

Surgical Management of Congenital Umbilical Hernia in Cross-Holstein Friesian Calf

Haben Fesseha Gebremeskel¹, Tamenech Bandaw¹, Isayas Asefa Kebede^{2,*}

¹*School of Veterinary Medicine, Wolaita Sodo University, P.O. Box: 138, Wolaita Sodo, Ethiopia*

²*School of Veterinary Medicine, Ambo University, P.O. Box: 19, Guder, Ethiopia*

***Corresponding Author:** Isayas Asefa Kebede, School of Veterinary Medicine, Ambo University, P.O. Box: 19, Guder, Ethiopia, Tel.: +251911894973, E-mail: isayasasefa@ambou.edu.et

Citation: Haben Fesseha Gebremeskel, Tamenech Bandaw, Isayas Asefa Kebede (2024) Surgical Management of Congenital Umbilical Hernia in Cross-Holstein Friesian Calf, SAJ Case Report 11: 102

Abstract

A four-month-old Holstein Friesian crossbred calf weighing 70 kg was admitted to Offa Woreda veterinary clinic with a history of swelling at the umbilical region three months ago. Clinical examination revealed an umbilical hernia on palpation, an oval hernia ring with large size and reducible nature was noted. The case was handled surgically using herniorrhaphy using overlapping mattress suture techniques and synthetic absorbable polyglycolic acid. A broad-spectrum antibiotic was given intramuscularly for five days post-operatively and the calf has complete healing was recorded on the 25th day post-operation. The present case report discusses the successful management of an umbilical hernia in the calf.

Keywords: Calf; Congenital Umbilical hernia; Herniorrhaphy

Introduction

A hernia is the protrusion or displacement of an organ, part of an organ, or tissue outside the abdominal cavity through an abnormal opening in the abdominal wall which can be noted from the outside of an animal's body and can be detected with an external examination. The umbilicus in newborn calves consists of the urachus, a tube that connects the fetal bladder to the placental sac, and the remnants of the umbilical vessels that transport blood between the fetus and its mother. Normally, just after birth, these structures shrink until only tiny remnants remain within the abdomen. If bacteria gain entry through the umbilicus, however, those remnants can become infected and require surgical removal. Additionally, if the area in the body wall through which these structures passed remains open, abdominal contents can protrude through the defect, resulting in an umbilical hernia. Umbilical hernias are the most common birth defect in calves and may be more common in the Holstein-Friesian breed. Hernia possibly occurs by accident or due to normal anatomical opening, which does not completely fulfill its function [1].

Anatomically hernia consists of three parts, hernial ring, hernial sac, and contents [2]. In cattle's most common site of a hernia is the abdominal wall which consists of the muscles and ligaments, which act as shield and the natural function of it carries the abdominal contents mainly the intestines. When any weakness extends in the abdominal wall, the shield loses its job and forms a hole called a hernial ring, then part of the viscera of the abdominal cavity passes through the hole and then bulges which is visible on the skin as a hernia [3]. The hernia either occurs when there is a natural weakness in the inguinal canal and femoral or the umbilicus area caused wide in these canals and the passing of viscera through it [4]. Thus, different types of hernia in small and large animals are classified according to their anatomical locations into umbilical, inguinal, scrotal, femoral, perineal, and ventral (or abdominal) hernias [5, 6].

An umbilical hernia is one of the most common congenital conditions in domestic animals. Congenital umbilical hernias are the most common surgical affections of cattle, buffalo, sheep, and goats [7, 8]. It occurs due to failure of normal closure of the umbilical ring at birth or due to malformation/ development or hypoplasia of abdominal muscles, however, the mechanism or reasons for failure to closure are not known. Furthermore, commonly occurs due to failure of normal development and closure of the umbilicus, infection at the site of the umbilicus, manual breakage of the umbilicus, clamping, or ligation of the umbilical cord, and potentially excessive straining [9, 10]. Moreover, 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 (less collagen in the ventral abdominal wall), hypoplasia of the abdominal musculature, and multiple births (twins, triplets, etc) are considered as the cause and predisposing factor for umbilical hernia [11, 12].

Although in previous reports, an umbilical hernia occurs more frequently in Holstein Friesian calves, it can occur also in any breed of cattle. Calves of 5-7-weeks of age are among the most affected age groups with umbilical hernia and it is reported in 4 to 15% of the calves. Females are much more frequently affected than males [13, 14]. Reports on hernias in small ruminants are very rare [10, 15-17]. There is less chance of strangulation since the ring size is too small for abdominal contents to pass except for omentum. On the other hand, if the internal ring size is more than 2 cm in diameter, there may be a potential site of abomasal and intestinal incarceration [6, 18].

Most hernias enlarge over time and, if not repaired surgically, they may cause pain, anorexia, and weight loss. Besides, incarceration and strangulation of the bowel are the most dangerous life-threatening sequela of herniation [9, 19]. An umbilical hernia can be symptomatic or asymptomatic upon its clinical presentation and is usually seen shortly after birth. Besides, it is usually painless if it is non-strangulated and non-infected hernias, and omentum, small intestine, or abomasum are the most common contents that appear in most cases of umbilical hernia. The size and shape of the hernial ring vary from ring diameter of less than 2 cm, 2-5 cm, and greater than 5 cm ring diameter. Moreover, the nature of the umbilical ring determines the degree of fibrosis and the possibility of suture retention [4, 9].

A primary diagnosis was made from the history and by palpation of the hernial region. The condition can be easily diagnosed by observing clinical signs, through external digital palpation and ultrasonography (especially for non-reducible hernias to identify contents of the hernial sac and differentiate from umbilical abscessation). Diagnosis of the cases, however, is confirmed by exploratory puncture of the swelling and demonstration of intestinal contents [20].

The umbilical hernia should be differentiated from disease conditions like omphalitis, omphalo-arteritis, omphalo-arteritis or phlebitis, omphalo-phlebitis, acquired hernia, rupture of abdominal wall, umbilical abscess, and urachal cysts or rupture. Since such cases are mostly associated with a hereditary element, careful consideration should be given when the animals are going to be used for further breeding [5, 12, 21].

Hernia can be managed using various medical and surgical methods. There are several ways to surgical treatment of a hernia which depend on the size of the hernial ring at the site, primary repair (Herniorrhaphy) surgical treatment of a simple hernia completed with sutures sited in a straight line in the abdomen, mesh repair (Hernioplasty), surgical repair of large and complex hernia by using networks and may use a laparoscope [22]. Complex abdominal wall and hernia treatment uses a mixture of primary and mesh [23]. Thus, radical surgery is the best option for the majority of symptomatic or asymptomatic umbilical hernias and is one of the most common surgical procedures performed [24, 25].

The prognosis depends on the type and condition of hernia. Besides, early diagnosis and treatment of the condition improve the outcome of the umbilical hernia [24, 26]. Despite its commonness, it is generally ignored by rural farmers unless it results in some serious form and affects the productivity and reproductivity of the animals. The present study describes the successful management of an umbilical hernia in a calf.

Case Presentation

A four-month-old Holstein Friesian crossbred calf weighing was admitted to Offa Woreda veterinary clinic with a history of swelling at the umbilical region 3 months ago. The clinical examination revealed reducible swelling that hung down around the umbilicus. The size of the hernia ring was three fingers in width. The clinical parameters like rectal temperature, heart rate, and respiratory rate were within normal range with good body condition. Based on clinical examination, the case was diagnosed as umbilical hernia.

Treatment

Pre-operative Preparations

The food and water intake were withheld, for 24 hours and 12 hours before surgery, respectively. The calf was restrained physically and sedated with an intramuscular administration of Xylazine hydrochloride at a dose rate of 0.1 mg/kg body weight. After proper sedation, the calf was controlled in dorsal oblique recumbency. Then, the surgical site (umbilical area) was aseptically prepared by clipping, shaving, scrubbing, and washing with water, and Salvon® (Cetrimide 3% and Chlorhexidine gluconate 0.5% solution). The site was also scrubbed with Povidone iodine solution. As well as the ring block anesthesia was achieved by Local anesthetic (Lidocaine hydrochloride 2%, Jeil pharm. Co. Ltd., Korea) with a dose rate of 1 ml/cm area to desensitize the abdominal muscle and alleviate pain during a surgical procedure.

Surgical Correction and Treatment

Following proper physical and chemical restraining and aseptic preparation of the surgical site, the calf was kept in the appropriate position for the next surgical procedure. A gentle and sufficient longitudinal incision was made in the middle of the swelling. The skin was detached from the subcutaneous tissue through blunt dissection and the incision was continued through the abdominal

muscle and peritoneum. Then, all muscular layers together with skin were grasped with a handheld retractor to get sufficient surgical field and the hernia ring was adequately exposed.

After careful dissection of skin and subcutaneous tissue, the condition of the hernial sac and the hernial ring was examined to confirm any adhesions in the abdominal organs. Upon insertion of a finger, slight adhesion of some part of the abomasum with the lower abdominal wall was found and it was gently detached and the herniated viscera (abomasum) were repositioned back in the abdominal cavity manually. Then, a 1 mm dissection was performed eccentrically around the edge of the hernial ring to make a fresh wound that helps to facilitate the healing process. Herniorrhaphy was done by overlapping mattress sutures using synthetic sterile absorbable polyglycolic acid suture materials size. The excess portion of the hernial sac was excised. Then, the subcutaneous tissue and skin were closed with an interrupted horizontal mattress using silk 2-0 size and the surgical site was properly cleaned and dressed with a 1% Povidone iodine solution and admitted home.

Postoperative Follow-Up and Results

Post-operatively, the dressing of the wound was done using a 1% Povidone-iodine solution on the second- and third-days post-operation. Besides, the calf was kept on the antibiotic Procaine penicillin (24 mg/kg), and dihydrostreptomycin sulfate (30 mg/kg) (Pen-Strep) was given intramuscularly for successive five days. Tetracycline wound spray was also applied over the wound area. Furthermore, the calf owner was also advised to closely monitor the calf and to allow some exercise, and supply good nutrition to facilitate wound healing. The complete healing was recorded on the 20th day post-operation without reoccurrence and other complications. Finally, the skin sutures were removed on the 20th day post-operatively.

Results and Discussion

A hernia is the protrusion of abdominal content through an opening in the body wall. Hernias have different congenital and acquired causes that have several deleterious effects, such as lowering the productivity and reproductivity of the affected animals [20]. In calves, umbilical hernia is the most common form of congenital affection [4, 27]. Similarly, in the current case report, an umbilical hernia is seen in a 4-month-old calf. However, many umbilical hernias are secondary to umbilical sepsis. Simple or uncomplicated hernias are easily reducible. Complicated hernias cannot be completely reduced [28]. Besides, the incidence of congenital defects in cattle is 0.2-3%, with 40-50% born dead and such defects are commonly visible externally. Congenital defects including umbilical hernia reduce the value of affected calves and should be managed using surgical operation. The condition is very common in dairy cattle, especially in Holstein Friesian breeds. It may be inherited by a dominant character within complete penetrance, or be conditioned by environmental factors [29].

Improper closure of the umbilicus at birth due to mal-development or hypoplasia of abdominal muscles is associated with umbilical hernia in calves. According to the current case report, a congenital umbilical hernia is presented in Holstein Friesian cross young calf with a three-finger breadth. This is similar to the previous reports which stated that; congenital umbilical hernia is common in Holstein's calf and mostly associated with heritability. Hernias are made up of hernia sac, and peritoneum, and may contain peritoneal fluid and viscera. The most common viscera involved in umbilical hernias in cattle were the abomasum with or without omentum. Hernias may be small at birth and enlarge with age and should be differentiated from umbilical sepsis [28]. The umbilical opening in the calf should be closed after birth in a few days. Failure of this opening to close properly results in an umbilical hernia and its cause might be either congenital or acquired factors that hamper this closure, such as omphalitis or abscesses [10].

Umbilical hernia can be managed using different treatment options depending on the size of the hernia ring. Herniorrhaphy and hernioplasty are reported to correct the congenital umbilical hernias as per the size of the hernial ring. In the case of smaller hernial rings, it can be easily managed through the application of bandages, clamps, or ligatures. Herniorrhaphy is the only remedy

that is commonly done under local anesthesia in calves. Besides, this should be applied in case of a large hernial opening (more than 1 finger in size or if it persists for more than 3 to 4 weeks) [9, 30]. But extensive umbilical hernias; however, are managed by hernioplasty [12, 31, 32]. In this case report, herniorrhaphy was performed.

The aim of surgical repair was to obliterate the hernia sac and repair of the defect in the abdominal wall. Absorbable sutures can be used in cases where the size of the hernial ring is no more than 4 fingers or if the hernia is less than 8 months old [10]. Similarly, herniorrhaphy was performed under proper anesthesia (regional nerve block) to manage umbilical hernia using absorbable suture material. Complications may develop in congenital umbilical hernias, which significantly can increase the complexity and expense of repair. This could be simple (or uncomplicated) hernias that are easily reducible while in case of complicated hernias (incarcerated viscera usually without strangulation, or concurrent infection of umbilical structures) cannot be completely reduced. Uncomplicated congenital umbilical hernias that have persisted until 5-6-months of age, gradually enlarged over time, or failed to respond to conservative therapy [32]. Similarly, in this case report, slight adhesion was seen during the procedure between the hernial sac and content.

Different methods have been previously described in the treatment of umbilical hernia. The most common method for repairing hernia defects in the calf is herniorrhaphy, especially with an adhesion with an umbilical hernia. Suture herniorrhaphy can be performed by closing the hernial ring with a horizontal mattress pattern of suture using absorbable or non-absorbable materials [10]. In this case report, the horizontal mattress pattern of suture using absorbable materials is used on the skin. The overlapping pattern provides a more secure closure of the hernial ring and can withstand pressure from abdominal content [33]. In the present case, surgical correction was carried out by using a vest over a pent pattern and the calf was fully recovered. No post-operative complications over the period of two months were reported by the owner.

The limitation of the current study was the case report was based on a single case study (Cross-Holstein Friesian Calf) and we couldn't compare it with the other cases such as local breed or others.

Conclusion

This case report describes an umbilical hernia in calves due to failure to close the umbilical cord. The case was managed through the Herniorrhaphy technique with a horizontal mattress pattern of suture using absorbable materials. Accordingly, an umbilical hernia can be managed through herniorrhaphy using the overlapping mattress suture technique and synthetic absorbable polyglycolic acid as suture material and recommended as an alternative technique.

Declarations

Competing Interests

All authors declare no competing conflicts of interest

Data Availability Statement

The data used in the current study are referenced in the article

Funding Statement

The current study was conducted without the support of funding sources

Consent for publication

Not applicable

References

1. Sutradhar BC, Hossain MF, Das BC, Kim G, Hossain MA (2009) Comparison between open and closed methods of herniorrhaphy in calves affected with umbilical hernia. *J Vet Sci*, 10: 343-7.
2. Amresh K (2009) Surgery of Abdomen and Organs of Digestive System. In *Veterinary Surgical Technique* 14: 310-2.
3. Singh BA, Preethi KHO, Devi AK, Gangwar NK, Katiyar SS (2014) Ventral Abdominal Hernioplasty Using Nylon Mesh in A Cow. *Indian Vet J*, 91: 93-4.
4. Kumar V, Kumar N, Gangwar A, Saxena A (2013) Using acellular aortic matrix to repair umbilical hernias of calves. *Aust Vet J*, 91: 251-3.
5. Farman RH, Al-Husseiny SH, Al-Ameer ANA (2018) Surgical treatment of hernia in cattle: A review. *Al-Qadisiyah Journal of Veterinary Medicine Sciences*, 17: 61-8.
6. Fossum TW (2013) *Small Animal Surgery Textbook*. Amsterdam, Netherlands: Elsevier Health Sciences.
7. Sutaria P, Prajapati HB, Dodia VD, Sutaria TV, Suthar BN (2014) Congenital omphalocele and its surgical management in a kid. *Ruminant Sci*, 3: 123-24.
8. Purohit S, Malik V, Singh S, Yadav S, Pandey RP (2015) Congenital anomalies and their surgical management in ruminants. *Ruminant Sci*. 4: 121-30.
9. Abdin-Bey M, Ramadan R (2001) Retrospective study of hernias in goats. *Scientific Journal of King Faisal University (Basic and Applied Sciences)* 2: 77-88.
10. Al-Sobayil FA, Ahmed AF (2007) Surgical treatment for different forms of hernias in sheep and goats. *J Vet Sci*. 8: 185-91.
11. Kumar A (2001) *Veterinary Surgical Techniques*. Noida, India: Vikas Publishing House Pvt Ltd.
12. Misk N, Misk T, Semieka M (2008) Hernias in some farm animals. Paper presented at 25th World Buiatrics Congress; Budapest, Hungary.
13. Baxter GM (2004) Hernias/umbilicus. In: Fubini SL, Ducharme NM, eds. *Farm Animal Surgery*. Philadelphia, USA: Saunders; 477- 83.
14. Hassen D, Kawo H, Gondore M (2017) A preliminary study on hernia in domestic animals in Gondar Town, North Gondar, North West Ethiopia. *J Vet Sci Technol*, 8: 420.
15. Das B, Nath B, Pallab M, Mannan A, Biswas D (2012) Successful management of ventral abdominal hernia in goat: A case report. *Int J Nat Sci*. 2: 60-2.
16. Jettennavar P, Kalmath G, Anilkumar M (2010) Ventral abdominal hernia in a Goat. *Vet World*. 3: 93.

17. Sagar PV, Harish D, Babu PP (2010) Ventral hernia in an Ongole cow: A case report. *Vet World*. 3(2): 90-1.
18. Hosie BD (2000) Hernias. In: Martin WB, Aitken ID, eds. *Diseases of Sheep*. 3rd ed. Oxford, UK: Blackwell Science; 74-5.
19. Slatter DH (2003) *Textbook of Small Animal Surgery*. Volume 1: Amsterdam, Netherlands: Elsevier Health Sciences.
20. Salim M, Hashim MA, Juyena N, Arafat TA, Dey RK et al. (2015) Prevalence of Hernia and Evaluation of Herniorrhaphy in Calves. *Int. J. Nat. Soc. Sci*, 2: 35-43.
21. Fubini SL, Ducharme N (2016) *Farm Animal Surgery*. Amsterdam, Netherlands: Elsevier Health Sciences.
22. Demirkiran AE, Ozgun H, Balkaya M, Cevikel H, Culhaci, N et al. (2003) Strangulated ventral hernia model in rats. *J. Investigative Surg*. 16: 93-7.
23. Whitfield-Cargile CM, Rakestraw PC, Hardy JN, Cohen D, Davis BE (2011) Comparison of primary closure of incisional hernias in horses with and without the use of prosthetic mesh support. *Equine Veterinary Journal*, 43: 69-75.
24. Chavez J, Demoor A (2012) Surgical treatment of umbilical infection in calves. *Veterinary Record* 77: 771-4.
25. Haile Y, Velappa R, Asrat M (2017) A study on the prevalence of umbilical hernia in calves in and around Gondar Town, North Gondar, North West Ethiopia. *International Journal of Veterinary Sciences and Animal Husbandry*, 2: 11-5.
26. Turner AS, McIlwraith, C. (2013) *Techniques in Large Animal Surgery*. Philadelphia, USA: Wiley-Blackwell.
27. Smith, B.P. (2009) *Large Animal Internal Medicine*, 3rd ed. Mosby-Elsevier Publishing: St. Louis, MO. 289-651.
28. Anderson DE (2004) Surgical diseases of the neonate. Paper presented at Proceedings of the WBC Congress; Québec, Canada.
29. Weaver AD, Atkinson O, Jean GS, Steiner A (2018): *Bovine Surgery and Lameness*. New Jersey, USA: John Wiley & Sons.
30. Kumar A, Mohindroo J, Sangwan V, Mahajan, SK, Singh, K, Anand A (2014) Ultrasonographic evaluation of massive abdominal wall swellings in cattle and buffaloes. *Turk J Vet Anim Sci*. 38: 100-3.
31. Kumar V, Kumar N, Gangwar AK, Sharma AK, Singh H et al. (2012) Acellular dermal grafts for the reconstruction of umbilical/ventral hernias in buffalo calves. *Vet. Pract*. 13: 12.
32. Purohit S, Malik V, Awasthi A, Kumar D, Katiyar P et al. (2012) Umbilical hernioplasty using nylon mesh in adult buffalo. *Ruminant Sci*. 1: 191-93.
33. Adam SB, Fessler JF (2000) Umbilical herniorrhaphy. In: Adams S, Fessler JF, eds. *Atlas of Equine Surgery*. Philadelphia, USA: WB. Saunders.
34. Rahman MN, Biswas D, Hossain MA (2001) Occurrence of umbilical hernia and comparative efficacy of different suture materials and techniques for its correction in calves. *Pakistan J. Biol. Sci*. 4: 1026-28.
35. Shah Z, Ahamd S, Sarwar MS, Khan MA, Ali, J (2016) Surgical intervention of umbilical hernia in dairy cross holstein friesian calf. *Meat Sciences and Veterinary Public Health* 1: 1-3.