ADDIS ABABA UNIVERSITY

COLLEGE OF VETERINARY MEDICINE AND AGRICULTURE

DEPARTMENT OF CLINICAL STUDIES

COMPILED CASE REPORTS ON DIFFERENT SURGICAL AFFECTIONS, TREATMENTS, AND THEIR OUTCOMES IN DIFFERENT DOMESTIC ANIMALS IN AND AROUND BISHOFTU TOWN, OROMIA, ETHIOPIA

MVSc THESIS

BY

YOBSAN DEGEFA DADI

JUNE 2022

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

BY

YOBSAN DEGEFA DADI

DEPARTMENT OF CLINICAL STUDIES

MVSc IN VETERINARY SURGERY

ADVISOR: CHERU TELILA FEYISA (DVM, MVSc, Assist. Prof.)

JUNE 2022

BISHOFTU, ETHIOPIA

APPROVAL SHEET

Addis Ababa University

College of Veterinary Medicine and Agriculture

Department of Clinical Studies

As MVSc research advisor, I hereby certify that I have read and evaluated this Thesis prepared under our guidance by Yobsan Degefa Dadi entitled **"Compiled Case Reports On Different Surgical Affections, Treatments, and Their Outcomes in Different Domestic Animals in and Around Bishoftu Town, Oromia, Ethiopia",** We approved for submittal to the dissertation assessment committee.

Submitted by: Yobsan Degefa Dadi _____ _____

Name of student Signature Date

This thesis has been submitted for examination with our approval as:

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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 Yobsan Degefa Dadi entitled **"COMPILED CASE REPORTS ON DIFFERENT SURGICAL AFFECTIONS, TREATMENTS, AND THEIR OUTCOMES IN DIFFERENT DOMESTIC ANIMALS IN AND AROUND BISHOFTU TOWN, OROMIA, ETHIOPIA"**, and recommended that it be accepted as fulfilling the thesis requirement for the degree of Masters of Veterinary science (MVSc) in Veterinary Surgery.

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STATEMENT OF THE AUTHOR

First and foremost, I declare that this compiled case report is my original work and that all sources of materials used in it have been properly cited. This case report has been submitted in partial fulfillment of the requirements for an advanced Master of Veterinary Surgery (MVSc) degree at Addis Ababa University's College of Veterinary Medicine and Agriculture, and it has been placed in the university/college library and will be made available to borrowers in accordance with the library's guidelines. I sincerely declare that this work is not being submitted to any other institution in the world for the medal of any academic degree, diploma, or certificate.

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LIST OF ABBREVIATIONS

AAU	Addis Ababa University
CIR	Constant Infusion Rate
CRT	Capillary Refill Time
CS	Cesarean Section
CNS	Central Nervous System
CVMA	College of Veterinary Medicine and Agriculture
CVP	Cervix and Vaginal Prolapse
DHWP	Donkey Health and Welfare Project
FAO	Food and Agricultural Organization
FAWC	Farm Animal Welfare Committee
GDP	Gross Domestic Products
IM	Intra Muscular
IOMT	Internal Obturator Muscle Transposition
IU	International Unit
IV	Intra Venous
OVH	Ovariohysterectomy
PCV	Packed Cell Volume
PGA	Polyglycolic Acid
PPF	Procaine Penicillin Fortified
VFA	Volatile Fatty Acid
VTH	Veterinary Teaching Hospital

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ABSTRACT

Ethiopia is endowed with huge potential livestock resources and holds the largest livestock population in Africa. Livestock provide the majority of the draught power required by approximately 80% of farmers who use animal traction to plough their crop fields and to generating income. Despite a large livestock population and existing conducive environmental and climatic conditions, the livestock output of the country is low due to inefficient and low coverage of veterinary services particularly surgical treatments. Surgical manipulation and treatments of various ailments and abnormalities in various domestic animals play a critical role in saving the lives of animals. The current case report compilation was carried out between September 2021 and May 2022 G.C on various surgical affection of domestic animals that were presented to Professor Feseha G/AB VTH and Donkey Sanctuary Clinic with aim of compiling and documenting various surgical procedures, techniques, associated complications, and their outcomes in different domestic animals. Prior to surgical interventions, the history, general physical examinations, and clinical findings of all cases were assessed and recorded on the patient record format. Depending on the species of animals and the type of surgical procedure to be performed, each animal was aseptically prepared and anesthetized prior to surgery. The prescribed specific surgical procedure for each specific condition was performed using appropriate technique, suture material, and patterns based on the requirement of the body site, followed by the provision of appropriate postoperative care and follow-up. During the study period, surgical procedures such as ovariohysterectomy, caesarean section, herniorrhaphy, tenotomy, dehorning, wound management, open castration, urethrostomy along with penile amputation, subcutaneous abscess, rumenotomy, partial tail amputations, and different prolapses were successfully performed in different domestic animals. In this study, a total of 21 patients underwent surgical intervention. From these, 66.7 % (14) were large animals while 33.3% (7) small animals. Among surgically treated animals, 85.71% (18) were completely recovered from their illnesses while 9.52% (2) were dead due to different reasons. Due to owner hesitation, the remaining 4.76 % (1) was slaughtered. Based on these results, it was ascertained that appropriate and aseptic surgical intervention can save the lives of many patients.

Key words: *Case report, Domestic animals, Surgical outcome, Surgical treatments*

INTRODUCTION

Ethiopia is endowed with huge potential livestock resources and holds Africa's largest livestock population that estimated about 65.35 million cattle's, 50.5 million goats, 48.96 million poultry, 39.89 million sheep, 8.98 million donkeys, 7.7 million camels, 0.38 million mules, 2.11 million horses (CSA, 2020), 10 million bee colonies (Tegegne and Feye, 2020), and a small number of pigs (FAO, 2019). The livestock subsector has an enormous contribution to Ethiopia's national economy and livelihoods of many Ethiopians, and still promising to rally round the economic development of the country (Metaferia *et al.*, 2011). Livestock provide most of the needed draught power for about 80% of farmers who use animal traction to plough their crop fields and they are critical in providing income to farmers, creating job opportunities, achieve food security, providing services, making a contribution to asset, social, cultural, and environmental values, and sustaining living standards (Leta and Mesele, 2014).

The livestock subsector accounts for approximately 16.5 percent of national GDP and 35.6 percent of agricultural GDP (Behnke and Metaferia, 2013). The subsector also covers nearly 20percent of total of total GDP and 20% of national foreign currency (Zeleke, 2021). The livestock production and management system is primarily extensive, with indigenous breeds being raised using low-input/low-output husbandry practices. Despite a large livestock population and favorable environmental conditions, the country's current livestock output is low. This is due to a variety of factors, including insufficient feed and nutrition, widespread diseases, poor genetic potential of local breeds, market issues, and inefficiency of livestock development services in terms of credit, extension, marketing, a shortage of trained labor, and a lack of coverage of veterinary infrastructure and services (Leta and Mesele, 2014; Desta, 2015).

In Ethiopia, treatment of individual sick animals got less attention until recent years, as the policy and manpower resources gave more attention to preventive medicine. This has contributed to a low level of infrastructure for veterinary practice as well as research in medical as well as surgical diseases of domestic animals. However, there has recently been an increase in demand for improved veterinary services as both the rural and urban communities have become more aware of the importance of treating individual animals. An increasing trend of keeping pure or

crossbred animals as companion pets (especially dogs) in urban areas has also contributed to an increase in demand for specific animal veterinary care (Tiruneh *et al*., 2014). Surgical problems are a major issue, and the failure of surgical treatment leaves no options other than culling or the possible loss of a productive/valuable animal through death. The problem can also hinder the growth, performance and economic value of the animal (Arju *et al*., 2014).

Veterinary surgery plays a crucial role in saving the life of animals through surgical manipulation and treatments of various ailments and abnormalities or deformities, and veterinarians perform surgery for a number of reasons, from treating a problem to preventing future problems and some surgeries are performed as emergency procedures related to an underlying problem behavior (Bain, 2020). Veterinary surgeons must perform a variety of surgical procedures in both the operating room and the field. However, performing major surgical operations is challenging for the general veterinary practitioner and it costs the country a lot in mortality (Tiruneh *et al*., 2014). Adequate practical training, exposure to surgical clinical cases, and empirical observation are all necessary components for reducing future surgical complications. Although there have been reports of various surgical treatments and corrections in Ethiopia, they are not well documented for future use and remain insufficient. Therefore, the objectives of this study were:

- To compile and document various surgical procedures, techniques, associated complications, and their outcomes in various domestic animals.
- To obtain knowledge and surgical management skills on different surgical treatment approaches in domestic animals.

2. MATERIALS AND METHODS

2.1. Study Area

The study was conducted from September, 2021 to May, 2022 G.C in and around Bishoftu town of Veterinary Hospital and Clinical centers namely: Addis Ababa University Professor Feseha G/AB Veterinary Teaching Hospital, Donkey Sanctuary Veterinary Clinic, on farms found in and around Bishoftu town of Ada'a district, Ethiopia. Professor Feseha G/AB Veterinary Teaching Hospital is located in Bishoftu town, which is in Oromia Regional State, 47.9 kilometers southeast of Addis Ababa (capital city of Ethiopia). Geographically it is located between 8 degrees 43' North 8 degrees 48' North latitude and 38 degrees 00' East 38 degrees 48' East longitude (Figure 1). Furthermore, the town is situated in a tepid to cool sub-humid mid-highland climate at an altitude of about 1920 m above mean sea level, with moderate weather conditions and the temperature in the area ranges between 16°C and 24°C (NMSA, 2005).

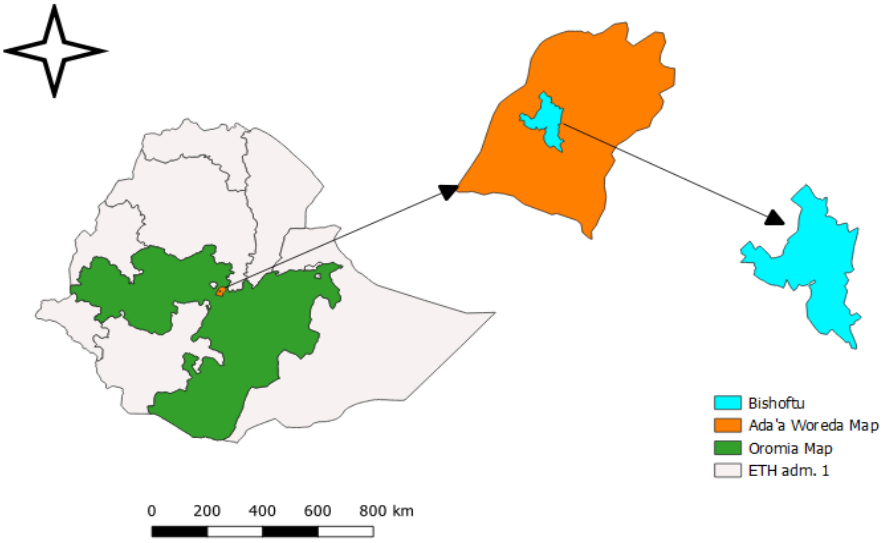

Figure 1: Map of geographical location of the study area

Source: Done by Quantum Geographic Information System software version 3.16.8-Hannover

2.2. Study Population

The study animals were domestic animals of different species, breeds, ages, and sex those were referred and directly presented to Addis Ababa University Professor Feseha G/AB Veterinary Teaching Hospital Additionally, some cases that requested ambulatory surgical service from Bishoftu town and its surroundings were included in the study. Generally, every animal that presented with surgical affection was included and a total of twenty one (21) domestic animals of different breeds, species, sex and ages were undergone different surgical procedures and corrections. From these, 11 were cattle, 3 were canine, 3 were equines, 1 was ovine, 1 was caprine, 1 was swine, and 1 was feline. Most of the study animals were managed extensively, except cross-breed cattle and swine, which were managed intensively, and companion animals.

2.3. Study Design

A descriptive clinical case report was used to document cases and detailed reports on individual animal patients. Each case report of surgically treated domestic animals included a history, physical examination, pre-operative animal preparation, surgical treatments, post-operative care, post-operative complications, and the outcome of an individual case.

2.4. Study Method

Different domestic animal species directly presented to Professor Feseha G/AB VTH, and those referred from Hidi, and Dire veterinary clinic with various surgical conditions were recorded with respective signalment, history, and clinical findings. The history of the patient involves the owner's chief complaints, duration and progression of the disease, animal management system, and presence of previous medication. During clinical examination, each admitted patient was thoroughly investigated for the affected organ or system and general parameters which include their body temperature, heart rate, respiratory rate, tissue perfusion status (capillary refill time and color of mucous membrane), body condition, the general health status of the patient, and their prognosis.

In the surgical condition that was exhibited by swelling/distension of body part or cavity, diagnoses were accompanied by doing exploratory puncture or fine-needle aspiration. Additionally, physical palpation was used to check for swollen part consistency, pain, reducibility, and size of draining lymph nodes. Percussion of the distended abdomen was used to detect its consistency, while the rectal examination was used to show the status of the bladder in adult large animals with a urinary problem. Most of the presented animals were stabilized before the intended surgical intervention while others admitted with emergency cases like dystocia, urinary obstruction, and bleeding wound were handled immediately without any delay. However, elective cases received appointments based on surgical condition and off-feeding status of the animal.

Some animals were fasted before their presentation for surgical intervention depending on the types of requested surgical procedure, age, and species of the animal. For safe and accurate administration of fluids, drugs, and anesthetic agents, the weight of small animals and young large animals were measured by using weight balances, while the weight of adult large animals was taken by estimation. Most of the surgical interventions were performed after confirming the condition, whereas few cases were performed as exploratory surgery. Admission of the patient for surgical intervention was done after getting informed signed consent form the owner of each animal.

Aseptic surgical procedures were used in all surgical cases to the greatest extent possible. For this purpose, scrubbing with diluted chlorhexidine and cetrimidine gluconate and final disinfection with 1% tincture iodine were considered as a routine form of aseptic scrubbing during each procedure. Post-operatively, all animals were followed by a repeated phone call or by physical presence when necessary until the patients were stabilized and fully recovered. Finally, surgical cases were compiled under different categories based on the types of surgical procedures performed and the systems affected. Accordingly, they were categorized as ovariohysterectomy, cesarean section, open castration, hernias, dehorning, tenotomy, prolapses, open wound management, abscess drainage, exploratory rumenotomy, partial tail amputation, urethrostomy along with penile amputations.

3. COMPILED CASE REPORTS ON DIFFERENT SURGICAL AFFECTIONS, TREATMENTS, AND THEIR OUTCOMES IN DIFFERENT DOMESTIC ANIMALS IN AND AROUND BISHOFTU TOWN, OROMIA, ETHIOPIA

3.1. Ovariohysterectomy in Bitch

Abstract

Ovariohysterectomy commonly performed surgical techniques in veterinary practice. This procedure was performed to prevent unwanted puppies. The owner requested to permanently sterilize the bitch since he didn't want any more puppies. Before surgery thorough physical examination of the bitch were conducted. Then the bitch was prepared for spaying after aseptic preparation of surgical site. The bitch was premedicated with xylazine and induced with a combination of ketamine and diazepam. The bitch was placed in dorsal recumbency and caudal midline skin incision was made to exteriorize and remove both ovaries and the uterus. Then the linea alba and subcutaneous tissue was closed by simple continuous suture pattern while the skin was sutured by subcuticular pattern with vicryl 2-0 size. On 14th day, it was noticed that the surgical site was healed completely in smart way without any complications and the bitch was in good health status.

Key words: *Bitch, Caudal midline, Ovariohysterectomy*

INTRODUCTION

Gonadectomy is one of the commonly performed surgical techniques in veterinary practice (Lee *et al*., 2013) and is a general term for interventions suppressing fertility in dogs, most commonly by surgically removing the testes in males (orchiectomy) or ovaries in females (ovariectomy/ovariohysterectomy). Desexing is promoted for pet population control, health benefits, and behavior modification (Urfer and Kaeberlein, 2019). It is also indicated for treatment of ovarian tumors, to promote involution of placental sites (non-responsive to medical

treatment), to prevent recurrence of vaginal hyperplasia and hormonal changes that can interfere with medical treatment in patient with endocrine disease such as diabetes (Ajadi *et al.*, 2018).

Spaying is consistently used as a sex-specific term for female gonadectomy; however, it may or may not also indicate concurrent hysterectomy. Ovariectomy/oophorectomy is the surgical removal of the ovaries in female dogs, while ovariohysterectomy refers to the surgical removal of both the ovaries and the uterus (Urfer and Kaeberlein, 2019). Ovariohysterectomy is the most commonly used desexing procedure in young females in North America, while ovariectomy without simultaneous hysterectomy is generally considered the method of choice for desexing young females in Western Europe (Lee *et al.*, 2013).

Ovariohysterectomy (OVH) is a surgical procedure used to treat a variety of female reproductive disorders. It can be done as an elective procedure or as a treatment method. It can also be performed as an adjunct to a number of surgical procedures such as mastectomy to reduce the risk of recurrence of malignant mammary tumor, chronic and recurrent metritis and a last resort for managing recurrent pyometra (Ajadi *et al.*, 2018). Benefits of elective OVH include elimination of unintended reproduction which in turn reduces the number of dogs that are unwanted and euthanized in shelters, prevention of sexually transmitted disease, pregnancy toxemia, metabolic disease and dystocia (Bencharif *et al.*, 2010).

Prepubertal gonadectomy of immature male and female animals aging from 6-to-14 weeks has been used to control pet over-population in United States. Apart from ensuring that the animal will never be able to reproduce after puberty, it is also less traumatic surgery when performed prior to puberty than in adult animals (Romagnoli, 2017).There are two commonly used surgical approaches for OVH procedures in female dogs, which are the midline incision and the flank incision. The midline incision is the more commonly used approach than the flank incision which is mostly performed in small or narrow-bodied dogs, or in dogs with significant mammary development (Urfer and Kaeberlein, 2019).

The ventral midline celiotomy (linea alba) is performed in the patient positioned in dorsal recumbency and incisions is placed in the cranial third of the distance between the umbilicus and

pubis (Tallant *et al.*, 2016). The incision placement varies depending on the age of the patient to improve the efficiency of the entire procedure. Incisions in adult female dogs are generally placed directly caudal to the umbilicus while incision in pediatric female dogs and cats is placed approximately halfway between the umbilicus and pubis (ASPCA, 2021). The flank incision is performed in the patient placed in lateral recumbency (Urfer and Kaeberlein, 2019).

Spaying is an abdominal operation which could entail various complications (Paskalev *et al.*, 2018). Complications are often associated with inappropriate surgical technique procedure which can easily prevented by being attentive to good surgical technique (Howe, 2006). Intraoperative and short-term post-operative complications include bleeding, trauma of organs, torn stitches, accidental ureteral ligation, dehiscence or infection of the incision, and very rarely organ prolapse and peritonitis (Benavides *et al.*, 2019). OVH has been reported to increase complications like obesity, urinary tract disorders, diabetes mellitus and hypothyroidism (Ajadi *et al.*, 2018).

Case history and clinical examinations: Four years old, 20kg, local breed bitch was presented to Addis Ababa University College of Veterinary Medicine and Agriculture Professor Feseha G/AB Veterinary Teaching Hospital for surgical sterilization of reproductive tract to prevent further breeding. The bitch has a history of multiple births to a large number of litters that all were delivered normally without complications. However, the owner wanted to have no more puppies from the bitch and decided to permanently sterilize her. Before commencing surgery the bitch underwent thorough general physical examination. Accordingly, all physical parameters such as the body temperature (38^0C), respiratory rate (28breath/min), and heart rate (130beat/min) were within normal physiological limits and the dog was found apparently healthy enough to undergo ovariohysterectomy.

Pre-operative preparation of the bitch: Since the surgery was elective, the dog was fasted for 12 hours before coming for operation. After sedating and inducing, the bitch was prepared by shaving the hair from the operation site and scrubbing the surgical field with a chlorhexidine solution (Figure 1A). Then the surgical field was scrubbed with iodine solution and sterile drapes were put on the field and fixed with towel clamps. Sterile surgical gloves were worn and

standard aseptic principles were followed in all surgical steps, including surgical scrubbing of hands with chlorhexidine solution and aseptic handling of instruments.

Anesthesia and animal control: Before commencing the surgical procedure the bitch was administered premedication and induction agents with selected anesthetic drugs. As a premedication, xylazine was given @ 2mg/kg and Tramadol (Tramadol hydrochloride, Sakar Health care Pvt. Ltd, Gujarat, India) @ 2 mg/kg IV) were administered. Once sedated, an intravenous catheter was placed in to cephalic vein and lactated ringers solution was administered @ 10ml/ kg/hr throughout the surgery. Thence the bitches were induced with combination of ketamine @5mg/kg and diazepam @ 0.15 mg/kg mixed in one syringe IV. Once anaesthetized, the bitch was positioned in dorsal recumbency with her fore and hind legs tied to the surgical table. The maintenance anaesthetic dose was given at half dose of the induction during the surgery.

Surgical correction and treatment: After positioning, stabilizing and aseptically preparing the incision sites, fenestrated sterile drape was put and fixed to surgical field by towel claps. The operation table was tilted slightly on the animal's head side to move the abdominal organs towards the diaphragm. Then the caudal ventral midline incision was made in the cranial third of the distance between the umbilicus and pubis for easy exteriorization of the ovaries (Figure 1B). Then incision was made through the three layers (skin, linea alba and peritoneum) to expose the abdominal cavity. After incising the skin, subcutaneous fat was trimmed off on either side of the linea alba to facilitate visualization and accurate incision of the linea alba. The linea alba was tented up with rat toothed forceps and stab incision was put on by using scalpel blade with the sharp edge facing up to avoid any possibility of causing injury to the underlying abdominal organs.

Then the incision was extended using blunt ended scissors with the jaws of a tissue forceps inserted into the stab incision to keep the linea alba tented during incision. After making around 6-8 cm long incision on the caudal ventral midline, an index finger was introduced into abdominal cavity to locate the left uterine horn. After exteriorizing the left uterine horn, the left ovarian suspensory ligament was broken with the left index finger while applying gentle caudal

traction by the right hand for easier manipulation of left ovary and ovarian pedicle. Then window was created on the mesovarium adjacent to the ovary to facilitate easy ligature on ovarian pedicles and two haemostatic clamps were placed on the ovarian pedicle. Then circumferential ligature was applied beneath the second haemostat which was located distant from the ovary by using vicryl 2-0 size. The jaw of the second haemostatic forceps was opened and a second trans-fixation ligature was placed in the place crushed with the hemostat and the pedicle was severed between the two clamps caudal to the ligature. Then the pedicle was loosely grasped with thumb forceps just before releasing the clamp from the stump to inspect for bleeding and the pedicle was replaced into the abdomen.

The right ovary was removed in the same way while the right index finger was used to break the suspensory ligament. After both ovaries were removed, the uterus was fully exteriorized and three clamps were placed on the uterine body cranial to the cervix before ligation (Figure 1C). The uterine arteries located on lateral sides of the uterine body were individually ligated caudal to the most caudal clamp. Thence, the middle clamp was removed and the circumferential ligature was paced on the crushed site using vicryl 2-0 size. The uterine body was severed between the proximal and middle clamps cranial to the ligature. Then the uterine stump was checked for bleeding and gently replaced into the abdomen. Closure of the abdominal incision was done in three layers. The first layer (linea alba) was closed with simple continuous suture pattern by using the vicryl 1-0 size and secondly, the subcutaneous tissues was sutured with simple continuous by using the vicryl 2-0 size (Figure 1D). Finally, the skin was closed with subcuticular suture pattern using vicryl 2.0 size and surgical area was cleaned with diluted iodine solution. Then the bitch was sent home following her full recovery from anesthesia.

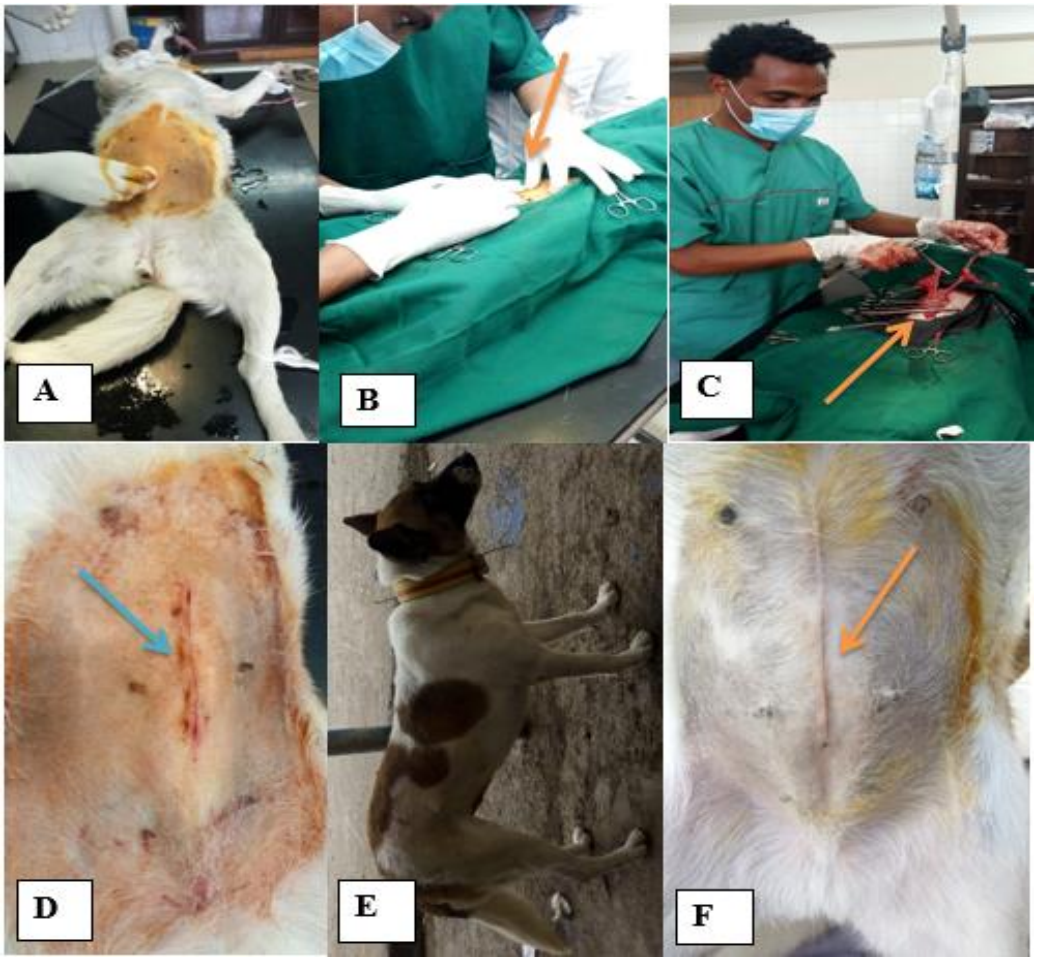

Figure 2: Ovariohysterectomy and its progression in bitch

A) Preparation of surgical site **B)** Surgical skin incision **C)** Hemostat placement on uterine body **D)** Just after skin closure **E)** Patient on 2nd day of operation **F)** Complete wound healing after 20th day

Post-operative care of bitch and outcome: After surgery was successfully a completed, procaine penicillin G (24mg/kg) and dihydrostreptomycin sulphate (30mg/kg) (Pen &Strep® Norbrook UK) and was continued for three consecutive days and tramadol (2% Tramadol Hydrochloride Sakar Health care Pvt.Ltd, Gujarat, India) was given @ 4mg/kg I.M for two days. The surgical site was also cleaned and scrubbed for consecutive three days (Figure 1E). The owner was advised to kept bitch in clean kennel and to apply a modified Elizabethan collar in addition to daily wound lavage with saline solution and mild antiseptics provided to him. The

owner was also advised to assess pain, inflammation at the surgical site, its defecation and urination behaviors and also to restrict exercise. On the 7th day follow-up, no complication was noted and the bitch was recovered uneventfully. On 20th day, it was noticed that the surgical site was healed completely in smart way without any complications (figure 1F) and the bitch was in good health status.

Discussion: Ovariohysterectomy in the bitch is a surgical procedure consisting of laparotomy with ablation of both ovaries and the uterus (Bencharif *et al.*, 2010). It is the most common elective surgeries for birth control, to prevent oestrus, pseudopregnancy, to prevent or decrease the risk of mammary cancer/tumor development (Hossain *et al.*, 2017). This is in agreement with present case that was done as elective surgery as the owner didn't want to have more puppies from the bitch. In United States and increasingly in much of Europe the practice of castrating male and spaying female dogs has become standard practice at about six month of age (Hart *et al.*, 2019). However, the current surgical case was performed at four ages but during an anoestrus period.

This surgical procedure was performed using injectable anaesthetic protocol with premedication, induction and maintenance for general anesthesia. But different authors (Bencharif *et al.*, 2010), (Brun *et al.*, 2011), (Lee *et al.*, 2013), (Tallant *et al.*, 2016) have been maintained anesthesia with isoflurane in 100% oxygen via endotracheal intubation. In current case this was not used due to absence of such inhalational anesthesia and the anesthetic machine is not fully functional. In accordance with (Tallant *et al.*, 2016), in current case the linea alba and subcutaneous tissue was closed with a simple continuous suture pattern as it is more advantageous in preventing delayed wound healing that could arise from leaking peritoneal fluid that may lead to postsurgical herniation. The skin incision was closed by subcuticular suture pattern to prevent the removal of suture by self-mutilation.

The midline incision and the flank incision are the two common surgical approaches for sterilizing female dogs. For both small and large breed dogs, the midline incision is the most common approach. (Urfer and Kaeberlein, 2019, ASPCA, 2021). This is in agreement with current case in which the ventral midline incision was done on the cranial third of the distance

between the umbilicus and pubis. Differently to the current case (McGrath *et al.*, 2004) have used flank incision which is easier to perform in smaller dogs or dogs with a narrow body conformation which permits easier access to the ovaries and uterus. But flank incision cannot be easily applicable in large breed and an obese animal as it needs extending incision to facilitate removal of the uterus; however, extending the incision can lead to increased muscle trauma and additional hemorrhage.

According to (Furneaux, 2011; Melo *et al.*, 2019), anesthesia problems, intraoperative hemorrhage, infection and self-inflicted trauma are the most common surgical complications of ovariohysterectomy. Complications associated with ovariohysterectomy often result from using inappropriate which can be easily prevented by being attentive to good surgical technique (Howe, 2006). This is in agreement with the present case on hand in which intraoperative complication like bleeding were curiously managed by administering antibiotic and analgesic, and daily wound dressing to prevent post-operative wound infection that results in successful healing without any complications. Generally, this surgical case report strongly recommends the caudal midline incision under general anesthesia and aseptic procedure for complication free recovery.

3.2. Caesarean Section in Jenny and Queen

3.2.1. Caesarean section in jenny

Abstract

Dystocia is defined as any birth that reduces neonatal viability, causes maternal injury, or requires assistance during delivery. Dystocia in jenny is very rare, (1-4%) of foaling, and mainly associated with postural defects due long fetal extremities. The present case report was aimed to describe surgical management of dystocia and its outcome in jenny. 5 years old, jenny with difficult birth was presented to VTH after about 3 hours of labor onset. The owner complained that the jenny has faced a car accident and damaged on her pelvic bone 3 years ago. As a result, she has faced dystocia and gave birth with an operation 1 year ago. Clinical findings revealed

fully dilated cervix and narrow pelvic cavity due to downward bending of the iliac wing and the fetal fore limbs were lodged in cervical region. The ventral midline was aseptically prepared for cesarean section and the surgical procedure was performed in dorsolateral recumbence under light general anesthesia and local infiltration of 2% lidocaine to the incision line. The live female fetus was removed and easily accessible fetal membrane was gently detached from the uterus and trimmed while the non-accessible part was left inside and simply removed per vagina after 9 hours of operation. Then uterus incision was apposed with simple continuous suture pattern biting all layers and then oversewed with Cushing suture pattern using # 2-0 polyglycolic acid (PGA). The linea alba was closed with simple interrupted suture pattern while subcutaneous tissue was closed with continuous interlocking pattern using # 2 polyglycolic acid. The skin was closed by horizontal matters with non-absorbable suture material # 2-0 silk. Finally, the jenny was recovered from anesthesia and met her foal to assist. The skin suture was removed on 21st day after complete wound healing and both the jenny and the foal was in good condition during 2 months follow up.

Key words: *Cesarean section, Dystocia, Jenny, Pelvic deformity*

INTRODUCTION

Equine species are long-day seasonal breeders, and their parturition process is very similar to that of other domestic animals in many ways (Thangamani *et al.*, 2018). The length of pregnancy period is 365 to 376 days but extreme variations range from 340 to 395 days and parturition is rapid and violent feature (Chauhan *et al.*, 2013; Evans and Crane, 2018). Foaling is a process of giving birth to foal which is prompt and forceful event in equine breeding (Mumtaz Ali Khan, 2020). During normal foaling the mare will become restless, sweating, frequent urination, contractions begin and the fetus changes position so that its head and forelimbs are in the birth canal as stage 1 starts which can last between 1 – 4 hours (Samper *et al.*, 2012; Rossdales, 2014). Stage II, which usually lasts less than 40 minutes, is the time of fetal delivery and it is characterized by appearance of the water bag or commencement of forcible straining, active abdominal contractions, she may choose to stand or lie down for the birth, appearance of fetal leg

and fetal delivery (Purohit, 2019). Delivery of the fetal membranes is considered stage 3 and is considered normal if it expel within the first 3 hours after parturition (Samper *et al.*, 2012).

Dystocia is defined as any birth that reduces neonatal viability, causes maternal injury/death, or requires assistance during delivery (Purohit, 2007; Sheetal *et al.*, 2018) and it is rare in equine compared to other domestic animals and causes a challenging condition to many equine practitioners (Khan, 2020). Dystocia in jenny is a very rare and estimated to be 1 - 4 % of foaling and it can be caused by maternal problems like abnormal pelvic conformation as a result of a previous injury, exhaustion or uterine inertia, infection such as Equine Herpes Virus which cause abortion in late pregnancy, absence of the expulsive forces. The major fetal problem related to dystocia includes fetal malposition, size, malformation, and twins (Chauhan *et al.*, 2013; Rossdales, 2014). Among these, the most common cause of dystocia in equines is mal-posture of the long fetal extremities, though positional and presentational abnormalities occur to a lesser extent. (Purohit, 2019).

Dystocia is declared when the 2nd stage of parturition exceeds 20 minutes without fetal expulsion in mare. Thus fetal mortality and future mare fertility depend on time and decision made during foaling (Khan, 2020). A delay in labor may result in compromise to the health of the fetus when oxygen delivery is decreased as the placenta begins to separate from the uterus (McCue, 2016). Equine dystocia is regarded as a true emergency as it is a threat to the dam and foetus (Ninu *et al.*, 2015). Dystocia in jenny is mainly associated with postural defects (lateral deviation of head and neck and flexion of limbs) and can be handled successfully through manual intervention by correcting postural defects while protecting the uterine and vaginal wall from lacerations (Chauhan *et al.*, 2013).

The risks are increased in small-sized donkeys because of the domed large forehead of some foals (Chauhan *et al.*, 2013). Choices for relieving equine dystocia include vaginal delivery, cesarean section surgery, or fetotomy can be the final decision. The choice of management may depend on the status of the fetus, duration and severity of the dystocia, economic value of the dam and fetus, clinician expertise, client preference, facilities available, and other considerations (McCue, 2016). Prompt assessment of the cause of dystocia is important for rapid decision-

making as to the course of action (Samper *et al*., 2012). If a fetus is alive, vaginal delivery may be attempted. But if a live foal with abnormal position could not be repositioned per vagina, a cesarean section should be opted as soon as possible (Maaskant *et al*., 2021).

Equine caesarean section is an emergency where the veterinarian should decide the need for general anaesthesia and the choice is made after considering the safety and comfort of the patient and foetus, comfort of the surgeon so that the surgery is completed rapidly (Ninu *et al*., 2015). Equine patients have a greater risk of mortality and morbidity related to general anesthesia than do other domestic species and humans (Rioja *et al*., 2012). Local anaesthesia for caesarean section should be considered a lifesaving procedure in very high risk patients (Ninu *et al*., 2015). The present case report was aimed to describe surgical management of dystocia and its outcome in jenny.

Case history and clinical examination: A 5 years old local breed jenny, weighing about 140kg was brought by vehicle to Addis Ababa University College of Veterinary Medicine and Agriculture Professor Feseha G/AB Veterinary Teaching Hospital because of difficulty in giving birth (Figure 2A). The owner stated that the jenny was straining, restless, and shows other signs of parturition in the last 3 hours of lobar. The owner also told that jenny has faced a car accident and her pelvic bone was damaged before 3 years. As a result, she gave birth with an operation 1 year ago.

Upon clinical examination, the jenny was restless, frequently straining, lying down and up, and there was an externally noticeable clinical sign that indicates the presence of a previous car accident like asymmetrical tuber coxae and slight crippling while she was walking. On general physical examinations, good body condition, rectal temperature (38.7 ^{0}C), respiration rates (16breaths/minute), and increased heart rates (52beats/minute). Per vaginal examination showed fully dilated cervix and narrow pelvic cavity due to downward bending of the iliac wing and the fetal forelimbs were lodged in cervix. Based on history and clinical findings, a decision was made to perform a cesarean section under general anesthesia in dorsolateral recumbence.

Animal stabilization, premedication, site preparation, and anesthesia: the jenny has received lactated ringer solution at a drip rate of 10ml/kg/hr and administered fortified procaine penicillin G at 25,000 IU/kg, intramuscularly as prophylactic. The jenny was premedicated with IV xylazine hydrochloride at 1.1mg/kg and induced with ketamine hydrochloride at 2.2 mg/kg after 5 minutes of xylazine injection and showing signs of sedation. Just after ketamine administration the donkey lost her body balance and carefully assisted to put in lateral recumbence and her legs were tied with rope for additional safety.

The maintenance anesthesia was achieved with constant rate infusion (CRI) technique by using a combination of ketamine at 7.2mg/kg/hr and xylazine at 2.1mg/kg/hr added into normal saline solution and fixed to the jugular vein at the drop rate of 6 drop/second. The ventral midline was widely shaved, washed, and scrubbed with tincture iodine solution as fast as possible to reduce time at recumbent position and anesthetic exposure. Local infiltration of lidocaine was also used on the incision line. Then the animal was shifted to dorso-lateral position with the help of an assistant and surgical drape was fixed and the area was re scrubbed with iodine tincture.

Surgical treatment procedures: After proper drabbing and final disinfection, skin incision (figure 2B) was made on ventral midline approximately 10 cm from the cranial base of the udder and extended cranially for about 30cm. Then subcutaneous tissue, line alba were incised, and huge peritoneal fat was trimmed off to expose the abdominal cavity. The gravid uterus was exteriorized (Figure 2C) while the remaining abdominal organs were packed with sterile drapes to prevent evisceration and contamination of the abdominal cavity. After exteriorizing and locking the uterus into incision line, a small incision was made parallel to uterine vasculatures and the incision was extended sufficiently with scissors for easy removal of the fetus and to avoid irregular tearing during fetal removal. Large blood vessels encountered during incision were ligated while minor bleedings were controlled with pressure mob and artery forceps.

A live female foal's hind legs were straightened and passed to assistant surgeon for fetal removal while the surgeon was stabilizing the uterus. Immediately after delivery, the foal passed to attendants to clean and kept not harming herself while trying to stand (Figure 2D), and searching for her dam. Following the removal of the fetus, easily accessible fetal membrane (nearly half

part of the placenta) was gently detached from the uterus and trimmed while the non-accessible part was left inside and easily removed per vagina after 9 hours of operation. Procaine penicillin powder was applied into the uterus and the uterus incision was apposed with simple continuous suture pattern biting all layers of the uterine wall to ensure adequate haemostasis.

Simple continuous suture was overlaid with Cushing suture pattern using # 2-0 polyglycolic acid (PGA). Then the drapes packed in the abdominal cavity were removed and linea alba was closed with simple interrupted suture pattern while subcutaneous tissue was closed with continuous interlocking pattern using # 2 polyglycolic acid (Polyglycolic Acid (PGA), USP 2, Huaian Angel Medical Instruments Co., LTD, Jiangsu, China). Finally, the skin was closed by horizontal matters with non-absorbable suture material # 2-0 silk. The surgical wound was cleaned with tincture iodine. On successful completion of the procedure, the jenny recovered from anesthesia and met her foal to assist.

Figure 3: Cesarean section and its outcome in jenny

A) The jenny up on arrival **B)** skin incision on the ventral midline **C)** exteriorized gravid uterus **D)** foal trying to stand after delivery **E)** cleaning and disinfection of surgical site during follow up **F)** foals suckling her dam on the 2nd day **G)** The jenny and the foal after 2 months

Post-operative care and outcome: The foal was assisted to suckle milk by positioning her mouth to the jennies teat and even by milking the teat into the foal's mouth till she becomes strong and suckle by herself (Figure 2F). The jenny and her foal were kept in Donkey Health and Welfare Project (DHWP) patient follow up room and followed there for 9 days. Fortified procaine penicillin G @ 25,000IU/kg, IM was continued for 5 days and diclofenac sodium was administered for 3 days to relieve post-operative pain. The surgical wound was cleaned daily with tincture iodine until healing was confirmed (Figure 2E). The owner was suggested to sterilize his donkey since the future development of dystocia is imminent. Based on this suggestion the owner was told his readiness to keep the animal indoor when she is fully recovered and to sterilize her before she starts mating. Subcutaneous swelling was observed on the ventral abdomen around the incision line on the 4th day of operation and totally regressed after 9 days of onset. The skin suture was removed on 21st day after complete wound healing and both the jenny and the foal was in good condition during 2month follow up (Figure G).

Discussion: Dystocia in equines is an emergency because of the powerful uterine and abdominal contractions involved in fetal expulsion resulting in rapid placental separation, such that dystocia significantly increases the risk of fetal hypoxia and reduces the likelihood of foal survival (Maaskant *et al.*, 2021). The present dystocia was associated with previous pelvic bone damage due to car accident. This case report was in line with (Purohit, 2019) finding that reported pelvic deformities are amongst possible indications for cesarean section. As the jenny had history of accident on her pelvic bone and previous surgical delivery, the animal was not manipulated for per-vaginal delivery; therefore, timely caesarean section was decided to save both the life of the jenny and foal.

The foal survival is high when the operation is performed early; 38% in emergency cesarean versus 90% in elective cesarean section and terminal cesarean sections carry a poor prognosis for foal survival as the foal suffers from fatal anoxia because of dehiscence of the allantochorion within 1 or 2 hours of the second stage labor. Hence, if the foal is alive the operation should be performed with minimum delay (Purohit, 2019). Accordingly in the present case, the foal was found alive during per vaginal examination upon arrival and early surgical decision was saved both lives of the jenny and foal.

A combination of xylazine, ketamine, and diazepam can be used for induction, while inhalation anesthesia is used for maintenance purposes. But in absence of inhalation anesthesia it can further be maintained by xylazine, ketamine, diazepam, and guaifenesin (Purohit, 2019). In equine patients, anesthetic induction with combination of ketamine and diazepam produces a fast and safe means of recumbency in emergency or elective procedures. But, it is believed that diazepam builds up in the fetal compartment and produces respiratory depression in the fetus at birth (Bidwell *et al.*, 2008). Local anaesthesia for caesarean section is considered a lifesaving procedure in very high risk patients (Ninu *et al.*, 2015). The present surgical case was performed under general anesthesia with a combination of xylazine and ketamine. Additional line infiltration with lidocaine was done to reduce pain during incision as the general anesthesia was kept at a light stage till fetal delivery.

Equine dystocia can be managed in different surgical techniques including ventral flank laparotomy, paramedian, and ventral midline approach. Most surgeons chose the ventral midline approach under general anesthesia, with the mare in dorsal recumbence tilted slightly towards the surgeon because it allows easy exteriorization of the uterus, considerably reduces the intra-abdominal pressure and the wound can therefore be easily repaired without excessive tension on the sutures (Purohit, 2019; Sharma *et al.*, 2021). Likewise, in the current case, ventral midline approach was chosen because of its above listed advantages, and the ventral flank laparotomy was performed in the previous cesarean section. Other approaches apart from midline necessitate muscle division, which results in greater hemorrhage and postoperative edema and a paramedian approach is used infrequently if there has been previous midline surgery (Purohit, 2019). But in the present case though midline approach was used, postoperative subcutaneous edema was observed. The swelling may not only be associated with the surgical approach but also it could be associated with animal species as it similarly appeared in her previous flank approach.

In the current midline approach, the incisional hernial risk was prevented by using appropriate closure technique and using suture material with an appropriate size and good tensile strength. The findings of (Dutt *et al.*, 2020) stated midline incision can be easily repaired without excessive tension on the sutures and the risk of incisional hernia is negligible. Similarly, in the current midline closure, there was no excessive tension when the patient kept in dorsal and

dorsolateral recumbency. But the suture tension increases when the animal moved into lateral position and is expected to be higher in the standing position due to full intestinal load. Therefore, it is difficult to neglect incisional hernia or evisceration unless appropriate suture material with appropriate size and tensile strength is used. Dorsal recumbency during anesthesia in the mare is more likely to cause hypotension due to aortocaval compression by the gravid uterus than lateral recumbency (Ninu *et al.*, 2015). Even though, dorsal recumbency allows sufficient space during uterus exteriorization and can reduce tension during wound closure, the current cesarean section was performed in dorsolateral recumbence to reduce hypotension and pressure on the vertebral column.

If the placenta remains attached to the endometrium, it is better not to attempt manual separation as this may lead to profuse bleeding and oxytocin is suggested on completion of uterine closure or if the placenta is not expelled within 4 hours to assist in uterine contraction and placental expulsion (Purohit, 2019). In the present case, easily accessible part of fetal membrane was removed to promote easier uterine closure by avoiding the incorporation of placenta into the suture line. The remaining part was easily removed per vagina after 9 hours of operation following its complete detachment by uterine contraction. This agrees with (Samper *et al.*, 2012; Maaskant *et al.*, 2021) who stated that as slow manual removal does not pose a serious health risk to the mare or her future fertility and as most mares become depressed, anorexic, dull and some will have a fever if not removed within 12 to 24 hours. As it was observed in the present case, if the patient is presented with fully dilated cervix, vaginal removal of the remaining placenta after some hours of the procedure was found better in minimizing operation time. Because the equine uterus needs fast closure to effect complete hemostasis of diffused bleeding.

The most frequent post-operative complications are abdominal pain, anemia, retained placenta, and diffuse sub-cutaneous edema at the operative site (Purohit, 2019). In the current case, only subcutaneous swelling was observed on the ventral abdomen around the incision line on the 4th day but completely regressed after 9 days of onset. During this procedure bleeding from the uterine incision was somewhat challenging and it was controlled by ligation and using hemostatic forceps. This agreed with (Ninu *et al.*, 2015; Dutt *et al.*, 2020) reports that used a similar technique to ensure adequate haemostasis. Generally, an appropriate cesarean section

without serious manual intervention can save the life of the patient and fetus. Therefore, timely decision for surgical intervention is essential to ensure the survival of both the dam and fetus.

3.2.2. Cesarean section in queen

Abstract

Dystocia is defined as a difficult birth or the inability to expel the fetus through the birth canal. Uterine inertia is a lack of or decreased uterine wall contraction during labor and parturition, and it is one of the common causes of dystocia in queen. A cat suffering from dystocia was presented after 10 hours of labor onset. Per-vaginal palpation revealed the presence of dead fetus that could not be delivered normally. Based on the findings, an emergency caesarean section was decided to be performed under general anesthesia to save the life of queen. Thus, after aseptically preparing the caudal midline, an incision was made to remove the dead fetus. The uterus and abdomen incisions were closed and the surgical site was cleaned and sent home. Unfortunately, due to a failure to adhere to the postoperative antibiotic treatments, the queen was dead on 8th days of operation probably due to metritis development.

Key Words: *Caesarean section, Dystocia, Queen*

INTRODUCTION

Dystocia is defined as difficult birth or the inability to expel the fetus through the birth canal without assistance (Forsberg and Persson, 2007). Cats have a much lower incidence of dystocia, 3.3–5.8 percent of parturitions, relative to large domestic mammals; even it is lower than in dogs. Dystocia occurs in of queen (Naoman and Uday, 2021; Talukder *et al*., 2021). Dystocia can either occur from the problems related to the dam or the fetus, and treatment may vary depending on the cause (Cavanagh, 2017). But in some cases, it can occur due to both maternal and fetal causes (Naoman and Uday, 2021).

The major causes of dystocia related to the dam are uterine inertia; which could be primary or secondary uterine inertia. Primary uterine inertia occurs when uterine muscles fail to contract because of abnormal fetal presentation and posture (Singh, 2020). The primary uterine inertia is again subdivided into two groups: complete and partial primary uterine inertia. Complete primary uterine inertia occurs when the second stage of labor completely fails to start and failed to expel the fetus. Partial primary uterine inertia occurs when there is normal delivery of a litter, but the uterus is exhausted before delivery of all the fetuses (Pretzer, 2008).

Secondary uterine inertia, or uterine fatigue, may be a primary cause of dystocia or may occur secondarily during dystocia of another cause. Secondary uterine inertia occurs due to uterine fatigue from tenacious straining in the absence of an obstruction within the birth canal or following the relief of the obstruction (Pretzer, 2008; Dolf *et al.*, 2018; Li *et al.*, 2021). It can be a consequence of another cause of dystocia, such as fetopelvic disproportion, in which the uterine contraction ceases due to exhaustion after a period of non-productive labour (Talukder *et al.*, 2021). Generally, uterine inertia can be associated with anatomical abnormalities of the birth canal, abnormal levels of hormones, or low plasma calcium (Sahoo *et al.*, 2018).

Other dam-related causes include partial or incomplete dilation of the cervix and narrowing of the birth canal, and health status of the animal (Pretzer, 2008). The fetal origin of dystocia like fetal anomaly, fetal oversize, abnormal presentation, position, and posture of the fetus can result in difficult delivery (Dolf *et al.*, 2018; Naoman and Uday, 2021). The veterinarians should attempt to identify and diagnose the cause of dystocia in queens to institute appropriate management techniques to save the life of both the dam and the fetus (Pretzer, 2008). Treatment of dystocia is divided into medical and surgical treatments with different aspects depending on causes, clinical findings, and health status (O'Neill *et al.*, 2019).

Medical treatment includes oxytocin and calcium, along with physical manipulation of the vagina and assisted delivery of the fetuses once presented in the caudal pelvic canal (Naoman and Uday, 2021). It is indicated if the dam is in good health, labor has not been unduly protracted, the cervix is dilated, fetal size is consistent with the likelihood of vaginal delivery, and no fetal stress is evident on ultrasound examination (Pretzer, 2008). Cesarean section is the

surgical intervention that must be performed as soon as feasible when a dam with dystocia fails to respond to the medical treatment or fetal distress is evident or when medical treatment fails or is not practicable (Dolf *et al*., 2018; Sahoo *et al*., 2018; Naoman and Uday, 2021). In the present surgical case report, surgical management of dystocia due to uterine inertia in local breed queen was described.

Case history and clinical examination: 1 year old primiparous local breed queen was presented to Professor Feseha G/AB Veterinary Teaching Hospital with history of difficulty in birth, depression, frequent licking of perineal area, black to greenish discharges from vagina and frequent granting. The owner stated as the animal had given birth to two live kitten 10 hours before presenting to VTH and she has been showing continuous straining to deliver extra fetus. On per- vaginal examination, there was dark green discharge from the birth canal (indicating placental separation and fetal distress) and only hind limb extremities could be palpated (Figure 3A). The queen was depressed, weakened and slow strain to deliver the remaining fetus. As the dead fetus could not be delivered normally; emergency surgery was decided by caesarean section under general anesthesia to save the queen's life.

Preoperative preparations, anesthesia and control: Before the queen underwent surgery, Penicillin (24mg/kg) and dihydrostreptomycin sulphate (30mg/kg) (Pen &Strep® Norbrook UK) was administered intramuscularly 30 minute before surgery. The queen was sedated by xylazine @ 1.1 mg/kg IM and then the ventral abdomen was prepared by shaving and cleaned with diluted antiseptics. Finally the incision area was scrubbed with iodine solution and draped aseptically. General anesthesia was achieved by intravenous administration of mixture of diazepam (manufactured by Intas pharmaceutical Ltd., India) @0.15mg/kg and ketamine (Ketamine Hydrochloride manufactured in Germany) @5mg/kg I.V. Then the patient was kept in dorsal recumbency with the four legs tied on surgical table. Lactated ringers solution was given IV at a rate of 10ml/kg/hr. throughout the surgical procedure.

Surgical treatment and management: Caudal ventral midline skin incision (Figure 3B) was made on linea-alba caudal to the umbilicus and the subcutaneous tissue and linea alba were incised one by one to exteriorize the uterus. The abdominal cavity was gently entered, the gravid

uterus was cautiously exteriorized and the remaining abdominal organs were packed off with sterile drape in order to prevent peritoneal contamination. Then, a stab incision was put on the uterus with blade on the relatively avascular area of uterine body and the incision was extended by using metzenbam scissors to make easy removal of the dead fetus. Then one dead fetus was moved to the incision site by gently squeezing the uterine horn (figure 3C). Then the associated placenta was removed by pulling gently. The uterine was checked for left fetus if any before closing the incised uterus. Then the uterus was sutured with two layers of inverting pattern lambert followed by Cushing fashion by using vicryl 2-0 size.

The surgical area of the uterus was checked for any bleeding and repositioned to its normal position. The abdominal incision was apposed in three layers; the linea alba was sutured with simple continuous pattern by using polyglycolic acid 910 (vicryl) 2-0 sizes and the subcutaneous tissue was sutured in simple continuous pattern. The skin was sutured with subcuticular pattern by using polyglycolic acid 910 (vicryl) 2-0 sizes with buried knot to avoid licking of suture material. After the closure was finished, the incision site was scrubbed with diluted iodine solution (Figure 3D).

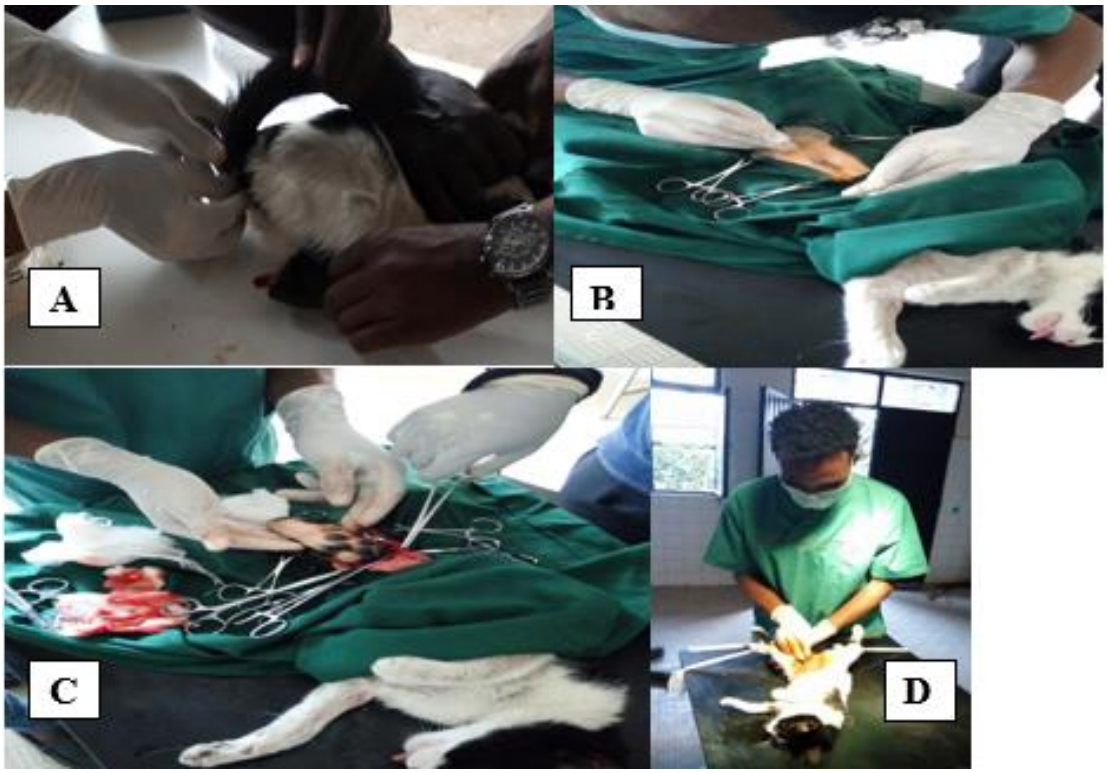

Figure 4: Caesarean section in queen

A) Per vaginal examination on arrival **B)** skin incision **C)** removal of dead fetus **D)** scrubbing after skin closure

Post-operative care of queen and outcome: Post operatively, penstrep (Penstrep-400 Holland) 1ml/20kg IM was prescribed for three days and analgesic tramadol hydrochloride (Tramadol hydrochloride 2% Sakar Health care PVt.Ltd, Gujarat, India) @ 2mg/kg IM B.I.D for two days was prescribed. The owner was advised to put modified Elizabeth collar and follow the animal for any complication as well as sign of discomfort. Accordingly, the owner reported as the queen decreased feed intake and was unable to give care to the kitten at home. On the 2nd day of operation, the queen was highly depressed and needs support. She had received warm lactated ringer's solution and 40% glucose separately to generate energy. Then the surgical site was properly scrubbed and sent home. On the 3rd day, the owner was not able to bring back the queen for the post-operative treatments and he did not answer the phone call. Then, on the 8th day, the owner had called and said he was too busy to bring the cat for treatment, but agreed to bring it tomorrow. However, he still fails to bring, and by midday, he had called and informed me that the kitten had died this morning.

Discussion

Dystocia is a difficult or prolonged parturition that requires an emergency medical or surgical intervention (Cavanagh, 2017). In cats, it may be caused by maternal or fetal factors or, a combination of both causes in some cases (Dolf *et al.*, 2018). In current case the queen had delivered two live kittens 10 hours before presentation and the queen was unable to give birth to remaining kitten. This can be due to partial primary uterine inertia where the uterine muscle becomes fatigued or weakened before delivery of all the fetuses during parturition. This was in agreement with the finding of (Talukder *et al.*, 2021) which stated as uterine inertia is the most common cause of maternal dystocia, and accounts for 60.6% of dystocia cases reported in cats.

The queen in current case was one year old primiparous and faced dystocia as a result of physical immaturity and small pelvis which requires strong uterine muscle contraction for delivery which

can lead to partial primary uterine inertia. This was in agreement with (Jackson, 2004; Oluwatoyin and Fayemi, 2011) finding that reported the first parity is highly associated with dystocia which might be due to mating them too early in life and physically immaturity. According to (Jakub *et al*., 2020) up to 80% of complications during parturition in bitches could only be resolved by surgical intervention.

Cesarean-section is applied when a dam with dystocia fails to respond to the medical treatment or fetal distress is evident (Dolf *et al*., 2018). But in case on hand, the queen was exhausted and no more strong straining was expected to assist with vaginal delivery. The fetus was also dead as the placenta was disrupted which is indicated by dark green vaginal discharge. As a result, emergency cesarean section was opted to save the life of the queen. This is in agreement with (Dolf *et al*., 2018), (Sahoo *et al*., 2018), (Naoman and Uday, 2021) who reported as dystocia is a frequently encountered complication during parturition and caesarian section is the method of choice in resolving difficult labour, regardless of previous attempts at conservative treatment.

In pet animals, the caudal midline approach needs less time to enter the peritoneal cavity as compared to the flank approach because the skin, subcutaneous fat, external and internal oblique muscles, and peritoneum were cut for the flank approach. The flank approach also has potential complications and might lead to difficulty in removing the entire uterine body (Burrow *et al*., 2006). This finding supports the current case management approach through caudal midline that enabled easier access to the uterine body and is advantageous in terms of reducing surgical site bleeding. A cesarean section was performed in this case to provide immediate relief and to save the life of the queen. Unfortunately, the queen died on the 8th day of surgery due to a failure to adhere to postoperative antibiotic treatments. This study indicated that even though the life of the exhausted queen could be saved through cesarean section, failure of appropriate post-operative treatment was lead to death probably due to metritis development.

3.3. Open Castration in Boar and Dog

3.3.1. Scrotal open castration in boar

Abstract

Surgical castration of male piglets has been a long-standing practice that is still practiced in most countries in order to get both calmer and fatten pigs. The current case aims to describe surgical castration of 4 years old boar at the farm level. The boar was used for breeding purposes for a long time and the farm owner wanted no more use for breeding purposes because of its weight that sows could not bear during mating. The owner also needs the boar for fattening and slaughter. So the owner wanted castration of the boar in order to remove the boar taint. Before undergoing the procedure, the boars underwent general physical examination, and the nature and status of both testicles were also examined and found apparently normal. After physically restraining, the testis was aseptically prepared and an adequate dose of 2% lidocaine hydrochloride was injected into both testicles. Then two sharp vertical incisions parallel to the median raphae were made to exteriorize the testicle. Then an incision was made on the parietal tunic and the testis was excised after ligating the vascular and avascular parts separately. Finally, the incision site was left open for drainage and managed as open wound management. The boar was recovered without complications and slaughtered after two months of operations.

Key words: *Boar, Boar taint, Open castration, Testis*

INTRODUCTION

Pig gonadectomy is a common practice in swine production around the world, and a large part of the slaughtered herd is of castrated males (Caldara *et al.*, 2013). Surgical castration of male piglets has been a long-standing practice that is still practiced in most countries in order to get both calmer and fatter pigs (Efsa, 2004: Bonneau and Weiler, 2019). It is done to prevent the development of unwanted sexual or aggressive behavior, as well as the development of boar taint, because the expected offensive taste and odor when cooking and eating the meat from

entire male pigs that consumers consider when purchasing pork (Commission *et al.*, 2010; Taint *et al.*, 2019; Lin-schilstra, 2021). Castration also stimulates fat deposition and has a negative effect on feed conversion that intact male pigs have better feed conversion and can have higher growth rates than surgically castrated pigs (barrows) (Morales *et al.*, 2017).

Boars are known to be more aggressive than both gilts and castrates and fighting associated with the mixing of unfamiliar pigs, hierarchy formation and competition can lead to skin lesions, reduced growth rate which can lead to potentially serious health and welfare problems (Defacqz, 2009). Ideally, surgical castration should be performed from 10-14 days of age with intratesticular local anaesthetic and manual restraint (Kelly *et al.*, 2010). Boar taint is caused by the deposition of skatole and androsterone in the tissues of uncastrated males and because these compounds are lipophilic, they accumulate in the adipose tissue of growing animals in relation to pubertal development (Taint *et al.*, 2019). Producers intend to lower the level of skatole and androsterone through castration with the use of pain relief, primarily through the application of general or local anesthesia and/or analgesia (Manteca, 2013).

Androstenone (5α-androst-16-ene-3one) is a testicular steroid with a urine-like smell and its production in the Leydig cells is regulated by the hypothalamic-pituitary-gonadal axis and after being released in the blood, androstenone can be catabolized by the liver, stored reversibly in the adipose tissue, or taken up by the salivary glands, where it is reduced to α-androstenol and β-androstenol that are excreted in saliva, where they act as pheromones to induce puberty in gilts or elicit mating behavior in the sow (Bradford *et al.*, 2013; Bonneau and Weiler, 2019). Skatole (3-methyl-indole) is a metabolite of the amino acid tryptophan in the hind gut, with a fecal odor and it is synthesized in the colon by microbial degradation of the indigestible but fermentable portion of the feed and intestinal cell debris (Taint *et al.*, 2019). Skatole is absorbed from the large intestine and circulates in the blood, where it can be catabolized by the liver or stored reversibly in the adipose tissue (Bonneau and Weiler, 2019).

The high variability in the human perception of androstenone odor does not exist for skatole: most consumers dislike the odor and flavor of meat exhibiting high levels of skatole (Bonneau and Weiler, 2019; Taint *et al.*, 2019). The main reason why entire male pigs have higher skatole

levels in adipose tissue than barrows or gilts is that the hepatic degradation of skatole is reduced, due to inhibition of the activity of catabolic enzymes by androstenone, testosterone (Bonneau and Weiler, 2019). While skatole levels in carcass fat can be reduced by adding non-digestible fibers to pig rations, androstenone inhibition is only achieved by castration or inhibiting the luteinizing hormone (LH) functions (Bradford *et al*., 2013; Manteca, 2013).

Castration is both painful and stressful for the animal during and for some time after the castration (Morales *et al*., 2017). Restraining during castration (which takes time) to minimize any movement may be held between the handler's legs with the head down, held on a flat bench, restrained in a v-trough or in a commercially available device (Efsa, 2004). surgical castration can cause pain and stress during castration and it can be minimised through the use of analgesics and local or general anesthetics (Hegerová and Juhás, 2021). The most widely used anaesthesia method for castration is the injection of lidocaine into the testicle, possibly combined with subcutaneous anaesthesia of the scrotum (Hopster and Spoolder, 2007). The analgesics meloxicam and fluxinin have both been shown to reduce the behavioural and physiological indicators of pain and stress when applied pre-operatively and analgesics can mitigate some of the post-operative effects of castration (Castration, 2012).

Alternatives to surgical castration include slaughtering pigs before they reach sexual maturity, using immunocastration techniques, sperm sexing for selection of female offspring and genetic selection for pigs with low levels of boar taint (Sutherland *et al*., 2010). They need to be practical, economically feasible, do not cause adverse impacts to animal performance and meet consumer requirements and principles of animal welfare (Caldara *et al*., 2013). The immunological castration using anti-GnRH can replace surgical castration of male pigs, as it has proved effective in reducing the concentration of the main hormones responsible for causing the carcass odor (Bradford *et al*., 2013). Immunocastration refers to the use of a commercial vaccine to stop the production of male hormones (i.e., gonadotropin- releasing hormone; GnRH) (Linschilstra, 2021).

The disadvantages of surgical castration are the labor cost to perform castration, reduced welfare related to pain during castration, the higher feeding cost and impact on the environment, and the

reduced value of the carcass because of the elevated fat content (Taint *et al.*, 2019). Hemorrhage, excessive swelling or edema, and infection are all potential complications of surgical castration that can impair performance, compromise health, and, in some cases, increase mortality (Morales *et al.*, 2017). The surgical castration of male piglets induces an increase in daily feed consumption with no compensation in growth rate which is a sharp reduction in feed efficiency where a total of 10% to 15% more feed is required to produce the same amount of meat compared to boars (Taint *et al.*, 2019). The current case report aims to describe an open castration in boar in order to remove unpleasant odor of the pork.

Case history and clinical examination: Upon request by the farm owner, 4 years old, 250kg, York shire breed boar castration was done at farm level (Figure 4A). The owner complained that boar which was used for the breeding purpose was aging and has increased in weight that the sows cannot bear his weight during mating. Therefore the owner wanted to fatten and slaughter the boar after removing the offensive taste and odor of the pork. Before undergoing the procedure the boar underwent general physical examination; temperature (38.8 ^{0}C), respiratory rate (20 breath/min), heart rate (70 beat/min) was found within the physiological limit. In addition the nature and status of both testicles were also examined and found apparently normal. Finally, the boar was admitted for open castration.

Anesthesia and animal control, pre-operative preparation of the boars: The boar was restrained physically with rope and chemically by using local anesthetics. The boar was restrained by securing a nose over the upper jaw and the noose was placed behind the canine teeth so that it does not slip off (Figure 4A) and fixed by one farm workers. Then both forelegs and hind legs are tied together and fixed by another farm workers and the boar was kept in lateral recumbency. After managing the animals, the area around the testicles was washed with water and soap thoroughly. Then the hair on the surrounding testicle was shaved and was again washed with diluted chlorhexidine solution and the tail was held to one direction to minimize the contamination. After the area was aseptically prepared, local anesthesia 12 ml was injected intra testicular to each testis by using lidocaine hydrochloride (2% lidocaine hydrochloride 20mg/ml which is manufactured by jeil pharma. Co. Ltd., Korea) at dose rate of 2mg/kg (Figure 4B). Finally the area was scrubbed with tincture iodine before incision.

Surgical correction and treatment: After preparing the testicle aseptically and well restraining, adequate vertical skin incision was done parallel to median raphae on testicle after pushing the testicles forward through the scrotum. After the skin, the fascial layer and tunica vaginalis were incised, the testicle was pulled out gently. Then the testicular chords were gently pulled caudally as long as possible and fat and soft tissue surrounding the spermatic cord was stripped away using a swab. Then the parietal tunic was incised and the vascular and avascular part was clamped (Figure 4C) using three haemostats to make a crush bed; double ligated separately using polyglycolic acid 910 (vicryl) 2-0 where one modified millers knot was applied below the distal haemostat from the testicle and one transfixation ligature placed at the place where the middle haemostat made.

Then after, the testicular chord were severed between the middle haemostat and the haemostat near the testis and removed. Once the clamp is released, the ligated stump was assessed for bleeding and the incision site was cleaned before replacing. A similar procedure was followed to remove the second testicle. After both testicles were removed, the incision site was checked for any bleeding and it was left open without suturing to allow discharges. Finally, the incision site was scrubbed with iodine solution and sprayed with suspension of wound spray (Figure 4D) before the barrow was released.

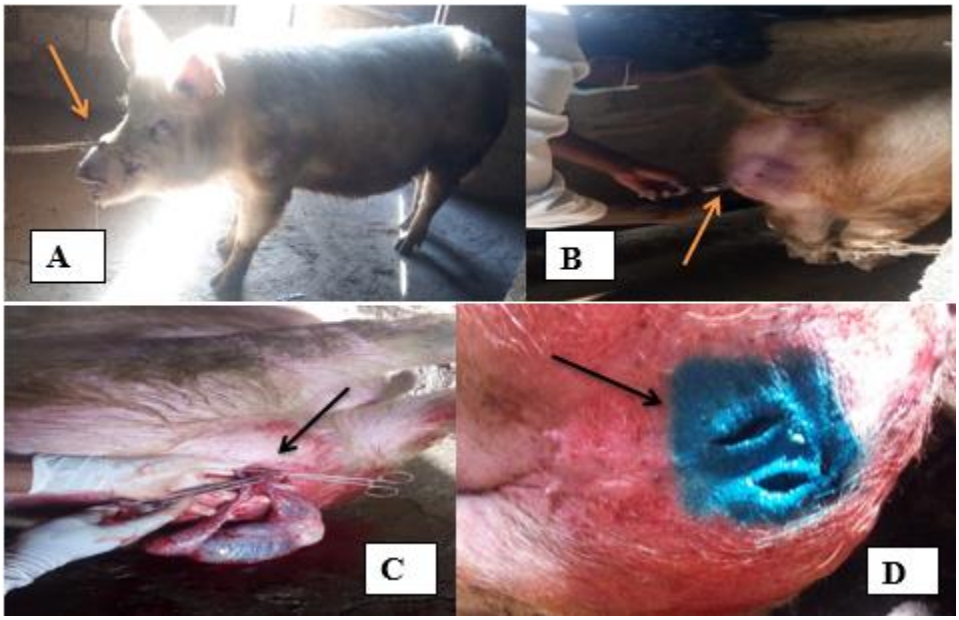

Figure 5: Open scrotal castration in boar

A) Presentation of boar with nose snare **B**) intratesticular injection of lidocaine 2% **C**) stump on the chords for ligature **D**) the wound sprayed with oxytetracycline spray

Post-operative care of boar and outcome: Post operatively the barrows were administered penicillin (24mg/kg) and dihydrostreptomycin sulphate (30mg/kg) (Pen &Strep® Norbrook UK) for three days. The farm workers were advised to regularly dress and spray surgical site with suspension of wound spray. Additionally, the farm workers were advised to regularly monitor the barrows for any complication such as active and prolonged hemorrhage. After 15 days of operation, the barrow was on good stage wound healing without complications and the owner reported the barrows was totally healed, improved in body condition and slaughtered after 2 months.

Discussion

Castration is performed to reduce the risk of boar taint, an odor that some customers find unpleasant when cooking and eating pork products in which sensitive consumers have described the smell as resembling urine, manure, and sweat (Lin-schilstra, 2021). In addition it prevents undesirable male aggressive and sexual behavior during the fattening period, so that barrows are quieter and easier to manage than entire males (Taint *et al*., 2019). This agrees with the current case that castration of the boar was done to reduce an unpleasant odor of the pork as the boar was no more used for breeding and transferred to fattening. Ideally, surgical castration should be performed from 10-14 days of age with intratesticular local anaesthetic and manual restraint (Kelly *et al*., 2010). But in current case a four years old boar was castrated because the boar was used for breeding purpose for long time and it was increased in body weight that sows cannot bear its weight during mating.

The boar was surgically sterilized in the form of open castration by intra testicular injection of local anesthesia (lidocaine) to alleviate pain and distress to the animal. This agrees with surgical protocol of (Hopster and Spoolder, 2007) which dictates that lidocaine is tissue-friendly and the most widely used anaesthesia for castration by injecting into the testicle. Restraining pigs during

castration to minimize any movement may be done by holding them between the handler's legs with the head down, holding them on a flat bench, restraining them in a V-trough or in a commercially available device (Efsa, 2004). But in the present case, the boar was too big to hold between handlers leg, so the boar was restrained by securing a nose over the upper jaw and the noose was placed behind the canine teeth so that it does not slip off, tying foreleg and hind legs and controlled in lateral recumbence with the help of farm workers.

After the boar is secured, two vertical cuts or one horizontal cut is made to the skin of the scrotum, and the testes are removed by cutting the spermatic cord with a scalpel (Review *et al*., 2013). This is also similar with the conducted castration procedure in that adequate, vertical incision was done on each testicle after pulling forward between thumb and index finger and then severed after ligating the spermatic chord. Potential complications associated with surgical castration include, and failure to remove both testicles. It has been suggested that surgically castrated barrows suffer from suppressed immunity, and exhibit higher incidences of inflammation, hemorrhage, excessive swelling or edema and poor wound healing (Review *et al*., 2013). In the present case there was no significant complication except little swelling at incision site in the first few days which was completely regressed after four days of operation.

3.3.1. Prescrotal open castration in dog

Abstract

Castration is commonly used surgical procedure in veterinary practice to control pet population, modification unwanted behaviors, and treatment of testicular or prostate gland diseases. The present case report was aimed to show prescrotal open castration techniques and its outcome in male dogs with unwanted behavior. A seven year old local breed dog was presented for euthanasia because of its aggressive and wandering behaviour. But the owner was advised to allow castration of the dog in order to reduce its aggressive behaviour rather than killing. After sedating and aseptically preparing the surgical site, small incision of about 3 cm was made in front of the testicle, through which both testicles were exteriorized. The vaginal tunic was incised and the spermatic cords were double ligated using 2-0 absorbable suture material and cutout.

Finally, the surgical wound was closed in two layers subcutaneous tissue and skin respectively. The surgical wound was completely healed without postoperative complications and unwanted behavior was completely avoided after one month of operation.

Key words: *Dog, Open castration, Prescrotal, Unwanted behaviors*

INTRODUCTION

Surgical sterilization of dogs is one of the most commonly performed procedures in veterinary practice. It is done as a method for various purposes like control of pet overpopulation, to prevent diseases of reproductive system; such as mammary neoplasia, benign prostatic hyperplasia, and to modify undesirable behavior, such as urine marking, aggression, and mounting of other dogs (Wahed *et al.*, 2014; Palestrini *et al.*, 2021). Performing a canine castration requires a variety of surgical skills, including hemostasis and ligation that have been identified by both general practitioners and surgeons to build critical skills for new graduates (Hunt *et al.*, 2020). Surgical castration without anaesthesia or analgesia is considered to be a painful and stressful procedure and it causes series physiological and behavioural changes (Manteca, 2013).

Castration, or orchiectomy, is surgical removal of the testicles (Mubashra, 2017). Canine castration can be performed by either through open or closed technique. In both open and closed techniques, the testis is displaced cranially and exposed by using the midline prescrotal skin incision (Howe, 2006). For dogs with both testicles in the scrotum, a single incision can be made in the skin just cranial to the scrotum (prescrotal) or on the scrotum. However, abdominal exploratory surgery is necessary for testicles that are retained in the abdomen (cryptorchidism), while removal of the testicle that is located near the sheath (prepuce) or in the groin (inguinal testicle) is achieved by skin incision made directly over the testicle (Bright, 2011).

Both prescrotal and scrotal approaches can be used for castration of adult dogs. The former technique is used more frequently as it is advantageous in terms of easier exteriorization of the testicles and spermatic cords. Though the scrotal approach can be used for safe castration of dogs

of any age, it is mainly preferred for castration of cats, large and small ruminants, horses, and pigs (Lennox, 2008; Digangi and Isaza, 2016). In larger dogs, the open technique is preferred because ligatures can be placed directly around the vascular pedicle, resulting in more secure ligations (Howe, 2006). In this technique, the surgeon opens the parietal tunic before placing a ligature around the vas deferens and testicular artery before removing the testicle.

In the closed technique, the parietal tunic is remains intact and a ligature is placed around the tunic and enclosed structures (testicular artery, cremaster muscle, and vas deferens) (Urfer and Kaeberlein, 2019). This technique is simpler to perform and minimizes the risk of peritoneal contamination by preventing communication between the abdomen and the parietal vaginal tunic. But it carries less secure ligatures because the vessels are ligated while being surrounded by the parietal tunic (Howe, 2006). Both testes usually are descended into the scrotum by 12 to 14 weeks of age in dogs and by birth in cats. The inguinal canal does not close until about 6 months of age in dogs and 7 to 8 months of age in cats (Kustritz, 2014). Therefore, the scrotum should be palpated prior to castration to ensure the presence of two descended testicles.

If testicles are not descended by 9-12 months of age, then the inguinal canal should be palpated to identify the cryptorchid testicle/s as the retention of inguinal or intra-abdominal (cryptorchid) testes increases the risk of testicular cancer (Heather *et al.*, 2019). Most castration incisions are closed with buried suture technique using absorbable suture material to decrease the risk of wound dehiscence associated with self-mutilation. Scrotal ablation (removal of the entire scrotum) is necessary during castration of animals affected with testicular cancer, trauma, or infection (Bright, 2011).

Despite castration being almost the sole method for control of pet's overpopulation globally it has disadvantages and postoperative complications such as hemorrhage, wound dehiscence, infections, and scrotal swellings (Wahed *et al.*, 2014). Swelling and bruising of the scrotum are more commonly seen after open castration and hemorrhage may be serious if it is intraabdominal and thus requires intensive supportive care and an abdominal approach to locate and ligate the spermatic cord. Since the male dog is considered to be scrotal conscious, the scrotum itself

should not be clipped or prepped, instead the scrotum should be draped out of the surgical field so as to avoid self-mutilation postoperatively (Howe, 2006).

Case history and clinical examination: A seven year old local breed dog was brought to Professor Feseha G/AB Veterinary Teaching Hospital for euthanasia because of its aggressive behavior. Additionally, the dog wanders out of the compound and ate somebodies sheep before two days that the owner pays 2000 birr for the sheep owner. But we advised the owner to castrate the dog to reduce its aggressive and wandering behaviour rather than to euthanize it. Then the owner accepted the advice and allowed castration of his dog. Before undergoing the surgical procedure the dog was examined for any abnormalities or physiological derangements and general physical examination reveals; heart rate 90beats/minute, respiratory rate 24breath/minute and the temperature 38.7^0C. Based on physical examination the dog was found apparently healthy and decision was made to perform open castration under general anesthesia.

Anesthesia and animal control, pre-operative preparation of the dog: The owner was informed to withhold the dog off feed and water for 12hrs before bringing the dog for next day appointment. On the next day, xylazine at dose of 2mg/kg, IM was given as pre anesthetic drug to sedate the dog. After sedation, the area between the scrotum and os-penis was shaved, washed by using water and soap. Long scrotal hairs were also cut short, and the scrotum is sprayed with antiseptic solution during surgical preparation using diluted chlorhexidine solution (savlon). Then the dog was put on surgical table in dorsal recumbence and draped with sterile drapes (Figure 5A).

An IV catheter was inserted and attached to an IV fluid supply line containing lactated ringers solution, which was administered at a calculated drop rate of 10 ml/kg/hr. A combination of diazepam (Intas pharmaceutical Ltd., India) at the 0.3mg/kg and ketamine (Ketamine Hydrochloride, Germany) @5mg/kg mixed in one syringe was given through the IV line for induction. Finally, before starting surgery, the area was scrubbed by using diluted iodine solution. The half dose of the same anesthetic agents was mixed in the same syringe to be given for maintenance through IV line as needed throughout the surgical procedure.

Surgical treatment: After securing the patient in appropriate position, prescrotal incision of about 4cm was made on midline just cranial to the scrotum on the skin and subcutaneous tissues (Figure 5B). Then one testicle was displaced cranially and pushed into the incision line using one hand while the remaining hand continue cutting incompletely incised subcutaneous tissue and fascia to let the testicle freely come out through the incision. By squeezing below the testicle, the cranial pole of the testicle was pushed up to the incision. The testicle, which was covered by a vaginal tunic (Figure 5C), was then grabbed and pulled with the right hand using a gauze sponge while the left hand held the scrotum and broke the scrotal ligament, which connects the scrotum to the caudal pole of the testicle, to fully exteriorize the testicle covered by vaginal tunics.

Then, the spermatic fascia and vaginal tunic over the testicle were incised, and the testicular parenchyma was exposed. The vaginal tunic was pulled away from the testicle and spermatic vascular cord. After gentle exteriorization of the cord, three sets of haemostats were placed across the spermatic cord to create a crush mark over which to place a ligature (figure 5D). Using polyglycolic acid 910 (vicryl) 2/0, double ligatures were placed around spermatic cord where one circumferential ligation was applied below the distal haemostat from the testicle and one transfixation ligature was placed at the place of the middle haemostat. Great care was given to avoid piercing of the spermatic cord vascular structures during introduction of the suture needle for placement of trans-fixation ligature. After ensuring that the ligature is tightly knotted to create complete haemostasis, the exposed spermatic vascular cord was then cut between the middle haemostat and the haemostat nearest to the testis.

The spermatic cord stump was checked for bleeding by removing the haemostat before replacing and the vaginal tunic was closed by using absorbable suture by placing an encircling ligature around the tunic and cremaster muscle. The same procedure was repeated for the second testicle, by using the same skin incision. Once both testes were removed and effective hemostasis is confirmed, the prescrotal incision was closed in two layers using the absorbable suture material polyglycolic acid 910 (vicryl) 2-0 size. The subcutaneous layer was sutured with simple continuous suture pattern by thoroughly obliterating the dead space and the skin was closed with subcuticular suture pattern, using absorbable suture material 2-0 polyglycolic acid 910 (vicryl).

Finally, the incision is inspected for gaps, oozing or any other problems and the area was cleaned with antiseptic solution (Figure 5E).

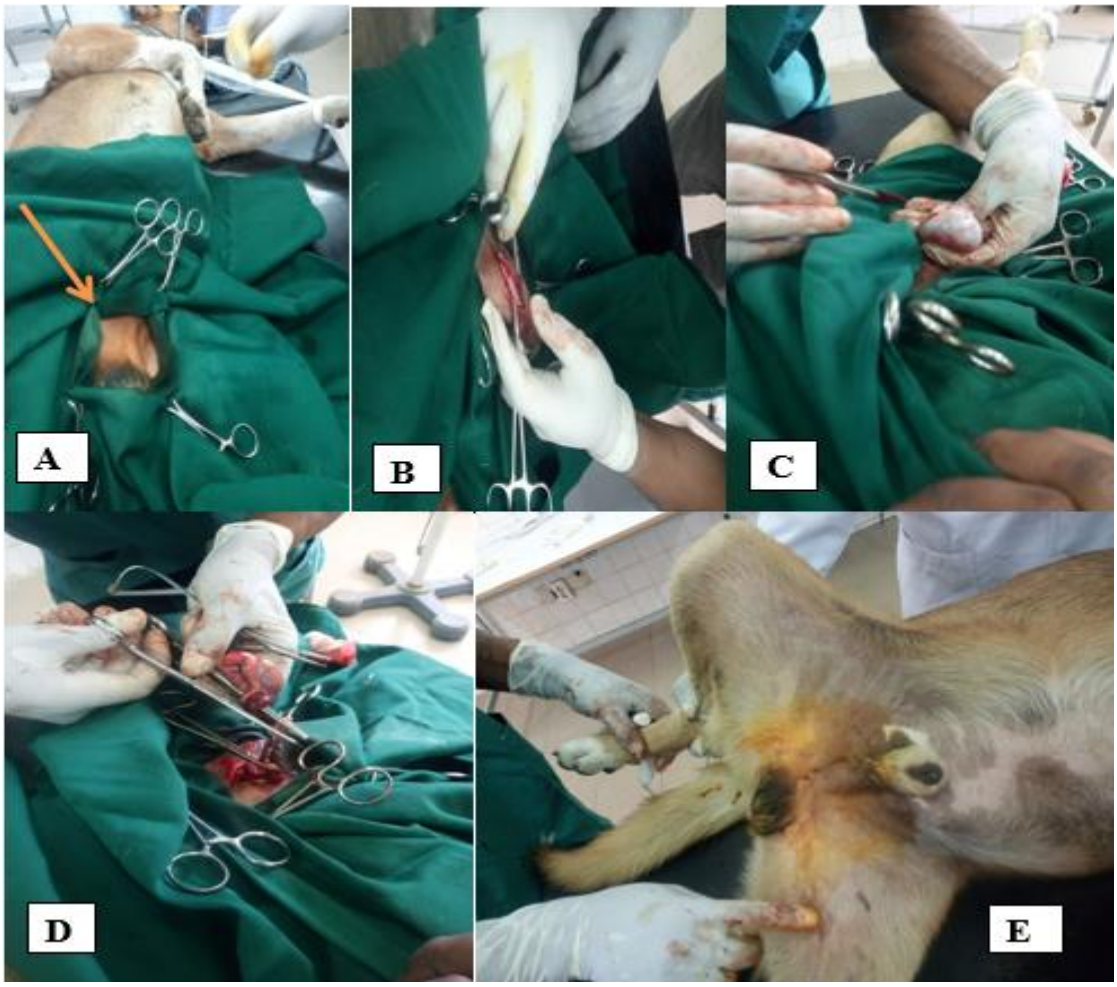

Figure 6: Prescrotal open castration in dog

A) Prepared incision site **B)** Skin incision **C)** Exteriorized testicle enclosed with vaginal tunic **D)** Ligation and cutting of spermatic cord after vaginal tunic incision **E)** After skin closure

Post-operative care of dog and outcome: The dog was treated medically penstrep (Penstrep-400 Holland) 1ml/20kg I.M for three days. The owner was advised to restrict exercise for few days, and use modified Elizabethan collars to avoid self-mutilation. In addition the owner was advised to follow the dog for any sign of discomfort during urination. Finally the dog was completely recovered from operation without any complication. Upon one month follow up the

owner was very happy with his dog's behaviour improvement and thanked us for the recommendation provided to him.

Discussion

Castration is performed frequently for reproductive neutering and for reducing or eliminating the behavioral patterns of intact males such as urine marking that evokes negative human reactions (Wahed *et al.*, 2014; Palestrini *et al.*, 2021). Similarly in the current case castration of the dog was done to reduce the aggressive and wondering behaviour of the dog, and its negative reaction of the dog toward human and animals. Traditionally veterinarians have been trained in pre-scrotal castration and it was considered as the ideal approach for castration of healthy animals (Misk and Samia, 1991) but a more recent study indicates that scrotal castration has a minimum risk of post- complications (Kim and Jeong, 2020). In current case the prescrotal approach was used with no postoperative complication.

Before skin incision, the incision site should have to be prepared aseptically by clipping an area around and including the scrotum; scrub with an appropriate antiseptic solution (Kustritz *et al.*, 2017) which is in line with current preoperative preparation of the surgical site. In a closed technique, the tunic is not incised; the spermatic cord, vessels, vas deferens, and associated structures are ligated together, usually with two or three separate knots to prevent bleeding (Lennox, 2008; Urfer and Kaeberlein, 2019). However in an open castration technique, the tough membranous covering of the testicle (parietal tunic), is incised and each structure is separately ligated (Howe, 2006). This report also agrees with the present case managements.

The traditional double ligation technique has been preferred for large breed dogs due to the presence of an extensive pampiniform plexus (Kim and Jeong, 2020). This also supports the case on hand in which double ligature is made to secure haemostasis. However, autoligation may be feasible in young puppies, since their pampiniform plexus has not yet formed completely, and in mature small breed dogs with smaller diameter of pampiniform plexus (Kim and Jeong, 2020). Opening the vaginal process (open technique) provides direct visualization and ligation of the spermatic cord and is less likely to result in suture slippage and hemorrhage but necessitates

closure of the vaginal process at the end of the procedure (Lennox, 2008). This report was found in agreement with the current case in which the vaginal tunic was closed to reduce the risk of any descending abdominal infection.

Some reports indicated as castration of male dogs has improved unwanted behavior like inter-male aggression, urine marking, roaming, and mounting of other dogs in approximately 50 to 70 % of the castrated dogs, possibly due to the reduction in blood testosterone (C, 1993; Palestrini et al., 2021). The risk of dog bite injury is an aspect of dog behavior that has substantial societal and public health implications. A systematic literature review based on observational studies of dog bite risk concluded that intact dogs were more likely than desexed dogs to cause bite injuries (Urfer and Kaeberlein, 2019). The present case also showed gradual behavioral improvement following castration can testify former finding. From these findings, it is possible to conclude as castration is the best choice to reduce the aggressive behaviour of the dogs.

3.4. Surgical Managements of Hernias in Domestic Animals

3.4.1. Traumatic abdominal intercostal hernia in bull

Abstract

Hernia is defined as the protrusion of tissue or an organ through an opening that can be caused by a traumatic tear in the abdominal wall or via natural opening. Abdominal intercostal hernias are rare and an abdominal intercostal hernia under an intact diaphragm is an even more infrequent event. Currently, 8 years old, local breed bull was brought to Professor Feseha G/AB VTH with an irreducible swelling on the right abdomen between the 10^{th} and 11^{th} ribs with signs of infection. The bull was sedated with IV xylazine at 0.02mg/kg and analgesia of the surgical site was achieved by local infiltrations of 2% lidocaine hydrochloride. Then the patient was controlled in a standing position in the crush and an elliptical incision was made over the hernia across the intercostal space after aseptic preparation. Careful dissection of skin and subcutaneous tissue was made and a segment of the cecum and omentum was observed as hernial contents. The perforated and inflamed part of the cecum was removed and the healthy part of the cecum

was sutured by two layers of inverting suture pattern. The hernial ring was refreshed and closed with a series of Vest- Over-Pant suture technique using vicryl 2 sizes. Then, the dead tissue was obliterated, and subcutaneous tissue was sutured by simple continuous pattern using polyglycolic acid 910 (vicryl) 2-0 and the skin was closed with simple interrupted using silk 2-0 size. The skin suture was removed on the 15th day, following complete healing of the wound and the bull had gained good body condition on third month of operation and was sold for beef.

Key words: *Abdominal intercostal, Bull, Herniorrhaphy, Trauma*

INTRODUCTION

Hernia is defined as the protrusion of an tissue or organ through a natural opening like inguinal canal or umbilical canal or that can be caused by a traumatic tear in the abdominal wall (Thangadurai *et al.*, 2016). Although herniation can occur elsewhere in the body, most of the hernia involves protrusion of the abdominal contents through the abdominal wall, diaphragm, or perineum (Hassen *et al.*, 2017). Any trauma due to camel kick, cattle horn thrust, violent contact with blunt instruments or car accident, an abscess in the abdominal cavity may cause weakening of abdominal muscles or abdominal distension due to pregnancy or violent straining during parturition can lead to hernia (Kumar *et al.*, 2014).

Hernia can be categorized into various parts depending on: the anatomical site of herniation (ventral or lateral abdominal hernia, diaphragmatic, inguinal or scrotal, umbilical, perennial, pelvic, and femoral hernia), based on cause of hernia (congenital or acquired hernia) (Farman *et al.*, 2018) depending on the type of the herniated tissue as enterocel (containing portion of intestine), epiplocel or omentocele (of omentum), enteroepiplocele (of intestine and omentum), Gastrocele (of stomach), vesicocele (of bladder), hepatocele (of liver), hysterocele (of uterus) and it may be, external or internal hernia (Hassen *et al.*, 2017).

Abdominal hernia refers to protrusion of a part of abdominal contents through a natural or pathological opening in the abdominal wall. Though, hernias can occur in different regions of the body, the most common site is the ventral abdominal wall and inguinal regions. It can also be

located low or high in the flank, along the costal arch or between the last ribs (Sadan *et al*., 2019). Intercostal hernias are rare phenomena caused by a disruption or weakness in the thoracoabdominal wall musculature resulting in herniation of fascia layers between adjacent ribs (Abunnaja *et al*., 2014). Intercostal hernias have also been categorized on the basis of their etiology, with majority resulting from trauma (blunt injury, penetrating injury, rib fractures). Recently, intercostal hernias have been categorized as intercostal hernias with diaphragmatic defects and intercostal hernias without a diaphragmatic defect (Luqman *et al*., 2018).

Generally, hernia has three components which includes; the hernial ring, sac, and contents (Farman *et al*., 2018). The ring is the actual limiting wall defect, which can be as narrow as a few millimeters or as large as several centimeters. The hernial sac consists of the tissues that cover the herniated contents while the contents of hernia are the organs or tissues that have moved to the abnormal location (Fesseha, 2020a). Although mobile structures such as the omentum and parts of the intestine can be involved in most sites, the nature of the contents can usually be predicted from the site of the herniation (Hassen *et al*., 2017). A primary diagnosis of hernia is history and physical examination mainly by palpation of the swollen region. However, additional confirmatory diagnosis of the cases can be done via exploratory puncture of the swelling mass and demonstration of the intestinal contents by using diagnostic imaging (Kadapatti *et al*., 2019).

Hernias can be treated in a variety of ways, including reduction and retention with a bandage, application of blisters or injection of irritant solutions close to the hernial ring after reducing hernia, placement of a ligature or through and through mattress sutures at the base of the hernial sac, and herniorrhaphy (Hassen *et al*., 2017). Even though it can be treated in different ways, the only effective treatment for abdominal hernia is surgery to restore the abdominal wall's integrity and prevent herniated contents from becoming incarcerated or strangulated. (Dey *et al*., 2018). The present case report aims to describe the surgical management of abdominal intercostal hernia and its outcome in bull.

Case history and clinical examination: An 8 years old, local breed bull was brought to Professor Feseha G/AB Veterinary Teaching Hospital with swelling on the right abdominal wall (Figure 6A). The owner complained that the bull was horn thrusted during the fight with another

bull before three weeks. The owner also added that the bull's feed intake was decreased and the size of the swelling was increasing gradually. Clinical examination revealed irreducible swelling on the abdomen between the 10^{th} and 11^{th} ribs (Figure 6A) with sign of infection and pain upon palpation. Close examination of vital organ parameters such as respiratory rate (28breaths/minute), heart rate (64beats/minute), and temperature (38 °C) were found within physiological limits. Up on history and physical examination, it was tentatively diagnosed as abdominal intercostal hernia and it was decided to be corrected surgical methods.

Preoperative preparations, anesthesia and animal control: The animal was sedated with IV xylazine at 0.02mg/kg and controlled in a standing position in the crush. Additionally, the rope tied to the horn and bull holder was used to make restraining more secure. Penicillin (24mg/kg) and dihydrostreptomycin sulphate (30mg/kg) (Pen &Strep® Norbrook UK) I.M was administered one hour before undergoing surgery as there may be infection. The skin surface on the surgical area was cleaned by washing and hair shaving. Then the area was prepared aseptically by scrubbing with Cimetidine 3% and Chlorhexidine gluconate 0.5% solution (savlon®). Finally, the site was scrubbed by using a tincture-iodine 1% inorder to decrease the microbial load in the area. Analgesia of the surgical site was achieved by local infiltrations of 2% lidocaine hydrochloride.

Surgical correction and treatments: Following proper restraining and aseptic preparation of the surgical site, an elliptical incision was made over the hernia along the intercostal space (Figure 6B). Blunt dissection was used to separate the skin from the subcutaneous tissue and extra skin was trimmed off. Bleeding was arrested by mopping and hemostatic forceps. After careful dissection of skin and subcutaneous tissue, a segment of the cecum and omentum was observed as hernial contents (Figure 6C). Up on further examination of the hernial ring, there was severe adhesion between herniated cecum and intercostal muscle (hernial ring). The involved part of the cecum was inflamed, necrotized, and perforated on its lateral point of adhesion. Then the adhesions were gently detached and the cecum was slightly pulled to expose the healthy part. The perforated and inflamed part of the cecum was removed and the healthy part of the cecum was sutured by two layers of inverting suture pattern (lambert and Cushing) by

using vicryl 3-0 size. Then hernial content was cleaned with saline water and gently repositioned back in the abdominal cavity (Figure 6D).

After the hernial contents were safely repositioned, the hernial ring was refreshed and closed with a series of overlapping mattress (Vest- Over-Pant) suture technique using synthetic sterile absorbable using polyglycolic acid 910 (vicryl) 2 sizes (Figure 6E). During the closure, each stitch was preset and held with artery forceps till all sutures were placed properly. After placement of all sutures, each suture was knotted tight starting from the center of the ring towards the end of the commissure. Then, the dead tissue was obliterated, subcutaneous tissue was closed by simple continuous suture using polyglycolic acid 910 (vicryl) 2-0 and the skin was apposed with horizontal mattress suture pattern by using silk 2-0 size. Finally, the surgical site was cleaned and dressed with a tincture-iodine 1% and the herniorrhaphy was successfully conducted and bull was admitted home.

Figure 7: Surgical management of traumatic abdominal intercostal hernia and its outcome

A) Clinical presentation of the bull **B)** After elliptical skin incision **C)** Herniated part of the cecum **D)** After hernial content was replaced **E)** Overlapping suture of the ring **F)** Bull after three months

Post-operative care: The previous prophylactic antibiotic was continued I.M for five days and diclofenac sodium at dose of 1.5mg/kg I.M was also administered for three days to relieve post-operative pain. Moreover, the surgical site was properly cleaned daily with a 1% tincture-iodine solution for five post-operative days. The owner reported as the bull is in good appetite following surgery and the wound was healing without evident complications. On 10^{th} day of follow up, the wound was in good healing progress and the skin suture was removed on the 15^{th} day, following complete healing of the wound. Finally, in the third month of operation, the bull had gained good body condition (figure 6F) and was sold for beef.

Discussion: Hernias have a number of negative consequences, including decreased productivity and productivity in affected animals (Thangadurai *et al.*, 2016). Intercostal hernias are rare phenomena caused by a disruption or weakness in the thoracoabdominal wall musculature resulting in herniation between adjacent ribs (Abunnaja *et al.*, 2014). Any trauma to different animal species may lead to the weakening of the abdominal muscles and can result in hernia (Das *et al.*, 2012). This finding agrees with the current case that the abdominal intercostal hernia has occurred following trauma caused by horn thrust.

Acquired abdominal intercostal hernia is when intra-abdominal contents reach the intercostal space directly from the peritoneal cavity due to an acquired defect in the abdominal wall musculature or fascia (Abunnaja *et al.*, 2014). This agrees with the present case that an abdominal content (part of the intestine and omentum) was passed through the abdominal wall musculature due to trauma. Abdominal content in direct contact with skin can stimulate the formation of adhesions that can interfere with normal digestion if it is not corrected at the appropriate time (Dey *et al.*, 2018). In the same way, the current case was presented with reduced appetite due to the firm adhesion formed between the hernial content (cecum) and hernial ring in addition to mild adhesion formed with the overlying skin.

There is no standardized approach to repair abdominal intercostal hernia. but the techniques to repair the defect may include primary closure and reinforcement absorbable or non-absorbable mesh and there are few case reports describing laparoscopic repair acquired abdominal intercostal hernia defects (Luqman *et al.*, 2018). In the current case primary closure of the defect was performed by suturing intercostal muscles and it has been shown to be effective and safe. The application of prosthetic reinforcement is favored in most cases, especially for very large or recurrent defects but it was reported to increase the risk of pain. In current case the defect was not very large and need not reinforcement of absorbable mesh. Laparoscopy has advantages as it enables adequate management of compromised hernia contents, allows treatment of other intraperitoneal injuries, and is minimally invasive. However, it is less favorable than the open intercostal approach in noncomplicated cases (Erdas *et al.*, 2014). But such advanced surgical management was not applicable in our VTH as it needs sophisticated materials and trained surgeons.

The contents of abdominal intercostal hernia may be an empty sac comprised solely of fascia elements or may contain abdominal and thoracic viscera, such as liver, lung, small and large bowel, omentum, or gallbladder (Abunnaja *et al.*, 2014). This agrees with the current in which part of the large intestine and omentum was found as the hernial contents. In the present case other viscera organs were not herniated may be due to absence of diaphragmatic defect. Generally, in this particular case appropriate surgical management complemented with medical treatment was played a major role in the successful outcome of abdominal intercostal hernia management in bull.

3.4.2. Perianal hernia in dog

Abstract

Hernia is an unusual opening through which tissue or organ protrudes. Perineal hernia refers to the herniation of pelvic and occasionally abdominal viscera into the subcutaneous perineal region. It can be unilateral or bilateral and results from weakening of the pelvic diaphragm muscles, favoring herniation of the abdominal viscera into the perineal subcutaneous area. The

perineal hernia is mostly seen in middle aged or uncastrated male dogs and it requires surgical reconstruction of the pelvic diaphragm. A twelve year-old, local breed intact male dog was presented with unilateral swelling on the right side of the perineal region which was reducible on palpation. The case was diagnosed as perineal hernia and unilateral perineal herniorrhaphy was done by closure of the pelvic diaphragm by suturing of the pelvic diaphragm muscles. After aseptically preparing the surgical site, curved skin incision over the hernia swelling was performed. Subcutaneous tissue was gently dissected and the hernial sac was incised and the herniated content was replaced to anatomic position manually. The hernial ring, subcutaneous tissue and skin were closed line by line and an intact male dog was castrated at the same time to reduce the chance recurrence. Through postoperative care was done and the dog was fully recovered without any complication and recurrence.

Key words**:** *Dog, Herniorrhaphy, Pelvic Diaphragmatic Muscles, Perineal hernia*

INTRODUTION

Perineal hernia refers to the herniation of pelvic and occasionally the abdominal viscera into the subcutaneous perineal region due to degeneration of muscle of pelvic diaphragm supporting the rectal wall which stretches and deviates (McCarthy *et al*., 2016; Nka *et al*., 2018). The pelvic diaphragm consists of internal obturator muscles, coccygeus muscle, the levator ani, the external anal sphincter, and the sacrotuberous ligament (Al-akraa, 2015). Weakness of the pelvic diaphragm muscle causes loss of support to the rectal wall and results in lateral or ventral deviation of the anus (Garnier and Giry, 2005). Perineal hernia occurs commonly in intact middle aged or old male dogs (Adeyanju *et al*., 2011). Although the etiology of perineal hernia remains unclear and controversial; congenital predispositions, muscular atrophy, hormonal imbalance, increase in intra-abdominal pressure, prostatic enlargement, and chronic constipation are proposed as the main causes. These factors can result in weakness of the pelvic diaphragm and lead to perineal hernia (Swieton *et al*., 2020; Zambelli *et al*., 2022).

Rectal diseases like rectal deviation, sacculation (dilatation of rectal wall), and diverticulum (mucosal protrusion through seromuscular layer of rectal wall) may play a role in perineal

herniation (Vnuk *et al*., 2006). Perineal hernia can a consequence of constipation, and occasionally urinary problem related to retroflection of the bladder (Adeyanju *et al*., 2011). Clinical signs associated with perineal hernia include constipation, obstipation, tenesmus, dyschezia, fecal incontinence, altered tail carriage, and skin ulceration (Yoon and Jeong, 2010; Heo *et al*., 2013). The definitive diagnosis of a perineal hernia is based on clinical signs and findings of a weakened pelvic diaphragm during a digital rectal examination and other diagnostic test include abdominal radiography and ultrasonography, which may help in evaluating the size of the prostate and determining whether the bladder is displaced into the hernia sac (Gill and Barstad, 2018).

Pelvic and abdominal contents may protrude between pelvic diaphragm and the rectum (Vnuk *et al*., 2006). Hernial contents typically includes bladder, prostate, intestine, and retroperitoneal (pelvic fat) structures that can also be displaced through the weakened pelvic diaphragm. Less commonly bladder retroflexes through the pelvic diaphragm and causes dysuria and leads to urinary obstruction, with rapid deterioration of the animal's condition (Garnier and Giry, 2005). Unilateral perineal hernia is more common (59%) than bilateral one which accounts for 41% of total herniation (Kashyap *et al*., 2017; Nka *et al*., 2018).

Surgical reconstruction of the pelvic diaphragm is commonly recommended for the correction of perianal hernia and several surgeries have been suggested, including a simple appositional technique, vascularized muscle flap transposition (internal obturator muscle, superficial gluteal muscle, semitendinosus muscle), and the use of implants or graft techniques (synthetic mesh, porcine small intestinal submucosa, canine small intestinal submucosa, autologous tunica vaginalis) (Guérios *et al*., 2017; Kitessa and Terefe, 2022). Although it has been considered the standard surgical treatment for perineal herniorrhaphy, the efficacy of internal obturator muscle transposition (IOMT) varies with 36% of recurrence rate after perineal herniorrhaphy in dogs (Swieton *et al*., 2020). Choosing an appropriate technique for herniorrhaphy is very important to prevent recurrence and restore normal defecation (Yoon and Jeong, 2010).

Postoperative complications associated with perineal herniorrhaphy like incisional infections, recurrence, rectal prolapses, fecal and urinary incontinence, sciatic nerve injury have been

reported (Yoon and Jeong, 2010). To reduce the risk of recurrence associated with prostate gland hyperplasia, castration is recommended to reduce the level of testosterone and relaxin hormone which is responsible for prostate gland enlargement (Kashyap *et al*., 2017). Rectal sacculation and diverticulum may cause straining to expel feces and may lead to disruption of the perineal hernia repair and needs sacculectomy (Pekcan *et al*., 2010). This particular case report aims to describe the surgical correction and management of perineal hernia along with orchiectomy in dog.

Case history and clinical examination: A twelve year-old, 20kg, local breed intact male dog was presented to Professor Feseha G/AB Veterinary Teaching Hospital with unilateral swelling on the right side of the perineal region (Figure 7A). The owner complained that the dog frequently strain without defecation, vomiting, has decreased feed intake, and the swelling is gradually increasing since 2 months of observation. Clinical examination revealed unilateral and reducible swelling on the perineum, mild dehydration, depression, tenesmus, and feces stuffed in the anal orifice. Based on history and physical examination the case was diagnosed as perineal hernia and it was decided to be corrected by herniorrhaphy.

Preoperative preparations: As there may be infection due to normal physiological derangement of gastrointestinal tract, procaine penicillin (24mg/kg) and dihydrostreptomycin sulphate (30mg/kg) (Pen &Strep® Norbrook UK) I.M was administered, impacted fecal was removed, and sent home to withheld feed and water overnight. On the second day, the patient was admitted to the hospital for surgical correction of the perineal hernia, penstrip of the same dose was administered through I.M one hour before surgery. Additionally, rectal enema was done to evacuate feces and to reduce the possibility of surgical site contamination during surgery. The dog was sedated and purse string suture pattern was placed on the anus to prevent fecal contamination of the surgical site. The hair on the surgical region was shaved and washed with water and antiseptics, and then scrubbed with iodine tincture. Then, the dog was placed on the surgical table in sternal recumbency with the tail diverted to the left direction. The operation table was tilted slightly in head-down position and the surgical area was scrubbed and the prepared site was draped. Intravenous lactated ringer solution was given at the rate of 10 ml/kg/hr with a calculated drop rate of 1drop/sec to restore and maintain the blood pressure.

Anesthesia and animal control: The dog was received diazepam (manufactured by Intas pharmaceutical Ltd., India) @ 0.3mg/kg I.M for sedation and later after the surgical site was aseptically prepared, the dog was placed on surgical table on sternal recumbency and induction anesthesia, the mixture of ketamine hydrochloride (Ketamine Hydrochloride manufactured by Germany) @ 5 mg/kg and diazepam (manufactured by Intas pharmaceutical Ltd., India) @ 0.15 mg/kg was administered through slow IV line and for maintenance anaesthesia, half of the induction dose was used during surgery.

Surgical treatments: Curved dorsoventral skin incision (Figure 7B) was made over the herniated mass and the subcutaneous and supportive tissue was bluntly dissected and retracted for further investigation of the hernia sac. Then the hernial sac was carefully incised to avoid sudden cuts to the underlying hernial contents. The hernia contents (retroperitoneal fat) (Figure 7C) was observed and gently replaced into the pelvic peritoneal space and hernial ring was carefully identified for closure. Accordingly, internal obturator muscle, weak coccygeus and levator ani muscles, external anal sphincter, and sacrotuberous ligament were identified. Before ring closure, herniated retroperitoneal fat was partially amputated and reduced. Then, a series of simple interrupted sutures were placed in two lines (suture line running medio-laterally and dorso-ventrally). In such a way, the external anal sphincter was dorsally apposed to levator ani, coccygeal muscles, sacrotuberous ligament by using medio-laterally running suture. Then ventral defect was closed by apposing internal obturator muscle to the external anal sphincter, levator ani, and coccygeus muscle with suture running dorso-ventrally by using # 2-0 polyglycolic acid 910 (vicryl) (Figure 7D).

The presence of suture gab was assessed with palpation and further sutures were placed accordingly. Subcutaneous tissue was sutured with continuous suture pattern by using polyglycolic acid 910 (vicryl) # 2-0 and the skin was closed subcuticularly with the same suture material. Then the surgical site was scrubbed with tincture iodine 1% solution and purse-string suture was removed from the anal opening (Figure 7E). Finally, the position of the patient was changed to dorsal recumbency for routine prescrotal castration procedure. Recovery from anaesthesia was uneventful and unilateral perineal hernia in dogs was successfully managed by perineal herniorrhaphy along with castration.

Figure 8: Perineal herniorrhaphy and its outcome in dog

A) Clinical presentation of the dog **B)** Curved skin incision **C)** Herniated retroperitoneal fat **D)** Closure of the hernial ring on progress **E)** After skin closure and release of anal purse string suture **F)** The dog after two months

Post-operative care and outcome: Systemic antibiotics Procaine penicillin G(24mg/kg) and dihydrostreptomycin sulfate (30mg/kg) (pen &strep® Northbrook UK) that was administered on the first day was continued for five days while tramadol (tramadol hydrochloride, Sakar health care Pvt. Ltd, Gujarat, India) @ 2mg/kg I.M given for three days. The surgical areas were cleaned and scrubbed with diluted iodine solution and the owner was advised to clean the wound once daily by using salt solution. The owners were also told to provide soft feed with laxative to prevent straining and to subjectively assess surgical site infection, pain, and discomfort, defecation, and urination behaviors. One week after the operation, the owner reported that the dog no longer experienced tenesmus. On the second week of operation, the dog was eating, drinking, and behaving normally without any sign of complications. One month after surgery,

surgical site was healed uneventfully and the dog was found normal with no sign of recurrence after two months (figure 7F).

Discussion

Perineal hernia is a protrusion of the pelvic organs into the ischiorectal fossa following degeneration of pelvic diaphragm muscles (Al-akraa, 2015). The perineal hernia usually occurs between the levator ani and coccygeus muscles and the external anal sphincter (Heo *et al*., 2013). This agrees with the present case in which the hernial content (retroperitoneal fat) was observed to protrude into the perineal region between the above mentioned structures (the levator ani and coccygeus muscles and the external anal sphincter) and internal obturator muscles due to weakness and atrophy of the muscles (levator ani and coccygeus muscles).

Although the etiology of perineal hernia remains controversial; weakening of the levator ani muscle is believed to play a significant role in the formation of perineal hernia (Swieton *et al*., 2020; Zambelli *et al*., 2022). Perineal hernia repair procedures include standard herniorrhaphy, transposition of the internal obturator muscle, semitendinosus muscle, or superficial gluteal muscle, autogenous fascia lata graft, porcine dermal collagen use, and polyproplene mesh (Pekcan *et al*., 2010). Here in the present case standard herniorrhaphy was used in the closure of the pelvic diaphragm by suturing the muscle of the pelvic diaphragm which is similar to surgical repair technique used by (Al-akraa, 2015) and (Yoon and Jeong, 2010).

In present case, the excess fat of the hernial content (retroperitoneal fat) was amputated and repositioned. Then starting dorsally, the external anal sphincter muscle was joined to the levator ani muscle, the coccygeus muscle, and sacrotuberous ligament while the internal obturator muscle was apposed to the external anal sphincter, levator ani, and coccygeus muscle, and to the sacrotuberous ligament to close ventral defect with simple interrupted pattern using # 2-0 polyglycolic acid 910 (vicryl). The dorsolateral sutures were needed to incorporate the sacrotuberous ligament since the levator ani and coccygeal muscles are often severely atrophied. This technique is similarly used by (Al-akraa, 2015), (Garnier and Giry, 2005), (Pekcan *et al*., 2010) to suture the muscle of the pelvic diaphragm.

Perineal hernia occurs commonly in intact middle aged or old male dogs and it occurs rarely in females (Adeyanju *et al.*, 2011). This is in agreement with the case on hand that the dog was intact and aged (12 years old). In intact male dogs, gonadal hormone imbalance is suspected, to cause perineal hernia and the proposed imbalances include excess estrogen secretion by the aging testis, causing relaxation of the pelvic diaphragm, and deficiency of androgenic steroids, causing weakening of the pelvic diaphragmatic musculature (Shahar *et al.*, 1996). Additionally, excessive relaxin synthesized in hypertrophied prostate glands can cause local muscle atrophy and soften connective tissue (Gill and Barstad, 2018). Therefore, orchiectomy helps in reducing hormones (Kashyap *et al.*, 2017). For this reason, in the present case castration was performed along with herniorrhaphy to reduce the risk of hernial recurrence. Similar surgical management methods were also used by (Pekcan *et al.*, 2010), (Martin *et al.*, 2012), (Al-akraa, 2015), (Swieton *et al.*, 2020) in perineal hernial repair.

According to (Pekcan *et al.*, 2010) surgical correction of rectal diverticulum or large sacculation should be carried out to prevent the recurrence of perineal hernia, and (Kitessa and Terefe, 2022) also performed rectal sacculectomy along with perineal hernia as it cause straining to expel feces and may lead to disruption of the perineal hernia repair. But in present case the anal gland and sac was not too large to cause disruption of the hernial repair. Colopexy (to prevent recurrent rectal prolapse), vasopexy (to prevent displacement of the bladder or prostate), cystopexy (to maintain the urinary bladder in its normal location, thereby preventing bladder retroflection) are performed as additional procedures along with pelvic diaphragm reconstruction in bilateral perineal hernia (Heo *et al.*, 2013; Gill and Barstad, 2018). In current unilateral perineal hernia, the above listed surgical fixation was not done as retroflection of bladder and rectal prolapse was not present.

Muscle appositional techniques (standard herniorrhaphy) used in closure of the pelvic diaphragm is associated with success rate 94.6% in 26 cases (Al-akraa, 2015). Recurrence of perineal hernia due to tension in the ventral area of the perineal diaphragm is the most commonly encountered complication after standard herniorrhaphy and it is reported to recur in 10 to 46% of cases (Heo *et al.*, 2013). Postoperative complications associated with herniorrhaphy include incisional infections, recurrence, rectal prolapses, fecal and urinary incontinence, sciatic nerve injury

(Yoon and Jeong, 2010). In the present case the dog was fully recovered without postoperative complications and inflammation which can be attributed to postoperative antimicrobial therapy and management. Surgical reconstruction of the pelvic diaphragm is commonly recommended for the correction of perineal hernia along with castration, and postoperative care and antimicrobial therapy.

3.4.3. Umbilical hernia in calf

Abstract

Umbilical hernia is a discontinuation of the abdominal wall at the umbilicus which results in protrusion of abdominal contents. It is a common anatomical defect in calves, foal, pups, and piglets. Umbilical hernia can occur either congenitally which is seen in the first few weeks of birth or acquired which is seen soon after birth or at any age. The objectives of the present study were to show surgical correction techniques and outcomes of umbilical hernia in the calf. Presently, a five-month old Holstein Friesian crossbred female calf was presented with a history of swelling on the umbilical area which was noticed few days after birth. The clinical examination showed reducible and painless swelling on the ventral abdomen around the umbilicus. The swelling was diagnosed as umbilical hernia and it was corrected by herniorrhaphy in dorsolateral recumbence under sedation and local analgesia. Surgical treatment was made by making elliptical skin incisions that included excessive skin overlaying the hernial sac for better apposition and adding external support to ring closure. The loop of small intestine was replaced and the hernial ring was apposed with overlapping mattress suture. Subcutaneous tissue was closed with continuous suture pattern while the skin was apposed with interrupted horizontal mattress. Finally, the calf was fully recovered without any complication and the skin suture was removed on the 12^{th} day of the operation.

Key Words: *Calf, Congenital, Herniorrhaphy, Umbilical hernia*

INTRODUCTION

Hernia is defined as the protrusion or displacement of an organ, part of an organ, or tissue outside the abdominal cavity via a natural or abnormal opening in the abdominal wall visible from the outside of an animal's body (Kilic *et al.*, 2005; Ranabhat, 2021). Most hernias are caused either due to congenital or acquired and commonly results in intestinal herniation in many animal species including cattle, sheep, goat, horse, and donkey (Moscuzza *et al.*, 2014). Hernia can be categorized into various parts based on the anatomical site of herniation. These classifications include ventral or lateral abdominal hernia, diaphragmatic, inguinal or scrotal, umbilical, perennial, pelvic, and femoral hernia (Hassen *et al.*, 2017; Farman *et al.*, 2018). Based on the level of contamination umbilical hernia can also be divided into three categories as uncomplicated umbilical hernia, umbilical hernia with subcutaneous infections (abscess), and umbilical hernia with umbilical remnant infection (Farman *et al.*, 2018).

Umbilical hernia is a break in the abdominal wall at the umbilicus that causes abdominal contents to protrude into the hernial sac formed by the skin and the surrounding connective tissue to proliferate (Iqbal *et al.*, 2019). The size of the swelling may be small at birth and gradually enlarges with age (Rahman, 2020). Umbilical hernias are the most common congenital defects in cattle of all breeds, particularly in calves of Holstein Friesian cattle (Moscuzza *et al.*, 2014). Besides, heritable factors, inflammation and sepsis of the umbilicus, post-calving infection of umbilical infection, breakage of the umbilicus during manual traction of the fetus, external trauma to the umbilicus, excessive straining, cloned calves, hypoplasia of the abdominal musculature, and multiple births are considered the predisposing factors for umbilical hernia (Farman *et al.*, 2018).

The risk of umbilical infection is increased in a cesarean section due to the clamping of the umbilical cord, retarding the normal retraction of the umbilical structures and allowing for bacterial contamination of the umbilical region (Moscuzza *et al.*, 2014). Acquired umbilical hernias are observed after a few weeks of birth as a result of inappropriate birth handling, such as unsafe manual cutting of the cord instead of allowing it to break on its own, cutting the cord too close to the body wall, or using excessive force during parturition (Hassen *et al.*, 2017). Types of

organ herniated depend on the size of the hernial ring, affected body part, and duration of hernias (Haile *et al.*, 2017).

Simple umbilical hernias are non-painful and reducible when palpated (Rahman, 2020). Adhesions may develop between the abdominal structures and sac, and the herniated contents may also become very voluminous. so that they cannot be reduced or strangled and endanger the animal's life (Haile *et al.*, 2017). Umbilical hernia should be differentially diagnosed from other swellings such as heamatoma, abscess, cyst, cellulitis, and neoplasm (Doijode, 2019). hernia is primarily diagnosed based on its historical background, hernial region palpation, and the exploratory puncture of the swelling (Farman *et al.*, 2018). Clinically, most hernias are characterized by the presence of a palpable mass of abdominal organs in the sac, hernial ring, and absence of pain during palpation (VanCamp, 2021).

Hernias can be treated in a variety of ways, including reduction and retention bandages, blister application, or injection of irritant solutions close to the hernial ring after reduction, and mattress sutures at the base of the hernial sac (Hassen *et al.*, 2017). The most common method used by veterinarians is open herniorrhaphy, which involves making an incision in the hernial sac to expose the hernial ring before pushing the abdominal components back into the cavity and suturing; closed herniorrhaphy differs from the open method in that it involves pushing the hernia back into the abdomen before suturing (Ranabhat, 2021; VanCamp, 2021).

Large hernial rings and weakened abdominal wall can be repaired by combining propylene or polyester meshes in the closure (Moustafa and Hamed, 2020; Rahman, 2020). The mesh is positioned beneath the muscle and is used to treat complex abdominal hernias with extensive tension produced along the incision of the abdominal muscle. Postoperative complications like stitch abscess, hemorrhage, peritonitis, inflammatory swelling, recurrence, and muscular weakness at the site of operation may be observed following umbilical herniorrhaphy (Sutradhar *et al.*, 2009; Nath *et al.*, 2016). The current case aims to describe the surgical management of umbilical hernia in calf.

Case history and clinical examinations: A five-months-old Holstein Friesian crossbred calf was presented to Agriculture Professor Feseha G/AB Veterinary Teaching Hospital, with a history of swelling at the umbilical region after birth and the size of the swelling has been increasing gradually. As her calving history indicated she was born normally without the owner's assistance. The appetite and water intake were reported to be normal. The clinical examination revealed reducible swelling that dangles around the umbilicus (Figure 8A). Up on palpation, it was non–painful with reducible hernial content and the size of the hernial ring was three fingers in breadth. The calf was in good body condition and clinical parameters like rectal temperature (38.3°C), heart rate (74beat/min), and respiratory rate (30/min) were recorded and found within the normal range. Based on history and clinical examination, it was diagnosed as umbilical hernia and decided to be treated by herniorrhaphy.

Pre-operative preparation, anesthesia and control of the calf: The calf was stabilized in lateral recumbence and the surgical site (umbilical area) was aseptically prepared by clipping, shaving, washing with water, and Salvon® (Cetrimide 3% and Chlorhexidine gluconate 0.5% solution) (Figure 8A). Diazepam (Sedil® 2%; Square Pharmaceuticals, Bangladesh) at a dose rate of 0.4 mg/kg was administered intramuscularly to sedate the patient. Later, the surgical site was locally desensitized by infiltrating local anesthesia was followed using lidocaine hydrochloride (2% lidocaine hydrochloride 20mg/ml which is manufactured by Jeil pharma. Co. Ltd., Korea) at dose rate of 10mg/kg in ring block around the hernial mass (Figure 8B). Then the surgical field was scrubbed with diluted iodine solution and the calf was placed in dorsal recumbency and sterile drapes were put on the field and fixed with towel clamps. Once the calf was sedated and controlled in dorsal recumbency, an intravenous catheter was placed and intravenous fluids lactated ringer solution at the rate of 1 drop/sec was given throughout the surgery.

Surgical correction and treatment: Following proper physical and chemical restraining and aseptic preparation of the surgical site, the site was re scrubbed and the calf was kept in the appropriate direction for the next surgical procedure. An elliptical incision was made through the skin on each side of the swelling and joined at each end. The skin was detached from the subcutaneous tissue by blunt dissection and extra skin was trimmed off, and the incision was

extended to the abdominal muscle and peritoneum. Bleeding was arrested by mopping and hemostatic forceps. After careful dissection of skin and subcutaneous tissue, hernial contents were pushed inside by digital pressure and the hernial sac was incised just above the ring, and segments of the intestine and omentum were seen as hernial contents. Then the hernial ring was exposed and examined to confirm the absence of adhesions and the hernial content was gently replaced back in to the abdominal cavity (Figure 8C).

Then, to facilitate the healing process, about 1 cm dissection was performed eccentrically around the edge of the hernial ring to create a fresh wound. Then, the herniorrhaphy was done by placing a series of overlapping mattress (Vest- Over-Pant) sutures through its edges using synthetic sterile absorbable using polyglycolic acid 910 (vicryl) 1 (Figure 8D). After all the sutures have been inserted, the ends of the suture are pulled in opposite directions, knotted tight starting from the centre towards the end of the commissure. Then, the subcutaneous tissue was sutured by using polyglycolic acid 910 (vicryl) 2-0 and the skin was closed with an interrupted horizontal mattress using silk 2-0 size (Figure 8E) after removing the excess portion of skin. Finally, the surgical site was cleaned and dressed properly with tincture- iodine 1%, and the herniorrhaphy was successfully completed and the calf was admitted home.

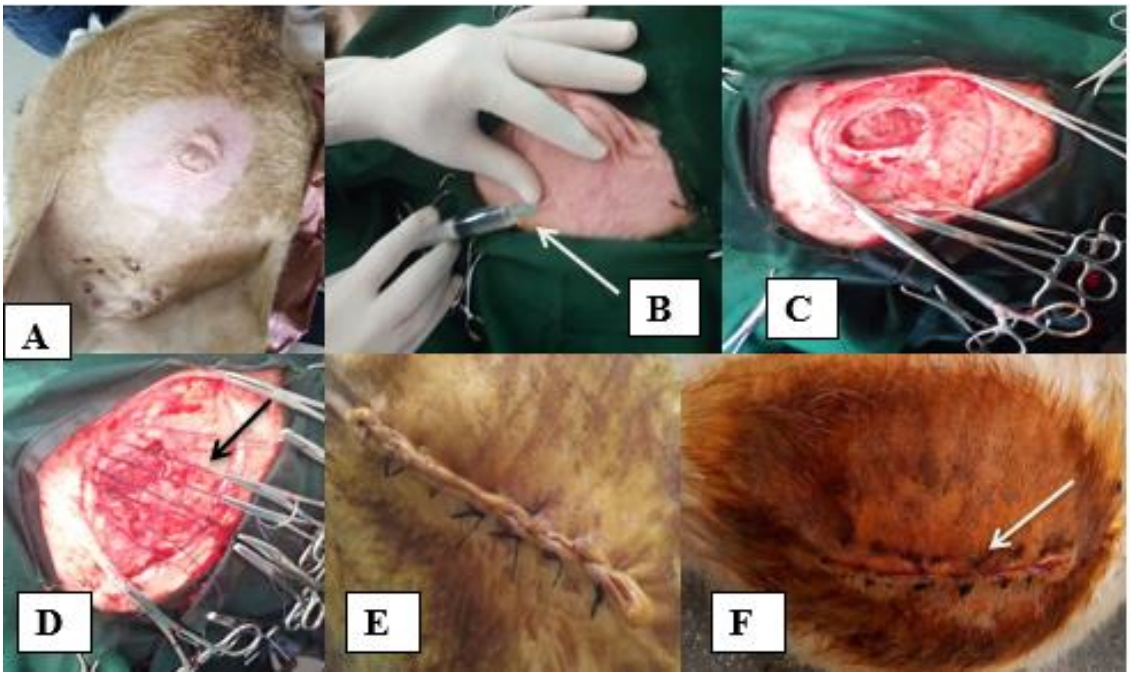

Figure 9: Surgical management of umbilical hernia in calf and its outcome

A) After site preparation **B)** Ring block anesthesia around the hernial mass **C)** After hernial ring was refreshed **D)** Preplaced Vest- Over-Pant sutures **E)** After skin suture **F)** On 12th day after skin suture removal

Post-operative care: The calf was treated medically with Procaine penicillin G (24mg/kg) and dihydrostreptomycin sulphate (30mg/kg) (Pen &Strep® Norbrook UK) I.M for three post operation days and diclofenac sodium was also administered I.M for three days to relieve post-operative pain. Surgical site antiseptic dressing was done properly by cleaning and dressing with a 1% tincture-iodine solution for three postoperative days. The owner was advised to avoid feeding green grass and large volume of drinking water for few days to prevent excessive pressure on the suture line. He was also advised to restrict the calf from exercise for the first 10 days. The wound was completely healed without any complication and the skin suture was removed on 12thday (Figure 8F). On the continued follow up after skin suture removal, the calf was in normal health and improved in body condition.

Discussion: The umbilicus in newborn calves consists of the urachus (a tube that attaches the fetal bladder to the placental sac) and the remnants of the umbilical vessels that carries blood between the fetus and the dam (Abbas *et al.*, 2021). In normal calving, after the rupture of the umbilical cord, the urachus, arteries, and umbilical vein normally shrink until only tiny remnants remain and retract into the abdomen, thus preventing environmental contamination (Moscuzza *et al.*, 2014). If the area remains open due to faulty closure of the umbilical opening at birth or hypoplasia of the abdomen muscles, it causes protrusion of abdominal contents through the opening resulting in an umbilical hernia (Doijode, 2019). The present case also agrees with this in that the abdominal contents protruded through the umbilical opening after birth.

Congenital umbilical hernias are of concern for heritability, although many umbilical hernias are secondary to umbilical sepsis (Sutradhar *et al.*, 2009). It is thought an autosomal dominant gene is one of the causes to increased incidence of umbilical hernias on farms using new sires. However, a single recessive gene may also be a risk factor for the development of congenital umbilical hernias (VanCamp, 2021). Some systemic conditions like umbilical abscess, diarrhea,

and constipation can cause an increase in the abdominal pressure and results in hernia (Doijode, 2019). Other causes include excessive traction on an oversized fetus or cutting the umbilical cord too close to the abdominal wall (Abbas *et al*., 2021). In the current case, the reason for this umbilical hernia might be congenital as this was seen after birth with no evidence of any injury.

Umbilical hernia can be managed using different treatment options depending on the size of the hernial ring (Fesseha, 2020d). Small hernias which are less than 5cm or two fingers width have a greater chance to resolve without surgical intervention by clamping, counter irritation, safety pins, trans fixation sutures and commercially available rubber bands (Iqbal *et al*., 2019). If the hernial ring is more than one finger in size or remains for more than two to three weeks, surgical intervention is recommended and open method is opted of for older calves herniorrhaphy (Sutradhar *et al*., 2009). This finding agrees with the current case in that the hernial ring was palpated and the size of the hernial ring was found to be the size of three fingers and the hernia persists for five months and was corrected by surgical interventions.

A part of the small intestine and omentum was found as hernial content without adhesion and it was gently repositioned back into the abdominal cavity through the umbilical ring manually. This is also similar to case report by (Ranabhat, 2021) in which parts of small intestines was found as hernial contents. Several approaches can be used to close the hernia opening, including the vest-over-pants method, vertical mattress, and simple apposition (Kilic *et al*., 2005). This is in agreement with the present case in which overlapping mattress (Vest- Over-Pant) was used to close the hernial ring after the edges were freshened.

In the present case, the umbilical hernial ring was closed by using absorbable suture material which agrees with (Abdin-Bey and Ramadan, 2001) finding which stated that absorbable suture materials can be used in cases where the size of the hernial ring is not more than four fingers or if the hernia is less than eight-months old. Generally speaking, surgical management along with administration of antibiotic and analgesic medication is effective for successful management of umbilical hernia in calves and in the present case umbilical hernia was successfully managed without any complication and recurrence.

3.5. Dehorning in Cow

Abstract

Dehorning is a routine husbandry procedure in many commercial dairy and beef production enterprises which involves the removal of the horn and horn-producing tissue. The present case report was conducted to indicate the techniques used in the management of horn fracture and its outcome in a cow. Seven years old local breed cow was presented with a history of horn fracture following fighting with other animals. Clinical examination revealed head shaking, complete fracture of left horn at a distal area with serous to purulent blood tinged discharge. Depending on the history and clinical examination, the case was diagnosed as unilateral complete horn fracture and decided to perform dehorning. After aseptic preparation of the surgical site, stabilization of the animal and locally desensitization of the incision area; a circular skin incision around the base of the left horn was performed for successful removal of the corium. Then the skin flap was closed by using the silk 2-0 size in simple interrupted suture pattern. Then the area was properly bandaged with gauze bandages and properly secured to the normal horn and admitted home. Finally, the cow was successfully recovered after effective post-operative conservative management.

Key words: *Cow, Dehorning, Horn fracture*

INTRODUCTION

Horns are the pairs of hard, bonelike, permanent growths projecting from the heads of cattle and it consists of dense keratin and elongates from its base (Jiregna and Abebe, 2019; Knierim *et al.*, 2009). Horns are produced from a separate centre of ossification (corium), the site of cells located at the junction of horn and the skin (Jesse *et al.*, 2016). In calves up to about 2 months of age, the horn bud is free-floating in the skin layer above the skull and as the calf grows older (≥6 months), the horn bud attaches to the skull, more precisely to the periosteum of the frontal bone overlying the frontal sinus (Knierim *et al.*, 2009; Espinoza *et al.*, 2020). After the horn bud attaches to the skull, the horn core becomes a bony extension of the skull, and around the age of

7 - 8 months the hollow centre of the horn core opens directly into the frontal sinuses of the skull (Irrgang, 2012).

Dehorning is a routine husbandry procedure in many commercial dairy and beef production enterprises which involves the removal of the horn and horn-producing tissue in genetically horned breeds of cattle (Espinoza *et al.*, 2020). Disbudding, which involves the removal or destruction of the horn-producing corium in young calves is preferred over dehorning if it can be performed prior to two weeks of age and may be performed as early as the first 24 hours of life (Rowth, 2014). Dehorning is considered a more painful procedure with longer healing time, as the horns are removed after the horn-producing corium has attached to the skull (Guidelines, 2019; Mainau *et al.*, 2012). If dehorning is not properly done by removing the whole corium, then horns can start re-growing (Jesse *et al.*, 2016).

Dehorning of cattle is practiced to reduce the risk for the stock persons during routine management practices, veterinary examinations and to reduce injuries to herd mates during aggressive interactions and competition at the feeding gate (Cozzi *et al.*, 2020). Dehorning is achieved using a variety of implements such as a dehorning knife, embryotomy wire, saws (hand and electric), guillotine shears and scoop dehorners (Group, 2013). Horn amputation is the most common method of dehorning following attachment of the horn-bud to the skull, typically undertaken after 2 months of age. This method has been shown to cause significant pain which persists for 7 to 9 h following dehorning in the absence of anaesthesia or analgesia (Espinoza *et al.*, 2020).

In adult cattle or cattle older than 6 months, the bony horn core has to be cut and different tools for the amputation of the horn are available like keystone dehorner (a guillotine type instrument with detachable blades, which has long handles and is capable of chopping off the largest cow horns and most bull horns); electrical saw or wire saw (Irrgang, 2012). The bone tissue should be cut and not just crushed or cracked and so to avoid crushing or cracking the bones of the skull, wire saws should usually be used when mature animals are dehorned (Knierim *et al.*, 2009). Ideally, disbudding/dehorning should occur prior to six weeks of age and after this age the horn bud attaches to the skull, and the procedure is much more invasive (Binversie *et al.*, 2014).

Dehorning often results in trauma to the frontal sinuses in older cattle and this in turn increases the risk of infection, excessive bleeding and prolonged wound healing (Group, 2013). Damage from horns can also result in reduced milk production and growth and complications associated with open wounds such as infection or fly strike (Faulkner and Weary, 2000). Amputation dehorning has been found to induce abnormal behaviours (increased frequency of head shaking, ear and tail flicking, reduced lying, decreased grazing and rumination) that persist for up to 8 hrs following dehorning. It can also affect physiological parameters and is characterized by elevated cortisol response up to 9 hrs of dehorning which are likely pain indicators (Espinoza *et al*., 2013).

The cornual nerve (cranial nerve V), a branch of the trigeminal nerve, provides sensation to the skin of the horn/horn bud region, and injection of a local anesthetic around the cornual nerve as it traverses the frontal crest desensitizes the area (Jiregna and Abebe, 2019). Local anesthesia as a cornual nerve block with lidocaine, virtually eliminates pain during dehorning and eliminates cortisol response (Armando and Buitrago, 2016). The significant trauma associated with dehorning in adult cattle increases the risk of infection and excessive blood loss and wounds may take 4-6 weeks or longer to fully heal (Group, 2013).

Dehorning leaves an open hole that reaches down into the sinuses of the head and this open hole into the head should be covered with gauze or cotton to keep out debris (e.g. dust, hay or insects) and dehorned cattle should also be protected from rain and dust storms until the open sinus has completely healed, which will take about 4 to 8 weeks (Irrgang, 2012). If a sinusitis occurs, the sinus must be flushed with disinfectants and to avoid infections caused by flies and maggots in the wound, dehorning should be done under cool and dry weather conditions (Knierim *et al*., 2009). This case report is aimed to describe the surgical management of complete horn fracture in cow.

Case History and Clinical Examination: Seven-years-old local breed cow with a medium body condition was brought to Professor Feseha G/AB Veterinary Teaching Hospital (VTH) after 48 hours of horn fracture. As the owner complained that he bought the cow before two weeks and the cow was newly mixed to the herds that other animals are fighting with her and the left horn

was broken. The owner also complained of pus discharge from the left horn following trauma while rubbing against inanimate objects.

Up on clinical examination, the horn length of the cow was around 15cm and it was completely broken at its distal third and there was oozing of serous to purulent and blood tinged discharge through the wound as shown in (Figure 9A). The cow frequently tries to mutilate her horn by rubbing against inanimate object and the broken horn was contaminated with dusts and foreign material. There was pain sensation with signs of vocalization on palpation of the wound area. Further vital organ parameters examination such as respiratory rate (28breaths/minute), heart rate (64beats/minute), and rectal temperature (38 °C) was revealed within physiological limits. Finally, based on the history and clinical findings, the case was diagnosed as complete horn fracture and decided to be managed through surgical unilateral horn amputation.

Pre-operative preparation of the cow: The cow was restrained adequately and the circumferential skin surface of the base of the left horn was aseptically prepared by washing with water and soap to remove any dirty (foreign material) and coagulated blood from the surgical site. Then the hair on the base of the horn was shaved, and cleansed with diluted chlorhexidine solution. Finally, the area was scrubbed with tincture-iodine solution and dried before readying for dehorning.

Anesthesia and Animal Control: The cow was controlled in a standing position in the well-built crush with rope on the neck that was fixed to the crush poll and held by the owner. Analgesia at the surgical site was achieved by injecting lidocaine (2% lidocaine hydrochloride, Jeil pharm. co. Ltd., Korea), loaded in a syringe with 18 gauge, 1-1.5 inch needle, 5 ml is injected halfway between the lateral canthus of the eye and base of the horn just under the shaft of frontal crest to block the cornual branch of zygomaticotemporal nerve in a fanlike manner. Then sensitivity of the skin around the horn bud was tested after 5 minutes of injection by pricking with needle before starting the incision.

Surgical treatment: After holding the cow's head in appropriate position, circular incision of skin around the base of the left horn was done for complete removal of corium. Then active

bleeding was occluded by tamponade and ligation of major vessels. Then after full layer skin incision the edges of the skin were bluntly detached from the bone by using sharp scissors while rostral traction was applied to form skin flap. Then after adequately exposing the proximal part of the bone and horn base, the base of the horn below the corium was cut with dehorning wire (figure 9B) and the subcutaneous tissues hanging the detached horn were cut by scissor and removed with the corium.

After complete removal of horn, the surgical area was cleaned with sterile gauze soaked into antiseptic solution to remove coagulated blood and scrubbed with tincture iodine 1%. Then the cavity was flushed with normal saline solution to remove any blood clots in the frontal sinus and then the skin edges were apposed by using suture silk 2-0 in simple interrupted suture pattern (Figure 9C). After skin closure surgical area was cleaned with an antiseptic solution and dried before applying topical wound spray which serves as antibiotic and flies repellant. Finally, the area was appropriately bandaged with several gauze folds that fixed at the position by tying to a healthy horn and base of the ear on the affected side and the cow was admitted home (Figure 9D).

Figure 10: Surgical management of horn fracture in local breed cow

A) Horn fracture at distal third **B)** Dehorning with dehorning wire **C)** Skin edge closure **D)** Gauze bandage after closure

Post-operative care and outcome: Procaine penicillin @ 24 mg/kg and dihydrostreptomycin sulphate @ 30 mg/kg (Pen & Strep® Norbrook, UK) was administered intramuscularly for five days and diclofenac sodium was administered intramuscularly for three days post operation. Wound spray (cyclo spray, Hangzhou Ruijiang Chemical Co., Ltd., China) was applied to surgical area and then properly bandaged with gauze. Bandaging was continued only for the first two days of operation. Then, wound site was cleaned every 2 days with iodine solution till healing became complete. The owner was also advised to supplement good nutrition to facilitate wound healing. Subsequently, the wound was healed uneventfully and skin sutures were removed on three weeks of operation.

Discussion

Dehorning is a routine husbandry procedure that involves the removal of the horn and horn-producing tissue in many commercial dairy and beef production enterprises (Jiregna and Abebe, 2019; Espinoza *et al.*, 2020). The cattle without horns are safer and easier to handle, cause less injury especially during transport and require less space (Armando and Buitrago, 2016). The current dehorning of cow was done for treatment of complete distal horn fracture. This was in agreement with findings of (Cozzi *et al.*, 2020; Mulatu *et al.*, 2021) which reports that dehorning is performed as therapeutic procedure in cattle with several horn affections such as avulsion, empyema, fracture, horn cancer, and septic horn maggot wounds.

Enough time should be allowed for the anaesthetic to numb the area before starting disbudding or dehorning and efficacy of the anaesthesia should always be controlled before disbudding/ dehorning by testing sensitivity of the skin around the horn bud by pricking (Knierim *et al.*, 2009). This finding totally agrees with the present case in that the cornual nerve was blocked by using 2% lidocaine and sensitivity was also checked before commencing the surgery. But in the current case, diclofenac sodium was administered intramuscularly to prevent post-operative pain

and distress. Fractures at the lower third can be treated by conservative method or by radical (amputation by flap) methods (Jiregna and Abebe, 2019; Prasad *et al.*, 2016). But the conservative treatment takes long time to heal relative to surgical treatments.

Local anaesthetic injection around the cornual nerve desensitizes horn bud region and virtually eliminates pain during dehorning (Jiregna and Abebe, 2019). However local anaesthesia does not provide an adequate post-operative pain relief and administration of nonsteroidal anti-inflammatories (NSAIDs), is a good option to prolong postoperative analgesia (Armando and Buitrago, 2016). According to (Reddy *et al.*, 2017) xylazine hydrochloride can be used to sedate the animals in addition to local anaesthetic injection. But in the present case xylazine was ignored because of the animal was docile and can be managed manually and so no need to sedation in addition to cornual nerve desensitization by lidocaine hydrochloride

After completion of amputation, the skin flap was closed with simple interrupted suture pattern using silk 2-0 size. This agrees with (Mulatu *et al.*, 2021) who had been used the same pattern. But disagree with (Jiregna and Abebe, 2019), (Reddy *et al.*, 2017) who had been used horizontal mattress to close skin flap. In present case as there was sufficient skin flap to close, so no need to use high tension suture pattern. In the present case, wound was managed by cleaning with 1% iodine tincture and by applying topical antibiotic (cyclo spray) and parenteral antibiotics. Additionally, diclofenac sodium was administered to prevent postoperative pain. This agrees with previous case report of Mulatu *et al.*, 2021 who used antiseptic solution (1% Povidone iodine solution), applied topical antibiotic (cyclo spray) for dressing the wound and administration of fortified procaine penicillin 220,000 IU/kg for better wound healing.

Dehorning procedure may cause several post- operative complications including bleeding, fly contamination and bacterial infections which occurs mostly following invasive procedures that expose the sinus cavity to the external contaminated environment (Irrgang, 2012). Therefore, appropriate post-operative management is very important to prevent these problems (Jiregna and Abebe,2019). This agrees with the case on hand in that the wound was dressed every 2 days in addition to administration of antibiotic and analgesic to reduce the post-operative bacterial

contamination and alleviate associated pain. As a result, there were no such postoperative complications encountered during the follow-up period.

3.6. Tenotomy in Kid

Abstract

Congenital flexor tendon contracture in forelimbs is one of the most prevalent musculoskeletal abnormalities in neonates. This alteration can present in mild, moderate and severe forms. Treatment of the mild and moderate condition can be by pharmacological therapy and physiotherapy; however, a severe case become complex and cause difficulty in feeding and thus requires surgical intervention. The objective of the present report is to describe the case of a 5 day old kid with severe contracture of the forelimb flexor tendons and its surgical correction by tenotomy of the forelimb tendons. After aseptic preparation and stabilization of the kid, skin incision was made between metacarpal and fetlock joint on the medial side of the limb along the line of superficial digital flexor tendon. Then, the superficial digital flexor tendon was exteriorized and tenotomy was carried out on both forelimbs. The surgical treatment along with post-operative support with bamboo splint and bandage was resulted in successfully recovery of the kid.

Key words: *Flexural deformity, kid, Tenotomy*

INTRODUCTION

Limb pathologies in cattle constitute one of the most important economic concerns of producers as they negatively influence their productive and reproductive performance (Fernández-Salas *et al.*, 2021). Tendons are an essential element of the muscle-tendon unit of limbs, they serve as a junction between the muscle fibers and the bone surface and have the function of giving mobility to the bone (Wavreille and Fontaine, 2009). New born calves, lambs and foals are affected with congenital deformity of musculoskeletal system mostly related to flexor and extensor tendon of fetlock and pastern joints (Rashmi *et al.*, 2018). Among these congenital deformity, knuckling

(contracture of the flexor tendons of fore limb) is commonly presented with bilateral affection, and it can rarely develops after birth (Kumar *et al*., 2017).

Congenital contracted flexor tendon is a common defect in cattle and occurs in numerous breeds (Anderson *et al*., 2008). Etiological origin of contracted tendon includes inherited factors, in utero malpositioning, overcrowding caused by size of the fetus relative to the dam. But some authors put their speculation as this condition could be caused by autosomal recessive gene (Rashmi *et al*., 2018). Congenital flexural limb deformities can cause structural abnormalities in the affected limbs due to shortening of superficial and deep digital flexor tendon and associated muscles at fetlock and pastern region. This can lead to loss of weight bearing, lameness, and a restricted range of motion (Sato *et al*., 2020).

Flexural deformities are classified as mild (if the calves are able to walk on their feet but the heels do not contact the ground), moderate (if the dorsal aspect of the hoof breaks over a vertical plane perpendicular to the ground), or severe (if the affected animals are forced to walk on the dorsal aspect of the pastern, fetlock, or carpus) (Anderson *et al*., 2008). In cattle, metacarpophalangeal flexural deformities in the forelimbs are the most common type of congenital limb deformity (Fernández-Salas *et al*., 2021). Successful treatment of flexural deformities depends on the site and severity of the deformity and on the appropriate use of medical, physical, and possible surgical therapy (Kumar *et al*., 2017).

Treatment of congenital flexural deformities should be initiated soon after recognition of the problem, with the severity of the condition dictating how treatment should proceed and animals with severe metacarpophalangeal flexural deformities may require surgical treatment. These surgical procedures generally treat the limbs by sequentially transecting the superficial digital flexor tendons, deep digital flexor tendons and suspensory ligament until the deformity is resolved (Pentecost *et al*., 2016). The number of transected tendons is determined intraoperatively, and generally, transection of the superficial digital flexor tendons and deep digital flexor tendons is not sufficient to improve flexion in calves with severe metacarpophalangeal flexural deformities (Sato *et al*., 2020). The current report describes a

congenital bilateral flexor tendon deformity on the forelimb of a lamb that was successfully corrected with a tenotomy along with postoperative splint stabilization.

Case history and clinical examination: A five-day-old kid was brought to Addis Ababa University College of Veterinary Medicine and Agriculture Professor Feseha G/AB Veterinary Teaching Hospital with bilateral forelimb flexural deformity and movement difficulty due to knuckling (Figure 10A). According to the owner, the kid was born with this defect before five days, and the kid was unable to suckle her mother unless assisted**.** Clinical examination revealed that; the kid was reluctant to move, both forelimbs were curved, and unable to bear weight (Figure 10A). The curved limb was attempted to be manually extended but failed. Aside from these congenital deformities, the kid was healthy, and all physical parameters were within physiological limits. Based on history and clinical signs the cases were diagnosed as contracted flexor tendon deformity and decided for surgical correction through tenotomy.

Pre-operative preparation, anesthesia and animal control: The kid's forelimb was aseptically prepared by washing with soap and water, shaving, and scrubbing. Then the kid was placed on the surgical table in lateral recumbency and the surgical site was draped (Figure 10B). The kid was stabilized both physically and chemically. Chemically, the kid was sedated with diazepam (manufactured by Intas pharmaceutical Ltd., India) @ 0.1mg/Kg I.V. Then intravenous analgesia was carried out at the medial side of the metacarpophalangeal joint by using 2ml lidocaine hydrochloride (2% lidocaine hydrochloride, Jeil pharma. Co.Ltd. Korea) and syringe after applying tourniquet. Physically, the kid was handled by assistants in lateral recumbence.

Surgical correction and treatment: following aseptic preparation and stabilization of the kid, about 8cm long incision made between metacarpal and fetlock joint on the medial side of the limb along the line of superficial digital flexor tendon. Then the skin was retracted with Allis forceps and a fascia was carefully incised to identify and avoid damage to the lateral palmar digital nerve and palmar metacarpal arteries and veins. The tendon capsule was incised and the superficial digital flexor tendons were identified. Then the tendon was elevated by placing forceps under the tendon to facilitate tenotomy (Figure 10C). Then, tenotomy was done on both medial and lateral superficial tendons and manual pressure was applied to extend the limb. Since

the extension was found sufficient after tenotomy, deep digital flexor tendon was left intact. Then skin was sutured with simple interrupted suture pattern by using vicryl 2-0 size. The same procedure and technique was applied on the other leg. After skin closure surgical sites were cleaned with iodine solution and dried before applying splint. Finally, both limbs were stabilized with bamboo splint and bandage (Figure 10D) and kept for a few days.

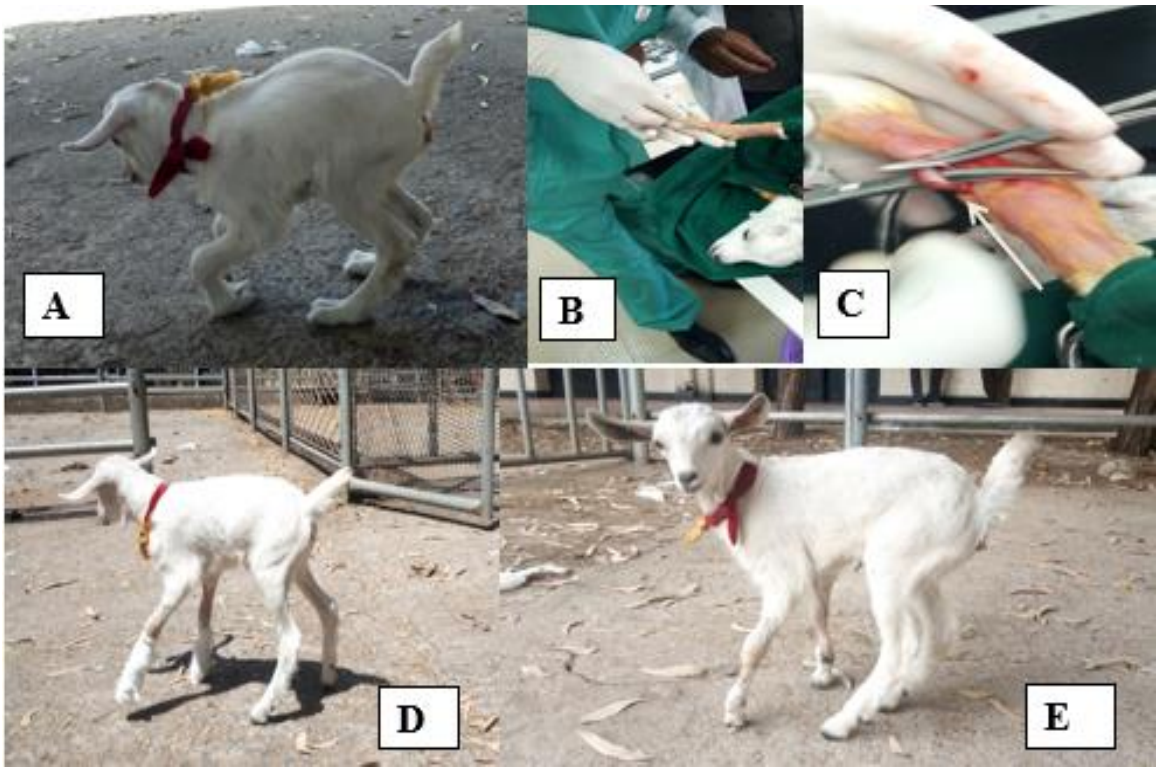

Figure 11: Surgical management of tenotomy and its outcome in kid

A) Knuckling in bilateral forelimbs of kid **B**) Administering local anesthetic with 2% lidocaine hydrochloride **C**) Exteriorized superficial digital flexor tendon **D**) After stabilization with bamboo splint **E**) The kid able to bear weight after splint removal

Post-operative care and outcome: After surgery was completed the kid was administered with antibiotic oxytetracycline 10mg/kg I.M for five consecutive days and anti-inflammatory dexamethasone @ 0.2 mg/kg for three days. In addition the kid was regularly inspected for any discomfort and progress of the operation. The owner was advised to give support during suckling and to check for any discomfort during exercise in the compound. The status of the surgical site

was checked and cleaned every 5 days till complete wound healing. The splint and bandage application was continued by changing with every 5 days until 25th days of operation (till both legs were able to bear weight). During the follow up period, the kid's locomotion was showed gradual improvement and totally restored on 45th day and the kid was found in good body condition (Figure 10E).

Discussion

Congenital deformity affecting flexor and extensor tendons is mostly observed in calves, lambs and foals, and results in knuckling of fetlock (Fernández-Salas *et al*., 2021). The current contracted flexural deformity of the kid was observed after birth which was in agreement with (Rashmi *et al*., 2018), (Sato *et al*., 2020) who reported common affection of claves with contracted flexural tendon deformity within the first few days of birth. The degree of knuckling may vary from mild flection of knee to severe flection of fetlock and pastern joints (Anderson *et al*., 2008). In concurrent with (Rashmi *et al*., 2018), the kid in the present case showed knuckling in both the forelimbs and was unable to bear weight, and severely affected.

A complete physical examination should be warranted to rule out other diseases before initiating surgical treatment for contracted tendon because contracted tendon always occurs with other abnormalities like cleft palate, arthrogryposis and dwarfism (Fazili *et al*., 2014). But in the present case the kid was not affected by other congenital abnormalities. Most flexural deformity of limbs can be corrected with non-surgical treatment but surgical method is routinely used for correction of more severe deformity or after the failure of other treatment methods (Rashmi *et al*., 2018). But in the current case, surgical interference was chosen as non-surgical treatment was not possible due to the severity of the condition and the failure of manual extension.

The primary goal of surgery is to release tension in the restrictive musculotendinous unit, allowing for greater stretch and a more normal range of motion of the affected limb (Auer, 2006). Accordingly, the fore limbs affected with flexural deformity started to bear weight immediately after the surgical correction with supportive splint and bandage application. According to (Anderson *et al*., 2008) treatment of flexural deformity should be initiated

immediately after recognition of the problem and when animals gets older, the contracted tissue becomes less responsive to treatment. This is also in agreement with the current management of superficial flexor tendon tenotomy that was conducted early.

The surgical technique used in this report was effective and caused a minimum invasion of tissues adjacent to the tendons. In bovines, (Steiner *et al.*, 2014) have mentioned the "Z" incision of affected tendons to elongate and appose end to end and to promote rapid recovery. However, it is important to consider that tendons are a highly innervated structure and post-surgical pain could be greater. Splints and bandages were used to align the limb so that the kid's tight tendons and ligaments could stretch and for restoring the limb to normal alignment and orientation. Similarly, (Fernández-Salas *et al.*, 2021) were also used splint and bandage as external fixations to restore the limb to normal alignment and orientation.

According to (Anderson *et al.*, 2008), (Adams and Santschi, 2015), even though its mechanism is not explained, intravenous administration of oxytetracycline was suggested as useful in treating animals with congenital flexural deformities to relax flexor musculotendon units. But, currently, similar drug was administered intramuscularly only to prevent post-operative infection. Additionally, nonsteroidal anti-inflammatory drug dexamethasone was administered to control pain associated with the stretching of the contracted soft tissue caused by splints and weight bearing. Post-operative complication like muscle, tendon atrophy, adhesion, and decubital wound can occur depending on the adopted surgical techniques and method of immobilization (Rashmi *et al.*, 2018). But, in case on hand, the kid was recovered without any complications. This was achieved due to good post-operative in addition to undertaking tenotomy. Generally, the success of superficial digital flexor tendon tenotomy depends on postoperative management provided.

3.7. Surgical Correction and Managements of Prolapse in Domestic Animals

3.7.1. Cervico-vaginal prolapses in cow

Abstract

Genital prolapses are mostly seen in ruminants, especially cattle, buffalo, sheep, and goats, and may be defined as protrusion of one or more pelvic structures. Cervix and Vaginal prolapse is common disorder of ruminants normally in late gestation and possibly after parturition. The present case report is aimed to describe surgical management of cervico vaginal prolapse on six years old Holstein Friesian cow having parturition prior to ten hours which was attended at the farmer's home. As the owner claimed, the condition occurred following parturition that he had assisted by pulling the calf manually and the prolapsed mass was increased in length and size gradually with time. On clinical examination, it was noticed that the prolapsed mass was found to be hanging with exposed vaginal wall and the mass was contaminated with fecal material. Depending on history and clinical examination, the case was diagnosed as second degree cervico vaginal prolapse and decided to manually replace to its normal position and put stay sutures. After stabilizing and managing the animal on standing position, the prolapsed mass was washed and cleaned with lukewarm water to remove the debris and salt solution was topically applied on the prolapsed mass to reduce edema before replacing in to normal position. Finally after replacing with manual gentle pushing, two horizontal mattress sutures was placed on vulvar lips by passing the suture materials (silk 2-0 sizes) through the tube of plastic from both sides to reduce pressure of suture material on the vulva. The suture material was removed on 6th days and no recurrence was reported.

Key words: *Cervico vaginal prolapse, Cow, Parturition, Stay suture*

INTRODUCTION

Genital prolapses are mostly seen in ruminants especially cattle, buffalo, sheep, goat and may be defined as coming out of one or more of the pelvic structures (uterus, vagina, and bladder,) from

their normal anatomical position through the genital (vaginal) opening (Kim, 2001). Uterine prolapse involves the complete prolapse of the uterus, vagina and cervix and the condition almost always occurs within the first 24 hours of calving and rarely reported afterwards (Firdaus *et al*., 2016). The cervico-vaginal prolapse is an emergency reproductive condition in dairy cows that commonly occur in pluriparous cattle with recurrence in subsequent gestations (Fesseha and Ayele, 2020).

Cervix and Vaginal Prolapse (CVP) is one of the most common reproductive disorders of ruminants in late gestation and may occasionally occur during the postpartum period (Dugassa and Bekele, 2021). CVP usually involve protrusion of the portion of the floor, lateral walls and roof of vagina through vulva along with the cervix and uterus, moving caudally and it adversely affects reproductive and productive performance by affecting conception rate, calving interval, and postpartum return to estrus (Balamurugan *et al*., 2018). Vaginal prolapses occur before calving during late pregnancy and most cases occur a few weeks prior to calving, when the increased size of the uterus puts pressure in the abdomen and the ligaments in the pelvic region begin to relax (Thomas, 2019).

Based on the severity, symptoms and duration of the condition genital prolapse has been classified into four grades. In second-degree prolapse, the vagina and often the bladder continuously protrude through the vulva. Grade I prolapse involves only vaginal mucus membrane that occurs only when the cow is recumbent and retracted back on standing (Fesseha and Kidanemariam, 2020). With grade II prolapse there is continuous exposure of vagina in any posture and often the bladder protrude through the vulva whereas in grade III prolapse there is complete eversion of vaginal mucosa, cervix, bladder and part of uterus with straining. There may be regular forceful contractions, and animal attempts to urinate but fails (Bhattacharyya *et al*., 2012; Sachan *et al*., 2019). In grade IV prolapse there was prolapse of genital organs along with part of rectum with extensive tissue necrosis caused by chronic exposure (Fesseha and Ayele, 2020).

The main reason for genital prolapse is a relaxation of the pelvic ligaments and surrounding soft tissue structures due to alterations in the hormonal profile during the last trimester of pregnancy

(Fesseha and Ayele, 2020). CVP is mediated by increased circulating concentrations of estrogens and relaxin during last trimester of pregnancy leading to relaxation and softening of the pelvic ligaments and it is aggravated by the continuous straining by the dam and the incomplete dilation of cervix (Balamurugan *et al*., 2018). Cervico-vaginal prolapse should be treated as early as possible, delay of which might lead to necrosis and lacerations of the prolapsed mass (Anil *et al*., 2017).

Early intervention and treatment of prolapsed uterine tissue is very useful in ensuring a good case prognosis and the survival of the cow where as poor or delayed intervention may result in contamination resulting in infection, bleeding, shock, gangrene formation and even death (Firdaus *et al*., 2016). The management and correction of a prolapsed cervico- vagina usually involves washing of the prolapsed organ, disinfection and reduction in size of edematous with glycerol, repositioning of organ and application of stay sutures (Dugassa and Bekele, 2021). Successful surgical management of cervico-vaginal prolapse can be achieved by retention suture or Buhner's suture technique (Kim, 2001). This case report aimed to describe a management techniques and surgical manipulation of cervico-vaginal prolapsed case in Holstein Friesian cow.

Case history and clinical examination: A six years old Holstein Friesian cow was attended at the farmer's home for treatment of prolapsed mass which was noticed by the farmer after 10 hrs of parturition. The owner informed that he have assisted the cow during delivery and the vagina starts to prolapse a soon she gave birth. He tried to manage the case by itself to help the cow and was unsuccessful. The client also informed as the cow was straining, off feed and water and the prolapsed mass was increased in length and size gradually with time. On clinical examination, it was found that the cow was in standing position and prolapsed mass was hanging with exposed vaginal wall and the mass was contaminated with fecal material (figure 11A).

The cow was showing signs of discomfort, restlessness, continuous straining, and intermittent prolapse of cervix and vagina was evident. The cow was also seen having difficulty in passing urine due to the prolapse. The physiological parameters (rectal temperature, respiration rate and heart rate) were slightly elevated. The cow was examined carefully, where found to have a prolapsed vagina and cervix without additional organs such as bladder. Depending on history and

thorough examination it was diagnosed as it was the second-degree cervico-vaginal prolapse and decided to manually replace to its normal position and put stay sutures on the vagina to prevent recurrence.

Preoperative preparations, anesthesia and animal control: The cow was restrained in standing position and caudal epidural anesthesia was performed at first intercoccygeal space by using 2% lidocaine hydrochloride (2% lidocaine hydrochloride, jeil pharma. co. Ltd., Korea) at the dose rate of 1ml/100 kg body weight to reduce straining. The prolapsed mass was lifted upward above the level of ischial arch to release the retained urine and then the mass was washed and cleaned with lukewarm water to remove the debris (Figure 11B). Then salt solution was topically applied on the prolapsed mass to aids with the reduction of edema.

Surgical correction and management: After aseptic preparation of the prolapsed mass properly, the prolapsed mass was lifted up with both hands and repositioned inside the pelvic cavity by gentle pushing with fisted hand simultaneously. Stay suture (figure 11C) was applied on the vulva to prevent the recurrence of the prolapse by using non absorbable suture materials by supporting with sterilized plastic tube materials after cutting in to appropriate size. The material was kept parallel to the vulva apart from vagina keeping some space for easy urination and two horizontal mattress sutures was placed on the vulvar lips by passing the suture materials (silk 2-0 sizes) through the tube of plastic from both sides to reduce pressure of suture material on the vulva (Figure 11C).

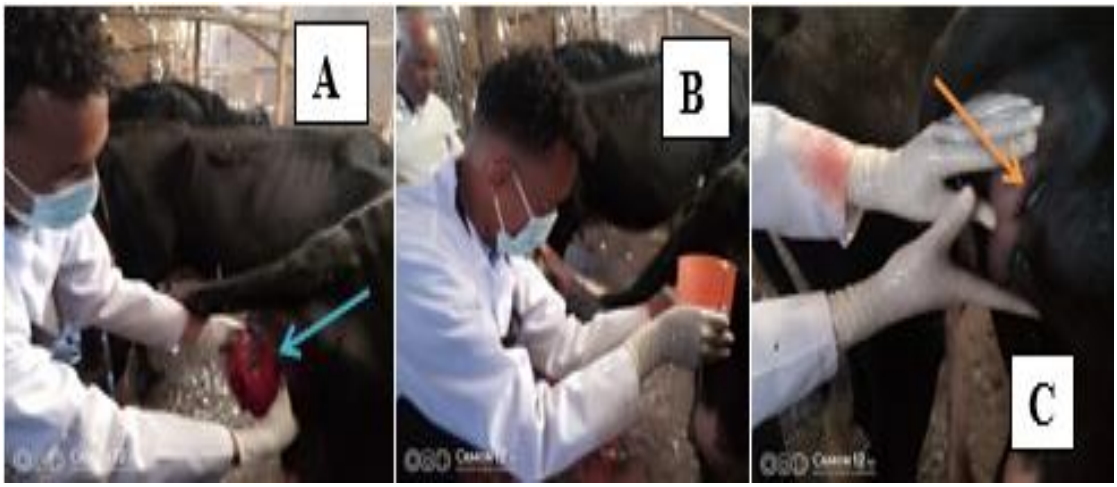

Figure 12: Cervico vaginal prolapse and its management in cow

A) Presentation of the cow with prolapse **B)** Washing the prolapsed mass with lukewarm water and salt solution **C)** After the prolapsed mass was replaced and stay sutures was placed

Post-operative care and outcome: Penicillin (24mg/kg) and dihydrostreptomycin sulphate (30mg/kg) (Pen &Strep® Norbrook UK) was given intramuscularly for 3 consecutive days. Additional anti-inflammatory drug, dexamethasone @ 0.2 mg/kg, was also administered intramuscularly for three days. The owner was advised to provide feed and well management in addition to attending and inspecting the recurrence as well as any discomfort felt such as during urination. The suture material was removed on 6^{th} days of management and the cow was recovered completely without recurrence.

Discussion

Genital prolapse, including cervical and vaginal prolapse in ruminants, is considered as an urgent maternal problem that needs immediate treatment before further complications ensue (Dugassa and Bekele, 2021). Forced extraction of the calf and dystocia have been implicated as causes of prolapse in dairy and beef cattle (Fesseha and Ayele, 2020). Accordingly in present case, cervico-vaginal prolapse was resulted from the excess labor force and straining of the cow for expulsion of the fetus and the case was managed as early as possible. The current case also agrees with (Sachan *et al.*, 2019) finding which stated that cervico vaginal prolapse as the protrusion of varying parts of the vaginal wall and cervix through the vulva so that the vaginal mucosa is exposed to external environment.

Cervico vaginal prolapse can be found before or after parturition but uterine prolapse is observed only at postpartum stage (Sachan *et al.*, 2019). The present case occurs within 10hrs of parturition which was in accordance with reports of different authors (Bhattacharyya *et al.*, 2012), (Anil *et al.*, 2017) that states vaginal prolapse occurred most frequently a few hours following parturition. There is also report of prepartum cervico vaginal prolapse by (Balamurugan *et al.*, 2018). Caudal epidural anaesthesia was achieved before the replacement of prolapse to reduce straining, and desensitization of the perineum which was in agreement with (Tadesse and Mulatu, 2019), (Anil *et al.*, 2017), (Yimer *et al.*, 2016).

The prolapsed mass was lifted upward above the level of ischial arch to release the retained urine, washed with lukewarm water to remove the debris. This is in agreement with (Nayak and Samantara, 2010), (Dugassa and Bekele, 2021) which uses lukewarm water to wash the prolapsed mass. Other authors like (Fesseha and Ayele, 2020), (Fesseha and Kidanemariam, 2020), (Anil *et al.*, 2017) were used 2% potassium permanganate solution to wash the prolapsed mass which is not available in our case. Reduction of the prolapsed mass can be done with topical application of salt solution as in this case or with cold water which aids with the reduction of edema (Sendilvelan, 2017).

The objectives of the treatment of cervico-vaginal prolapse were to retain it in position and prevent recurrence of the prolapse (Yimer *et al.*, 2016). Successful surgical management of cervico-vaginal prolapse can be achieved by retention suture or Buhner's suture technique (Kim, 2001). In current case, the retention suture was placed by using available local material (plastic tube) after sterilizing and cutting of the plastic tube to support tension of suture material and keeping on external vaginal wall just bilateral to vulvar tips. Accordingly, (Tadesse and Mulatu, 2019), (Fesseha and Kidanemariam, 2020), (Yimer *et al.*, 2016) were also used purse string suture, a modified Buhner's technique, modified boot- lace suture as a retention suture to prevent recurrence. But successful management of uterine prolapse in doe was reported by (Gupta *et al.*, 2021) without using vulvar retention suture.

In the present case report, Buhner's technique was not applied due to lack of the tape and its needle, rather the retention suture used proved to be very effective in both preventing recurrence of the prolapsed mass and protecting the vulva from suture material pressure. Therefore this stay suture is recommended as an alternative technique, particularly in developing countries where farmers cannot afford repeated costly treatment of their livestock. It has also advantage of sufficient space (between the suture knot and the ventral vulvar commissure) for easy urination, no need to make and sew the incisions above and below the vulva.

Generally, early intervention and treatment of genital prolapsed cases is useful in ensuring a better case prognosis and cow survival, while poor or delayed treatment may result in complications. In this surgical case report, correction and management of cervico-vaginal

prolapse were effectively addressed by washing, cleaning, and retracting back to the pelvic cavity and putting stay sutures combined with bilateral configuration of sterile synthetic plastic strip material to the vulvar lips for a short period of time to prevent recurrence. So I strongly recommend as the case should have to be managed early as soon as possible and using of stay sutures possibly by using nearly available materials to support suture materials and to prevent recurrence.

3.7.2. Rectal prolapse in jenny

Abstract

Rectal prolapse is a protrusion or eversion of the rectal mucous membrane from the anus. A four years old female jenny was presented to Donkey Sanctuary Veterinary Clinic with a history of prolapsed mass hanging from of anal region from last two days with signs of straining and difficulty to defecate. On clinical examination, it was found that there was congested mucous membrane, soiling with dirt, ulceration and some deadly tissues on the protruded rectum and frequent straining. After thorough examination and clinical findings, the case was diagnosed as rectal prolapse and it was found that will be Type II rectal prolapse with spasmodic colic and tenesmus. The prolapsed rectal mass was washed with diluted solution of chlorhexidine and glycerine jelly was applied after injection of adequate dose of lidocaine in to caudal epidural space. After preparing aseptically, the prolapsed mass was gently reduced to the original position without resection of the part. Stay suture was applied with purse string suture by using silk 2-0 size to retain the prolapsed mass in to the pelvic cavity. Finally on fifth days of post operation the stay suture was removed and the jenny was recovered uneventfully.

Keywords: Jenny, Prolapse, Purse String, Rectum

INTRODUCTION

Rectal prolapse occurs when the layers of the rectal wall protrude through the anal opening to the outside environment (Abubakar *et al.*, 2010). Depending on the number of layers involved, it can be classified as partial (incomplete) or complete (Indra *et al.*, 2019). It's incomplete when only

the rectal mucosa or a small portion of the rectum's circumference is everted, and it's complete when two or all three of the rectum's layers, or the entire circumference, are everted (Furo and Anderson, 2010). It is also divided into four types: type I involves only the rectal mucosa and submucosa protruding through the anal sphincter; type II involves the full thickness prolapse of the entire rectal ampulla or a portion of it; type III involves the inclusion of part of the small colon intussuscepted in the rectum without being projected by the anus; and type IV involves intussusception of the peritoneal rectum and part of the smaller colon by the anus, which is more common in females affected by dystocic births (Abarca, 2021).

Rectal prolapse may occur in animals of any age, breed, or sex (Allu *et al*., 2020). The direct cause of the rectal prolapse is increased abdominal pressure and weakening of the anal sphincter as well as anal tissues (Grudzień *et al*., 2018). Rectal prolapse may occur following any disease that causes tenesmus, including diarrhea, rectal neoplasia, severe enteritis and parasitism or it can occur following elevations in intra-abdominal pressure during parturition or coughing (Patel *et al*., 2016). Predisposing factors to rectal prolapse includes constipation, diarrhea/dysentery, parasitism, water shortage, administration of medicines that cause edema of the rectal mucosa, direct trauma to the rectum, coughing, rapid growth, variable temperature, tail docking, neoplasia of the rectum or distal colon, urolithiasis, urethral obstruction, cystitis, parturition, genetic disposition, mycotoxins, lactation, and dystocia (Njoku *et al*., 2014).

Diagnosis of rectal prolapse can be made based on history, physical examination, and clinical symptoms and if the prolapse is diagnosed early, protruding tissue may be short and prolapsed mucosa will appear bright-red and no ulceration whereas in long-term rectal prolapse, the rectal will appear longer and the mucosa will appear as red or black accompanied by ulceration or necrotic (Indra *et al*., 2019). The most common clinical signs are difficulty in defecation, proctitis, inability to control pelvic muscles, and severe pain (Abarca, 2021).

The prognosis of rectal prolapse depends on the cause, prolapse level, duration of prolapse, and tissue viability and thus to achieve permanent healing, the main causes must be diagnosed and treated while chronic rectal prolapse without manual treatment usually results in a poor prognosis (Indra *et al*., 2019). The treatment of rectal prolapse depends on the recognition of the

type of prolapse, tissues involved, the size and reducibility of the prolapse and degree of tissue damage, which can only be resolved with conservative mechanical reversion (cases type I and II) or surgery (type III and IV) (Abarca, 2021). Failure to identify and treat the underlying cause of rectal prolapse often results in its unsuccessful treatment (Furo and Anderson, 2010).

A minor rectal prolapse of viable mucosa may be reduced manually and maintained by a purse-string suture on the anus for about 7 days, leaving a small orifice for stool passage and desiccants such as hypertonic solutions of glucose or granulated sugar can be applied on the prolapsed tissue to reduce the edema before reduction and placement of the purse-string suture (Furo and Anderson, 2010). If the prolapse cannot be manually reduced because of inflammation, ulceration and necrosis, then surgical amputation or resection and anastomosis of exposed tissue may be required (Patel *et al*., 2016). A nonreducible viable prolapse or a recurrent rectal prolapse that fails to respond to more conservative treatment may be treated by celiotomy and colopexy (Furo and Anderson, 2010). The current case describes the management of rectal prolapse in donkey.

Case history and clinical examinations: Four years old, local breed jenny was brought to Donkey Sanctuary Veterinary Clinic with history of prolapsed mass hanging from anal region from last two days with signs of straining and difficulty to defecate. The owner reported that whenever there was a colic episode, the mass would protrude outside and now it has become stiff and not retract inside. The owner also informed us that he bought the jenny before one month and fed it on dry feed such as wheat bran and hay. The jenny was not getting sufficient water to drink due to the dry season and rivers being far from them. On clinical examinations, the prolapsed mass of the rectum was characterized by a doughnut shaped prolapsed mucosa and sub-mucosal layers of the rectum. The colic was intermittent and the animal was showing tenesmus. There was congested mucous membrane, ulceration, and some deadly tissues on the protruded rectum (Figure 12A) and frequent straining. Physical examination reveals heart rate 76beat/min, respiratory rate 38breath/min, temperature 37.2 ^{0}C. After thorough examination and clinical findings, the case was diagnosed as rectal prolapse, and it was found to be Type II rectal prolapse with spasmodic colic and tenesmus. The case was decided to be reduced manually for repositioning to its original place and maintained by using a purse-string suture.

Animal control and anesthesia, pre-operative preparation: The animal was controlled in standing position after holding her fore leg in hanging position with the animal owner. The area supposed for injection of the epidural anesthesia was also shaved and disinfected and then 2% lidocaine hydrochloride was administered through sacro-coccygeal space to reduce straining, facilitate repositioning of the prolapse, and permit surgical manipulations. The effect of analgesia on the perineum was verified by pricking the area with a sterile needle. Then the prolapsed rectal mass was washed, with diluted solution of chlorhexidine solution and lubricated with glycerine jelly. The tail was wrapped with sterile gauze and diverted to one direction, and then the visible dirt materials of prolapsed mass were removed manually with gloved hand. The ulcerated and necrotized tissues were gently debrided, and removed and the mass was ready for retraction in to pelvic cavity.

Surgical correction and managements: After the prolapsed mass was aseptically prepared, the mass was repositioned in to the normal anatomical position manually after lubrication with liquid paraffin (Figure 12B). The protruded mass was repositioned in its normal anatomical position by hand manipulation, but when the hand was removed, the mass returned to its original position. To keep the prolapsed mass in the pelvic cavity, a non-absorbable suture material was used to place a purse string suture through the skin and deep fascia around the anus (Figure 12C). The purse string suture was placed gently as loose enough by leaving two-finger opening into the rectum of the jenny and the area was scrubbed with iodine. Complete successful management of rectal prolapse was done and no reoccurrence of the prolapse was reported.

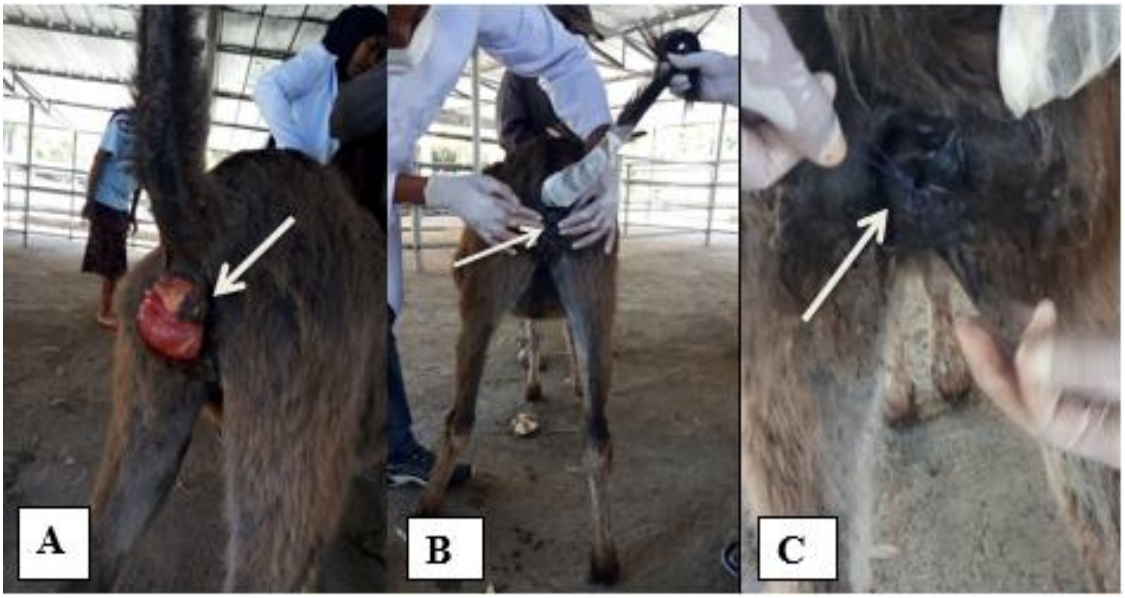

Figure 13: Rectal prolapse and its surgical management in jenny

A) Presentation and appearance of the prolapsed rectum **B)** After manipulation and replacing prolapsed organ **C)** After placement of purse string suture on anal orifice.

Post-operative care and outcome: Postoperatively, the jenny was administered penicillin (24mg/kg) and dihydrostreptomycin sulphate (30mg/kg) (Pen &Strep® Norbrook UK) I.M for three days, and flunixine meglumine was given @ 1.1 mg/kg Intravenously (IV). In addition ivermectin peros at dose rate of 1ml/50kg was given for deworming purpose. Feeding was withdrawn for 24 hrs in order to reduce possible irritation of the rectal mucosa during defecation and paraffin oil was also administered to lubricate the gastro intestinal lining to easily evacuate the faeces. The owner was advised to follow and loosen the tie during defecation, and follow the animal for any sign of discomfort associated with stay suture. The owner was also told to keep the jenny on easily digestible green fodder. On fifth days of follow up there was no sign of recurrence and the stay purse string suture was removed. Finally, the problem was completely resolved, and after one month of phone calls, the owner reported that it hadn't reoccurred.

Discussion

Rectal prolapse are common in working donkeys secondary to diarrhea, prolonged continuous coughs, high parasitic loads (Gasterophilus and Strongylus), and malnutrition, but without a predisposition related to age or sex (Abarca, 2021). The rectal prolapse in present case was caused by constipation arising from ingestion of indigestible feed materials (wheat bran and hay) with very little water supplementation which leads to violent straining of the jenny. This was in agreement with (Njoku *et al*., 2014) and (Abubakar *et al*., 2010) case reports in which violent straining due to constipation as a result of feeding dry feed and lack of sufficient water intake. Even though (Getachew *et al*., 2012) reports gasterophilosis as a main cause of rectal prolapse in working donkeys in Ethiopia, in current case no parasite was found and detected through the rectum.

In the present case, the jenny was controlled in a standing position and administered caudal epidural analgesia with 2% lidocaine hydrochloride at a dosage rate of 1ml/100Kg to reduce straining during reposition of the prolapsed mass. Similarly, lidocaine has been used in the correction of rectal prolapse in colt by (Abubakar *et al*., 2010) and in buffalo by (Kashyap *et al*., 2019). But (Patel *et al*., 2016) have used xylazine to sedate a mule while (Njoku *et al*., 2014) used xylazine and ketamine with a similar case of rectal prolapse. In the present as the prolapse was type II rectal prolapse, it can be easily replaced under epidural anesthesia and no need to sedation or general anesthesia.

The usual procedure for correction of rectal prolapse is reduction by a gentle massage, reposition and retention by application of a purse-string suture pattern (Čech *et al*., 2010). Manual reposition of anatomical position with support of external application of suture helps faster recovery of the prolapsed and to reduce chance of recurrence following straining (Allu *et al*., 2020; Kashyap *et al*., 2019). Similar method of repositioning and retention of the replaced rectum was made by a purse-string suture placed through the skin and deep fascia around the anus; using of a non-absorbable suture materials. But (Patel *et al*., 2016) have not used retention suture because colic sign and tenesmus were reduced.

According to (Khurma *et al*., 2016), surgical correction (amputation) of prolapse can be indicated when reposition is impossible (because of severe swelling or adhesions) or when perforating injuries or necrosis of the mucosal layers are present. But in present case there is no severe damage and necrosis of the prolapsed mass and thus no amputation was done. If successful symptomatic treatment is done for removing the etiological agent the reoccurrence of Type II rectal prolapse can be reduced to minimal level (Patel *et al*., 2016). This is similar with present case management that the jenny was kept on easily digestible green fodder and recovered uneventfully without recurrence.

The treatment of the case on hand was aimed to reduce the prolapsed mass as well as correcting the spasmodic colic and tenesmus. To reduce the colic flunixine meglumine was given @ 1.1 mg/kg Intravenously (IV). This is also similar with treatment adopted by (Patel *et al*., 2016) to reduce the recurrence. Generally speaking, once the condition is exists it should have to be treated soon before the prolapsed mass desiccated and contaminated with flies. So the report supports that the animal owners should have to supplement adequate water for the jenny and prevent from other predisposing factors before the problem commence in addition to requesting veterinary assistance soon.

3.7.3. Paraphimosis in bull

Abstract

An 8 years old local breed bull was presented with paraphimosis after 1 day of onset. The history stipulated as this condition was noticed following sexual excitement and mounting of an adult cow. Clinical examination revealed edematous, non-retractile protruding penis bended at the caudal part of prolapse, and narrow preputial orifice relative to penile engorgement. Then based on clinical examinations and history the case was diagnosed as paraphimosis and decided to reduce the swelling and reposition the prolapsed penis. Following physical restraining of the bull and aseptic preparation of the exposed penis and prepuce, the penis was repositioned in to preputial cavity and purse string was placed at preputial orifice to prevent the recurrence. Finally,

the suture material was removed on fifth day of management and recurrence was not reported during 7th day follow up.

Key words: *bull, paraphimosis, purse string suture*

INTRODUCTION

Paraphimosis is the inability to completely retract the penis into the preputial cavity and usually occurs after erection, after semen collection or coitus. It may occur either due to swelling of glans penis following mechanical injury or constriction of prepuce behind the glans penis or disease. This make difficult to draw the organ back through the preputial orifice (Deka, 2018). Paraphimosis is an emergency once the foreskin/sheath or penis can't return to its normal location after extension. The associated clinical signs may include difficulty or pain during urination and painful erection (Fesseha, 2020b). The clinical signs may vary depending on the duration of occurrence and the extent of constriction of the prepuce (Paul *et al*., 2020).

If paraphimosis is not managed early, it can lead to the rapid development of edema, usually within 6–24 hours of onset. This in turn impairs venous and lymphatic drainage and contributes to the formation of a large edematous cuff at the preputial ring that prevents withdrawal of the penis into the prepuce (Koch *et al*., 2015). Conditions that can affect both prepuce and penis including, trauma, infection, and neoplasia are considered as the major predisposing factors for occurrence of paraphimosis in domestic animals (Fesseha, 2020b). In dogs, paraphimosis is easily differentiated from priapism (persistent erection without sexual stimulation), congenitally shortened prepuce, congenital deformity of the os penis, or penile neoplasia or hematoma (Fesseha, 2020b).

Priapism and penile paralysis are frequently complicated by secondary paraphimosis when the prolapsed penis is traumatized and circulation is impaired and result in edema formation. Chronically protruded penis mostly become dry, fissured, and cornified (Nev and Kisani, 2015). Castration normally results in a hormonal change and subsequently the desire for sex disappears. Even though castrated animals can’t produce sperm, some animals castrated after maturity are

able to still experience erection (Nev and Kisani, 2015). Management of the paraphimosis should be directed at reducing or controlling edema formation and preventing further trauma to the exteriorized penis. It can be achieved by hydro-therapy, the application of tight bandages, and surgical replacement technique (Koch *et al.*, 2015). The current case aims to reduce the swelling and reposition the prolapsed penis.

Case history and clinical examination: An eight years old local breed bull was presented to Veterinary Teaching Hospital, with complaint of anorexia, constant bellowing and protrusion of penis which was noticed the day before admission following attempt of mounting an adult cow in the field. Up on clinical examination there was protruded oedematous penis soiled with dirt (Figure 13A) that could not be replaced into prepuce. The penis was not necrotized and has sufficient blood supply that tends to bleed during palpation. Finally, based on history and clinical findings it was diagnosed as paraphimosis and the treatment was finalized to be through surgical manipulation.

Preoperative preparations, control and anaesthesia: the bull was controlled in lateral recumbency and the legs tied with rope and held by assistants. The hair on the perpetual orifice was clipped (Figure 13B) and protruded penis was carefully scrubbed with water and salvon® (Cetrimide 3% and Chlorhexidine gluconate 0.5% solution) to remove attached debris. Then the exposed penis was washed with salt solution to reduce the edema (Figure C). Then lidocaine hydrochloride 2% was topically applied on the protruded penis to reduce the pain during retraction of penis.

Surgical correction and treatment: After meticulously cleaning the protruded penis it was lubricated with 1% tetracycline ointment for easier replacement. Then, the penis was retracted back into preputial cavity by gentle sliding in gradual manner. After replacing the prolapsed penis in to the cavity purse string suture was placed by using non absorbable suture material with silk 2-0 size to prevent recurrence (Figure 13D). Finally, the area was cleaned with diluted chlorhexidine solution and the bull was sent home.

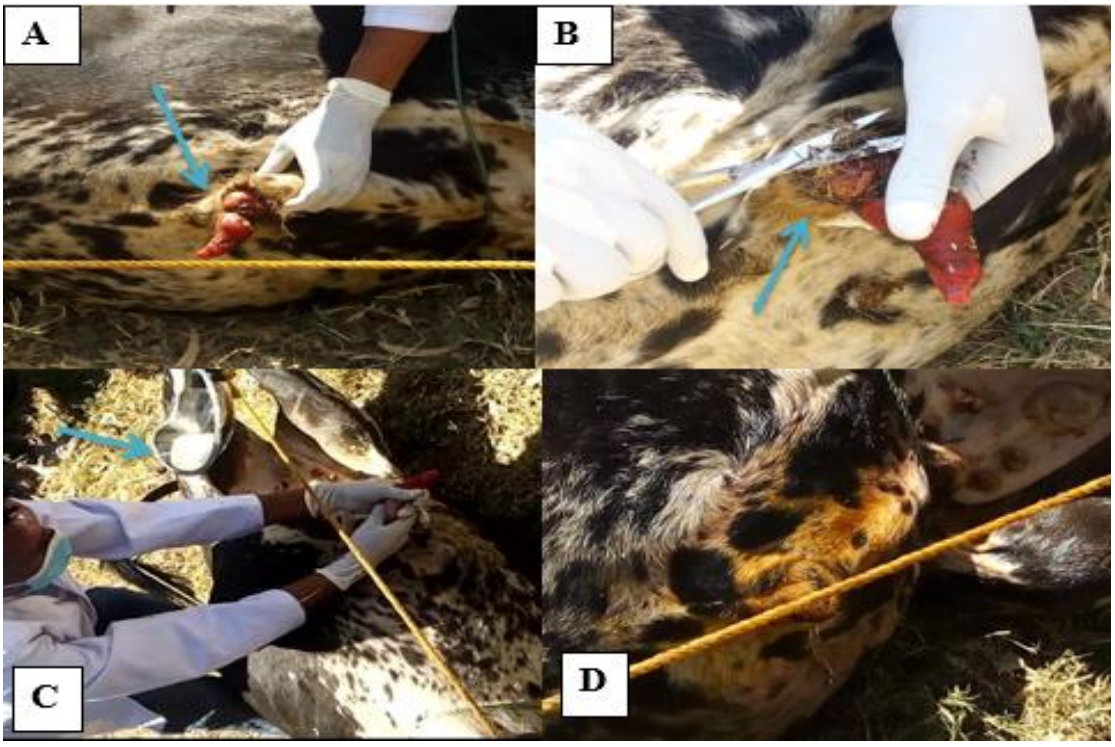

Figure 14: Paraphimosis and its management in bull

A) Protruded penis **B)** Clipping hair around the prepuce **C)** Using salt solution **D)** After the penis is replaced back to prepuce

Post-operative care and outcome: Postoperatively, the bull was received intramuscular oxytetracycline (20%) and dexamethasone @ 10mg/kg and 0.2 mg/kg, stat respectively to reduce infection and regress the swelling. Finally the purse string suture was removed on fifth day and bull was recovered completely without any complication and recurrence up on follow up on seventh day.

Discussion

Paraphimosis is defined as an inability to retract the penis into the preputial cavity. The principal goal of treating acute paraphimosis is to reduce the edema and reposition the prolapsed penis to the preputial cavity as soon as possible to prevent other complications (Ravikumar *et al.*, 2019). Accordingly, in the current case, the protruded penis was washed with water, antiseptics, and

concentrated salt solution to minimize the edema. This is in line with the previous report of (Fesseha, 2020b), (Deka, 2018), and (Adeola and Enobong, 2016) that uses similar case handling procedure to manage similar case in different domestic animals.

Paraphimosis may occur due to congenital factors like narrowness of the preputial orifice or shortened preputial sheath that predispose to paraphimosis. On the other hand acquired paraphimosis can occur due to mechanical trauma and infection (Paul *et al*., 2020). Mechanical injury to the penis and penile retractor muscles innervations can lead to paralysis of penis resulting in paraphimosis (Deka, 2018). According to reports of (Fesseha, 2020b), trauma to the penis during coitus is considered as the most common cause of paraphimosis. This agrees with the current case that occurs due to trauma to the penis during coitus.

After replacement of prolapsed penis, temporary purse string suture was applied to the preputial orifice to keep the penis in the preputial cavity (Ravikumar *et al*., 2019). This technique was similarly used for the present case to prevent recurrence. Following surgical correction, long acting oxytetracycline and dexamethasone were administered intramuscularly to prevent infection and inflammation of prepuce and penis. The report concludes that depending upon the severity of case early cleaning and repositioning of glans penis with surgical intervention along with medical therapy is required for the successful management of paraphimosis in bull.

3.8. Open Wound Management in Jenny

Abstract

Equines are important animals to the resource-poor communities in rural and urban areas of Ethiopia, providing traction power and transport services at low cost. Wounds are amongst one of the commonest health concerns to afflict working donkeys in many countries and they are highly affected by hyena bite in relation to other domestic animals. Seven years old, local breed, female donkey was presented to Addis Ababa University, Donkey sanctuary veterinary clinic, following a hyena bite over posterior body part on the upper quarter of right hind leg which was traumatized in the form of avulsion. After preparing the surgical site, the wound was thoroughly

irrigated or cleaned with normal saline to remove all the dirt, and loose and unviable flesh was trimmed. Since there was loss of part of tissue and the wound edges were irregular and wide to close, it was left as open wound to heal through second intention. Finally, the peripheral area of the wound was pasted with zinc oxide followed by regular lavage and dressing with antiseptics until nearly healed leaving the wide scar of connective tissue at the affected part.

Keywords: *Hyena Bite, Jenny, Open wound*

INTRODUCTION

Equines are important animals to the resource-poor communities in rural and urban areas of Ethiopia, providing traction power and transport services at low cost (Seid, 2018). Donkeys are commonly used to transport different products such as crops, vegetables, water, fuel wood and livestock feed and they are very important source of the income for many families (Aragaw *et al.*, 2016; Tsega *et al.*, 2016). Despite the donkeys' invaluable contributions to the people in Ethiopia the donkey is the most neglected animal and has a very low status (Tesfaye *et al.*, 2015). They are forced to work overtime in harsh environments without sufficient resources (food, veterinary treatment and shelter) and abused by beating (Bekele *et al.*, 2020).

Wounds are amongst one of the commonest health concerns to afflict working donkeys in many countries (Getnet *et al.*, 2014). Wound is defined as the disruption of the anatomic and cellular continuity of tissue caused by chemical, physical, thermal, microbial, or immunological injury to the tissue (Nagar *et al.*, 2016) and it ranges from a simple breakage in the epithelial integrity of the skin or it can be deeper, extending into subcutaneous tissue with damage to another structures such as muscles, tendons, nerves, vessels, parenchymal organs and even bone (Elnar and Ailey, 2009). Working donkey wounds include tissue damage with or without blood/exudates/pus, abscess formation, and any secondary bacterial complication (Seid and Birhan, 2019).

Overloading, lack of padding, improper load position to fall, hyena bites, and injuries inflicted by horned zebu are the most common causes of wounds in working donkeys (Tsega *et al.*, 2016). Donkeys are highly affected by hyena bites in comparison to other domestic animals due to

inadequate feed and water supply, which leads donkeys out of stoll during dusk to search for feed and water, the deep sleep of donkeys due to lethargy and grazing without a keeper (Beyene and Asfaw, 2017). Bites (lacerated wounds) will be identified by its irregular edges with the underlying tissues removed in addition to hemorrhage (Seid and Birhan, 2019). The highest hyena bite is encountered during the rainy season due to the sky's cloudy cover, making it difficult to hear the sounds that are produced by the animal; dogs deep sleep due to coldness; the predator animals don't see/hear/run and they will be hunted easily by hyena (Beyene and Asfaw, 2017).

The primary aim in the management of wounds is to achieve fast wound healing with optimal functional and aesthetically satisfactory results, which is accomplished by preventing infection and trauma, and by facilitating an environment that increases healing of the wound (Singer and Dagum, 2008). Dressings are used to improve and support the healing process by reducing contamination, oedema, or exudate and further trauma, and it optimizes moisture, temperature, pH, and gaseous exchanges at the wound site (Seid, 2018). In clinically treated wounds, surgical debridement and washing with slightly warm water were found to be valuable steps in removing granulation tissue and debris and preventing infection (Seid, 2018).

For wound management, a variety of treatment options (analgesics, antibiotics, and nonsteroidal anti-inflammatory drugs) are available, with appropriate antibiotic treatment regimens that routinely employed when the wound is at high risk of becoming infected or is known to be already infected (Seid and Birhan, 2019). Normal wound healing is a dynamic and complex process that includes bleeding, coagulation, the initiation of an acute inflammatory response to the initial injury, regeneration, migration, and proliferation of connective tissue and parenchyma cells, as well as the synthesis of extracellular matrix proteins, remodeling of new parenchyma and connective tissue, and collagen deposition (Elnar and Ailey, 2009). The case at hand aims to describe the open wound management of hyena bite in donkey.

Case history and clinical examination: Seven years old, local breed, female donkey was brought to Addis Ababa University, Donkey sanctuary veterinary clinic, following a Hyena bite over posterior body part (Figure 14A). The owner complained that the donkey was bitten by a

hyena while searching for feed at night, and he heard barking dogs and assisted the donkey in surviving. The donkey was highly traumatized in the form of an avulsion of the skin along with the dermis and fascia of the upper quarter of right hind leg and few parts of the lateral thigh. The wound edges were irregular and wide to close but almost fresh (Figure 14A). Fortunately the wound was unilateral and the donkey able to walk. The physical examination parameters were examined; the temperature (38.5ºC), respiratory rate (72breaths/min), heart rate (50beats/min) and pulse rate (52beats/min) are within normal physiological limits and the mucous membrane were also pink (normal). Depending on clinical examination, the cause was diagnosed as avulsion type of open wound due to hyena bite and was managed as open wound management.

Anesthesia and animal control, pre-operative preparation: Animal was physically restrained by lifting one of her forelimb and keeping in hanged position by the owner. After physical restraining and stabilizing of the animal in standing position, periphery of the wound was washed with water and soap and the hair surrounding the wound was shaved. The operation was conducted in standing position

Surgical correction and treatment: After preparing the surgical site, the wound was thoroughly irrigated by using normal saline in order to remove all debris or other foreign materials from a wound. Loose and devitalized tissue flesh was trimmed (Figure 14B) by using forceps, scissors, or a scalpel to remove. Since there was loss of part of tissue and it was wide to close, it was left as open wound and allowed to heal through second intention of wound healing. Finally, the peripheral area of the wound was pasted with zinc oxide (Figure 14C) and the jenny was sent home.

Figure 15: Open wound management in jenny

A) Clinical presentation of the jenny **B)** Removal of loose and devitalized tissue **C)** After the wound was cleaned, trimmed and pasted with zinc oxide

Post-operative care and outcome: postoperatively, the donkey was given penicillin (24mg/kg) and dihydrostreptomycin sulphate (30mg/kg) (Pen &Strep® Norbrook UK) I.M for 3 days. The owner was advised to keep the cleanliness of the surgical area from contamination and to inspect the overall status of the wound. The wound was regularly cleaned, lavaged with normal saline and wound periphery was frequently cleaned with antiseptics and pasted with zinc oxide cream until nearly healed leaving the narrow scar of connective tissue at the affected part after two months. In addition the owner was also advised to provide adequate feed for his donkeys in addition to building good shelter for his animal which is wild animal proof. Finally depending on the phone call communication the donkey was successfully healed after three months of management.

Discussion

A wound is an injury to the tissue caused by a chemical, physical, thermal, microbial, or immunological agent that disrupts the normal continuity of anatomic structures (Mickelson *et al*., 2017). Wounds are one of the most common health concerns to affect working donkeys in many

countries (Getnet *et al.*, 2014). Donkeys are highly affected by hyena bites in comparison to other domestic animals due to inadequate feed and water supply, which leads donkeys out of stoll during dusk to search for feed and water (Beyene and Asfaw, 2017). This in agreement with the present case on hand in which the jenny was bitten by hyena while searching for feed in the night. Similarly the study conducted by (Addis and Megra, 2017) had found that hyena bite in working donkeys were very common and sever in the same locality (Ada'a district).

Depending on the severity of the wound, hyena bites can cause severe tissue loss and even death in donkeys. The thigh and perianal muscle area were the most common anatomical sites of bite. This could be due to quantity and quality of muscles, whereas the limbs were unlikely to be bitten by a hyena. This could be due to poor muscle quality, and the limbs were raised during kicking to give the hyena no time to bite (Addis and Megra, 2017). This ideas and suggestion also agreed with this case in which the donkey was bitten at the upper thigh and perineum area which may be due to presence of different muscles. Topical administration of zinc had increased wound healing, enhanced local defense systems, decreased rates of infection and also stimulates reepithelialization of wounds (Lansdown *et al.*, 2007). Accordingly in present case, after the wound was cleaned and debrided, the wound was pasted with zinc oxide cream for the above listed purpose and to keep the wound moist and clean.

In treatment of wounds, surgical debridement and washing with slightly warm water were found to be valuable steps in removing granulation tissue and debris and minimizing infection (Seid, 2018). Debridement is the process of removing necrotic and devitalized tissue from a wound in order to create a fresh, clean wound bed for primary or delayed closure (Mickelson *et al.*, 2017). This is in agreement with the current case in that loose and devitalized tissues were trimmed to minimizing risk of infection and managed without closure. Open wounds often must be managed for several days, weeks, or even months until they can be closed or they heal by second intention (Mickelson *et al.*, 2017). The current case at hand is characterized by wide area and avulsion type of wound in which the wound was difficult to close and only decided to be managed as open wound for second intention wound healing.

The present case is in agreement with study conducted by (Beyene and Asfaw, 2017) which states that making good housing that is constructed by stonewalls that are long enough for the hyena to jump over and strong enough to be sited close to the home for assisting during attacks, good fencing, early management of the animal, allowing free time for the animal to graze, and early treatment of injured animals are among preventive measures. Accordingly, in the present case the donkey owner was advised to provide sufficient feed and give free time to graze and also to construct good fencing to prevent hyena from his animals.

3.9. Management of Subcutaneous Abscess in Cow

Abstract

An abscess is a circumscribed inflammatory lesion which consists of a purulent exudate (accumulation of pus) surrounded by a limiting membrane (the pyogenic membrane) in confined tissues or organs. As the owner complained, the cow had horn trust three weeks ago and the area was enlarged and the animal gradually lost appetite for feed and water. On palpation, the mass was hot, fluctuating, has soft consistency and exploratory aspiration reveals, yellowish, creamy pus. Based on history and clinical findings the case was diagnosed as a subcutaneous abscess and it was decided to be treated by surgical for complete evacuation of the pus. The animal was restrained in right lateral recumbency with affected leg uppermost and the surgical site was prepared aseptically. Then, about 4 cm long incision to the skin on the ventral part of the abscess, and incision was deepened into pyogenic membrane to expose pus filled cavity. A large volume of pus was drained off and the cavity was thoroughly rinsed repeatedly with gauze soaked in dilute tincture iodine (0.5%) till fresh blood oozed. Postoperatively, wound cleaning and changing gauze pack was done daily for consecutive 4 days. Besides, the animal was received penstrep (Penstrep-400 Holland) @1ml/20kg for three days and diclofenac sodium at dose rate of 2mg/kg for successive two days to control associated pain. The cow completely healed on 20th day with no signs of recurrence and the owner was so happy for the treatment provided.

Key words: *Abscess, Cow, Drainage*

INTRODUCTION

An abscess is a circumscribed inflammatory lesion which consists of a purulent exudate (accumulation of pus) surrounded by a limiting membrane (the pyogenic membrane) in confined tissues or organs (Sahoo and Ganguly, 2016). Abscesses can develop anywhere in the body and may be classified either as skin abscess or internal abscess in which internal organs such as the lungs, brain, kidneys, liver, mammary gland, tonsils, spleen and spinal cords are involved (Buba *et al*., 2020). A skin abscess, also called a boil, is a bump that appears with in or below the skin's surface and it is one of the common types of abscess that appears externally as a swollen, and pus-filled lump below the skin surface whereas internal abscesses develop inside the body, in an organ, or between the organs spaces (Al-Harbi, 2011).

Abscess can be caused by bacteria (Staphylococcus aureus, Streptococcus pyogenes, Klebsiella pneumoniae, Vibrio vulnificus and Salmonella spp), parasites (Schistosoma mansoni and Toxocara canis) or foreign substances of which bacterial infection is the most common and these pyogenic organisms gain entrance into body tissues by means of a small open wound on the skin, release their toxins which destroys intact cells and then elicit an acute inflammation at the site which is characterized by swelling, pain, redness and heat (Buba *et al*., 2020). Following entry of bacteria, the white blood cells in the body attacks the bacteria and some nearby tissue dies, leaving a hole which then filled with pus to form an abscess and the neutrophils that collect at the site also engage in lysis of dead tissues and phagocytosis of the organisms. Thick yellowish pus forms from the broken-down tissue which consists of an accumulation of dead or living bacteria, extracellular fluid and degenerate leucocytes (Hassan *et al*., 2019).

A skin abscess most commonly develops on the head, neck/dewlap, back, chest, and limbs through which the bacteria enter in circulation causing necrosis of tissue leading to migration to the area of least resistance to form the abscess (Sahoo and Ganguly, 2016). The clinical sign of an abscess depends on where it develops in the body. The main sign observed in cutaneous/skin abscess include pain in the affected area, redness, high temperature (warmth), tenderness, and swelling. However, it's more difficult to physically identify and diagnose an abscess located inside the body (Fesseha and Getachew, 2020)

A skin abscess may be confused with a cyst, haematoma, tumour, inflammation and hernia (Sahoo and Ganguly, 2016). An abscess must be differentiated from other swellings through an exploratory puncture which reveals blood in hematoma; serous fluid in cysts; synovial fluid in bursitis; nothing or content of herniated intestine. Most skin abscesses are harmless. However, there are cases in which an abscess can lead to serious, potentially life-threatening complications if left untreated. Sometimes, skin abscesses are more difficult to treat and may require surgical drainage (Kofler *et al*., 2004).

Abscesses can be treated in various ways, depending on the type of abscess and its size. The main treatment method includes antibiotics, and drainage procedure. A small skin abscess may simply shrink, or dry up, drain naturally, and disappear without any treatment (Ganguly, 2016). However, large abscesses may require to be treated surgically by creating a ventral drainage incision and thoroughly flush with clean water under moderate pressure and using a gloved finger to gently aid the removal of pus. Adjacent parenteral antibiotics can also be administered in serious abscess cases to clear the infectious agent (Sahoo and Ganguly, 2016). The present case report was aimed to describe the skin abscess management in cow.

Case history and clinical examination: A seven year old local breed cow was presented after long suffering from a large swelling on the thigh region of the left hind leg (Figure 15A). As the owner complained, the cow had horn trust three weeks ago and the area was enlarged and the animal gradually lost appetite for feed and water. Trauma was visible over and around the abscess and the animal was reluctant to move due to associated pain. On palpation, the mass was hot, fluctuating, has soft consistency. To differentiate it from other types of lesions causing swelling like hematoma, hernia, tumor, exploratory aspiration of the swollen mass was done using a 16-gauge sterile needle attached to syringe. Consequently, yellowish, creamy pus was aspirated. All physiological parameters were within the normal range. Based on history and clinical findings the case was diagnosed as a subcutaneous abscess and finally it was decided to be treated by surgical for complete evacuation of the pus. The case was handled at the owner's home as the patient couldn't go far.

Pre-operative patient preparation, control, and anesthesia: The animal was secured in right lateral recumbency with affected leg uppermost. The surgical site was prepared by washing with water and salvon® (Cetrimide 3% and Chlorhexidine gluconate 0.5% solution), and shaving hair from the swollen area (Figure 15B). Then, 2% lidocaine hydrochloride (2% lidocaine hydrochloride jeil pharma. co.Ltd, Korea) was injected directly over incision line that proposed be on the most ventral aspect of the abscess.

Surgical Treatment: Following proper restraining of the cow in lateral recumbency surgical site preparation, the accumulated pus drainage was done by making about 4 cm long incision to the skin on the ventral part of the absences. The incision was deepened into cutaneous and pyogenic membrane to expose pus filled cavity. A large volume of pus was drained off and the cavity was thoroughly rinsed repeatedly with gauze soaked in dilute tincture iodine (0.5%) till fresh blood oozed. The cavity was packed with gauze soaked in tincture iodine.

Figure 16: Management of subcutaneous abscess in cow

A) Presentation of the cow **B)** After site preparation **C)** On the 7th day of operation

Post-operative care and outcome: postoperatively, wound cleaning and changing gauze pack was done daily for consecutive 4 days. Besides, the animal was received an antibiotic named penstrep (Penstrep-400 Holland) @1ml/20kg for three days and diclofenac sodium at dose rate of 2mg/kg for successive two days to control associated pain. On 4th day iodine soaked gauze packing was terminated and the cavity flushed with iodine solution. Additionally, oxytetracycline wound spray was applied to wound area and the animal showed remarkable

improvement after 7th day of operation (Figure 15C). The owners were also advised to clean the wound daily using homemade saline solution (1 tea spoonful table salt in 1 liter water) and subjectively assessed for discomfort, unpleasant discharges, pain, and inflammation at the wound site. Fortunately, the owner reported as the cow was showed good healing progress, and completely healed on 20th day with no signs of recurrence and the owner was so happy for the treatment provided.

Discussion

An abscess is defined as a circumscribed inflammatory lesion that contains purulent exudates. Causes of abscesses formation include a breach on the skin surface or mucous membrane, trauma, non-sterilized needle used for intramuscular injection, and puncture/penetrating wounds that allow entrance of pyogenic microorganisms (Sahoo and Ganguly, 2016). This is in agreement with present case in which abscess was caused because of breach on the surface of the skin following horn thrust that allowed entrance of unidentified pyogenic bacteria. Abscesses may start in the site of injury or in compromised tissue where leukocytes accumulate and progressive necrosis of surrounding cells expands the size of abscess (Sanousi *et al.*, 1989). In present case, trauma was visible over and within the vicinity of the abscess, hence it could be speculated that the causative organism could have gained access either through haematogenous or lymphatic route.

Abscess is characterized by spontaneous abscess formation in subcutaneous and, occasionally, inter-muscular tissue and superficial lymph nodes (Sanousi *et al.*, 1989). In the present case, abscess was located subcutaneously in the thigh region following horn thrust. This result was in agreement with the reports of (Kawy *et al.*, 2015) who stated as the predilection sites of abscesses in different animals depend mainly on the way of entrance of the infection. It is also in agreement with the study of (Fesseha and Getachew, 2020) who reported that abscess was commonly located subcutaneously in different body parts of the of cattle.

Diagnosis of cutaneous and subcutaneous abscesses can be easily performed by physical examination (Hassan *et al.*, 2019). Additionally, making exploratory puncture is highly

diagnostic in all abscess cases irrespective of size, consistency, and nature of abscess (Fesseha and Getachew, 2020). These reports were found in agreement with presently used diagnostic methods used. Hence currently exploratory puncture was used to differentiate subcutaneous abscess from cyst, haematoma, tumour, and inflammation that can occur in affected body part. But deep abscesses often require imaging/ ultrasonographic examination (Hassan *et al.*, 2019).

Presently diagnosed large abscess was treated by evacuating pus from the abscess cavity along with antibacterial therapy which was followed by postoperative regular cleaning of the cavity. This is in line with treatment methods used by (Hassan *et al.*, 2019) in the treatment of superficial abscesses in dairy cow. The present case was managed successfully without evidence of recurrence and the animal showed body condition improvement within one month of treatment. From these, it can be concluded that at field or farm level, successful management of skin abscess in cattle can be attained through proper surgical drainage and appropriate postoperative care.

3.10. Exploratory Rumenotomy in Cows

Abstract

Rumenotomy is one of the most widely used surgical techniques for the diagnosis and treatment of different rumen conditions in ruminants. Six (cow 1) and nine (cow 2) years old Holstein Friesian cross breed cow was brought to Veterinary Teaching Hospital (cow 1) and attended at home (cow 2) with the history of complete anorexia, bloating, stop ruminating, and depression. The owner of cow 1 complained that the cow had accidentally ate a large amount of spoiled hay, potato, and grains from home five days prior and local veterinarian tried medical treatment of the case and the animal did not show any improvement and can't stand from a recumbent position. The owner of cow 2 was informed as the cow ate and swallowed large plastic bags with salt and left over food in the compound. On the basis of history and clinical examination, the cow was tentatively diagnosed as having rumen acidosis (case1) and foreign body impaction (case 2) and decided to conduct rumenotomy to evacuate the rumen and prevent systemic side effects (case 1) and to remove impacted foreign bodies (case 2). Paravertebral nerve block was performed by

lidocaine hydrochloride @ 1ml/ 100kg to block T13, L1 and L2 nerves, and linear infiltrations were also performed in the incision line to put in sufficient analgesia enclosing the site of incision. After the surgical site was prepared aseptically, a sharp vertical skin incision was made on the left upper flank and abdominal muscles were incised and then the rumen was gently pulled out of the incision, and the rumen wall was anchored to the skin incision by 6 stay sutures to the skin. Then the rumen wall was incised and about two-third of the fermented and foamy ruminal contents were evacuated (case 1) and large plastic bags, pieces of clothes, and ropes were removed from the rumen while small sized nails were removed from the reticulum (case2). After closure of the rumen and skin incision, the surgical site was scrubbed and diclofenac sodium was also administered to relief post-operative pain. Unfortunately, at the mid night the cow was dead after 6 hours of operation (case 1) and the cow was slaughtered after 10 day of operation (case 2).

Key words: *Cow, Foreign materials, plastic bags, Ruminal acidosis, Rumenotomy*

INTRODUCTION

Increasing population and the growth of manufacturing sectors in developing countries have increased the demand for plastic production, and in proportion to the growth of plastic industry, generation of plastic waste is also increasing (Priyanka and Dey, 2018). Cattle are known to ingest different types of indigestible materials referred to as foreign bodies, because of their indiscriminate feeding habits (Mushonga *et al.*, 2015). Ruminants reared in urban and sub-urban areas may be exposed to indigestible materials such as plastic, leather and metals which causes impaction, ultimately with interference of the flow of ingesta leading to rumen distension and the absence of defecation (Negash *et al.*, 2014).

Ingestion of indigestible foreign bodies is mainly associated with nutritional deficiencies, environmental pollution, and poor feeding management, and causes various problems in the rumen and reticulum of ruminants (Negash *et al.*, 2014). Ruminal impaction due to plastic materials is observed in all domestic and wild ruminants (Ramaswamy and Sharma, 2011). Cattle are more susceptible to the development of ruminal impaction due to plastic materials than

buffalo, sheep, and goats. This can be attributed to the prehensile nature of these animals, and they do not have highly sensitive prehensile organs such as lips and tongues that discriminate sense of taste, making them indiscriminate feeders (Priyanka and Dey, 2018). The presence of foreign materials in the ruminants fore-stomachs has gained attention in recent years as it results in reduction of production, and death of animals in some cases (Mushonga *et al.*, 2015).

Ruminants are able to consume fibrous plant material, because the fermentation processes carried out by the microorganisms found in the rumen (mainly ciliated protozoa and bacteria, but also yeasts) produce volatile fatty acids (VFAs) from complex carbohydrates and other products (such as proteins and B vitamins), and they are absorbed mainly through the ruminal wall, or later in the omasum and abomasum (Martin *et al.*, 2021). The rumen is typically described as a fermentation vat and the by-products of fermentation include methane, carbon dioxide, ammonia, and nitrate, need to be cleared (Niehaus, 2008).

Ruminal acidosis has been shown to cause consistent economic losses in dairy farming, primarily due to the reduction in milk yield, premature culling and increased losses as a result of death (Marchesini *et al.*, 2013). Anaerobic microbes in the rumen and cecum ferment carbohydrates to VFA and lactate. Herbivores absorb these organic acids from the rumen and cecum for metabolism by tissues. Normally, lactate is present in the digestive tract at only low concentrations, when carbohydrate supply is increased abruptly (i.e., following grain engorgement or during adaptation to high-concentrate diets), the supply of total acid and the lactate accumulation in the mixture increase (Owens *et al.*, 1998).

Specific strains of microbes that attach to grain particles liberate glucose from starch granules, and ruminal bacteria (Streptococcus bovis, coliforms) that are normally noncompetitive can grow very quickly when given high amounts of glucose, becoming more important sources of lactate and releasing endotoxins (Owens *et al.*, 1998). Lactate accumulation occurs in acute acidosis as a result of increased glucose production and decreased glucose use, causing lactic acid–forming bacteria to proliferate (Meyer, 2017). The rumen microbial population also changes with the changing rumen pH and with increased lactate accumulation so that lactate producers such as Streptococcus bovis and Lactobacillus species proliferate and protozoa and cellulolytic microbes

decline (Marchesini *et al.*, 2013). If the rumen pH cannot be equilibrated, the acids will be absorbed into the blood and the bicarbonate buffering capacity of the body is overwhelmed, systemic acidosis can result (Meyer, 2017).

Depending on the nature of the ingested foreign materials and the diagnostic tools, the detection of foreign materials in the ruminants stomachs is obviously accomplished by exploratory surgery and, occasionally, by ultrasonography (Mushonga *et al.*, 2015). Treatment of clinical acidosis can be difficult and chances of success depend on the severity of the case (Golder and Lean, 2013). It is life-threatening conditions affecting the forestomach compartments in which the affected animals may require rumenotomy to fully evacuate the rumen and thwart systemic side effects (Ducharme, 1990; Marchesini *et al.*, 2013). Some of the conditions affecting the forestomach may be amenable to nonsurgical managements like impactions of the rumen, omasum, or abomasum may be alleviated by oral fluids and laxatives while omasal or abomasal impactions may be more successfully treated by rumenotomy and direct administration of fluids and laxatives through the rumeno-omasal orifice (Lozier and Niehaus, 2016).

Rumenotomy is a surgical entry into the rumen usually through the left flank where the organ dominates and the procedure is a clean-contaminated surgery but it is effective and safest procedure for retrieving ingested foreign materials as well as to resolve other conditions of the paunch and its related structures (Saidu *et al.*, 2020). It is commonly performed surgical procedures in cattle to correct a various of conditions affecting the bovine forestomachs, including hardware disease, foreign body ingestion, choke, and bloat (Hartnack *et al.*, 2014). Other indications for performing a rumenotomy include removal of rumen contents in cases of acute toxin ingestion, grain overload, or frothy bloat and it has also been used to decrease rumen fill to aid in other abdominal surgeries such as cesarean section (Niehaus, 2008).

The location of the rumen against the left body wall makes it an easy portal though which to access other proximal gastrointestinal (GI) structures including the rumen, the reticulum and the reticulo-omasal orifice (Niehaus, 2008). The selection of rumenotomy techniques depends on the personal preference of the veterinarian and those techniques involves placement of stay sutures or suturing the rumen to the skin prior to rumenotomy and other methods employ fixation

devices to stabilize the rumen such as in Weingarth's ring and Gabel rumen board rumenotomy techniques (Dehghani and Ghadrdani, 1995). The objective this case report is to describe exploratory laparotomy through rumenotomy in two cows due to foreign body impaction, and ruminal acidosis.

Case history and Clinical Examination

Case 1

Six years old Holstein Friesian cross breed cow was referred to Addis Ababa University College of Veterinary Medicine and Agriculture Professor Feseha G/AB Veterinary Teaching Hospital from dire veterinary clinic with the history of complete anorexia, bloating, stop ruminating, and depression. The owner complained that the cow had accidentally consumed a large amount of spoiled hay and potato before five days. The owner also informed that the cow had also consumed some amount of grains from home accidentally. The owner also informed that a local veterinarian attempted medical correction of the condition by administration of indigestion powder and antibiotics for the past three days but the animal did not show any improvement and can't stand from recumbent position. Then was referred to Veterinary Teaching Hospital and brought the cow with vehicles.

Upon arrival and physical examination, the cow was lethargic and highly depressed with a rough hair coat and dehydrated. Clinical examination revealed pale mucus membrane, the abdomen was highly distended and no rumen motility could be detected. Body temperature (38 °C), respiratory rate (35breaths/minute), and heart (64beats/minute) were within normal range although respiration was labored. On the basis of history and clinical findings the cow was tentatively diagnosed as rumen acidosis and decided to conduct emergency rumenotomy to evacuate the rumen and prevent systemic side effects.

Case 2

A nine-year-old Holstein Friesian cross-bred cow was treated at home for complete anorexia stopped ruminating, depression, and frequent abdominal distention that started before one week. The owner was informed as the cow ate and swallowed large plastic bags with salt and left over food in the compound. He also reported that the cow always needed to eat plastic materials in the compound. A clinical examination revealed a pale mucus membrane, a rough hair coat, and a hard impacted mass on external palpation of the abdomen, with low ruminal motility of one cycle in 3 minutes. Body temperature (38.5 °C), respiratory rate (28breaths/minute), and heart (62beats/minute) were within normal range. On the basis of history and clinical examination cow was tentatively diagnosed as ruminal foreign body and confirmatory diagnosis was conducted by exploratory rumenotomy.

Preoperative preparations, Anesthesia and animal control: The cows were highly lethargic and the operation was going to be done as an emergence case for case 1 and as elective for case 2. Before conducting the operation, an intravenous fluid line was set for Ringer's Lactate (Unique Pharmaceuticals Ltd., UK) at the rate of 1 drop/sec using the jugular vein to correct the dehydration status, and the cow was also administered with Procaine penicillin @ (24mg/kg) and dihydrostreptomycin sulphate @ (30mg/kg) (Pen and Strep® Norbrook, UK) intramuscularly before the operation in both cases. The cow was placed on right lateral recumbency and the leg was tied and fixed by the owner and other personnel in case 1 while the operation was conducted in standing position in case 2.

The skin surface on the left paralumbar fossa, approximately a distance of 3-5 cm from the last rib and ventral to the transverse process of lumbar vertebrae, were prepared aseptically by washing with water, soap, and salvon® (Cetrimide 3% and Chlorhexidine gluconate 0.5% solution). Then the hair was clipped and shaved with a blade and cleaned thoroughly with a standard solution of salvon®. Finally, the surgical site was scrubbed with a tincture-iodine 1% solution in order to decrease the microbial load in the area, and a sterile drape was placed and fixed by towel clamps on the proposed surgical site before final preparation of the surgeon (Figure 16A).

The paravertebral nerve block was performed by lidocaine hydrochloride (2% lidocaine hydrochloride, Jeil pharma. co.Ltd., Korea) @ 1ml/ 100kg to block T13, L1 and L2 nerves using an 18-gauge syringe to desensitize the flank area, abdominal muscles and alleviate pain during the surgical procedure in both cases. The needle was inserted halfway between the intervertebral transverse process and the needle was slightly angled to reach and deposit the lidocaine in the subarachnoid space. Linear infiltrations were also performed in the incision line to put in sufficient analgesia enclosing the site of incision.

Surgical treatment: After aseptically preparing the surgical sites, a sharp vertical skin incision with a length of approximately 35 cm was made on the left flank region below the lumbar transverse process. After blunt dissection of the skin from the subcutaneous tissue, the incision was continued chronologically through the external and internal abdominal oblique, transverse abdominal muscle, and peritoneum. Then all the muscular layers together with skin were grasped with a handheld retractor to get a sufficient surgical field and exposure of the rumen. Then the rumen was gently pulled out of the incision, and the rumen wall was anchored to the skin incision dorsally, ventrally, cranially, and caudally by 6 stay sutures into the skin using chromic cut gut of 2/0 size (figure 16E).

The rumen wall was incised about 25cm longitudinally in the vertical direction on the dorsal compartment away from the blood vessel area. Then the rumen was found full of fermented and foamy contents and about two-thirds of this ruminal contents were evacuated from the rumen in case 1 (Figure 16B). In case 2 the rumen was explored and large amount plastic foreign bodies (polythene bags), pieces of cloths and ropes were removed from the rumen. Then the rumen and reticulum were further explored for foreign bodies if there were any, and in addition, some small-sized nails were removed from the reticulum. The quantities of the foreign bodies collected from the rumen were weighing about 12kg.

Then, the ruminal incision site and surrounding area were cleaned from ingesta and rinsed with sterile isotonic saline solution in both cases. The ruminal incision was sutured in two layers with chromic cut gut of 2–0 sizes in lambert followed by a Cushing suture patter (figure 16 C, G). After closing the rumen wall, the stay sutures were removed and the rumen was replaced in the

abdomen in its normal position. The former hand glove was changed with another new surgical glove and then the peritoneum and transverse muscle were sutured with a simple continuous suture pattern using absorbable polyglycolic acid 2-0 size. The two oblique muscles and subcutaneous tissues were sutured with polyglycolic acid 1-0 in a simple interrupted pattern. Finally, the skin incision was closed by simple interrupted pattern with silk 2-0 size in case 1 (Figure 16D) and by ford interlocking suture with silk 2-0 sizes (Figure 16H) in case 2, and the site was scrubbed. Bleeding during the procedure was managed by using different straight and curved hemostatic forceps depending on the site and condition, and mopping with sterile gauze.

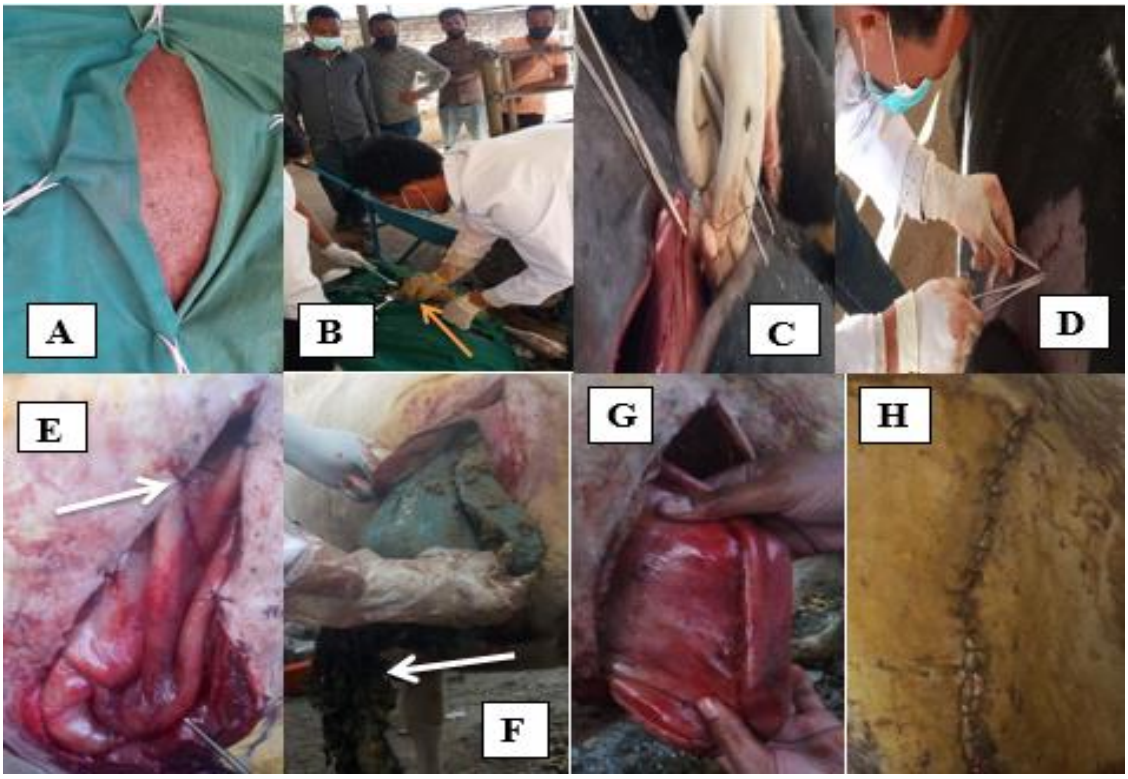

Figure 17: Surgical procedure of rumenotomy in cows

A) After aseptic surgical site preparation **B)** During evacuation of ruminal contents in case 1 **C)** Closure of rumen on progress in case 1 **D)** Closure of abdominal muscle on progress case 1 **E)** Skin closure on progress in case 1 **E)** Stay suture of rumen wall to skin **F)** Removal of foreign materials **G)** After closure of the rumen **H)** After skin closure

Post-operative cares and outcome: Procaine penicillin (24mg/kg) and dihydrostreptomycin sulphate (30mg/kg) (Pen &Strep® Norbrook UK) was prescribed for intramuscular administration for five days post operation. Following the operation, intravenous fluid was continued by using Ringer's Lactate (Unique Pharmaceuticals Ltd., UK) at the rate of 1 drop/sec through the jugular vein to correct the dehydration status, and diclofenac sodium at a dose of 2.5mg/kg was also administered to relieve post-operative pain in both cases. Since the cow was recumbent and the owner home was far from the VTH, it was decided to follow the cow at the VTH overnight in case 1. Soft and easily digestible grass feed and water was offered to the cow but the cow was still reluctant to feeding and drinking.

Up on follow up the cow was severely grunting and highly weakened. Unfortunately, at the mid night the cow was dead after 6 hours of operation. In case 2 the surgical site was cleaned and scrubbed daily, and antibiotic was continued for five days while analgesia was given for three days. The owner was advised to decrease feed supplementation in quantity for first weeks and to clear off polythene materials and iron sheets by burying in to the ground and supplement the cow with salt lick as a source of mineral supplement. The owner was also advised to closely monitor the cow and to provide good nutrition to facilitate wound healing. But unfortunately, the cow was still reluctant to feed and was found depressed. Finally, the owner decided to slaughter the cow on the 10^{th} day of operation.

Discussion

Surgical affections of the ruminant forestomach are the subject of attention almost all over the world and cause major economic importance due to severe loss of production and production ability (Ramaswamy and Sharma, 2011). Rumenotomy is a routine procedure for many diseases in cattle, such as, traumatic reticuloperitonitis, acute and recurrent bloat, ingestion of foreign bodies like nylon ropes or plastic bags that are obstructing the reticulo-omasal orifice, and carbohydrate engorgement (Ducharme, 1990; Asrat and Melkamu, 2015). Accordingly, the current rumenotomy cases were conducted due to ruminal acidosis in case 1 and ingestion of foreign bodies in case 2. In the present case report, emaciation, pale mucus membrane, anorexia, rough hair coat, and distended abdomen were among the common clinical findings in the

affected cows. These results were in agreement with the report by (Bakhiet, 2008) in which animals with forestomach affection are unable to digest feeds normally, so they are prone to feed deficiency, which can be manifested by different clinical signs.

Grain bloat has been commonly diagnosed in confined animals in barns offered finely ground grains in which these diets contribute in changing the rumen microenvironment that favors froth production and reduce rumen motility leading to the condition (Ismail *et al.*, 2007). According to (Asrat and Melkamu, 2015), the primary cause of acidosis was feeding a high level of rapidly digestible carbohydrate, such as barley and other cereals, often resulting in death in acute cases. These findings agree with the present case in which the cow accidentally consumed some grains in addition to spoiled hay and potatoes. The current case was also in agreement with the study conducted by (Meyer, 2017) which concluded that animals with severe ruminal acidosis manifests different clinical signs like large decrease in feed consumption, severe dehydration, anorexic, cattle's may be recumbent, and severely lethargic.

The change in acidity changed the rumen flora, with acid-producing bacteria taking over and they produce more acid, making the acidosis worse (Ismail *et al.*, 2007). Moreover, animals with severe cases of ruminal acidosis have a guarded to poor prognosis in that the increased acid was then absorbed through the rumen wall, causing metabolic acidosis, which in severe cases can lead to shock and death (Asrat and Melkamu, 2015). These findings agree with the present case in that the cow in case 1 was suffered from severe ruminal acidosis, causing metabolic acidosis which is severe cases and leads the cow to death.

In case 2, rumenotomy was conducted to remove foreign bodies, in which major part of the foreign body was in the rumen while the small part was removed from the reticulum. This finding agrees with the findings of (Fromsa and Mohammed, 2011; Mushonga *et al.*, 2015) which may be attributed to the larger rumen volume and the cumulative size. The current case 2 was in agreement with (Priyanka and Dey, 2018) that stated polythene bags/plastics accumulated in rumen will get entangled with each other during ruminal contractions and leads to the formation of hard mass. Later on, this hard plastic mass obstructs the orifice between reticulum

and omasum thereby causing hindrance to the ruminal movements, decrease in rumen motility and thereby cause ruminal atony and ruminal impaction.

In cattle, the probability of post-operative complications from rumenotomy has been estimated as between 5-15%, depending on the general condition of the animal prior to surgery and concurrent diseases (Martin *et al*., 2021). Because rumenotomy is a non-aseptic procedure, broad-spectrum antibiotics such as oxytetracycline (Saidu *et al*., 2022), penicillin (Geehan *et al*., 2006), ampicillin (Callan and Applegate, 2017) was administered to reduce the incidence of peritonitis and abscess formation after a rumenotomy. Accordingly in the current case penstrip was administered as prophylactic before starting surgery to reduce complication as there may be spillage of rumen contents in the abdomen and continued for five days in case 2 while cow in case 1 fails before completion of the treatment.

In present both cases paravertebral nerve block was performed by lidocaine hydrochloride to block T13, L1 and L2 and to desensitize the flank area, abdominal muscles and alleviate pain during the surgical procedure. Additionally linear infiltrations were used in the incision line to numb and put in sufficient analgesia enclosing the site of incision. Similar anesthetic protocol was also used by (Dehghani and Ghadrdani, 1995), (Mamuti and Gjino, 2013), (Fesseha, 2020c). Combination of diazepam and ketamine was used in goats by (Udegbunam *et al*., 2019) while (Saidu *et al*., 2022) used xylazine as sedation prior to the administration of inverted L-block regional anaesthesia with 2% lidocaine hydrochloride. In present case general anesthesia was not used because of its potential risks such as regurgitation of ruminal contents, excessive salivation and the possibility of pulmonary aspiration.

In present case, after skin and all muscular layers were incised, the rumen was gently pulled out through the incision and rumen wall was anchored to the skin incision by 6 stay sutures dorsally, ventrally, cranially, and caudally before rumenotomy. Different authors have been used different techniques of rumenotomy; the rumen was sutured to the skin using a continuous inverting Connell or cushing suture pattern (Dehghani and Ghadrdani, 1995), a Weingarth's ring was fixed to the dorsal commissure of the incision by its thumb screw and the rumen was fixed to the ring (Asrat and Melkamu, 2015b), the rumen was clamped to the skin with towel clamps at various

locations around the incision (Niehaus, 2008; Udegbunam *et al*., 2019). According to (Dehghani and Ghadrdani, 1995) who compared these four techniques with regard to procedure time and concluded that a rumenotomy with continuous inverting sutures required significantly more time than the other methods due to the time spent suturing the rumen to the skin and subsequently removing these sutures for ruminal closure.

The prognosis and outcome of rumenotomy largely depends on the presenting complaint and preoperative condition of the animal and not operative factor (Niehaus, 2008). According to (Hartnack *et al*., 2014) findings, several animals died due to complications from their presenting condition, rather than complications from the surgery itself. This agrees with the present cases in which the surgical procedures of rumenotomy were successfully completed and clients seemed satisfied with the surgical procedure. But the cows were failed to recover from the problem and died few hours following surgery in case 1 and the owner decided to slaughter the cow after 10 days because of failure to full recovery in case 2. So once the case has been occurred it must be managed soon before the animals are immunologically compromised.

3.11. Partial Tail Amputation in Cow and Ram

3.11.1. Partial Tail Amputation in cow due to gangrenous tail necrosis

Abstract

Inflammation and necrosis of the tail may occur in any animal species, and multiple factors may operate to cause necrosis with an initial lesion due to some form of trauma. The tail diseases can be treated conservatively or by amputation proximal to the affected site. But neglected tail affections may lead to the spread of disease to the spinal cord and decreased milk production. The current case aims to describe the surgical treatment of gangrenous tail necrosis. A 7-year-old local breed cow was presented to the Veterinary Teaching Hospital (VTH) with a necrotized tail on the distal parts. The owner reported that there was a minor lesion on the tip of the tail, followed by signs of inflammation in about a week, and the wound on the tip started to extend to the middle. The owner also reports that the cow was treated by the local veterinarian with

antibiotics and failed to respond. A necrotized lesion and fracture of the coccygeal vertebrae on the distal part of the tail are revealed on clinical examination. Based on the history and clinical observation, the case was diagnosed as gangrenous tail necrosis and decided to be managed through partial tail amputation. After aseptic preparation and caudal epidural anesthesia in the first intercoccygeal space by using 2% lidocaine hydrochloride @ 1ml/100kg, a V-shaped skin incision was made just distal to the desired amputation site on the dorsal and ventral tail to create skin flaps. Then the tail was amputated cranial enough to the skin incision, proximal to the intervertebral articulation. The skin flap was closed over the coccygeal bone with interrupted sutures using silk 2-0 size. The wound healed uneventfully, and the skin sutures were removed on the 12th day of the operation.

Key words: *Cow, Gangrenous tail necrosis, Partial tail amputation*

INTRODUCTION

Animals use their tails for different functions to communicate strong emotions such as agitation, balance, gripping, attracting mates, annoyance and anger, happiness as well as to prevents the animal from the ectoparasites nesting on its body or other irritations (Dasari *et al.*, 2021). Diseases of the tail are common in cattle and different of lethal bacterial infections can leads to necrosis, gangrene and wounds of the tail (Nuss and Feist, 2011). In spite of its normal anatomy and physiology, the tail is more prone to different infections like dermatitis, trauma, necrosis, gangrene, fracture, paralysis, luxation and disk spondylitis (Pratheepa *et al.*, 2021).

Inflammation and tail necrosis may occur in all animal species and the exact etiology remains unclear; however, multiple factors may operate to cause necrosis with initial lesion due to some form of trauma (Patil *et al.*, 2020). The economic losses from tail necrosis is reduced price of the affected animal, the cost of the treatment, predisposing the affected animals to infections and gangrene, loss of communication way and loss of the animal beauty (Salib and Farghali, 2016). Tail gangrene in buffaloes and cows is common, and several most possible causes can be identified, such as deficiency of fatty acids, corynebacterium bovis, and microfilaria (Dasari *et al.*, 2021).

The tail diseases can be treated conservatively or by amputation proximal to the affected site, and neglected tail affections may cause the spread of disease to the spinal cord, reduced milk production and may cause animal death in rare cases (Salib and Farghali, 2016). Vaccination against tetanus is the most immediate treatment for animals with tail affection. In addition, it has been common practice to amputate tail affections to prevent the progression of the disease up the tail which may cause the animal to death (Dasari *et al.*, 2021). Tail docking implies the amputation of part or all of an animal's tail and tail amputation should only be performed on those animals whose tail or associated structures have been injured (Lakshmi *et al.*, 2016).

Treatment with anti-inflammatory agent and antibiotic is known to bring relief to the pain and assist healing after the amputation of the tail (Jena and Sahoo, 2017). Tail amputation in cattle is a very opposing subject because in some countries, it is done prophylactically for management reasons without any medical indication and the prophylactic tail amputation is done 7–8 cm below the vulva in calves and 5–6 cm below the vulva in heifers and mature cows (Nuss and Feist, 2011). Therapeutic caudectomy is indicated for traumatic lesions, neoplasia and perianal fistula. Complications of tail amputation includes infection, dehiscence, scarring, fistula recurrence and anal sphincter and rectal trauma (Lakshmi *et al.*, 2016).

Case history and clinical examination: A seven-year-old local breed cow was presented to Addis Ababa University College of Veterinary Medicine and Agriculture Professor Feseha G/AB Veterinary Teaching Hospital (VTH) with a necrotized tail below the middle part of the tail (Figure 17A). As the farmer reported, there was a minor lesion on the tip of the tail, followed by signs of inflammation in about a week, and the wound on the tip of the tail started to extend to the middle. The owner also reports that the cow was treated by the local veterinarian with antibiotics but failed to respond. On clinical examination, there was a highly necrotized lesion on the distal part of the tail, and a fractured coccygeal vertebra was also diagnosed at the distal part of the tail (Figure 17A). A closer look at vital organ parameters like heart rate (64 beats per minute), respiratory rate (28 breaths per minute), and temperature (38 °C) revealed that they were all within physiological limits. Finally, based on the anamnesis and clinical findings, the case was diagnosed as gangrene of the tail and it was decided to be managed through partial tail amputation.

Preoperative preparations, Anesthesia and animal control: The exact point of disarticulation was determined by palpation, and the surgical site above the necrotized part of the tail was clipped, shaved, and cleaned with an antiseptic solution. The site for epidural anesthesia was also prepared aseptically. Then the cow was properly restrained in both physical and chemical methods. Physically, the cow was controlled in a standing position in the well-built crush which adequately restrains the cow, and the cow was fixed to the crush poll and assisted by the owner. Chemically, caudal epidural anesthesia was administered in the first intercoccygeal space by using 2% lidocaine hydrochloride (2% lidocaine hydrochloride, Jeil Pharma Co., Ltd. Korea) @ 1ml/100kg by using an 18 G needle.

The first intercoccygeal space was located with the tip of a finger when the tail was manipulated up and down with the other hand. Then an 18 G hypodermic needle was inserted at an angle of 45° to a depth of about 0.5 to 1 inch to enter the vertebral canal. During epidural anaesthesia, the correct position of the needle was checked by the hanging drop technique, which was performed by placing a few drops of lidocaine into the needle hub. If the needle enters the correct position, the drop of lidocaine is observed to be aspirated under the effect of negative pressure in the epidural space. The desensitization of the animal was tested by poking various parts of the tail with a sterile needle after the injection of epidural anesthesia.

Surgical treatment and outcomes: After site preparation and anesthetic protocol were completed, the joint space was identified by palpating the vertebral bodies while flexing and extending the tail near the proposed amputation site. Then a tourniquet was placed around the tail above the amputation site to temporarily reduce blood supply to the tail. Then a V-shaped skin incision was made just distal to the desired amputation site on the dorsal and ventral tail to create skin flaps that are longer than the desired tail length. Tail skin was freed and elevated from the underlying subcutaneous tissue through sharp transection of fibrous attachments.

The lateral (near the transverse processes) and median (ventral to the tail) coccygeal vein and artery were then double ligated using vicryl 2-0 size cranial to the level of the amputation. Then the tail was amputated cranial enough to the skin incision and proximal to the intervertebral articulation by inserting a scalpel blade into the dorsal joint space perpendicular to the long axis

of the tail and cutting connecting ligaments and muscles. Then the skin was pulled over the bone end to evaluate the flap length, and the excess flap was trimmed (Figure 17B). The skin flap was closed over the coccygeal bone with interrupted sutures using silk 2-0 size (Figure 17C). Finally, the incision site was scrubbed with diluted iodine solution and a successful partial tail amputation was completed.

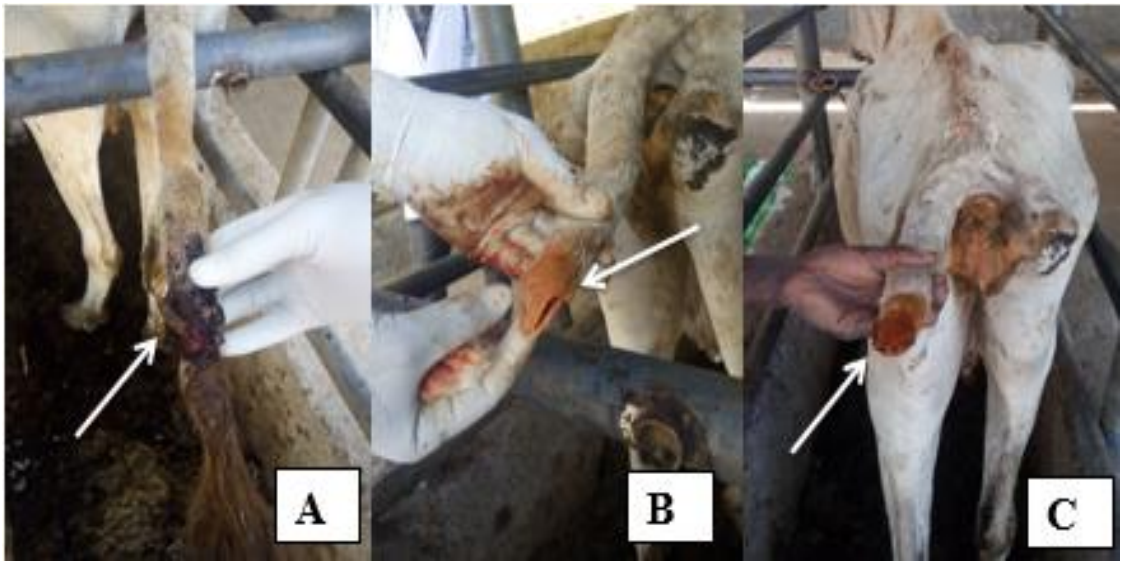

Figure 18: Partial tail amputation in cow due to gangrenous tail necrosis

A) Clinical presentation of the cow **B)** After affected part was removed and the skin flap estimation **C)** After skin flap suture

Post-operative Care and Outcome: For three days after surgery, penicillin (24 mg/kg), dihydrostreptomycin sulphate (30 mg/kg) (Pen & Strep® Norbrook, UK), and diclofenac sodium (2 mg/kg) were administered intramuscularly. Diclofenac sodium (2 mg/kg) was also administered intramuscularly for three days postoperatively to relieve post-operative pain. The surgical area was cleaned and scrubbed with a tincture-iodine 1% solution for five days. The wound healed uneventfully and skin sutures were removed on the 12th day of the operation.

Discussion

Tail amputation in cattle was a very controversial subject because, in some countries, it was carried out prophylactically for management reasons without any medical indication (Patil *et al*., 2020). Diseases of the tail are common in cattle, and multiple factors may operate to cause necrosis with initial lesion due to some form of trauma (Nuss and Feist, 2011). Tail crushing that causes blood clots and traumatization of tail tissues followed by invasion of bacteria leads to necrosis, gangrene and sloughing of tail tissues including bones (Salib and Farghali, 2016). Accordingly, in the present case, the initial lesion at the tip of the tail due to some trauma was invaded by a bacterium that led to necrosis and sloughing of tail tissue.

External parasitic infestations and bad hygiene (accumulation of manure that produces an excessive amount of ammonia which dries and cracks the skin of the tail) cause damage to the tail skin barrier and expose it to cracks and fissures (Salib and Farghali, 2016). Similarly, in the current case, the inflamed tail was contaminated with fecal material, which may also cause damage to the skin barrier. In the current case, the necrosis on the tip of the tail extends to the middle part with tail tip alopecia, which is in agreement with (Ural *et al*., 2007) finding that necrosis were accompanied by infection, circumscribed crust, suppuration, phlegmone with gross abscess formation and dermato- cosmetic color changes in advanced stage of necrosis.

According to (Patil *et al*., 2020) diseases of the tail did not respond to the routine medical management and demand amputation of the tail. Similarly in current case the cow was treated with antibiotics by local veterinarians and the cow fails to respond and demands tail amputation. According to (Salib and Farghali, 2016) the treatment of tail necrosis depends on the severity of lesions in which medicinal treatment was applied for the early mild tail necrosis whereas surgical treatment was carried out for the severe gangrenous tail necrosis that were also adopted by (Ural *et al*., 2007) who employed antibiotic administration or amputation of the affected area of the tail for severely affected cattle. Similar to those above findings the case on hand which fails to respond routine medical management was treated by tail amputation and administration of penstrip for three days after surgery.

While amputating the tail, the incision should be placed on the healthy zone proximal to the affected area (Dasari *et al.*, 2021). This similar with the present case and V- shaped skin incision was made distal to distal proposed amputation site on dorsal and ventral surface to raise two triangular flaps of skin. This is also in agreement with (Satyanarayana *et al.*, 2014), (Salib and Farghali, 2016), (Pratheepa *et al.*, 2021) who uses V or U - shaped skin incision 1 to 2 cm distal to the joint space at the proposed amputation site to raise two triangular flaps of skin. In similar way with (Lakshmi *et al.*, 2016), (Dasari *et al.*, 2021), (Jena and Sahoo, 2017), (Olatunji-Akioye *et al.*, 2010) the lateral and median coccygeal vein and artery was double ligated cranial to the level of the amputation and the tail was amputated cranial enough to the skin incision, proximal to the intervertebral articulation by using scalpel blade.

The excessive skin was trimmed for perfect apposition of the skin edges and the skin flaps were sutured with simple interrupted pattern using silk 2-0 size. This is also in agreement with (Patil *et al.*, 2020) and the excessive ventral flap was trimmed so that the dorsal flap can be pulled over the bone tip by (Pratheepa *et al.*, 2021). In conclusion, clinical cases of cow with gangrenous tail necrosis were managed successfully with surgical and medicinal treatments. Tail infections should be recommended to be treated in earlier stage with conservative treatments and should be surgically amputated if medical treatment fails before it extends toward the healthy part of tails.

3.11.2. Partial tail amputation in ram due to car accident

Abstract

Tail docking is carried out as a management practice in pigs, sheep and cows because it prevents pigs from biting their tails, fly strikes on sheep and to reduce the risk of mastitis and hygiene in dairy cows. The present case aims to describe surgical treatment of tail injury through partial amputation of the tail in ram. A four years old local breed ram was brought to Veterinary Teaching Hospital with a clinical presentation of damaged tail due to car accident three hours before its appearance. The clinical examination revealed that the tail of the ram was damaged on distal 1/3 and its blood supply was also crushed due to the accidents. The presented case was diagnosed as the tail was severely damaged and it was suggested for surgical management in the

form of partial tail amputation. After aseptic preparation of the surgical site, caudal epidural nerve block was done by injecting lidocaine 2% @ (1ml/100kg) at the first inter coccygeal space to desensitize the area. Tourniquet was applied proximal to the proposed amputation site to control temporary bleeding. Then a circular skin incision was made on the proposed amputation site proximal to damaged and devitalized part, and the tail was amputated. The tail skin was gently freed and elevated from the underlying fats through sharp transection of the attachments and some part of the tail fat which hinders closure was removed to facilitate easy and tension free skin closure. Finally the skin incision was closed with simple interrupted suture pattern by using silk 2-0 size. Post-operative antibiotic for five days and analgesic for three days was administered in addition to cleaning and scrubbing daily with tincture iodine. The skin suture was removed on 15th days of operation and the surgical wound was healed uneventfully rather the ram increased in body condition.

Key words: *Injury, Partial amputation, Ram, Tail*

INTRODUCTION

Tail docking is the amputation of a part or all of an animal's tail (Eyarefe and Oguntoye, 2016). Tail docking is carried out as a management practice in pigs, sheep and cows because it prevents pigs from biting their tails, fly strikes on sheep and to reduce the risk of mastitis and hygiene in dairy cows. It is also performed on other animals, such as dogs, for aesthetic purposes (Sinmez *et al.*, 2016). Tail docking in sheep has been a controversial practice in the global agricultural community for nearly one hundred years and currently many farmers decide to tail dock sheep for health or aesthetic reasons and others choose to leave their sheep with their natural tail length to eliminate pain associated with the tail docking procedure, or to improve profits by selling to retailers who specify for non-docked tails (Hooker *et al.*, 2017).

The fat deposited in the tail is considered as an energy source for the fat-tailed sheep during the times of low energy intake. However, the fat deposition in the body or tail requires more energy than the deposition of lean tissue and the effect of docking on conversion rate of concentrates into meat tissue was more efficient than into fat tissue (Ayg *et al.*, 2003). Tail docking is carried

out to obtain lean and tasty carcasses from the fat-tailed breed, to reduce the amount of fat in the carcass, to improve feed utilization, to enhance the gain in live weight and to facilitate mating with lean-tailed sheep breeds (Sinmez *et al*., 2016). Although the studies referring to the docking of lambs of the fat-tailed sheep breeds showed various effects on the growth rate, carcass characteristics and fat deposition over the body, the majority found that docking of lambs improves the live weight gain in fattening, feed efficiency and carcass characteristics (Ayg *et al*., 2003).

Tail size increases with age in early life, although it also varies considerably between breeds and thus tail docking should be done as early in life as possible and it is also difficult to define precisely the age above which tail docking should be designated as a procedure suitable only for a veterinary surgeon (FAWC, 2008). Docking tails is carried out in sheep farms in different countries and it is accomplished by several methods including rubber rings (elastrator), hot iron cautery, emasculator, or removal with a scalpel or knife, crush and cut, and surgery (Stamm *et al*., 2019). Docking at an early age has benefits to both the health and welfare of lambs at a later age(Stull *et al*., 2002). Tail docking in sheep begins the first week after the birth of a lamb and continues until day 20 to 25 (Sinmez, *et al*., 2016). Tail docking in lambs up to 7 days old is best done with a rubber ring; for older lambs up to 8 weeks, the tail should be removed either by a hot docking iron or a clamp; tail docking of lambs above the age of 3 months should only be undertaken by a veterinary surgeon using pain relief (FAWC, 2008).

Sheep with long tails and wool become easily contaminated by the accumulation of feces and urine on their hindquarters and this warm, moist environment attracts some species of female flies to lay their eggs (fly strike). In a time period of less than one day, these larvae feed on the skin's surface causing irritation, and then penetrate the skin as they develop further and bacterial infections from maggot infestation can occur; leading to toxemia, and even death (Stull *et al*., 2002). The appropriate length for docking is variously expressed as visibility of 0.7 inches of tail, docking at the third or fourth coccygeal vertebrae, or docking at the end of the caudal fold (Anonimous, 2014). A portion of the tail should remain after docking such that as the tail is lifted during defecation, the caudal folds on each side direct the feces away from the body. Caudal

folds are the flaps of skin located near the rectum that attach to each side of the tail, and are most visible from the underside of a lifted tail (Stull *et al*., 2002).

Removal of the tail has the potential to affect many aspects of the animal's anatomy, physiology, behaviour, farm management, and production, as well as susceptibility to dag formation, urine staining and consequent fly strike (Fisher *et al.*, 2004). Behavioral and physiological evidence of pain responses during and after tail docking includes active behaviors indicating restlessness, change in posture, and standing very still (Hooker *et al*., 2017). The procedure is also painful, resulting in up to 3-4 hours of physiological and behavioural changes and thus it is important that docking be undertaken properly, the benefits of tail removal must outweigh the harms and those harms should be minimised (Fisher *et al*., 2004). The present report describes the successful surgical management of partial tail amputation in ram.

Case history and clinical examinations: A four years old local breed ram was brought to the Addis Ababa University College of Veterinary Medicine and Agriculture Professor Feseha G/AB Veterinary Teaching Hospital with a clinical presentation of damaged tail around its 1/3 of length and bleeding from the damaged part of the tail. The anamnesis suggested that the ram's tail was damaged by car accident three hours before its appearance to the Veterinary Teaching Hospital for treatments (Figure 18A). A thorough body examination was also carried out to identify the physical status of the animals and to detect any defect in other parts of the body.

The tail was also palpated to detect pain, heat, and extent of damage and the presence of infection. Accordingly, the clinical examination revealed that the tail of the sheep was damaged and its blood supply was also crushed due to the accidents. Clinical parameters like heart rate (74beat/min), respiratory rate (28breath/min), and rectal temperature (39 ^{0}C) were found within the normal physiological limits. The presented case was diagnosed as the tail was severely damaged and cannot be managed by medical treatments alone and thus it was suggested for surgical management in the form of partial tail amputation.

Preoperative preparations, anesthesia and animal control: The area intended for incision was aseptically prepared widely by washing with soap and water thoroughly and then the hair on the

area and surrounding was clipped by scissors and shaved by using sterile surgical blade. Then after, the area was re washed with soap and water (Figure 18A) and the skin was scrubbed with tincture iodine. The ram was stabilized both physically and chemically. Physically the ram was placed on the surgical table and its leg was tied to the table and assisted by personnel. Chemically, caudal epidural nerve block was done by injecting lidocaine 2% @ (1ml/100kg) at the first inter coccygeal space to desensitize the area. The desensitization of the animal was tested by poking various parts of the tail with a needle.

Surgical correction and treatments: after aseptic preparation of the surgical site, tourniquet was applied proximal to the proposed amputation site to control temporary bleeding. Then a circular skin incision was made on the proposed amputation site proximal to damaged and devitalized part, and the tail was amputated (Figure 18B). The tail skin was gently freed and elevated from the underlying fats through sharp transection of the attachments to provide a tension free closure. Additionally, some part of the tail fat which hinders closure was removed to facilitate easy and tension free skin closure. The tourniquet was removed and the surgical site was evaluated for bleeding and minor skin bleeding during the operation was identified and controlled by hemostatic forceps. Finally the skin incision was closed with simple interrupted suture pattern by using silk 2-0 size (Figure 18C) and the surgical site was scrubbed and the ram was sent home.

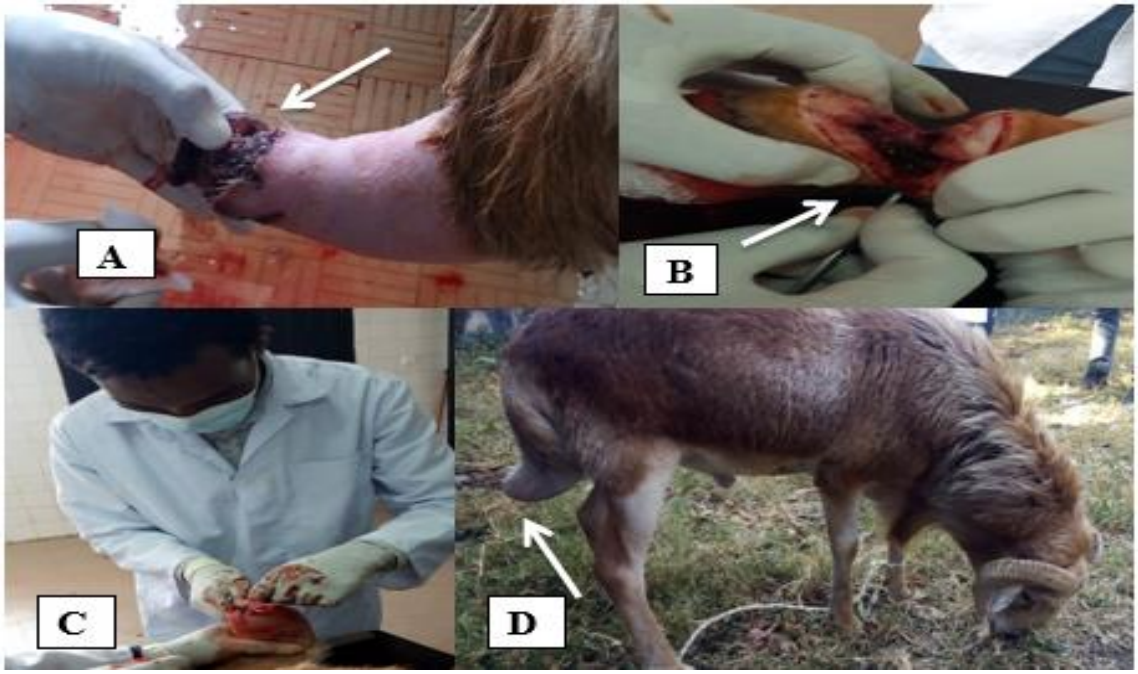

Figure 19: Partial tail amputation and its outcome in ram

A) Clinical presentation and preparation of the site **B)** Excision of the damaged part **C)** Closure of the skin flap **D)** After suture removal on day

Post-operative care and outcomes: In the post-operative period, an antibiotic named penstrep (Penstrep-400 Holland) 1ml/20kg was administered intramuscularly for five days and analgesic diclofenac sodium (2mg/kg) was administered intramuscularly for three days post operation. The surgical site was cleaned with antiseptic and scrubbed daily with tincture iodine. The healing process was clinically evaluated and the surgical was healed uneventfully and the skin suture was removed on 15th days of operation (Figure 18D). The ram was completely healed from the problem without any complications and increased in body condition.

Discussion

Tail docking is the amputation of a part or all of an animal's tail and is carried out as a management practice in pigs, sheep and cows because it prevents pigs from biting their tails, fly strikes on sheep and to reduce the risk of mastitis and hygiene in dairy cows (Eyarefe and Oguntoye, 2016). But the current partial tail amputation in buck was done as therapeutic purpose for damaged tail due to car accident. In the current case, amputation of the tail was carried under caudal epidural block in the first inter-coccygeal space. Similar anesthetic protocols were applied by (Satyanarayana *et al.*, 2014), and (Jena and Sahoo, 2017) during tail amputations in buffaloes. But they used general anesthesia for sedation in addition to the epidural nerve block. In the present case, general anesthesia was not used because of its adverse effects like regurgitation of ruminal contents, excessive salivation, and the possibility of pulmonary aspiration, and because the case was an emergency, where the ram was not withheld from feed and water.

Tail amputation can be done by making V or U - shaped skin incision 1 to 2 cm distal to the joint space at the proposed amputation site to raise two triangular flaps of skin (Salib and Farghali, 2016). But in present case, circular skin incision was made on the proposed amputation site and the tail was amputated or transected. This was done because of it is not easy to raise the skin from the underlying fat rather the tail fat that hinders skin closure was partially removed from the tip of tail to facilitate easy skin closure. In accordance with (Pratheepa *et al.*, 2021) the desensitization of the animal was tested by poking various parts of the tail with a needle after the injection of epidural anesthesia and hemorrhage during the operation was controlled effectively by applying tourniquet which was released subsequently.

In current case skin flap was closed by using simple interrupted suture pattern which is in line with (Salib and Farghali, 2016), and (Jena and Sahoo, 2017) but it was not in agreement with (Dasari *et al.*, 2021) who used horizontal mattress suture pattern. In present case simple interrupted suture was opted as there was enough skin flaps to close and no need to use tension suture. Generally, early surgical partial tail amputation for treatment of damaged tail was found important to save the life the animals without further complication.

3.12. Urethrostomy Along With Penile Amputation in Bulls

Abstract

Urolithiasis is the formation of uroliths in the urinary tract, which can lodge anywhere from the bladder to the urethral orifice, but most commonly at the distal end of the sigmoid flexure in ruminants, obstructing urine flow. A 6 (case 1) and 7 (case 2) year-old bull were brought to Veterinary Teaching Hospital with a history of anuria followed by swelling on ventral abdominal and penile region and they were off feed and water for last 3-4 days. At presentation, the bull was depressed, dehydrated and frequently attempts to urinate with dribbling from prepuce and there were edematous swelling over the ventral abdominal and penile region. The bull (case 1) was treated by a local veterinarian with antibiotics without any improvement in the condition. Per rectal examination of the both bulls revealed partially distended urinary bladder. On the basis of history and clinical examination, the cases were diagnosed as obstructive urolithiasis and it were decided to perform post-scrotal urethrostomy along with penile amputation. Caudal epidural anesthesia in the sacrococcygeal space was administered using 2% lidocaine hydrochloride @ 1ml/100kg. After aseptic preparation, skin incision was made on the midline just caudal to the scrotum to exteriorize the penis which reveals necrosis of the penis and urethral rupture due to obstruction at the distal bend of the sigmoid flexure. Then the penis was cut proximal to the affected part and stump of the penis was protruded and anchored to the edge of the skin incision with simple interrupted using vicryl 2-0. Muscles and subcutaneous tissues were sutured by simple continuous suture pattern and skin edges were closed with simple interrupted pattern by using silk 2-0 size. Skin suture were removed on 14th days with no healing complication and the animals were recovered and sold for beef at a good price after 64 (case 1) and 41 (case 2) days of operation.

Key words: *Bulls, Obstruction, Penile amputation, Post-scrotal urethrostomy, Urethral rupture*

INTRODUCTION

Urolithiasis is the formation of uroliths which may lodge anywhere in the urinary tract from the bladder up to the urethral orifice and most frequently at the distal end of sigmoid flexure in ruminants leading to obstruction in urine flow (Alimi *et al.*, 2018; Saharan *et al.*, 2020). Obstructive urolithiasis is frequently encountered surgical condition in all species of animals but most commonly in cattle, buffalo and sheep and the condition results in a series of abnormalities that arise from a failure of excretory process and accumulation of waste products in the body with fluid and electrolyte disturbances (Saharan *et al.*, 2020).

Urolithiasis results in considerable economic losses to the owner in terms of death of the animal, lower weight gain, medicinal and surgical treatment costs (Mohmmad Aarif Khan et al., 2013). Although, urolithiasis equally affects male and female animals but obstruction occurs mainly in males due to presence of long and narrow urethra (Shrestha *et al.*, 2019). The factors that favour development of obstruction include anatomical long convoluted urethra-sigmoid flexures, urethral process in small ruminants, surgical factors early castration and exogenous factors, estrogens as growth promoting implants (Khan *et al.*, 2013).

Season also tends to have an influence on the occurrence of urolithiasis in bovine (Sutradhar *et al.*, 2018). Reduced water consumption, lack of green fodder, feeding of concentrates like wheat bran and rice bran which are rich in phosphorus caused an increased excretion of phosphates in urine which along with decreased urine pH and increased urine concentration and concurrent hypovitaminosis A triggers urolith particularly struvite crystal formation during winter months (Saharan *et al.*, 2020). imbalance intake of minerals; high phosphorous and low calcium are commonly used as concentrate rations which predispose the animal to phosphate uroliths (Shrestha *et al.*, 2019).

Clinical signs of most of the animals with intact bladder were complete anorexia or inappetance, stranguria or anuria, intermittent strain, frequent attempt to urination, reluctant to walk and stay in a wide stance with their hind limbs stretched backwards (Sutradhar *et al.*, 2018). However, complete urethral obstruction can cause rupture of the bladder or urethra within 24–48 hours

which is followed by short-timed improvement because of reduced pressure in the urinary bladder (Poore *et al.*, 2017). Diagnosis of Urolithiasis and rupture of the urinary bladder or urethra in cattle, sheep and goats is based on the clinical symptoms, physical examination, abdomenocentesis, radiography and sonograph (Mohsin *et al.*, 2014).

Medical treatment has been described with marginal success in relieving the obstruction during early stages of the disease and the treatment comprises use of antibiotics, muscle relaxants, urine acidifiers, litholytic drugs, correction of fluid and electrolyte imbalances and dialysis (Saharan *et al.*, 2020). Complete obstructive urolithiasis demands surgical treatment and the surgical interventions include penile catheterization, urethrotomy, penile transaction with urethral fistulation (urethrostomy), tube cystostomy, bladder marsupialization, intrapelvic cystic catheterization and penile amputation (Khan *et al.*, 2013).

The different surgical interventions employed for the management of obstructive urolithiasis in cattle are aimed either at urolith removal for normal urine flow establishment or for urinary diversion to allow the time for the urinary tract to restore patency (Parrah *et al.*, 2013). The choice of procedure depends on the extent of tissue damage secondary to the obstruction, the value of the animal, clinical status of the animal and duration of obstruction, and the owner's expectations for continued use of the animal (Saharan *et al.*, 2020).

Urethrostomy, also called urethral fistulation, with penile amputation is the treatment of choice for urethral rupture and/or necrosis where repair of urethra is not possible or where recurrence of urethral obstruction due to urolithiasis is very high (Kushwaha *et al.*, 2021). Urethrostomy helps in elimination of the most commonly affected segment of urethral tract, and thus prevents recurrence (Bisla *et al.*, 2016). In feedlot animals, this technique is used as a salvage procedure to utilize the meat; however, this procedure can also be used as a permanent treatment in working and other animals (Kushwaha *et al.*, 2021).

Case history and clinical examinations

Case 1

A six years old local breed bull was brought to Addis Ababa University College of Veterinary Medicine and Agriculture Professor Feseha G/AB Veterinary Teaching Hospital with the history of anuria since a week, swelling on ventral abdominal and penile region and off feed and water for last 3-4 days. At presentation, the bull was dull, depressed, dehydrated and frequently attempts to urinate and the prepuce opening was swollen and prolapsed (Figure 19A). The swelling over the penile region and prepuce was edematous. The owner reports that the bull was treated by a local veterinarian with antibiotics for few days without any improvement in the condition and the swelling on ventral abdominal and penile region were also incised by local veterinarian to remove the edema (Figure 19A). Per rectal examination of the bull revealed partially distended urinary bladder. Up on physical examination, rectal temperature (38.9 ^{o}C), heart rate (80 beats/minute) was recorded. On the basis of history and clinical examination, the case was diagnosed as obstructive urolithiasis and it was decided to perform post-scrotal urethrostomy along with penile amputation.

Case 2

A seven years old local breed bull was brought to Addis Ababa University College of Veterinary Medicine and Agriculture Professor Feseha G/AB Veterinary Teaching Hospital for investigation of anuria of approximately 10 days duration. Animal showed abdominal pain manifested by straining, frequently attempt to urination with little dribbling. Clinical findings in the case was similar to case 1, except that ventral abdominal edematous swelling was more, extending from scrotum to the umbilicus (Figure 19B), but preputial opening was not swollen. On per rectal examination urinary bladder was intact and found partially distended. The physical examination revealed elevated body temperature, increased heart rate and respiration rate. On the basis of history and clinical examination, the case was diagnosed as obstructive urolithiasis and it was decided to perform post-scrotal urethrostomy along with penile amputation.

Preoperative preparations: Before conducting the operation, both bulls were administered with Procaine penicillin @ (24mg/kg) and dihydrostreptomycin sulphate @ (30mg/kg) (Pen &Strep® Norbrook UK) intramuscularly one hour before the operation. In both cases, after the bulls were restrained with caudal epidural anesthesia and rope assisted by personnel, the skin surface on the post-scrotal region was prepared aseptically by washing with water, soap, and salvon® (Cetrimide 3% and Chlorhexidine gluconate 0.5% solution). Then the hair was shaved and cleaned thoroughly with salvon®. Finally, the area was scrubbed with a tincture-iodine 1% solution to decrease the microbial load in the area and sterile drape was placed and fixed by towel clamps on the proposed surgical site.

Anesthesia and animal control: In both cases, the bulls were restrained both chemically and physically. Chemically, caudal epidural anesthesia in the sacrococcygeal space was administered by using 2% lidocaine hydrochloride (2% lidocaine hydrochloride, jeil pharma. co.Ltd. Korea) @ 1ml/100kg using 18 G needle and physically, the bulls were restrained with rope assisted by personnel in right lateral recumbency (Figure 19B) with left hind limb pulled cranially and tied with the both forelimbs to expose the surgical site. Then after the surgical site (post scrotal) area was aseptically prepared and scrubbed, linear infiltration of 2% lidocaine hydrochloride to the site of incision was done to desensitize the area.

Surgical treatments and outcomes: After restraining and aseptic preparation was completed, the surgical area was checked for desensitization and about 10 - 12cm long skin incision was made on the midline just caudal to the scrotum. Penis was exteriorized after subcutaneous incision and blunt dissection. The examination of the exteriorized penis revealed necrosis of the penis (Figure 19C), and urethral rupture (Figure 19D) due to obstruction of the urethral lumen by calcified granules stuck into the distal bend of the sigmoid flexure, as well as fibrous adhesions around the rupture site and necrotized urethra distal to rupture site. Then the affected area was thoroughly irrigated with saline water. Dorsal penile blood vessels were ligated proximal to ruptured urethra and proximal bend of sigmoid flexure and then tourniquet was applied proximal to the resection line and the penis was cut proximal to the affected part and about 5cm distal to the proximal end of the skin incision (Figure 19E).

Immediately after releasing the tourniquet, the powerful urine was voided (in case 1) and 6hr after operation (in case 2) indicating a patent urethra. About 4 cm long stump of the penis was protruded and anchored to the edge of the skin incision (Figure 19F) with simple interrupted suture using 2-0 vicryl on either side and cranially beneath the stump of the penis to prevent inward turning of the stump. Straight artery forceps was inserted in urethral lumen from transacted site and urethra was incised longitudinally up to 2 cm to make a V-flap. Each arm of urethral V-flap was sutured to the skin on either side in simple interrupted pattern to make a permanent urethral opening (stoma). An indwelling catheter was placed in the urethra and the catheter was anchored to skin (Figure 19F). The remaining muscles and subcutaneous tissues are sutured by simple continuous suture pattern using vicryl 2-0 and skin edges were closed with simple interrupted pattern by using silk 2-0 size (Figure 19F). Finally, the surgical site was scrubbed and the animal was made to stand.

Figure 20: Post-scrotal urethrostomy along with penile amputation in bull and its progress

A) Clinical presentation of the bull (case 1) **B)** After presentation (case 2) and restraining on progress **C)** During exteriorization of necrotized penis **D)** Incision the urethra **E)** Cutting of the

penis **F)** After resection of penis, catheter placed in urethra, stump anchored to the skin, and skin closure **G**,**H)** During follow up after skin suture removal

Post-operative cares and outcome: Antibiotic used preoperative was continued for 5 days and the bull was also administered dexamethasone @ 0.2 mg/kg intramuscularly to reduce swelling of glans penis for 3 days for both cases. Wound area in both bulls were cleaned and flushed with iodine tincture till complete healing. The animal was let to drink water and started feeding normally within 30 minutes of the procedure. The owner was advised to provide plenty of water and food for the patient. In addition, he also advised not to use the animal for draft purpose and to feed and sell it for slaughter purposes within 3 months. Skin suture was removed on 14th days with no healing complication and the animal was recovered (Figure 19 G, H). In case 2, urine flow started 6 hours after surgery and feed and water intake resumed from the next day. Ventral abdominal swelling was reduced markedly by the seventh days in both cases. Up on follow up with a phone call, the animals in both cases were able to gain body condition, which caused urination problems, and they were sold for beef at a good price after 64 (case 1) and 41 (case 2) days of operation.

Discussion

The formation of calculi in the urethra of intact and castrated males causes urinary tract obstruction in ruminants, which frequently results in urethra or urinary bladder rupture (Kalim *et al.*, 2011). Clinical signs of most of the animals with intact bladder were complete anorexia or inappetance, stranguria or anuria, reluctance to walk, and frequent attempts to urinate (Makhdoomi *et al.*, 2013). This finding is in agreement with the current study in which both cases were presented with the same clinical signs like anorexia or inappetance, stranguria or anuria, swollen and prolapsed prepuce opening, reluctance to walk, and frequent attempts to urinate.

Urethrostomy is a surgical procedure indicated in cases of ruptured urethra and necrosis of penis either due to urethral calculi or any other reason like irreparable injury to penis and penile urethra, and recurrent urethral obstruction (Ansari, 2016). In both the cases, urethrostomy along

with penile amputation was done because the obstructive urolithiasis had resulted severe necrosis of the penis and urethra. The wound in both cases was suggested that a sharp calculus has ruptured the urethra and caused infiltration of urine in subcutaneous tissue and muscles around ventral abdomen. The skin on the ventral abdomen was bluish in appearance suggesting ischemia and necrosis of the skin. However the calculus had escaped from the site. This is in agreement with finding of (Bhokre *et al*., 2011) in which urolith causes rupture of urethra and subcutaneous infiltration of urine.

There are many surgical treatment options for urinary obstruction and the choice of surgical technique depends on the value and future use of the animal, available facilities, surgeon's experience, animal's condition, and the respective integrity of the urethra and bladder (Saharan *et al*., 2020). Urethrostomy, also called urethral fistulation, with penile amputation is the treatment of choice for urethral rupture and/or necrosis where repair of urethra is not possible or where recurrence of urethral obstruction due to urolithiasis is very high (Kushwaha *et al*., 2021). This finding is in agreement with the current case in which the urethra was ruptured and severely necrotized in both cases and urethrostomy along with penile amputation was opted for treatment.

Perineal urethrotomy and urethrostomy techniques have poor long-term outcome, because of stricture formation urethrotomy/urethrostomy site, which leads to repeat urethral obstruction (Parrah *et al*., 2013). This technique is used as a salvage procedure to utilize the meat; however, this procedure can also be used as a permanent treatment in working and other animals (Kushwaha *et al*., 2021). In the current management of urolithiasis, the surgical approaches were opted based on the size of the animal, status of the bladder, and intended use of the animals. These above-listed shortcomings were also observed in the current cases that undergone post scrotal penile amputation and unable to breed after the procedure and slaughtered at 64 (case 1) and 41 (case 2) days due to urethral stricture before gaining expected body condition.

Urethrotomy is mainly useful for early cases of urethral obstruction or in the absence of either urethral or bladder rupture (Kalim *et al*., 2011) whereas urethrostomy is a surgical treatment of urethral obstruction that is mainly used for urethral rupture cases (Tiruneh, 2000). To perform urethrostomy the location of obstruction should be identified before surgical intervention (Kumar

et al., 2019). This agrees with current procedure of urethrostomy along with penile amputation in that the urethra was ruptured and necrotized. Post–scrotal urethrotomy site were used to retrieve urinary calculi in current case which is in agreement with finding of different authors (Poore *et al*., 2017; Saharan *et al*., 2020; Kushwaha *et al*., 2021) that dictates post–scrotal was the most common urethrotomy site and calculi mostly retrieved from the distal part of the sigmoid flexure in a single incision.

In current both cases calculi were not found in the urethra, this can be due to the calculi can be passed through ruptured urethra after necrosis of tissue. The urethrostomy can be performed with or without amputation of the penis and carried out in the perineum or the ventral abdominal wall based on the site of obstruction (Tiruneh, 2000). In the current both cases, urethrostomy was executed together with penile amputation at the base of the scrotum/post-scrotal to permanently divert urine flow proximal to the affected urethra. Penile amputation was done because it was non-viable and to prevent it to act as a source of infection and it allows protrusion of the urethra through the skin incision and advantageous in avoiding urine scalding of the surgical site. Similar case were also reported by (Kushwaha *et al*., 2021).

Leakage of urine resulted in swelling in ventral abdominal region as it happens with ruptured urethra due to obstructive uroliths and subcutaneous accumulation of urine did not allow healing, instead it caused urine scalds and necrosis of urethra and penis (Kushwaha *et al*., 2021). In present case stab incisions over the most ventral part of swollen area were made in order to drain the urine accumulated subcutaneously. This was the reason why swelling subsided within a week. This agrees with (Bhokre *et al*., 2011) which made three stab incisions on skin up to the depth of sub- cutaneous level to drain the urine. Urolithiasis is a life threatening disease of ruminants that causes economic loss to the farmers due to loss of animals and cost of treatment (Sutradhar *et al*., 2018). Slaughter can be recommended if the ante mortem inspection is satisfactory. However, in present case we feel that all attempts be made to save the animal in order to give maximum economic benefit to the farmers and they were sold for beef at a good price after 64 (case 1) and 41 (case 2) days of operation.

4. SUMMARY OF COMPILED SURGICAL CASE REPORTS

In the present case report, a total of 21 surgical treatments were performed in different domestic animal species using various techniques. These procedure comprises ovariohysterectomy 1 (4.76%), Cesarean section 2 (9.52%), castration 2 (9.52%), hernia management 3 (14.28%), dehorning 1 (4.76%), tenotomy 1 (4.76%), prolapses 3 (14.28%), open wound management 1 (4.76%), abscess drainage 1 (4.6%), rumenotomy 2 (9.52%), tail amputation 2 (9.52%), urethrostomy along with penile amputation 2 (9.52%). Among these procedures, hernias, and prolapses were found the most performed surgical procedure in two different animal species while cesarean section, castration, rumenotomy, tail amputation, urethrostomy along with penile amputation were the 2nd leading surgical procedures. The number of each animal species that undergone various surgical procedures were presented in (Figure 21) below. Bovine species were mostly subjected to different surgical procedures followed by canine and equines.

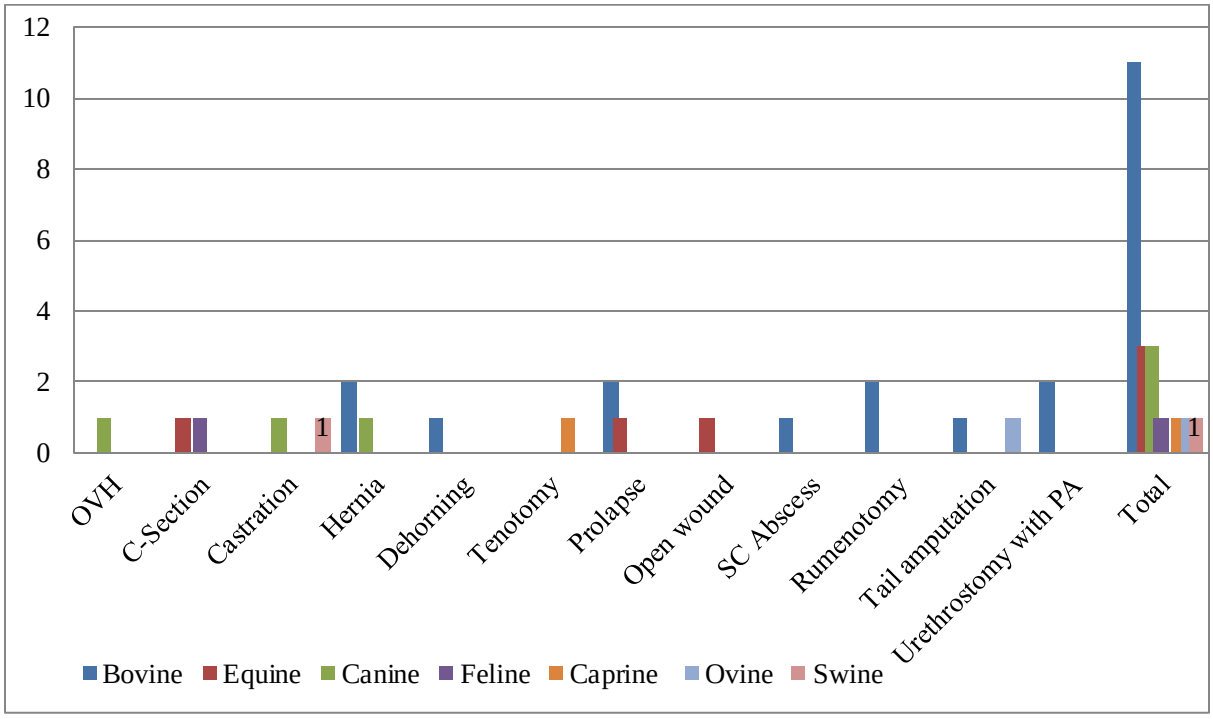

Figure 21: Types and the total number of surgical procedures in each animal species

Among the total animals that underwent surgical procedures, 85.71% (18) of animals were fully recovered after surgical procedures, 9.52% (2) of the animals died, while 4.76% (1) slaughtered few days after the operation. Among the dead animals, 4.76% (1) was died after undergoing a cesarean section due to a failure to adhere to the postoperative antibiotic treatments. The second animal was died after rumenotomy due to severe ruminal acidosis that failed to respond medical treatments. One case was slaughtered before recovery due to decreased feed intake. The number of totally recovered, slaughtered before recovery, and died animals after the surgical management was summarized by the (figure 22) below.

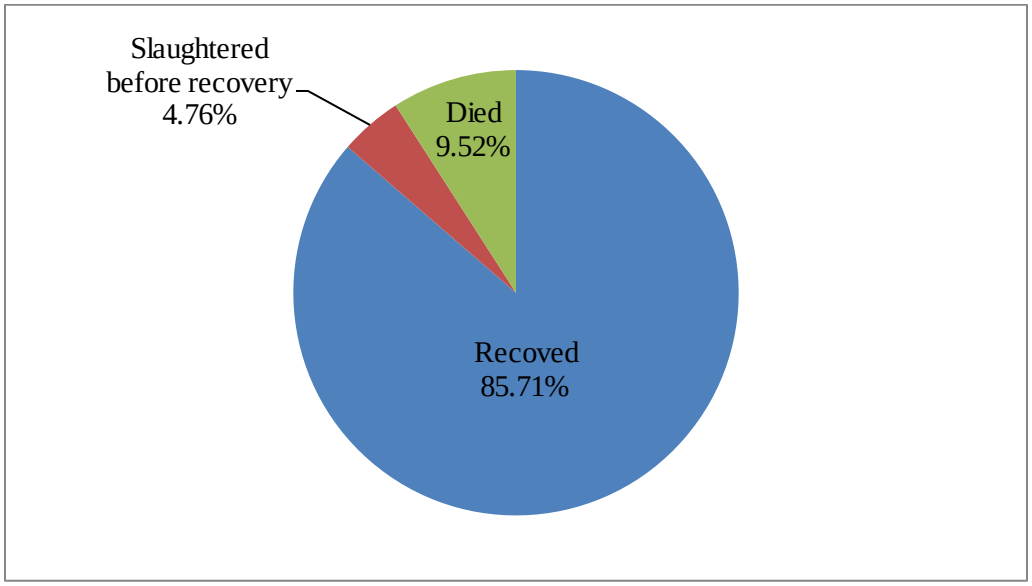

Figure 22: Summary of recovered, slaughtered before recovery, and died animals

The respective complications and outcomes of each surgical procedure were recorded accordingly and were indicated in (Table 1).

Table 1: Surgical procedures, postoperative complications, and their outcome

Animal species	Surgical treatment	Post-operative complications	Outcomes
Bovine	Abdominal intercostal hernia	____	Recovered
	Umbilical hernia	____	Recovered
	Cervico-vaginal prolapse	____	Recovered
	Subcutaneous abscess	____	Recovered
	Rumenotomy	Decreased feed intake in case 2	Case 1 died, case 2 Slaughtered after 10 days
	Tail amputation	____	Recovered
	Urethrostomy along with penile amputation	Stricture formation	Recovered and slaughtered after 64(case1) and 41(case2) days
	Dehorning	____	Recovered
	Paraphimosis	____	Recovered
Canine	OVH	____	Recovered
	Perineal hernia	____	Recovered
	Prescrotal castration	____	Recovered
Equine	Open wound Mgmt.	____	Recovered
	C-section	Minor ventral swelling	Recovered
	Rectal prolapse	____	Recovered
Feline	C-section	Failure to adhere to post-operative treatment	Died
Caprine	Tenotomy	Minor skin lesion due to pressure of bamboo splint	Recovered
Ovine	Tail amputation	Minor swelling	Recovered
Swine	Open castration	Minor swelling around the incision	Recovered and slaughtered after 2 months

5. CONCLUSION AND RECOMMENDATIONS

Livestock and pet animals are essential assets for livelihoods in improving the lifestyles of society, especially in developing countries. However, these animals can be exposed to different ailments and abnormalities which can be controlled and treated through emergency or elective surgical intervention, and different veterinary services. In the present surgical case reports, various surgical cases have undergone surgical treatments and management with different surgical procedures and techniques. In the current study, a total of 21 surgical patients, most of the patients recovered (85.71%) completely while 14.29% were unable to recover due to some limitations like failure to early treatments and adherence to postoperative cares. Even though most of patients those underwent surgical procedures were recovered successfully in the study areas, there were no inpatient or recovery room for critically ill animals, basic surgical equipment and instruments, and enough anesthetic drug accessibility. Therefore, depending on the above conclusion, the following recommendations were forwarded:

- The Veterinary Hospital should provide in patient room for close follow up of critically ill animals
- The Veterinary Hospital should have to provide sufficient anesthetics drugs, surgical facilities and antiseptics to provide efficient surgical treatments for the patients
- The government should have to give special consideration on adequate coverage of veterinary services in different animal hospital and clinics

6. REFERENCES

Abarca, R. (2021). Type II rectal prolapses in vulnerable donkeys: three case reports. *Research, Society and Development*, **9**(12), 2013–2015.

Abbas, M., Nasir, A., Kashif, M., Ijaz, F., Nasir, M. A. and Riaz, M. (2021). Surgical treatment of omphalocele with intestinal evisceration in cow calf of Sahiwal: A case report. *Iraqi Journal of Veterinary Sciences*, **35**(4), 745–748.

Abdin-Bey and Ramadan, R. . (2001). Retrospective Study of Hernias in Goats. *Scientific Journal of King Faisal University*, **1421**(1), 77–88.

Abubakar, A., Adamu, U., Yakubu, A., Busayo, E., Suleiman, N. and Sa'idu, B. (2010). Rectal prolapse associated with constipation in a curly colt (case reports). *Nigerian Veterinary Journal*, **34** (3), 859–862.

Abunnaja, S., Chysna, K., Shaikh, I. and Tripodi, G. (2014). Acquired abdominal intercostal hernia: case report and systematic review of the literature. *Hernia*, **18**(5), 607–615.

Adams, S. and Santschi, E. (2015). Management of Congenital and Acquired Flexural Limb Deformities. **46**, 117–125.

Addis, A. and Megra, T. (2017). Retro respective studies of hyena bite in ethiopian donkeys , eastern shoa , central ethiopia. **5**(1), 500–508.

Adeola, B. and Enobong, H. (2016). Surgical Management of Paraphimosis in Dog : A Case Report. **16**(1), 49–51.

Adeyanju, J., Yakubu, A., Jibril, A., Buhari, S. and Alayande, M. (2011). Bilateral perineal hernia with bladder retroflexion in a 13-year-old intact Jack-Russel Dog : Case report. **9**(1), 50–53.

Ajadi, T., Makinde, F., Adebayo, O. and Adeleye, A. (2018). Incidence, indication and prognosis of ovariohysterectomy in dogs in Abeokuta, Nigeria. *Sokoto Journal of Veterinary Sciences*, **16**(2), 47.

Al-akraa, A. (2015). Standard Herniorrhaphy , Polypropylene Mesh and Tension Band for Repair of Perineal Hernia in Dogs. *International Journal of Advanced Research*, **3**(10), 174–181.

Al-Harbi, K. (2011). Prevalence and etiology of abscess disease of sheep and goats at Qassim Region, Saudi Arabia. *Veterinary World*, **4**(11), 495–499.

Alimi, O., Bashir, M., Shuaibu, Y., Abdullahi, A. and Olu, S. (2018). Obstructive Urolithiasis in Ouda-Yankasa Ram: Case Report. **15**, 2989–2993.

Allu, T., Rajapantula, M., Killi, L. and Naidu, G. (2020). Clinical management of vaginal and rectal prolapse in crossbred jersey cow – a case report. *International Journal of Science, Environment and Technology*, **9**(2), 133–135.

Anderson, D., Desrochers, A. and St. Jean, G. (2008). Management of Tendon Disorders in Cattle. *Veterinary Clinics of North America - Food Animal Practice*, **24**(3), 551–566.

Anil, M., Rajashri, M. and Reddy, K. (2017). Management of Post Partum Cevico-Vaginal Prolapse in a Non-Descript Cow: A Case Report. *Theriogenology Insight - An International Journal of Reproduction in All Animals*, **7**(2), 75.

Anonimous. (2014). Welfare implications of Tail Docking of Lambs. *American Veterinary Medical Association*, 1–4.

Ansari, M. (2016). Surgical technique for the management of obstructive urolithiasis in a buffalo calf: A case report. *Buffalo Bulletin*, **35**(1), 5–9.

Aragaw, K., Abdella, A., Fekadu, A., Kassaye, A. and Sheferaw, D. (2016). Skin associated problems in working donkeys in three districts of Sidama Zone , Southern Ethiopia. **20**(2), 99–118.

Arju, M., Samaddar, K., Rahman, M., Haq, M., Rana, M., Ns, J. and Hasan, M. (2014). Surgical affections: A comparative scenario of Chittagong region. *International Journal of Natural and Social Sciences*, **1**(2), 31–36.

Armando, J. and Buitrago, G. (2016). Dehorning of cattle.

ASPCA. (2021). Spay/Neuter Training Reference Guide for Veterinarians. **17**.

Asrat, M. and Melkamu, S. (2015). Current Advances in surgical Management of Ruminal Disorders of Bovine. **5**(4), 683–693.

Auer, J. (2006). Diagnosis and Treatment of Flexural Deformities in Foals. *Clinical Techniques in Equine Practice*, **5**(4), 282–295.

Ayg, T., Bing, M. and Karaku, F. (2003). The effects of docking on performance and carcass characteristics of male Karaka ş lambs. **33**(3), 185–192.

Bain, M. (2020). Surgical and Behavioral Relationships With Welfare. *Frontiers in Veterinary Science*, **7**, 1–11.

Bakhiet, A. (2008). Studies on the rumen pathology of Sudanese desert sheep in slaughter house. *Scientific Research and Essays*, **3**(7), 294–298.

Balamurugan, B., Jena, D., Ramamoorthy, M. and Sushobhit, K. (2018). Successful Management of Pre Partum Cervico- Vaginal Prolapse Concurrent With Dystocia in Cattle: a Case Report. **7**(2), 613–617.

Behnke, R. and Metaferia, F. (2013). The Contribution of Livestock to the Ethiopian Economy – Part II. *Policy Brief Series*, **2**(11), 4.

Bekele, F., Goshu, D., Lulu, D. and Wankila, E. (2020). Retrospective Assessment of Donkeys Health and Welfare problems in Dale Sadi District Haro Sabbu Veterinary Clinic , Oromia, Ethiopia. 1–12.

Bencharif, D., Amirat, L., Garand, A. and Tainturier, D. (2010). Ovariohysterectomy in the Bitch. *Obstetrics and Gynecology International*, **2010**, 1–7.

Beyene, A. and Asfaw, Y. (2017). Predisposing factor of hyena bite to domestic animals in ada ' a woreda. **4**(03), 58–62.

Bhattacharyya, H., Fazili, M., Buchoo, B. and Akand, A. (2012). Genital prolapse in crossbred cows: Prevalence, clinical picture and management by a modifified bühner's technique using infusion (drip) set tubing as suture material. *Veterinarski Arhiv*, **82**(1), 11–24.

Bhokre, A., Negash, G., Gebrekidan, B., Gugsa, G. and Tadesse, G. (2011). Short communication: Surgical Management of Urethral Obstruction in three Bullocks. *Ethiopian Veterinary Journal*, **14**(2).

Bidwell, L., Embertson, R., Bone, N. and Ru, M. (2008). Diazepam levels in foals after dystocia birth. Proceedings of the 54th Annual Convention of the American Association of Equine Practitioners, San Diego, California, December 6-10 2008. **54**, 286–287.

Binversie, L., Educator, A. and County, U. (2014). Disbudding / Dehorning Dairy Calves.

Bisla, R., Tayal, R. and Ganguly, A. (2016). Research article evaluation of sub-ischial urethrotomy for the treatment of obstructive urolithiasis in male buffalo calves. **55**(2), 224–228.

Bonneau, M. and Weiler, U. (2019). Pros and Cons of Alternatives to Piglet Castration.

Bradford, J., Mellencamp, M., Ave, M., Oak, R., Drive, C. and Park, F. (2013). Immunological control of boar taint and aggressive behavior in male swine. 12–19.

Bright, R. (2011). Castration of Male Dogs. 2011.

Brun, M., Silva, M., Mariano, M., Motta, A., Colomé, L., Feranti, J., Pohi, V., Ataide, M., Guedes, R. and Santos, F. (2011). Ovariohysterectomy in a dog by a hybrid notes technique. *Canadian Veterinary Journal*, **52**(6), 637–640.

Buba, D., Gurumyen, G., Oragwa, O., Oziegbe, S., Patrobas, M. and Dunka, H. (2020). Retrospective analysis of cutaneous abscess in cattle, goats and pigs slaughtered at the Jos abattoir, Nigeria. *Sokoto Journal of Veterinary Sciences*, **17**(3), 44.

Burrow, R., Wawra, E., Pinchbeck, G., Senior, M. and Dugdale, A. (2006). Prospective evaluation of postoperative pain in cats undergoing ovariohysterectomy by a midline or flank approach. *The Veterinary Record*, **158**(19), 657–660.

brady, M. and Belen, J. (1993). Benefi ts of Castration in Male Dogs. *Purdue Department of Animal Sciences*.

Caldara, F., Moi, M., Sousa, L., Correia, I. and Almeida, D. (2013). Carcass Characteristics and Qualitative Attributes of Pork from Immunocastrated Animals. **26**(11), 1630–1636.

Callan, R. and Applegate, T. (2017). Temporary Rumenostomy for the Treatment of Forestomach Diseases and Enteral Nutrition. *The Veterinary Clinics of North America. Food Animal Practice*, **33**(3), 525–537.

Castration, S. (2012). Piglet castration and alternatives to castration. 1–6.

Cavanagh, A. (2017). Canine Dystocia. Veterinary Team Brief, May, 29–34.

Čech, S., Jan, Z., Malá, E. and Doležel, R. (2010). Innovation of surgical correction of rectal prolapse in sows. *Acta Veterinaria Brno*, **79**(1), 121–125.

Chauhan, P., Sindhi, S. H. and Thakor, K. (2013). Fetal dystocia due to dorso-pubic position and postural defects in a jenny: A case report. *Veterinary World*, **6**(2), 116–117.

Commission, E., Presidency, B., European, S., Union, E. and Market, I. (2010). European Declaration on alternatives to surgical castration of pigs.

Cozzi, G., Gottardo, F., Brscic, M., Contiero, B., Irrgang, N., Pentelescu, O., Windig, J., Mirabito, L., Eveillard, F., Cozzi, G., Gottardo, F., Brscic, M., Contiero, B. and Irrgang, N. (2020). Dehorning of cattle in the EU Member States : A quantitative survey of the current practices. *Livestock Science*, **179**, 4–11.

CSA. (2020). Agricultural sampling survey. Report on Livestock and Livestock Characteristics, *II*(March), 1–215.

Das, B., Nath, B., Pallab, M., Mannan, A. and Biswas, D. (2012). Successful management of ventral abdominal hernia in goat: a case report. *International Journal of Natural Sciences*, **2**(2), 60–62.

Dasari, S., Maramulla, A., Guddeti, S. and Deeti, S. (2021). Management of Tail Affections in Cows and Buffaloes. **10**(06), 458–466.

Defacqz, R. (2009). Federation of veterinarians of europe.

Dehghani, S. and Ghadrdani, A. (1995). Bovine rumenotomy: Comparison of four surgical techniques. 693–697.

Deka, D. (2018). Management of Paraphimosis in a Bull: A Case Report. *International Journal of Science and Research (IJSR)*, **7**(7), 1484–1485.

Dey, T., Sutradhar, B., Das, B., Shahedul, S., Quadery, A. and Veterinary, T. (2018). Surgical Management of Large Abdominal Hernia in a Male Goat. **5**, 3–5.

Digangi, B. and Isaza, N. (2016). Scrotal Approach to Canine Orchiectomy.

Doijode, V. (2019). Umbilical hernia in ruminant calves: A review. **8**(4), 164–167.

Dolf, G., Gaillard, C., Russenberger, J., Moseley, L. and Schelling, C. (2018). Factors contributing to the decision to perform a cesarean section in Labrador retrievers. *Biomedical central Veterinary Research*, **14**(1), 1–9.

Ducharme, N. (1990). Surgery of the bovine forestomach compartments. *The Veterinary Clinics of North America. Food Animal Practice*, **6**(2), 371–397.

Dugassa, J. and Bekele, K. (2021). Cervico vaginal prolapse correction and management by using bilateral configuration of sterile synthetic plastic materials in local breed cow. *International Journal of Veterinary Science and Research*, **7**, 073–076.

Dutt, R., Niwas, R., Kumar, S., Saini, D., Dangi, A. and Poonia, A. (2020). Surgical Management of Dystocia Due to Foetal Deformity in a Mare Surgical Management of Dystocia Due to Foetal Deformity in a Mare.

Efsa, Q. (2004). Welfare a spects of the castration of piglets. Scientific Report of the Scientific Panel for Animal Health and Welfare on a request from the Commission related to welfare aspects of the castration of Piglets. 1–18.

Elnar, T. Ailey, T. (2009). The Wound Healing Process : an Overview of the Cellular and Molecular Mechanisms. **37**(5), 1528–1542.

Erdas, E., Licheri, S., Calò, P. and Pomata, M. (2014). Acquired abdominal intercostal hernia: case report and systematic review of the literature. *Hindawi Publishing Corporation*, **18**(5), 607–615.

Espinoza, C., Lomax, S.and Windsor, P. (2020). Animals The E ff ect of Topical Anaesthesia on the Cortisol Responses of Calves Undergoing Dehorning. 1–11.

Espinoza, Lomax, S. and Windsor, P. (2013). The effect of a topical anesthetic on the sensitivity of calf dehorning wounds. *Journal of Dairy Science*, **96**(5), 2894–2902.

Evans, L. and Crane, M. (2018). The clinical companion of the donkey. 267.

Eyarefe, O. and Oguntoye, C. (2016). Cosmetic tail docking: An overview of abuse and report of an interesting case. *Biomedical Central Veterinary Research*, **12**(1), 16–19.

FAO. (2019). The future of livestock.

Farman, R., Al-Husseiny, S. and Al-Ameer, A. (2018). Surgical treatment of hernia in cattle: A review. *Al-Qadisiyah Journal of Veterinary Medicine Sciences*, **17**(2), 61–68.

Faulkner, P. and Weary, D. (2000). Reducing Pain After Dehorning in Dairy Calves. *Journal of Dairy Science*, **83**(9), 2037–2041.

FAWC. (2008). Farm Animal Welfare Committe Report on the Implications of Castration and Tail Docking for the Welfare of Lambs. **36**.

Fazili, M., Bhattacharyya, H., Mir, M., Hafiz, A. and Tufani, N. (2014). Prevalence and effect of oxytetracycline on congenital fetlock knuckling in neonatal dairy calves. *The Onderstepoort Journal of Veterinary Research*, **81**(1).

Fernández-Salas, A., Alonso-Díaz, M., Martínez-Flores, M. and Morgado-Ramírez, D. (2021). Flexor tendon contracture in the forelimbs of a calf: case report. 1–11.

Fesseha, H. (2020a). Hernias in Farm Animals and its Management technique: A Review. *International Journal of Clinical Studies and Medical Case Reports*, **4**(4).

Fesseha, H. (2020b). Practical Clinical Investigation of Acute Paraphimosis in Bull and its Surgical Management. ***3***, 68–71.

Fesseha, H. (2020c). Rumenotomy due to Metallic Foreign Bodies in Rumen of Adult Dairy Cow.

Fesseha, H.(2020d). Umbilical-Hernia-in-Cross-Holstein-Friesian-Calf-and-Its-Surgical-Management-A-Case-Report.

Fesseha, H. and Ayele, A. (2020). Recurrent Prepartum Cervico-Vaginal Prolapse in a Crossbred Holstein Friesian Dairy Cow. *Veterinary Medicine – Open Journal*, ***5***(1), 21–23.

Fesseha, H. and Getachew, Y. (2020). Management of Superficial Skin Abscess in Cattle: A Case Report. *Open Access Journal of Biogeneric Science and Research*, ***2***(2).

Fesseha, H. and Kidanemariam, F. (2020). Surgical Management of Chronic Cervico-Vaginal Prolapse in a Zebu Local Breed Dairy Cow-Case Report . *JOJ Wildl Biodivers*, ***2***(1), 3.

Firdaus, F., Abdullah, J., Abba, Y., Sadiq, M., Lim, E., Chung, T., Hambali, I., Bitrus, A., Azmi, M., Lila, M., Haron, A. and Saharee, A. (2016). Clinical Case of Uterine Prolapse in a Cow: It is an Emergency.

Fisher, M., Gregory, N., Kent, J., Scobie, D., Mellor, D. and Pollard, J. (2004). Justifying the appropriate length for docking lambs tails: a review of the literature. *Proceedings of the New Zealand Society of Animal Production*, **64**, 293–296.

Forsberg, C. and Persson, G. (2007). A survey of dystocia in the Boxer breed. *Acta Veterinaria Scandinavica*, **49**(1), 1–9.

Fromsa, A. and Mohammed, N. (2011). Prevalence of indigestible foreign body ingestion in small ruminants slaughtered at Luna Export Abattoir, East Shoa, Ethiopia. *Journal of Animal and Veterinary Advances*, **10**(12), 1598–1602.

Furneaux, R. (2011). Ovariectomy or ovariohysterectomy. *Journal of Feline Medicine and Surgery*, **13**(3), 162.

Furo, M. and Anderson, D. (2010). Rectum Prolapse Rectal Prolapse Rectal Prolapse. *Science Direct*, **1**.

Ganguly, S. (2016). Bacteriological examination of pus sample collected from a cow : a case study. *International Journal of Research -granthaalayah*, **4**(12), 31–33.

Garnier, E. and Giry, M. (2005). Perineal hernia. *Pratique Veterinary*, **17**, 9–11.

Geehan, A., Amel, O. and Shnain. (2006). Comparison of two techniques in children. *Surgery Journal*, 9–13.

Getachew, A. M., Innocent, G., Trawford., Reid, S. and Love, S. (2012). Gasterophilosis: a major cause of rectal prolapse in working donkeys in Ethiopia. *Tropical Animal Health and Production*, **44**(4), 757–762.

Getnet, F., Feyera, T., Alemu, F., Niguse, A. and Abera, T. (2014). Injuries in Donkeys and Mules : Causes , Welfare Problems and Management Practices in Amhara Region , Northern Ethiopia. **9**(4), 98–104.

Gill, S. and Barstad, R. (2018). A review of the surgical management of perineal hernias in dogs. *Journal of the American Animal Hospital Association*, **54**(4), 179–187.

Golder, H. and Lean, I. (2013). Ruminal Acidosis: How to diagnose and how to treat. *The Australian Cattle Veterinarian*, **2013**(69), 19–21.

Group, G. (2013). Cattle standards and guidelines – disbudding and dehorning Prepared by the Cattle Standards and Guidelines Writing Group. 1–20.

Grudzień, W., Szarek, J., Dzikowski, A., Babińska, I. and Sołtyszewski, I. (2018). Rectal prolapse (prolapsus recti) in swine as a still open problem. *Polish Journal of Natural Sciences*, **33**(2), 341–348.

Guérios, S., Monteiro, J. and Da Silva, D. (2017). Fascia lata flap to repair perineal hernia in dogs: A preliminary study. *Turkish Journal of Veterinary and Animal Sciences*, **41**(5), 686–691.

Guidelines, A. (2019). Dehorning guidelines.

Gupta, S., Sharma, A. and Singh, M. (2021). Post Partum Uterine Eversion and its Management in a Doe: A Case Report. *Indian Veterinary Journal*, **98**(4), 27–28.

Haile, Y., Velappa, R. and Asrat, M. (2017). A study on the prevalence of umbilical hernia in calves in and around Gondar Town , North Gondar , North. **2**(2), 11–15.

Hart, B., Hart, L., Thigpen, A. and Willits, N. (2019). Best age for spay and neuter : a new paradigm.

Hartnack, A., Niehaus, A. and Anderson, D. (2014). Surgery of the bovine rumen: indications and factors relating to outcomes in cattle in Ohio and Kansas. *American Association of Bovine Practitioners*, **45**(1), 214.

Hassan, N., Parrah, J., Hamadani, H., Ganie, A., Dar, R. and Dar, K. (2019). Management of large subcutaneous abscess in a dairy cow.

Hassen, D., Bedu Kawo, H. and Gondore, M. (2017). A Preliminary Study on Hernia in Domestic Animals in Gondar Town, North Gondar, North West Ethiopia. *Journal of Veterinary Science and Technology*, **8**(01), 1–8.

Heather B. (2019). Development of a Robust Canine Welfare Assessment Protocol for Use in Dog (Canis Familiaris).

Hegerová, T. and Juhás, P. (2021). Castration and alternatives in pig : advantages and disadvantages. *Aacta Fytotechn Zootechn*, **24**(1), 60–63.

Heo, S., Lee, D. Bin and Lee, H. (2013). Repair of bilateral perineal hernia with semitendinosus muscle transposition along with colopexy and cystopexy in a bitch. *Journal of Veterinary Clinics*, **30**(5), 371–375.

Hooker, A., Pairis-Garcia, M. and Kieffer, J. (2017). Tail Docking in Sheep and Cortisol Levels. 1–10.

Hopster, H. and Spoolder, H. (2007). Castration under anaesthesia and/or analgesia in commercial pig production.

Hossain, D., Chaudhary, P., Parvez, A., Paul, P., Yadav, S. and Hasan, T. (2017). Spaying as a Tool for Birth Control: A Case Report. *Research Journal for Veterianry Practitioners*, **5**(2), 19–24.

Howe, L. (2006). Surgical methods of contraception and sterilization. *Theriogenology*, **66**(3), 500–509.

Hunt, J., Heydenburg, M., Kelly, C., Anderson, S. and Dascanio, J. (2020). Development and Validation of a Canine Castration Model and Rubric. Educational Research Report, **47**(1), 24–29.

Indra, R., Wardhita, A. and Pemayun, I. (2019). Rectal Resection and Anastomosis Method as Rectal Prolapse Treatment in Persian Kitten: Case Report. *Indonesia Medicus Veterinus*, **8**(4), 424–431.

Iqbal, U., Mubeen, M. and Rafiq, S. (2019). Surgical Correction of Umbilical Hernia in Non-descript Buffalo Calf: A Case Study. **4**(1), 2018–2020.

Irrgang, N. (2012). Horns in cattle – implications of keeping horned cattle.

Ismail, Z. , Al-Majali, A., and Al-Qudah, K. (2007). Clinical and Surgical Findings and Outcome Following Rumenotomy in Adult Dairy Cattle Affected with Recurrent Rumen Tympany Associated with Non-Metallic Foreign Bodies. Al-Qudah Department of Veterinary Clinical Scie. *American Journal of Animal and Veterinary Sciences*, **2**(3), 66–71.

Jackson, P. (2004). Dystocia in the Dog and Cat. *Handbook of Veterinary Obstetrics*, 141–166.

Jakub, D., Małgorzata, O., Wiesław, B. and Wojciech, N. (2020). Dystocia after unwanted mating as one of the risk factors in non-spayed bitches: a retrospective study. *Animals*, **10**(9), 1–9.

Jena, B.and Sahoo, A. (2017). Amputation of Tail with Varicose Veins in a Buffalo: A Case Report. 8–11.

Jesse, F., Abba, Y., Sadiq, M., Umer, M., Chung, E., Bitrus, A., Latif, N., Hambali, I., Haron, A. and Lila, M. (2016). A Suspected Case of Suppurative Frontal Sinusitis in a Friesian Heifer: Clinical Management. *International Journal of Livestock Research*, **6**(8), 50.

Jiregna, D. and Abebe, F. (2019). Unilateral Surgical Amputation of Horn Due to Suppurative. **4**(2), 45–48.

Kadapatti, V., Santosh, H., Srinivasa Murthy, K., Koushiek., Yadav, S., Sunil, C., Lamani, T. and Nagaraja, B. (2019). Traumatic Ventral Herniorrhaphy in a HF Cow: A Case Report. *International Journal of Current Microbiology and Applied Sciences*, **8**(09), 649–653.

Kalim, M., Zaman, R. and Tiwari, S. (2011). Surgical management of obstructive urolithiasis in a male cow calf. *Veterinary World*, **4**(5), 213–214.

Kashyap, D., Dewangan, G. and Giri, D. (2019). Rectal prolapse in crossbred buffalo (Bubalus Bubalis) calf. *Buffalo Bulletin*, **38**(1), 173–177.

Kashyap, D., Giri, D. and Dewangan, G. (2017). Surgical Correction of Recurrent Perineal Hernia Using Polypropylene Mesh , Synthetic Collagen and Surgical Glue in Rottweiler Dog: a Case Report. *Exploratory Animal and Medical Research*, **7**, 106–109.

Kawy, H., Misk, N., Hady, A. and Sadan, M. . (2015). Prevalence and Management of Some Surgical Affection in Cattle and Buffaloes at Qena Governorate in Field Situation. *International Journal of Veterinary Sciences Research*, **1**(4), 79–87.

Kelly, E., Potter, J. and Beltman, M. (2010). A practical approach to simple procedures in pet pigs. *Veterinary Ireland Journal I*, **10**(9), 472–473.

Khan, Mohmmad Aarif, Makhdoomi, D., Gazi, M., Sheikh, G. N. and Dar, S. (2013). Clinico-sonographic evaluation based surgical management of urolithiasis in young calves. *African Journal of Agricultural Research*, **8**(48), 6250–6258.

Khan, Mumtaz Ali. (2020). dystocia in mare. 366–369.

Khurma, J., Choudhary, C., Sharma, V., Singh, K. P. and Akbarpur, B. (2016). Surgical Management of Rectal Prolapse in a Buffalo. *International Journal of Science, Environment*

and Technology, **5**(5), 3409–3414.

Kilic, N., Derincegöz, O. and Yaygingül, R. (2005). Surgical Correction of Umbilical Disease in Calves: A Retrospective Study of 95 Cases. *YYÜ Vet Fak Derg*, **16**(2), 35–38.

Kim, J. and Jeong, S. (2020). Evaluation of Autoligation Technique for Castration in Small Breed Dogs. **37**(2), 75–81.

Kim, J. (2001). Case report : Case report. *Canadian Family Physician*, ***47***(10), 788–789.

Kitessa, J. and Terefe, K. (2022). Perineal herniorrhaphy along with anal sacculectomy in dog: Case report. **8,** 39–42.

Knierim, U., Irrang, N., Roth, A., Gorniak, T. (2009). *D*. Report on the assessment of dehorning and the keeping of horned dairy and beef cattle. **2**(2), 1.

Koch, C., Brien, T., Livesey, M. and Acvs, D. (2015). How to Construct and Apply a Penile Repulsion Device (Probang) to Manage Paraphimosis. **55**, 338–341.

Kofler, J., Martinek, B. and Reinöhl-DeSouza, C. (2004). Treatment of infected wounds and abscesses in bovine limbs with Ligasano-polyurethane-soft foam dressing material. *Berliner und Munchener tierarztliche Wochenschrift*, **117**(9–10), 428–438.

Kumar, N., Mathew, D., Gangwar, A., Remya, V., Muthalavi, M., Maiti, S. and Sharma, A. (2014). Reconstruction of large ventro-lateral hernia in a buffalo with acellular dermal matrix: A method for treating large hernias in animals: A case report. *Veterinarski Arhiv*, **84**(6), 691–699.

Kumar, S., Mathur, A. and Jana, S. (2017). Surgical Correction Of Congenital Arthrogryposis Of Carpal Joint In Calves: Short Communication. **7**(1), 110–112.

kumar Sahoo, A., Nath, I., Nahak, A., Behera, S., Parija, D. and Nayak, S. (2018). Surgical Management of Dystocia due to Secondary Uterine Inertia in Dog: Case Report.

Kumar, Scholar, R., Sharun, K., Kumar Verma Scholar, N., Arif Basha Scholar, M., Rajesh Kumar Scholar, C., Kumar, R., Kumar Verma, N., Arif Basha, M. and Pawde, A. (2019). Management of obstructive urolithiasis in a bullock by urethrotomy. *Journal of Pharmacognosy and Phytochemistry*, **8**(3), 2080–2082.

Kushwaha, R., Gupta, A. K. and Dwivedi, D. (2021). Surgical Management of Traumatic Penile Necrosis and Urethral Rupture By Penile Amputation and Post-Scrotal Urethrostomy in Bovines. **60**, 145–148.

Kustritz, M. (2014). Pros , Cons , and Techniques of Pediatric Neutering. ***44***, 221–233.

Kustritz, M., Slater, M., Weedon, G. and Busby, P. (2017). Determining optimal age for gonadectomy in the dog: a critical review of the literature to guide decision making. *Clinical Theriogenology*, **9**(2), 167–211.

Lakshmi, N., Saibaba, M., Arun, S. and Rao, C. (2016). Successful Surgical Management of Tail amputation in a Panther (Panthera pardus). **3**(2), 450–451.

Lansdown, A., Mirastschijski, U., Stubbs, N., Scanlon, E. and Ågren, M. (2007). Zinc in wound healing: Theoretical, experimental, and clinical aspects. *Wound Repair and Regeneration*, **15**(1), 2–16.

Lee, S., Lee, S., Park, S., Kim, Y., Seok, S., Hwang, J., Lee, H. and Yeon, S. (2013). Comparison of ovariectomy and ovariohysterectomy in terms of postoperative pain behavior and surgical stress in dogs. *Journal of Veterinary Clinics*, **30**(3), 166–171.

Lennox, A. (2008). There's more than one way to do it : surgical castration techniques. 1824–1826.

Leta, S. and Mesele, F. (2014). Spatial analysis of cattle and shoat population in Ethiopia: Growth trend, distribution and market access. *SpringerPlus*, **3**(1), 1–10.

Li, P., Wang, L., Qian, X., Morse, A., Garfield, R. and Liu, H. (2021). A study of uterine inertia on the spontaneous of labor using uterine electromyography. *Taiwanese Journal of Obstetrics and Gynecology*, **60**(3), 449–453.

Lin-schilstra, L. (2021). Examining Alternatives to Painful Piglet Castration Within the Contexts of Markets and Stakeholders: A Comparison of Four. 1–35.

Lozier, J. and Niehaus, A. (2016). Surgery of the Forestomach. Veterinary Clinics of NA: *Food Animal Practice*, **32**(3), 617–628.

Luqman, M., Mughal, A., Waldron, R. and Khan, I. (2018). Laparoscopic Intaperitonael onlay mesh repair of an acquired abdominal intercostal hernia: Case Reports. *Biomedical journal*, **2018**, 2–4.

Maaskant, A., Bruijn, C., de, Schutrups, A. and Stout, T. (2021). Dystocia in Friesian mares: Prevalence, causes and outcome following caesarean section. *Equine veterinary education*, 190–195.

Mainau, E., Temple, D. and Manteca, X. (2012). Impact of dehorning and disbudding on the well-being of calves. The farm animal welfare fact centre.

Makhdoomi, D., Gazi, M. and Husbandry, A. (2013). Obstructive urolithiasis in ruminants: A review. 233–238.

Mamuti, D. and Gjino, P. (2013). The anesthetic techniques of local anesthesia during the rumenotomi in cattle. *Albanian Journal of Agriculture and Science*, **12**, 411–413.

Manteca, X. (2013). Effect of castration on the welfare of pigs.

Marchesini, G., De Nardi, R., Gianesella, M., Stefani, A., Morgante, M., Barberio, A., Andrighetto, I. and Segato, S. (2013). Effect of induced ruminal acidosis on blood variables in heifers. *Biomedical central Veterinary Research*, **9**(98).

Martin, K., Sarangom, S., Philip, S. and Kankonkar, A. (2012). Repair of Recurrent Perineal Hernia Using Polypropylene Mesh in a Dog. 59–61.

Martin, S., López, A., Morales, M., Morales, I., Tejedor-junco, M., Corbera, J., Martin, S., Alberto, J., Rumenotomy, C. and Morales, M. (2021). Rumenotomy in small ruminants: a review.

McCarthy, D., Lux, C. and Seibert, R. (2016). Perineal evisceration secondary to a bite injury in a dog with an untreated perineal hernia. *Canadian Veterinary Journal*, ***57***(10), 1053–1056.

McCue, P. (2016). dystocia in equines. 1–23.

McGrath, H., Hardie, R. and Davis, E. (2004). Lateral flank approach for ovariohysterectomy in small animals. *Compendium on Continuing Education for the Practicing Veterinarian*, **26**(12), 922–930.

Melo, C., Martínez, J. and Rojas, M. (2019). Complications of surgical sterilization by ovariohysterectomy in female dogs: A systemic review. *Revista de Medicina Veterinaria*, **1**(37), 83–93.

Metaferia, F., Cherenet, T., Gelan, A., Abnet, F., Tesfay, A., Ali, J. and Gulilat, W. (2011). Ministry of Finance and Economic Development and Ministry of Agriculture: Areview to improve estimation of livestock contribution to the national GrossDomestic Product. *Inter governmental authority on developments of Livestock Policy Initiative*, 0–42.

Meyer, N. (2017). Diagnosis and Management of Rumen Acidosis and Bloat in Feedlots. Veterinary Clinics of North America: *Food Animal Practice*, **33**(3), 481–498.

Mickelson, M., Christoph Mans, A. and Colopy, S. (2017). Principile of wound management and wound healing in the exotic pets. *Vet Clinic in North America Exot Animal Practice*, **19**, (1).

Misk N and Samia M. (1991). Recent advances in surgical management of urolithiasis in sheep and goat. *Assiut veterinary medical journal*, **26***(51), 228-234*.

Mohsin,. (2014).. *African Journal of Agricultural Research*, **9**(26), 2055–2061.

Morales, J., Dereu, A., Manso, A., Frutos, L. De, Piñeiro, C., Manzanilla, E. and Wuyts, N. (2017). Surgical castration with pain relief affects the health and productive performance of pigs in the suckling period. 1–6.

Moscuzza, C., Milicich, H., Álvarez, G., Gutierrez, B. and Nahum, M. (2014). Calving assistance influences the occurrence of umbilical cord pathologies treated surgically in calves. 405–408.

Moustafa, A. and Hamed, M. (2020). Comparison of primary incisional umbilical hernia closure in calves and buffalo calves with and without assistance for prosthetic mesh. **67**(2), 54–59.

Mubashra, A. E. (2017). Effects of hospital service quality on patients satisfaction and behavioural intention of doctors and nurses. *Saudi Journal Medicine andPharmaceutical. Science*, 818–821.

Mulatu, Z., Dugassa, J. and Telila, C. (2021). Unilateral Surgical Amputation of Horn Due to Different causes in Cattle and Goat: Case Report Case Description Case history and examination. ***1***(1), 1–8.

Mushonga, B., Habarugira, G., Musabyemungu, A., Udahemuka, J., Jaja, F. and Pepe, D. (2015). Investigations of foreign bodies in the fore-stomach of cattle at ngoma slaughterhouse, rwanda. *Journal of the South African Veterinary Association*, **86**(1), 1–6.

Nagar, H., Srivastava, A., Srivastava, R., Kurmi, M., Chandel, H. and Ranawat, M. (2016). Pharmacological Investigation of the Wound Healing Activity of Cestrum nocturnum (L .) Ointment in Wistar Albino Rats.

Naoman, T. and Uday. (2021). Causes and Treatment of Feline Dystocia. *Journal of Applied Veterinary Sciences*, **6**(4), 28–31.

Nath, S., Sen, A., Rahman, M., Das, S., Ersam, R. and Alam, R. (2016). Umbilical Hernia in Calves in Sylhet Region, *Bangladesh*. **3**(7), 19–25.

Nayak, S. and Samantara, S. (2010). Surgical correction of chronic cerivco-vaginalprolapse in a red sindhi cow through intravaginal approach. *Veterinary World*, **3**(9), 427–428.

Negash, S., Sibhat, B., Sheferaw, D., Sheferaw, D. and Attribution, C. (2014). A postmortem study on indigestible foreign bodies in the rumen and reticulum of ruminants , eastern Ethiopia. 1–5.

Nev, T. and Kisani, A. (2015). Paraphimosis in a 7 Month Old Wether: A Case Report. *Department of Veterinary Surgery and Theriogenology*, 148–149.

Niehaus, A. (2008). Rumenotomy. **24,** 341–347.

Ninu, A., Saxena, A., Sivanarayanan, T., Remya., Binsila, B., Maiti, S. and Zama, M. (2015). Caesarean in mare by Marcenac incision under local anaesthesia. *Iranian Journal of Veterinary Research*, **16**(1), 117–119.

Njoku, N., Jeremiah, K., Ukaha, R. O. and Orajaka, C. (2014). A case of complete rectal prolapse in an in-gilt. *Case Reports in Veterinary Medicine*, **2014**, 10–13.

Nka, P., Sharma, S., Chaudhary, R., Niwas, R. and Arora, N. (2018). Surgical Management of Perineal Hernia in a Crossbred Cow: A Case Report. *International Journal of Current Microbiology and Applied Sciences*, **7**(12), 385–388.

NMSA. (2005). National Metrological Services Agency Agrometeorological Bulletin. *Seasonal Agro Meterological Bulletin Bega*, **15**(03), 1–19.

Nuss, K. and Feist, M. (2011). Tail amputation for treatment of osteomyelitis of the first and second coccygeal vertebrae in a cow.10–13.

O'Neill, D., O'Sullivan, A., Manson, E., Church, D., McGreevy, P., Boag, A. and Brodbelt, D. (2019). Canine dystocia in UK first-opinion emergency care veterinary practices: Clinical management and outcomes. *Veterinary Record*, **184**(13).

Oluwatoyin, A. and Fayemi, O. (2011). A survey on cases of dystocia in bitch at southwestern Nigeria. *Global Veterinaria*, **6**(1), 97–100.

Owens, F., Secrist, D., Hill, W. and Gill, D. (1998). Acidosis in Cattle: A Review. *Journal of Animal Science*, **76**(1), 275–286.

Palestrini, C., Mazzola, S., Caione, B., Groppetti, D., Pecile, A., Minero, M. and Cannas, S. (2021). Influence of gonadectomy on canine behavior. *Animals*, **11**(2), 1–12.

Parrah, J., Moulvi, B., Hussain, S., Makhdoomi, D., Athar, H., Dedmari, F. and Hamadani, H. (2013). Evaluation of different surgical techniques for the management of bovine obstructive urolithiasis. *Veterinary Practitioner*, **14**(2), 515–522.

Paskalev, M., Antonov, A., Garnoeva, R. and Simeonov, R. (2018). A rare late post-Castration complication in a bitch: A case report. *Bulgarian Journal of Veterinary Medicine*, **21**(3), 371–377.

Patel, R., Patel, N., Singh, N. and Singh, P. (2016). Successful management of rectal prolapse in a mule (Equus mulus). *Journal of Livestock Science*, **7**(7), 35–37.

Patil, M., Sreedhara, J. and Kumar, D. (2020). Medicinal and surgical management of tail infections in buffaloes. *Buffalo Bulletin*, **39**(1).

Paul, D., Saikia, K. and Sharma, M. (2020). Successful Management of Paraphimosis in Two Cow Bulls of Lakhimi Breed. *International Journal of Livestock Research*, **10**(6), 1.

Pekcan, Z., Besalti, O., Sirin, Y. and Caliskan, M. (2010). Clinical and Surgical Evaluation of Perineal Hernia in Dogs: 41 Cases. *Kafkas Univ Vet Fak Derg*, **16**(4), 573–578.

Pentecost, R., Niehaus, A. and Anderson, D. (2016). Surgical Management of Fractures and Tendons. *The Veterinary Clinics of North America. Food Animal Practice*, **32**(3), 797–811.

Poore, L., Hendry, R., Steyl, J. and Pfitzer, S. (2017). Perineal urethrostomy to treat obstructive urolithiasis in a captive hand-raised steenbok (Raphicerus campestris). *Journal of the South African Veterinary Association*, **88**, 1–6.

Prasad, V., Kumar, P., Harikrishna, N., Sreenu, M., Vidyasagar, P., Mahesh, R., and Bhagyaraju, D. (2016). A comprehensive study on surgical affections of horns in buffaloes (Bubalus bubalis). 280–287.

Pratheepa, K., Karuppiah, A. and Vijay, K. (2021). Tail amputation, management of tumour like growth in tail of the cross-bred cows. *Journal of Entomology and Zoology Studies*, **9**(1), 778–780.

Pretzer, S. (2008). Medical management of canine and feline dystocia. *Theriogenology*, **70**(3), 332–336.

Priyanka, M. and Dey, S. (2018). Ruminal impaction due to plastic materials-An increasing threat to ruminants and its impact on human health in developing countries. *Veterinary World*, **11**(9), 1307–1315.

Purohit, G. (2007). Intra-partum conditions and their management in mare. *Journal of Livestock Science*, 20–37.

Purohit, G. (2019). Dystocia and its Management in the Mare. *Journal of Livestock Science*, **2**(20–37).

Rahman, C. (2020). Case reports of umbilical hernia and its complications in calves. *Kerala Veterinary and Animal Sciences University*.

Ramaswamy, V. and Sharma, H. (2011). Plastic bags: Threat to environment and cattle health: A retrospective study from Gondar city of Ethiopia. *IIOAB Journal*, **2**(1), 7–12.

Ranabhat, R. (2021). *Surgical Correction of Umbilical Hernia in Buffalo Calf : A Case Report*. **3**(6), 33–35.

Rashmi, P. and Priyadharshini. (2018). Surgical management of congenital flexor tendon deformity in calves: A review of three cases. *Journal of Entomology and Zoology Studies*, **6**(3), 544–546.

Ravikumar, K., Varudharajan, V., Selvaraju, M. and Prakash, S. (2019). Successful management of paraphimosis in a buffalo bull. *Indian Veterinary Journal*, **96**(7), 74–75.

Reddy, K., Kumar, V., Ganesh, S. and Raghavender, K. (2017). Unilateral Horn Cancer in Cow and its Surgical Management: A Case Report. *International Journal of Current Microbiology and Applied Sciences*, **6**(8), 3349–3352.

Review, L., Implications, W., States, U., Castration, S., and States, U. (2013). *Swine Castration*. 1–5.

Rioja, E., Cernicchiaro, N., Costa, M. C. and Valverde, A. (2012). Perioperative risk factors for Mortality and length of hospitalization in mares with dystocia undergoing general anesthesia: A retrospective study. *Canadian Veterinary Journal*, **53**(5), 502–510.

Romagnoli, S. (2017). Early-age neutering in dogs and cats: advantages and disadvantages. *Revista Brasileira de Reprodução Animal*, **41**(1), 130–132.

Rossdales. (2014). Dystocia: an equine emergency.

Rowth, I. (2014). Dehorning and Disbudding of Cattle. 1–9.

Sachan, V., Singh, V. and Saxena, A. (2019). Study on Biochemical Changes During Peri-Parturient Prolapse in Murrah Buffaloes. *Haryana Veterinary*, **58**(1983), 98–101.

Sadan, M., El-Shafaey, E.and El-Khodery, S. (2019). Abdominal hernias in camel (Camelus dromedaries): Clinical findings and treatment outcomes. *Journal of Veterinary Medical Science*, **81**(5), 675–681.

Saharan, S., Mathew, R. and Jain, V. (2020). Obstructive urolithiasis in buffalo calves in haryana: a review of *143* cases. *Haryana Veterinary*, **59**, 90–92.

Sahoo, S. and Ganguly, S. (2016). Surgical Management of Abscess in Camel: A Case Report:

World Journal of Biology and Medical Science, **2**(4), 2–5.

Saidu, A., Fadason, S., Ochube, G. and Adamu, S. (2022). Assessment of Standing and Recumbent Restraint Positions and the Significance of Rumenotomy Techniques Based on the Profiles of Serum Amyloid a in Kano Brown Goats. *Macedonian Veterinary Review*, **45**(1), 61–69.

Saidu, A., Fadason, S., Ochube, G. and Adamu, S. (2020). Comparative Evaluation of Standing and Lateral Recumbency Restraint Positions for Rumenotomy Based on Transforming Growth Factor- β Responses in Kano-Brown Goats. *Iranian Journal Of Veterinary Surgery*, **15**(1), 24–31.

Salib, F. and Farghali, H. (2016). Epidemiological, therapeutic and surgical studies on Tail necrosis in Egypt. *International Journal of Veterinary Science*, **5**(1), 44–47.

Samper, J., Act, D. and Plough, T. (2012). How to Deal With Dystocia and Retained Placenta in the Field. 2–4.

Sanousi, S., Hamad, A. and Gameel, A. (1989). Abscess disease in goats in the Sudan. *Revue d'élevage et de Médecine Vétérinaire Des Pays Tropicaux*, **42**(3), 379–382.

Sato, A., Kato, T. and Tajima, M. (2020). Flexor tendon transection and post-surgical external fixation in calves affected by severe metacarpophalangeal flexural deformity. *Journal of Veterinary Medical Science*, **82**(10), 1480–1483.

Satyanarayana, G., Sreenu, M., Prasad, V. and Naidu, G. (2014). Management of tail affections in buffaloes. *International Journal of Agricultural Sciences and Veterinary Medicine*, ***2***(4).

Seid, A. (2018). Effect of topical application of mixture of cod liver oil and honey on old (chronic) wounds and granulation tissue in donkeys. *Journal of Veterinary Medicine and Animal Health*, **10** (3), 78–88.

Seid and Birhan. (2019). A review on equine wound management and healing process. *Online Journal of Animal and Feed Research*, **9**(2), 68–85.

Sendilvelan, S. (2017). Uterine Prolapse in a Jersey-Red Sindhi Cross Cow Research. *Journal of Pharmaceutical , Biological and Chemical Sciences*.

Shahar, R., Shamir, M., Niebauer, G. and Johnston, D. (1996). A possible association between acquired nontraumatic inguinal and perineal hernia in adult male dogs. *Canadian Veterinary Journal*, **37**(10), 614–616.

Sharma, A., Negi, V., Sharma, P., Kumar, H., Sharma, A., Singh, M. and Kumar, P. (2021). Dystocia due to breech presentation and caesarean under local anaesthesia and sedation in a mare. *SVU-International Journal of Veterinary Sciences*, **4**(4), 16–21.

Sheetal, S., Patil, A., Sahatpure, S., Gahlod, B., Akhare, S., Registrar, H. and Superintendent, H. (2018). Management of dystocia due to primary uterine. *International Journal of Science, Environment and Technology*, **7**(2), 584–587.

Shrestha, S., Thakur, B., Regmi, B. and Shah, M. (2019). Management of Obstructive Urolithiasis in a Male Buffalo Calf Using Tube Cystostomy Technique. *International Journal of Applied Sciences and Biotechnology*, **7**(1), 120–123.

Singer, A. and Dagum, A. (2008). Current Management of Acute Cutaneous Wounds. *The new england journal o f medicine*, **2008**, 1037–1046.

Singh, G. (2020). Management of Dystocia due to Primary Uterine Inertia in Bitch: A Case Report. *Theriogenology Insight: An International Journal of Reproduction in All Animals*, **10**(1), 1–5.

Sinmez, C., Ali, Y., Ismail, U., Askin, Y. (2016). Tail Docking and Ear Cropping in Ruminants: A Comparison of Welfare Aspects in the World and Turkey. *Journal of Faculty of Veterinary Medicine, Erciyes University*, **13**(1), 58–69.

Stamm, F., de O., Molento, M. and Molento, C. (2019). South Brazilian farmers perceptions concerning sheep tail docking. *Ciencia Rural*, **49**(4), 1–6.

Steiner, A., Anderson, D. and Desrochers, A. (2014). Diseases of the tendons and tendon sheaths. *The Veterinary Clinics of North America. Food Animal Practice*, **30**(1), 157–175,

Stull, C., Payne, M., Berry, S. and Hullinger, P. (2002). Evaluation of the scientific justification for tail docking in dairy cattle. *Journal of the American Veterinary Medical Association*, **220**(9), 1298–1303.

Sutherland, M., Davis, B., Brooks, T. and Mcglone, J. (2010). Physiology and behavior of pigs before and after castration: effects of two topical anesthetics. *Animal, The International Journal of Animal Biosciences*, **4**(12), 2071–2079.

Sutradhar, B., Hossain, M., Das, B. and Kim, G. (2009). Veterinary Science Comparison between open and closed methods of herniorrhaphy in calves affected with umbilical hernia. *Journal of Veterinary Science*, **10**(4), 343–347.

Sutradhar, Tuli Dey, Saroj Kumar Yadav, and Mohammad Bayazid Bostami. (2018). Surgical Management of Obstructive Urolithiasis in Small Ruminants by Tube Cystostomy in Chittagong, Bangladesh. *Journal of Agricultural Science and Technology*, **8**(2), 89-98.

Swieton, N., Singh, A., Lopez, D., Oblak, M. and Hoddinott, K. (2020). Retrospective evaluation on the outcome of perineal herniorrhaphy augmented with porcine small intestinal submucosa in dogs and cats. *Canadian Veterinary Journal*, **61**(6), 629–637.

Tadesse, T. and Mulatu, E. (2019). Clinical Management of Post- Partum Complete Uterine Prolapse in Crossbred Dairy Cow: A Case Report. *Journal of Science Medical central*, **7**(1), 1–2.

Taint, B., Meat, O. and Traits, Q. (2019). Pros and Cons of Alternatives to Piglet Castration : Welfare , Boar Taint , and Other Meat Quality Traits. *Multidisciplinary Digital Publishing Institute (MDPI)*, **9**(884), 1–12.

Tallant, A., Ambros, B., Freire, C. and Sakals, S. (2016). Comparison of intraoperative and Postoperative pain during canine ovariohysterectomy and ovariectomy. *Canadian Veterinary Journal*, **57**(7), 741–746.

Talukder, A., Das, Z., Rahman, M., Rahman, M. and Rahman, A. (2021). Caesarean section followed by ovariohysterectomy in a Bangladeshi domestic cat: A surgical intervention for management of dystocia due to partial primary uterine inertia. *Veterinary Medicine and Science*, **7**(5), 1564–1568.

Tegegne, A. and Feye, G. (2020). Study of Selected Livestock Innovations in Ethiopia. Social Science Research Network(SSRN) *Electronic Journal*.

Tesfaye, A., Tekle, Y., Taddele, H. and Yihdego, H. (2015). Survey of Common Skin Problemof Working Equines in and Around Mekelle, North Ethiopia. *Academic Journal of Animal Diseases*, **4**(1), 30–38.

Thangadurai, R., Panneerselvam, S. and Kathirvel, S. (2016). Surgical management of ventral abdominal hernia in a lamb. *Indian Veterinary Journal*, **93**(3), 73–74.

Thangamani, A., Srinivas, M., Prasad, B. and Kumar, L. (2018). Periparturient Event and Dystocia in Equine: A Review. *International Journal of Science, Environment*, **7**(2), 648–658.

Thomas, S. (2019). Dealing with Prolapses. *Hereford world*, 56–57.

Tiruneh, R. (2000). A retrospective study on ruminant urethral obstruction in Debre Zeit area,

Ethiopia. *Revue de Medecine Veterinaire*, **151**(8–9), 855–860.

Tiruneh, Roman, Bersisa, G. and Sori, M. (2014). Surgical conditions and requested procedures for ruminants and small animals handled at the College of Veterinary Medicine and Agriculture clinic, Debre Zeit, Ethiopia: A retrospective study 1999-2007. *Ethiopian Veterinary Journal*, **18**(2), 83–97.

Tsega, A., Worku, Y., Tesfaye, T. and Nazir, S. (2016). Prevalence of Wound and Associated Risk Factors of Donkeys in Merawi District. *Journal of Animal Research*, **6**(5), 765–771.

Udegbunam, R., Ugwu, A., Onuba, A., Okereke, N. and Udegbunam, S. (2019). Effects of sub-anaesthetic (low) dose ketamine infusion on intra-operative and postoperative pain in goats anaesthetized with diazepam-ketamine prior to rumenotomy. *Sokoto Journal of Veterinary Sciences*, **17**(1), 19.

Ural, K., Aktaş, M., Aliç, D., Karakurum, M., Haydardedeoğlu, A. and Cingi, C. (2007). Tail-Tip Necrosis in Beef and Dairy Cattle: A Report of Seven Cases in Ankara. *Kafkas Üniv Vet Fak Derg*, **13**(2), 203–207.

Urfer, S. and Kaeberlein, M. (2019). Desexing dogs: A review of the current literature. Multidisciplinary Digital Publishing Institute (MDPI) *Animals*, **9** (12), 1086.

VanCamp, M. (2021). Umbilical Disease: A Hidden Challenge, Investigating Umbilical Health Literature and the Impact of an Umbilical Disinfectant in Cattle.

Vnuk, D., Maticic, D., Kreszinger, M., Radisic, B., Kos, J., Lipar, M. and Babic, T. (2006). A modified salvage technique in surgical repair of perineal hernia in dogs using polypropylene mesh. *Veterinarni Medicina*, **51**(3), 111–117.

Wahed, R., Korittum, A. and Abu-ahmed, H. (2014). Evaluation of Pinhole Castration Technique Compared With Traditional Method For Castration in Dogs. Alexandria Journal of Veterinary Sciences, **42**, 90–98.

Wavreille, G. and Fontaine, C. (2009). Normal tendon: anatomy and physiology. *Electronic Medicines Compendium- Locomotor System*, **42**(1), 1–12.

Yimer, N., Syamira, S., Rosnina, Y., Wahid, H., Sarsaifi, K., Bukar, M. and Yap, K. (2016). Recurrent vaginal prolapse in a postpartum river buffalo and its management. *Buffalo Bulletin,* **35**(4), 529–534.

Yoon, H. and Jeong, S. wuk. (2010). Coexistence of sciatic, dorsal, and caudal perineal hernias in a dog. *Journal of Veterinary Clinics*, **27**(5), 584–587.

Zambelli, D., Ballotta, G., Valentini, S. and Cunto, M. (2022). Total Perineal Prostatectomy: A Retrospective Study in Six Dogs. *Multidisplinary Digital Publishing Institute* (*MDPI*) *of Animals*, **12**(2), 1–11.

Zeleke Mekuriaw. (2021). *Ethiopia's Livestock Systems: Overview and Areas of Inquiry*.

7. ANNEXES

Annex 1: Case recording and management format

Date._____

Case No._____

Name of the Hospital/Clinic: Professor Feseha G/AB VTH ____ Donkey Sanctuary Veterinary clinic_____ Hidi veterinary clinic_____ Dire veterinary clinic_____

Animal detail and identification

Species: Bovine_____Ovine_____Caprine_____ Feline____ Canine____ Swine___ Equine____

Breed _____ **Sex:** Male____ Female_____ **Name if any**_____

OWNER DETAIL

Owners' Name _____Address Town _____Village _____ House No___

Occupation_____ Phone No _____

CASE HISTORY

_____

_____

_____

CLINICAL FINDINGS

Body Temp _____c0 Respiration rate _____Breaths/min Heart rate _____ Beat/min Ruminal Motility ____/min Gut sound _____ VMM: Normal pale Congested Jaundice Cyanotic CRT:_____Body Condition:_____ Superficial Ln: PF___ PS___MND ___ RPH_____ Other_____

Description of Case

_____

_____

_____

Organ or system affected: Nervous____ Muskulo skeletal____ Respiratory____ Circulatory___ Digestive____ Urogenital____ Integuments____ Other _____

Sample taken: Feces____ Blood____ skin scraping____ Nasal swab___ vaginal swab___ Ruminal content____Urine_____Other_____

Differential Diagnosis

List: _____

Laboratory Result:_____

Tentative Diagnosis:_____

Definitive Diagnosis:_____

PATIENT CARD

Prognosis:_____

OBSERVATION AND TREATMENT

Clinical work to be performed:

Surgical_____Medical_____Gynecology/Obstetric_____Follow up/Quarantine_____

Medical treatment administered_____

Name of Staff in Charge: _____Signature_____

Student in Charge: _____ Signature_____

Annex 2: Preoperative medication and stabilization format

Patient Name: _____

History: _____

Clinical and lab findings_____

_____

Diagnosis_____

Other _____

Prophylaxis_____

Analgesia_____

Fluids:_____

Others_____

Annex 3: Anesthetics and intraoperative evaluation format

Date: _____

Time: _____to_____

Procedure _____

Surgical Team Surgeon _____

Assist surgeon _____

Anesthetist _____

Patient monitor _____

Animal Species_____Age_____Sex_____Weight_____Body condition_____

Pregnancy_____ Preanesthetic _____Anesthetic drug_____ Dose_____Route_____

Total dose _____

Intraoperative Complications and Findings

1._____

2._____

3._____

Measures taken to control complication

_____

_____

Record of Different Vital Parameters

Vital Parameters	Before Medication	After Induction of Anesthesia			
		5min	10min	20min	end
Temperature					
HR/min					
RR/ min					
MM Color					
Pulse quality					

Annex 4: Post-operative care evaluation format

Date: _____to_____

Surgical procedure: _____

Surgical techniques _____

Antibiotics_____

Analgesia_____

Fluid_____

Others _____

Post-operative complications and treatment

1._____

2._____

3._____

4. Outcome_____

Annex 5: Translated owner's consent format

Owner's name: _____ Telephone: _____

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

I, the owner of the above-mentioned animal, being informed of the terms of the procedure and consented to the surgery of _____to be performed on my animal.

Signature: _____ Date: _____