by applying pressure cranially. The testis was stabilized between an index finger and a thumb along the planned incision site on midline. After pushing the testicle cranially to protect the urethra, the prescrotal skin, subcutaneous tissue and spermatic fascia were incised on the top of the mobilized testis (Figures 21C & 22A). During incising, pressure on the testis with the index finger and thumb was applied to facilitate extrusion of the testis. The first testicle within the parietal tunica vaginalis was observed. On the surface of the parietal tunic, a little aggregation of fat shows that the incision depth is appropriate for a closed castration. Using both hands, the cranial pole of the testicle up to the incision was tilted with squeezing below the testicle to force it out of the incision. The testicles was grabbed with the right hand, and a gauze was used in the left to break down the scrotal ligament, which attached the scrotum to the caudal pole of the testicle.

The testicle straight up with the left hand while stripping downward at the base of the cord with the right hand was lifted using a gauze to separate the spermatic cord from surrounding tissues and it was stretched out to less than 1 cm in diameter. The cord was wipped upward toward the testicle to remove any remaining fat (Figure 21D).

In the former animal, the cord over one index finger was fanned out to separate the structures and the needle between the cremaster muscle and the vessels was passed. Two simple throws on the vessel side were encircled the entire cord and square knot was applied. Encircling ligature was placed above the first ligature, spacing ligatures at least 0.5 cm apart. The cord was clamped several centimeters below the testicle, then the cord was grasped above the ligatures with thumb forceps and transected. The cord was lowered toward the dog and released after inspecting the end for hemorrhage. The contra-lateral testicle was mobilized cranially up to the incision site and incised through the overlying fascia in order to make a

second incision in the subcutaneous tissue and spermatic fascia. The contralateral testis was exteriorized. At this point, all the steps were advanced to the contra-lateral testis.

In the latter one, the vaginal tunic was incised to extrude testis from the vaginal tunic (Figure 22B). A hemostatic clamp was placed across the tunic where it attaches to the epididymis and the ligament of the tail of the epididymis was digitally separated from the tunic without avulsing the tail of the epididymis from the testis (Figure 22C). The testicular arteries, venous pampiniform plexus, and ductus deferens were exposed when the tunic was detached and reflected towards the patient. Three clamps across these structures were applied. Using catgut 3-0, a circumferential ligature was applied within the crush of the most proximal clamp closest to the patient. A transfixing suture was put between the first suture and the second clamp, just a few millimeters from the first ligature, and the ligatures were examined with forceps to assure occlusion of the vascular plexus, and the spermatic cord was transected between the two remaining clamps. Then, the clamp attached to the stump was removed and replaced within the vaginal tunic after checking hemorrhage. The process was also repeated for the contra-lateral testis. The vaginal tunic was not transected and sutured.

In both, the three edges of subcutaneous tissues (left, middle and right) were apposed with catgut 2-0 in simple interrupted pattern. The skin was retracted laterally with thumb forcep to visualize two ringlike openings laterally and the urethra on midline, and bites of the subcutaneous tissue approximately 5 mm below the incision edge was taken including the superficial edge of the septal remnant. Then, the incision was closed with catgut 2-0 in intradermal pattern by avoiding the urethra in the middle. Lastly, the knot was buried.

Postoperative management and outcome: Procaine penicillin G, 200000 IU/ml + Dihydrostreptomycin sulphate, 200 mg/ml, 1ml/20kg body weight was administered intramuscularly q 24 h for 3 days (Figure 22D). Tramadol, 5mg/kg body weight was given orally twice per day for 3 days. The owner was advised to restrict activity to on-leash walking for 7 days; to check the incision at least once daily; to wear collar that was made from locally available material for the first 7 days after surgery, and to feed regular diet. The dogs were healed after 2 weeks.

Figure 21: Closed castration in dog

A) Shaving of prescrotal area just caudal to os-penis (B) Scrubbing of an intended area (C) Pushing testicle forward and incision was made over testicle (D) Wipping by gauze to remove any remaining fat

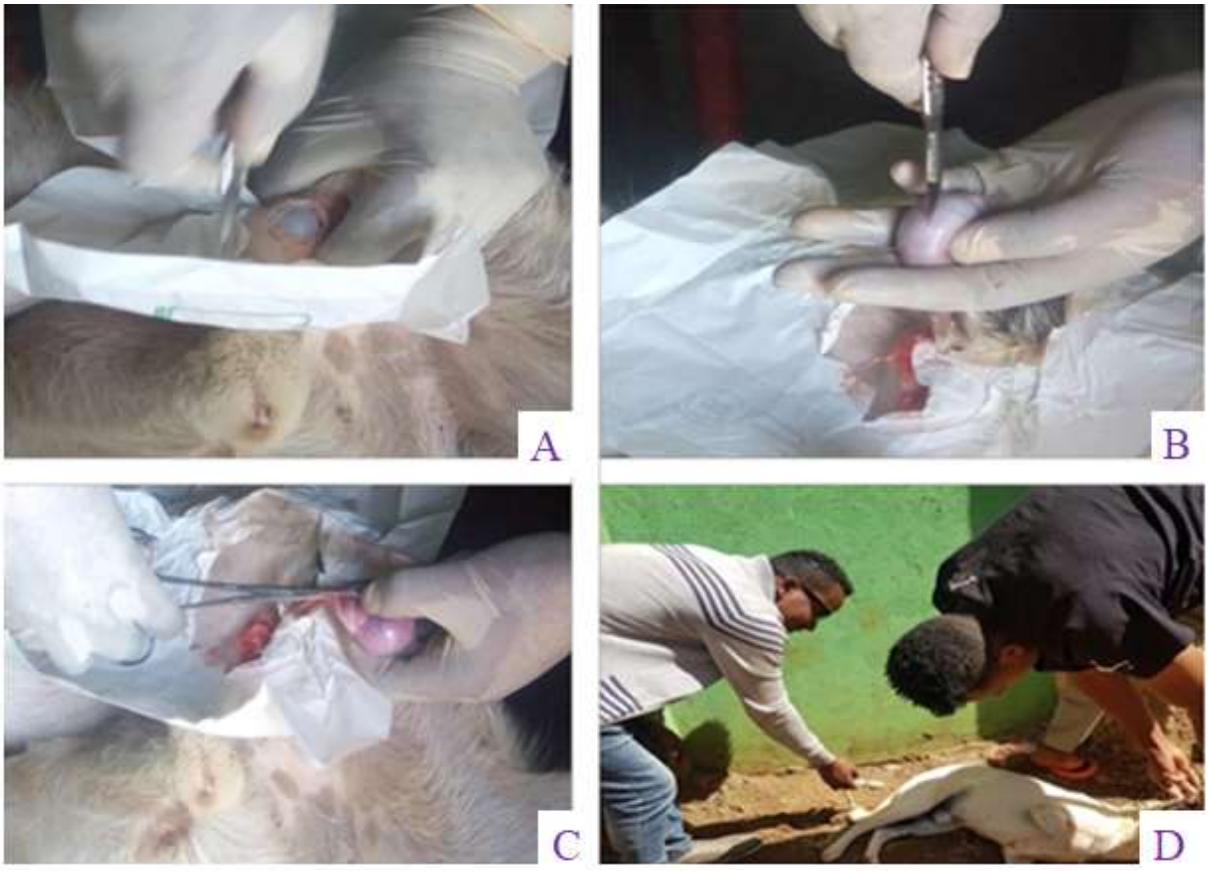

Figure 22: Open castration in dog

A) Pushing testicle forward and incising over testicle (B) Incision of tunica vaginalis (C) Detaching of tunic from testis (D) Giving of treatment after operation

Discussion

Castration has several advantages, including reducing overpopulation and unwanted dogs; decreasing male aggressiveness and roaming behavior; decreasing the incidence of undesirable urination behaviors; reducing prostate diseases and possible tumors of the perianal area; assisting in the prevention of perineal hernias in older men; preventing tumors involving the testes or scrotum; and preventing tumors involving the testes or scrotum; repairing traumatic wounds where surgery might not be able to save the scrotum or testes; repair scrotal hernias; prevent bladder stones from obstructing the urethra; control some hormonal abnormalities; prevent the reproduction of puppies with inherit malformations or diseases (Molecare pet vets, 2017).

There is little evidence for the appropriate age to castrate animals because the timing is less defined in dogs, although the optimal age could be determined by a variety of factors, including species, breed, body size, and breed-specific disorders. Males castrated after 1 year of age are more likely to develop a common skin tumor than those castrated before 1 year of age or intact canines. There is also delayed growth plate closure in males castrated early in life. Extrapolating these findings to all breeds of dog will be erroneous since some conditions occur more frequently in certain breeds than others (Sundburg *et al*., 2016).

Any size dog can undergo closed castration as long as the spermatic cord is stretched and stripped to a tight diameter (less than 1 cm). Small cords are encircled twice with 2-0 or 3-0 absorbable monofilament sutures, while cords greater than 5 mm in diameter are ligated with at least one transfixing/encircling suture. During ligation, cords can be clamped; however, big cords are simpler to transfix if not clamped. Spermatic cords in dogs are thicker than in cats and the vessels are more easily torn once the cremaster muscle is broken; therefore, ligatures or hemoclips may be safer for hemostasis than tying the cords on themselves (Tobias, 2010). Finally, dogs should be neutered because neutering is the most reliable means of population control in today's world.

3.5.3. Castration in stallion

Abstract

Castration, involves the surgical removal of both testicles, which is carried out to prevent unwanted breeding and behavior. A 22 months old stallion was presented to the VTH, CVMA, AAU with history of wasting of grazing time with mounting of mares. Upon palpation of scrotum, a stallion had both testicles descended in the scrotum. Vital signs were within normal range. It was sedated with Xylazine @2 mg/kg IM. The stallion was restrained in lateral recumbency. The skin was infiltrated 1 cm apart from the median raphe with local analgesic solution, continued into the subcutaneous tissue, and the drug was injected directly into the testis. The spermatic cord in the region of emasculation was also infiltrated. Castration was performed through separate incisions on the infiltration lines for both testicles. Pen-Strep @1ml/25kg & Flunixin meglumine @2.2 mg/kg were administered IM q 24 h for 3 days. The stallion was healed after 21 days of operation.

Key words*: open castration, separate incision, stallion*

Introduction

Castration is one of the most common surgical procedures performed in equine (Kilcoyne, 2013). It is usually done to facilitate the management of a particular animal when it is in the company of females, and can be performed at any time. However, the stallion is often left intact for 12 to 18 months to allow for development of certain desirable physical characteristics. Prior to castration, it should be ascertained that the animal is healthy and that both testes are descended (Hendrickson and Baird, 2013).

Although several castration methods have been documented, such as the open, closed and section-ligation release techniques, the closed and open castration are the most common. Both of them are performed through two scrotal incisions 1 cm away from of the median raphe (Vaghela *et al*., 2016). The purpose of this case was to describe castration in stallion.

Case description: A 22 months age 180 kg body weight local stallion was presented to the VTH, CVMA, AAU with history of wasting of grazing time by mounting of mares.

Upon palpation of scrotum, a stallion had both testicles descended in the scrotum. Vital signs such as rectal temperature (38^{o}C), heart (30 beats/min) and respiratory (11 breaths/min) rates were within normal range. The mucous membrane was pinkish with less than two seconds capillary refill time. Therefore, decision was made to perform open castration on the stallion.

Preoperative preparation, anesthesia and control*:* The stallion was restrained in lateral recumbency (casted with the left side down). The upper hind leg was tied securely with the upper fore limb. It was sedated with Xylazine, 2 mg/kg intramuscularly. The surgical site was prepped Following surgical preparation of the area, 1 cm away from the median raphe was located (Figure 23A), and the skin was infiltrated on the line with 10 ml of local analgesic solution (Figure 23B); this infiltration was continued into the subcutaneous tissue. The local anesthetic was injected directly into the testis (Figure 23C) and spermatic cord to reduce the movements during the procedure. The spermatic cord in the region of emasculation was also infiltrated and then left to take effect for 10 minutes.

Surgical technique: Castration was performed through separate incisions for both testicles, with incisions located 1 cm apart from the median raphe (on the infiltration lines) (Figure 23D). The lower testis was grasped between the thumb and forefingers, and the first skin incision was made for the length of the testis. The incision was continued through the tunica

dartos and scrotal fascia, leaving the common tunic (tunica vaginalis parietalis) intact. Then, pressure exerted by the thumb and forefingers to extrude the testis which was still contained within the common tunic . The testis was then grasped in the left hand, and the subcutaneous tissue was stripped from the common vaginal tunic as far proximally as possible. The removal of the subcutaneous tissue from the common tunic was made with the help of a gauze sponge. The common tunic was then incised over the cranial pole of the testis, and the incision was continued proximally with a finger hooked within the tunic.The testis was now released from within the common tunic. The mesorchium was penetrated digitally to separate the vascular spermatic cord from the ductus deferens, common tunic, and external cremaster muscle (avascular part) (Figure 23E). The latter structure (musculofibrous portion of the spermatic cord) was transected with attention to removing as much of the common tunic as possible. The testis was grasped, and the vascular portion was severed by emasculator (Figure 23F). The emasculator remained in position for a minute, and was then released. The skin incisions were enlarged by pulling them apart with the fingers until a 10-cm opening was obtained. The median raphe was removed to further facilitate drainage. Any redundant adipose tissue or fascia was also removed.

Postoperative management and outcome: Procaine penicillin G, 200000 IU + dihydrostreptomycin, 200 mg (PenStrep 20/25®, Deventer, The Netherlands) (1ml/25kg) was administered intramuscularly q 24 h for 3 days. Flunixin meglumine, 2.2 mg/kg, q 24 h was given intramuscularly q 24 h for 3 days. Wound spray was applied around the wound (Figure 23G).

The owner was advised to keep the stallion under close observation for several hours after castration to make sure that it was not hemorrhaging, and under general observation for the first 24 hours and periodically during the first week following surgery for other complications. The animal was forcibly exercised twice daily from the day following surgery to good drainage and satisfactory exercise until healing was complete. The client was also instructed to separate the gelding from mares for at least a week to limit pregnancies. Eventually, the stallion was healed after 21 days of operation and started working (Figure 23H).

Figure 23: Open castration in stallion

A) Measuring of infiltration line (1 cm) apart from the median raphe (B) Infiltration of lidocaine HCL 2% (C) Injection of lidocaine into testis (D) Incision of intended site (E) Separation of avascular and vascular (F) Using emasculator to severe vascular portion (G) Applying spray in the wound (H) The horse after 21 days of operation

Discussion

Possible aims for carrying out castration in horse include a desire to prevent masculine or aggressive behavior in animals inappropriate for breeding, testicular trauma or neoplasia, or inguinal herniation. (Kilcoyne, 2013) If a horse is anesthetized and only one testis is descended, the schedule should be cancelled unless the surgeon is familiar with cryptorchid castration (Hendrickson and Baird, 2013). In the UK, it has been traditional to castrate stallions during the spring and autumn to avoid the presence of flies, contamination by winter mud and the disruption of haemostasis associated with hard frost. Thus, this may occur in field castration where skin wounds are not closed. On the other hand, castration in aseptic condition with skin closure may be carried out at any season (Green, 2001).

Complications, that are that frequently reported after castration, include scrotal swelling, edema, hemorrhage, omental herniation, eventration, penile trauma, scirrhous cord formation, incisional infection, hydrocele and peritonitis have been reported. Most post-operative complications are mild and may not be fatal, but eventration, haemorrhage, penile trauma and peritonitis are considered as life-threatening (Kilcoyne, 2013).

Eventually, the horse or pony must have two testicles descended into the scrotum to complete routine castration. If the testicles are only partially descended, the animal should be castrated under general anaesthesia. Avoiding castration during fly season and extreme cold/wet conditions is advisable. Therefore, castration shoud be carried out in spring and autumn to avoid the flies of summer and the mud of winter.

3.5.4. Castration in camel

Abstract

Camel castration is a common management method to control aggressive behavior in camels, particularly during the rutting season. A 12 years old dromedary camel weighing 380kg was presented to the VTH, CVMA, AAU with history of aggressive behavior during the rutting season. Upon palpation of scrotum, the camel had its both testicles descended in the scrotum. Vital signs were within the normal range. It was sedated with Diazepam @0.2 mg/kg IV. The camel was restrained in the left lateral recumbency. The operation site was thoroughly prepped and scrubbed with povidine iodine. Two large scrotal incisions were performed to exteriorize the testicles. The tunica vaginalis was incised longitudinally. Through the

mesorchium, the vascular and nonvascular sections of the spermatic cord were separated, ligated and severed distal to the ligatures. The wounds left open. Long acting tetracycline @20 mg /kg was administered IM stat. Flunixin Meglumine @1.1 mg/kg, was given IV q 24 h for 3 days. The wound was healed after 14 days.

Key words*: castration, Camelus dromedaries, large incision*

Introduction

Dromedary camel (*Camelus dromedarius*), is an Arabian or one humped camel, which was domesticated in the Arabian Peninsula. It has capable of living in desert due to its anatomical structure and ecological adaptation (Soliman, 2015), which allow for conservation of energy and water as well as improvement of locomotion to acquire scarce resources. Rutting season is a breeding season when a camel shows sexual activity. This period is associated with significant modifications to the morphology of genital organs. In males, spermatogenesis is at its highest, thus causing a significant increase in the size and weight of the testes. Although these morphological changes are exhibited throughout the camel population, the time period and duration of rutting varies among different camel species and different geographical locations (Chase, 2019). The camel testes are ovoid in shape and are located in the perineal position. At about seven months of age, they lie caudally to the superficial inguinal ring, and second to third years of age, they descend in the scrotum. During this time, the testes are quite small but increase in size at the onset of puberty. Surprisingly, they become enlarged and protrude when the animal is sexually active in the rutting season, and return to their normal size in the sexually dormant period. Usually one testicle is higher in position, and many camels have larger left testicle (Siddiqui and Telfah, 2010).

Castration is an elective surgery that is usually performed to make the camel docile and easy to control. Occasionally, it is done to avoid accidental mating when the animal is not desirable for breeding purpose and in certain testicular abnormalities such as orchitis, irreparable traumatic injuries and tumors (Telfah *et al*., 2012). The objective of this case was to describe open castration that was done to manage aggressive behavior of camel.

Case description: A 12 years old dromedary camel weighing 380kg was presented to the VTH, CVMA, AAU with history of aggressive behavior during the rutting season. Thus, the owner wanted his camel to be castrated in order to make it docile during the breeding season. Upon palpation of scrotum, the camel had its both testicles descended in the scrotum. Vital

signs such as rectal temperature (40.5^0C), heart (44 beats/min) and respiratory (9 breaths/min) rates were within the normal range. The mucous membrane was pinkish with less than two seconds capillary refill time. Therefore, it was decided to perform open castration on the camel through two large incisions.

Preoperative preparation, anesthesia and control: The animal was withheld from food for 24 hours prior to surgery. It was sedated with Diazepam (Gland Pharma Limited, India), 0.2 mg/kg intravenously. The camel was first hobbled, and then restrained in the left lateral recumbency with the upper hind limb pulled forward and tied securely with the upper fore limb that gave a reasonable space for surgical manipulation. After surgical preparation of the area, 1 cm away from the median raphe was measured and the skin was infiltrated on a line with 10 ml of local analgesic solution; this was continued into the subcutaneous tissue and then injected directly into the testis (Figure 24B), waited to become effect for 5 minutes. The operation site was thoroughly prepped and scrubbed with povidine iodine and kept dry.

Surgical technique: The left testicle was first squeezed out through a large scrotal incision (Figure 24C). The tunica vaginalis was freed from its attachments by incising longitudinally. Through the mesorchium, the vascular and nonvascular sections of the spermatic cord were separated (Figure 24D). Firstly, the avascular portion was transfixed with chromic catgut #2 and severed distal to the ligature to easy and maximal exteriorization of the vascular portion. The cord's vascular part was completely exteriorized and ligated with chromic catgut #2. The cord was then transfixed below the ligature using the chromic catgut #2. The forceps were firmly applied below the transfixation ligature and the cord was severed distal to it (Figure 24F). The same procedure was repeated on the counter testicle. The wounds left open. The site was cleaned with a sterilized swab and sprayed with antibiotic spray.

Postoperative management and outcome: Long acting tetracycline, 20mg/kg was administered intramuscularly. Flunixin Meglumine, 1.1 mg/kg, was given intravenously q 24 h for 3 days. Tetracycline wound spray was applied to operation area. The camel’s wound was healed after 14 days (Figure 24H) and started working.

Figure 24: Open castration in dromedary camel

A) Presentation of the camel at VTH (B) Infiltration of lidocaine HCL in scrotal skin and deep layers and directly to testis (C) A large scrotal incision to protrude the testis (D) Isolation of avascular and vascular vessels in order to ligate separately (E) Occlusion of vascular vessel with three forceps (F) Ligation of vessels with circular and transfixing ligatures (G) Checking of bleeding after transection cord (H) The camel was healed after 14 days

Discussion

Camels that aren't destined for breeding are frequently castrated. Castrates are easier to handle and are better at work. Castration can also be used to increase meat production potential. The procedure can be performed at any time of year, as long as the animals are healthy enough to withstand the stress involved. The typical surgical procedure entails opening both the scrotal sacs and the tunica vaginalis cavities with two large incisions, removing the testes, and leaving the wounds open (Telfah *et al*., 2012). Modified technique, instead of two large scrotal incisions are developing. Accordingly, a single, small prescrotal midline incision are used to exteriorize both the testicles through it, and the incision is closed with one interrupted horizontal mattress suture of USP-2 chromic catgut. This procedure provide quite encouraging, cosmetically pleasing outcome because there is a small scar in the prescrotal midline region which is even not visible due to its location (Telfah *et al*., 2012).

Immunocastration is the process of stimulating an immunological response to create antibodies by administering a GnRH analog. It is an alternative to traditional castration for reducing both aggressive and sexual behavior since it lowers blood testosterone levels, resulting in easier handling and less stress for the animals as well as carcasses with fewer lesions (Bolado-Sarabiaa et al., 2018). In the end, in order to make docile during breeding period, castration of camel is recommended.

4. SUMMARY OF SURGICAL CASES, PROCEDURES AND TECHNIQUES

Surgical procedures are classified as major and minor, as well as survival and non-survival outcomes. All surviving surgical procedures on vertebrate animals must be performed following aseptic techniques to avoid postoperative infections, such as the use of sterile tools. Surgical technique has a great impact on post-operative complications like infection and pain. With proper technique, postoperative complications can be minimized.

Table 1: Total number of surgical cases accompanied by management procedures and techniques followed in the course of case-study

Domestic species (common & scientific names)	Number of cases	Surgical procedures/Techniques used
Bos Taurus & indicus (cattle)	7	Correction of paraphimosis, Dehorning (cosmetic and without suture), Drainage of subcutaneous abscess, Eye enucleation, Laceration closure/repair, Umbilical herniarrphy
Equus asinus (Donkeys)	2	Surgical management of rectal prolapse, Wound management
Equus caballus (Horse)	1	Open castration
Ovis aries (Sheep)	4	Cesarean section, Correction of paraphimosis, External splints coaptation, Ventrolateral herniarrphy
Capra hircus (Goats)	1	Cesarean section
Canis familiaris (Dogs)	4	Closed & open castration, En Bloc resection of Epulis, Mastectomy
Felis catus (Cats)	3	Closed & open Castration, Ovariohysterectomy
Camelus dromedarius (Dromedary camel)	1	Open castration
Total	23	

Scientific names' source: (Teletchea, 2019)

5. CONCLUSION AND RECOMMENDATIONS

In recent years, there has been a surge in small-scale and intensive livestock farming in urban and periurban areas, as well as a trend of keeping exotic domestic dogs and cats as companion pets. These scenarios may present potential for contagious and non-infectious diseases, as well as management issues such as small animal overpopulation and aggressive behavior. These demands may expedite veterinary surgical treatments.

As a result of the foregoing conclusion, the following recommendations are suggested:

- To effectively address or tackle surgical challenges, surgeons need to be equipped with knowledge and skill of surgical procedures.
- The surgeon should cogitate the value of the animals during preoperative surgical considerations, especially food animals.
- To achieve a successful outcome of the operation, surgeries should be performed aseptically.
- In out-patient settings, proper advising of the client and follow up of the operated cases may help reduce the occurrence of postoperative complications.

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7. APPENDICES

Appendix 1: Normal heart rate of various domestic animal species

Domestic animals	Beats/Minutes	Domestic animals	Beats/Minutes
Foal, newborn	128	Sheep/Goat, yearling	85-100
• 1-2 days	100-128	• adult	70-80
• 1-2 weeks	80-120	• old	55-60
• 3-6 month.	64-96		
		Piglets, newborn	130-140
• 6-12 month.			
	48-72	Piglets, 12-14wk.	110-115
• 1-2 year	40-56	Pig	
Horse, adult,		• adult sow	85-95
• Stallion	28-32	• boar	60-70
• Mare/MC*	33-40	Dog,	
Ass/Mule,		young	110-120
• young	65-75	adult, 5m	80-120
• Adult	45-60	adult, 1 year	60-80
Calf, newborn	115-140	Cat, young	130-140
• 1-2 weeks	108	Cat, adult	100-120
• 1-2 months	100-105	Rabbit	120-150
• 3-6 months	95-100	Camel	30-50
• yearling	90	Elephant	25-30
Cow, adult	40-60	Chicken	180-440 (312 average)
Ox*, adult	35-70	Lamb/kid	110-120

Source: DACA, 20014; Detweiler and Erickson, 2004

Appendix 2: Normal rectal temperatures of various domestic animal species

Animal	Average		Range	
	°C	°F	°C	°F
Stallion	37.6	99.7	37.2–38.1	99.0–100.6
Mare	37.8	100	37.3–38.2	99.1–100.8
Donkey	37.4	99.3	36.4–38.4	97.5–101.1
Camel	37.5	99.5	34.2–40.7	93.6–105.3
Beef cow	38.3	101	36.7–39.1	98.0–102.4
Dairy cow	38.6	101.5	38.0–39.3	100.4–102.8
Sheep	39.1	102.3	38.3–39.9	100.9–103.8
Goat	39.1	102.3	38.5–39.7	101.3–103.5
Pig	39.2	102.5	38.7–39.8	101.6–103.6
Dog	38.9	102	37.9–39.9	100.2–103.8
Cat	38.6	101.5	38.1–39.2	100.5–102.5

Source: Reece, 2015

Appendix 3: Normal respiratory rate of various domestic animal species

Animal category/spp.	**Rates per minute**	**Animal category /spp.**	**Rate per minute**
Foal	14-15	pig	10-12
Horse, adult	9-10	Dog, young	20-22
Calf, newborn	56	old	14-16
2 wks	50	cat	20-30
5 wks	37	Rabbit	50-60
6 mo	30	Guinea-pig	100-150
yearling	27	Camel	5-12
Cattle, adult	12-16	Chicken	15-30
Lamb/kid	12-20	rurkey	12-16
Sheep/Goat,adult	12-15	Duck	16-28
Old	9-12	Goose	12-30

Source: DACA, 2014

Appendix 4: Surgical cases recording format

Date._____
Case No._____

Case handling place: VTH _____ SPANA _____ other _____

Signalment: Species_____ Breed _____ Age _____

Sex_____ body weight _____Animal identification_____
_____ Name /if any/ _____

Case history_____
Body temperature _____Respiratory rate_____
Heart rate_____Mucous membrane color_____
Capillary refill time_____ Surgical Procedure_____
Clinical examination_____
Diagnosis: Laboratory, Radiography and ultrasound (if necessary)_____
_____
Preoperative preparation, anesthesia and control_____
Surgical technique_____
_____
Postoperative care
_____
Outcome
_____

Appendix 5: Client's consent format at VTH

አዲስ አባባ ዩኒቨርስቲ እንስሳት ህክምናና ግብርና ኮሌጅ የእንስሳት ህክምና ማስተማሪያ ሆስፒታል

የእንስሳት ቀዶ ጥገና የእንስሳት ባለቤት ስምምነት ዉል

የባለቤት ስም: _____ ስልክ: _____

የእንስሳት ውገን: _____ ጾታ: _____ ዕድሜ: _____

እኔ_____ቀን_____ዓ/ም_____ስሙ/ስሟ_____የተባለዉን/ችዉን እንስሳ ለህክምና ወደ እንስሳት ህክምና ማስተማሪያ ሆስፒታል አምጥቼ ምርመራ ከተደረገለት/ላት በኃላ የቀዶ ጥገና ህክምና እንደሚያስፈልገዉ/ጋት ተናግሮኛል። እኔም ቀዶ ጥገናዉ እንዲሠራልኝ ስስማማ ከሥራዉ ጋር በተያያዘ የአካል ጉድለት ወይም የሞት አደጋ ቢደርስ ሙሉ ኃላፊነት የእኔ የባለቤቱ መሆኑን ስስማማ በዚህም ምክንያት ሐኪሙን በኃላፊነት የማልጠይቅ መሆኔን በፈርማዬ አረጋግጠለሁ።

የባለቤቱ ፊርማ: _____ቀን_____

Addis Ababa University, College of Veterinary Medicine and Agriculture, Veterinary Teaching Hospital

Client's consent form

Owner's name: _____ Telephone: _____

Animal species: _____ Animal name: _____ Sex: _____ Age: __

I, the owner of the above mentioned animal, on_____day_____year brought to VTH, college of veterinary medicine, Addis Ababa for treatment. Nevertheless, after diagnosis of the animal, the surgeon informed me that the case demands surgical intervention. Accordingly, I reflected my agreement with sign about risks that encounter during surgical involvement even the animal has gotten serious injuries and death concerned me.

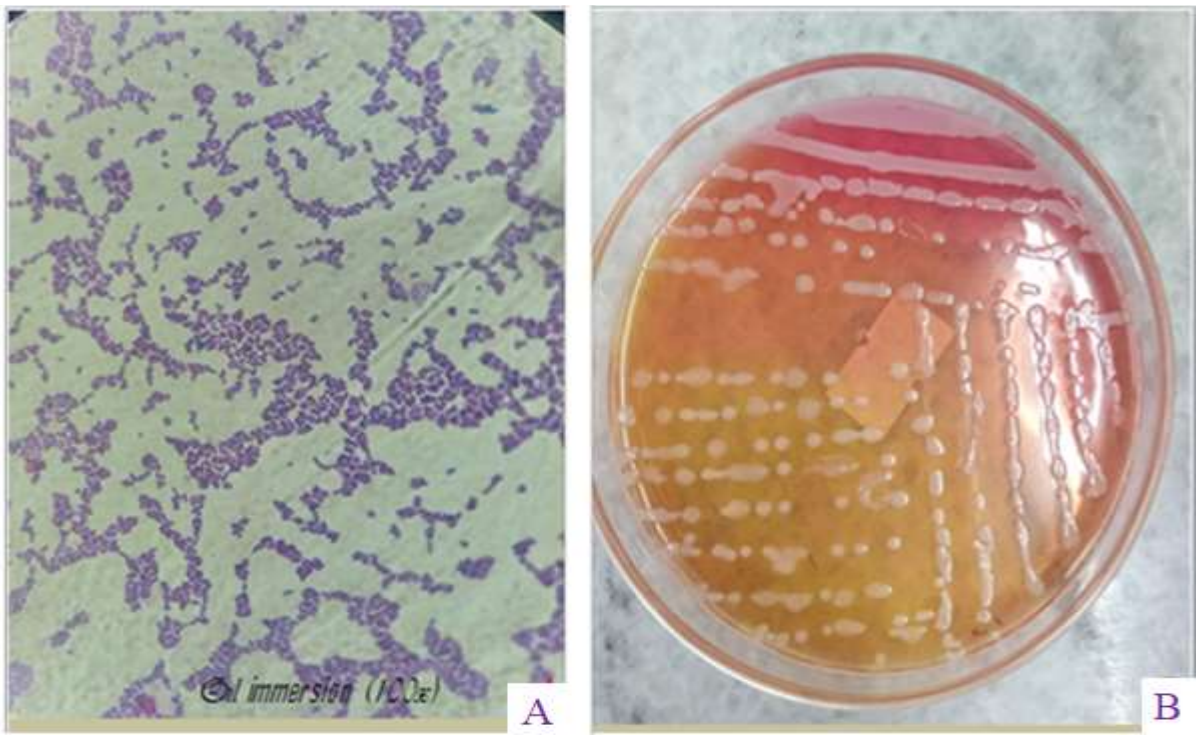
Signature: _____ Date: _____

Appendix 6: Estimation of weight with girth circumference (Calculating ruminants and horse body weight)

Variables	Animal weight in pounds
The circumference of the animal (girth in relation to the location of the animal's heart) The length of the animal's body	Heart girth x heart girth x body length / 300

N.B. *Calculation of pets' body weights were measured by balance*

Appendix 7: Laboratory finding of subcutaneous abscess in ox



A) Staphylococcus Aureus in Gram stain **(**Violet color cocci resembling bunches of grapes) (B) Staphylococcus Aureus in mannitol agar (yellow colonies with yellow zones)

Appendix 8: Common **a**nesthetics, analgesics & antidotes in domestic animals

Pre-anesthetic drugs used for premedication in cattle		
Drugs	Dose and route of injection	Purpose of use and other comments
Xylazine	0.05 to 0.1 mg/kg IM	Tranquilization, analgesia, muscle relaxation, caudal epidural analgesia, and anesthetic-sparing effects
Diazepam	0.02 – 0.1 mg/kg IV	Anxiolytic and sedation
Tramadol	4 mg/kg IV	Analgesic in calves
Antagonists of anesthetics and other emergency drugs used to reverse overdose and treat anesthetic complications in cattle		
Drugs	Dose and route of injection	Purpose
Yohimbine	0.125 - 0.2 mg/kg IV	Alpha-2 antagonists used to reverse side effects of xylazine and other drugs of the same group
Tolazoline	0.5–1.5 mg/kg IV	
Atipamezole	20– 50 μg/kg IM (or slow IV)	
Idazoxan	0.05 mg/kg IV	
Flumazenil	0.02 mg/kg IV	Benzodiazepine reversal
Doxapram	1 mg/kg IV	Respiratory stimulant
Commonly used analgesics and doses for postoperative pain management in cattle		
Drugs	Dose and route of injection	Purpose
Flunixin meglumine	1.1–2.2 mg/kg q 24 h IV/I.M.	Opioids used for pain management both during surgery and postoperatively. Note: Opioids have short duration of action requiring frequent dosing for postoperative analgesia.
Meloxicam	0.5 mg/kg once IV, SC	
Pre-anesthetic drugs used for premedication in sheep		
Drugs	Dose and route of injection	Purpose of use and other comments

Xylazine	0.1–0.4 mg/kg IV	Tranquilization, analgesia, muscle relaxation, caudal epidural analgesia and anesthetic-sparing effects
Diazepam	0.1 mg/kg IV	Anxiolytic and Sedative
Antagonists of anesthetics and other emergency drugs used to reverse overdose and treat anesthetic complications in sheep		
Drugs	Dose and route of injection	Purpose
Yohimbine	0.125 mg/Kg	To reverse alpha-2 adrenoceptor agonists like xylazine
Tolazoline	0.5–1.5 mg/kg IV	
Atipamezole	20– 50 μ g/kg IM (slow IV)	
Flumazenil	0.02 mg/kg IV	To reverse benzodiazepines
Pre-anesthetic drugs used for premedication in goats		
Drugs	Dose and route of injection	Purpose
Xylazine	0.05–0.1 mg/kg IV mg/kg IM	Tranquilization, analgesia, muscle relaxation, caudal epidural analgesia and anestheticsparing effects.
Diazepam	0.1 to 0.2 mg/kg IV	Anxiolytic and sedation
Antagonists of anesthetics and other emergency drugs used to reverse overdose and treat anesthetic complications in goats		
Drugs	Dose and route of injection	Purpose
Yohimbine	0.125 mg/Kg	To reverse alpha-2 adrenoceptor agonists like xylazine
Tolazoline	0.5–1.5 mg/kg IV	
Atipamezole	20– 50 μg/ kg IM (or slow IV)	To reverse alpha-2 adrenoceptor agonists like xylazine
Flumazenil	0.02 mg/kg IV	Reversing benzodiazepines
Commonly used analgesics and doses for postoperative pain management in shoats		
Drugs	Dose and route of injection	Purpose

Flunixin meglumine	1.1–2.2 mg/kg q 24 h IV/I.M.	Opioids used for pain management both during surgery and postoperatively. Note: Opioids have short duration of action requiring frequent dosing for postoperative analgesia.
Meloxicam	0.5 mg/kg once IV, SC	
Pre-anesthetic drugs used for premedication in Camels		
Drugs	Dose and route of injection	Purpose
Atropine	0.04 mg/kg IM or 0.01-0.02 mg/kg IV	Anticholinergic used to prevent vagal bradycardia, salivation and bronchial secretion
Xylazine	0.1 to 0.25 mg/kg IM	Used for tranquilization, analgesia and muscle relaxation
Diazepam	0.2 to 0.4 mg/kg IV	Use for sedation or anxiolysis
Antagonists of anesthetics and other emergency drugs used to reverse overdose and treat anesthetic complications in camels		
Drugs	Dose and route of injection	Purpose
Yohimbine	0.125–0.25 mg/Kg IV	Alpha-2 antagonists To reverse side effects xylazine and other drugs of the same group
Tolazoline	0.5–1.5 mg/kg IV	
Atipamezole	0.1–0.15 mg/kg IM (or slow IV)	
Flumazenil	1.0 –2mg/kg IV	Antagonist for benzodiazepines
Doxopram	0.1 mg/kg IV	For treatment of respiratory depression
Epinephrine	0.01 mg/kg IV	For emergency treatment of cardiac arrest, anaphylaxis
Atropine	0.04 mg/kg IV/IM	For emergency treatment of bradycardia

Diazepam	0.1– 0.5 mg/kg IV	For emergency treatment of Seizures
Dexamethasone	2 mg/kg	For shock treatment. Should not be used in case of shock caused by septicemia
Postoperative analgesics in camel		
Drugs	Dose and route of injection	Purpose
Phenylbutazone	2-4 mg/kg IV q 24-48 h	Note: Perivascular injections may result in phlebitis
Meloxicam	1mg/kg, PO q 72 h	
Flunixin Meglumine	1.1 mg/kg, IV, q 24 h	
Pre-anesthetic drugs used for premedication in Equine		
Drugs	Dose and route of injection	Purpose
Atropine	0.002-0.01 mg/kg IV	To prevent or treat bradycardia during anesthetic period
Xylazine	2 mg/kg IM or 1.1 mg/kg IV in horses, 2.6-3.0 mg/kg IM or 1.3-1.5 mg/kg IV in donkeys	Used for tranquilization, analgesia muscle relaxation, caudal epidural analgesia & anestheticsparing effects. Note: care must be taken as animals may kick.
Antagonists of anesthetics and other emergency drugs used to reverse overdose and treat anesthetic complications in equines		
Drugs	Dose and route of injection	Purpose
Yohimbine	0.075 mg/kg IV	Alpha-2 antagonists used to reverse side effects xylazine and other drugs of the same group
Tolazoline	2.0 mg/kg IV	
Atipamezole	0.1-0.2 mg/kg IV	
Flumazenil	0.01 to 0.04 mg/kg IV	Benzodiazepine antagonist
Doxapram	0.5-1.0 mg/kg IV	Analepticrespiratory stimulant
Commonly used drug and doses for postoperative pain management		
Drugs	Dose and route of injection	Purpose

Tramadol	2 mg/kg IM q 4 h	Opioids used for intraoperative as well as postoperative pain management
Meloxicam	0.6 mg/kg q 24 h IV, PO	NSAIDs better used for only postoperative pain and pain due to other inflammatory diseases. Note: don't give phenylbutazone above 4.4 mg/kg q 12 h, because of its higher toxicity risk
Phenylbutazone	4.4 mg/kg q 12 h for 4 days followed by 2.2 mg/kg q 24–48 h IV, PO	
Flunixin meglumine	1.1-2.2 mg/kg q 24 h IV/IM	
Pre-anesthetic drugs used for premedication in dogs		
Drugs	Dose and route of injection	Purpose
Atropine	0.04 mg/kg IM, 0.02 mg/kg used to prevent bradycardia	Anticholinergics, used to prevent or treat vagal-induced bradycardia.
Xylazine	1.0 to 2.0 mg/kg IM	Used for tranquilization, analgesia & muscle relaxation
Diazepam	0.2 to 1 mg/kg IV	For sedation and anxiolysis
Tramadol	2 mg/kg IM	Opioid analgesics. Note: Best drugs for surgical pain management, but require frequent dosing per day for postoperative pain management due to short duration of action.
Induction and maintenance drugs used in dogs		
Drugs	Dose and route of injection	Purpose
Diazepam	0.5 mg/kg IV	Combination
Ketamine	5 mg/kg IV	
Xylazine	1 mg/kg IM	Combined for induction

Ketamine	10 mg/kg IM	Note: Give IV fluids and avoid overdosing
Atropine	0.04 mg/kg IM	
Antagonists of anesthetics and other emergency drugs used to reverse overdose and treat anesthetic complications in dogs		
Drugs	Dose and route of injection	Purpose
Yohimbine	0.1-0.125 mg/kg slow IV or 0.3-0.5 mg/kg IM	Alpha-2 antagonists used to reverse side effects xylazine and other α-2 adrenoceptor Tolazoline 0.5-1.0 mg/kg IV or 2-5 mg/kg IM agonists
Tolazoline	0.5-1.0 mg/kg IV or 2-5 mg/kg IM	
Atipamezole	0.05-0.2 mg/kg IV,IM	
Doxapram	0.2-0.5 mg/kg IV	Respiratory stimulant used to treat anesthetic induced respiratory depression
Dexamethasone	4-6 mg/kg IV	To treat life-threatening airway swelling.
Diphenhydramine	2-4 mg/kg SQ, IM, IV, PO	To treat allergic reactions due to drugs, vaccines or snake bites
Furosemide	2-4 mg/kg IV	To treat pulmonary and cerebral edema
Atropine	0.02 mg/kg IV; 0.04 mg/kg IM	Used to treat bradycardia (HR < 60 bpm in dogs) caused by deep anesthesia
Glycopyrolate	0.01 mg/kg IV	
Isoproterenol	0.5 μg/kg IV	
Epinephrine	0.02-0.2 mg/kg IV	
Ephedrine	0.1-0.5 mg/kg IM	To treat hypotension due to deep anesthesia
Propranolol	0.02-0.06 mg/kg) slow IV	Beta-adrenergic blockers used to treat severe sinus tachycardia
Esmolol	0.25-0.5 mg/kg slow IV	
Commonly used drugs and doses for postoperative pain management in Dogs		
Drugs	Dose and route of injection	Purpose

Meloxicam	0.2 mg/kg on day 1; 0.1 mg/kg q 24 h Thereafter IV, SC, PO	Note: Most NSAIDs are not licensed for pre-operative pain medication due to side effects such as GIT ulceration renal failure. Their use is better limited for postoperative pain medication in well hydrated patients.
Tramadol	2-4 mg/kg IV or 5-10 mg/kg PO, q 6–12 h	Opioid analgesics. Good for both pre-and postoperative pain medication
Pre-anesthetic drugs used for premedication in cats		
Drugs	Dose and route of injection	Purpose
Atropine	0.04 mg/kg IM, 0.02 mg/kg IV	Anticholinergics, used to prevent salivation and bronchial secretion and treat vagal bradycardia
Xylazine	1.0 to 1.8 mg/kg IM	Tranquilization, analgesia and muscle relaxation
Diazepam	0.2 to 1 mg/kg IV	Anxiolytic, anticonvulsant and muscle relaxation
Tramadol	2 mg/kg IM	Opioids– most potent analgesic drugs of choice for both pre and post-surgical pain. They are preferably used in combination with a sedative or tranquilizer.
Induction and maintenance drugs used in cats		
Drugs	Dose and route of injection	Purpose

Diazepam	0.5 mg/kg IV	Combined for induction
Ketamine	5 mg/kg IV	
Xylazine	0.26 mg/kg IM	Combined for induction and maintenance
Ketamine	11 mg/kg IM	
Atropine	0.02 mg/kg IM	
Commonly used drug doses for postoperative pain management in cats		
Drugs	Dose and route of injection	Purpose
Meloxicam	0.3 mg/kg once SC OR 0.1 mg/kg on day 1; 0.05 mg/kg q 24 h thereafter SC, PO	Opioid and NSAIDs used for analgesic treatment. Opioids are used for pain management both during surgery and postoperatively. Note: opioids have short duration of action requiring frequent dosing for postoperative analgesia
Tramadol	2 mg/kg IV, SC or 2–10 mg/kg PO	
Antagonists of anesthetics and other emergency drugs used to reverse overdose and treat anesthetic complications in cats		
Drugs	Dose and route of injection	Purpose
Yohimbine	0.1 - 0.125 mg/Kg slow IV	Alpha-2 antagonists to reverse side effects xylazine and other drugs of the same group.
Tolazoline	1 - 2 mg/Kg	
Atipamezole	0.05-0.2 mg/kg IV,IM	
Naloxone	0.04 mg/kg IM or 0.01 mg/kg IV	Full Opioid antagonist.
Diazepam	0.5 – 1 mg/kg IV (If IV access gets difficult give rectally)	For treatment of seizures
Epinephrine	0.02-0.2 mg/kg IV	For emergency treatment of cardiac arrest, anaphylaxis

Atropine	0.02 mg/kg IV or 0.04 mg/kg IM	For prevention or emergency treatment of bradycardia
Doxapram	1-5 mg/kg IV	For treatment of respiratory depression.
Dexamethasone	4-6 mg/kg IV	To treat life-threatening shock and airway swelling
Diphenhydramine	2-4 mg/kg SQ, IM, IV, PO	To treat allergic reactions due to drugs, vaccines or snake bites
Furosemide	2-4 mg/kg IV	To treat pulmonary and cerebral edema

Source: VDACA, 2020