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Umbilical herniorrhaphy in adult cattle using polypropylene mesh for abdominal reinforcement – Report of two cases

Marcio Flores
University of Passo Fundo, Innovation and Business, FAMV – HV, ZIP Code
Jerbeson Hoffmann Silva
University of Passo Fundo, Innovation and Business, FAMV – HV, ZIP Code
Renato Nascimento Libardoni
University of Passo Fundo, Innovation and Business, FAMV – HV, ZIP Code
Carin Fernanda Ponath
Federal University of Rio Grande do Sul
Carlos Bondan
cbondan@upf.br
University of Passo Fundo, Innovation and Business, FAMV – HV, ZIP Code

Case Report

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Abstract

Umbilical hernia is an omphalopathy that affects calves, with low incidence, but significant importance on farms. It is characterized by total or partial protrusion of abdominal contents through a defect in the abdominal wall. Surgical treatment is recommended in cases of large hernial rings, and the use of implants such as polypropylene mesh is indicated for defects greater than 15 cm. This report describes the umbilical herniorrhaphy procedure associated with polypropylene mesh in two Holstein heifers. An 18-month-old heifer (560 kg) presented with a 23 cm umbilical hernia, and a 10-month-old heifer (403 kg) presented with a 14 cm defect. Both umbilical hernias were classified as true, reducible, and non-contaminated. Closed herniorrhaphy was performed using a modified horizontal mattress suture pattern with a double 0.50mm nylon, followed by reinforcement with polypropylene mesh fixed to the outer sheath of the rectus abdominis muscle. Postoperative management included antibiotic therapy, anti-inflammatory and analgesic drugs, and daily wound care. Both animals showed satisfactory recovery, with no complications and good surgical wound healing.

Background

A hernia is characterized by a total or partial protrusion of an organ through a defect in the abdominal wall (Torkaman et al., 2025). Hernias have three components: hernial ring, hernial sac, and contents (Hendrickson and Baird, 2013; Monteiro et al., 2023), and can be classified into two types, based on its origin: congenital, evident at birth, which may or may not be hereditary; and acquired, which can be caused by trauma, degeneration, and surgical procedures (Sutradhar et al., 2009; Monteiro et al., 2023).

When hernias present with a hernial ring, a hernial sac formed by peritoneum and the hernial contents, usually an abdominal organ, they are classified as true hernias (Spadola et al., 2022), and when they do not have all these structures, they are classified as false hernias (Fubini and Ducharme, 2016). They are also classified as reducible and irreducible, where the hernial contents may or may not return to the abdominal cavity through manipulation (Monteiro et al., 2023).

Diagnosis can be made through general and specific clinical examination. The specific examination is performed by gently palpating the increased volume to correctly distinguish the characteristics of the structures present in the hernial sac (Monteiro et al., 2023). Ultrasound can also be used for evaluating the characteristics of the present structures (Fubini and Ducharme, 2016).

Surgical treatment is indicated when the hernial ring has a diameter greater than five centimeters, using an open or closed herniorrhaphy technique (Henriksen et al., 2020). For cases with a hernial ring larger than 15 centimeters, the inclusion of implants, such as polypropylene mesh, is indicated (Hendrickson and Baird, 2013; Fubini and Ducharme, 2016). The objective of this report is to describe two umbilical herniorrhaphy procedures associated with the use of polypropylene mesh in two adult Holstein cattle, which is not common in the field surgical routine of adult cattle.

Case presentation

Two adult Holstein heifers, presenting with umbilical hernias of significant size, were evaluated for the possibility of surgical resolution. The first animal (ANIMAL 1), an 18-month-old Holstein heifer, weighing 560 kg, presented with a physical examination showing a retal temperature of 37.9°C, pink mucous membranes, a heart rate of 60 beats per minute, a respiratory rate of 16 breaths per minute, and a capillary refill time of two seconds. The second animal (ANIMAL 2), a 10-month-old Holstein heifer, weighing 403 kg, presented a physical examination showing a retal temperature of 38.4°C, pale pink mucous membranes, a heart rate of 64 beats per minute, a respiratory rate of 24 breaths per minute, and a capillary refill time of two seconds.

During the specific clinical examination, the hernial ring was palpated, and neither animal presented pain. ANIMAL 1 presented with an umbilical hernia of approximately 23 cm (Fig. 1A), and ANIMAL 2 presented with an umbilical hernia of 14 cm. In both cases, these were true, reducible, and non-contaminated hernias. Due to the large extent of the anatomical defects described, surgical treatment was chosen using the closed herniorrhaphy technique with polypropylene mesh.

Pre-anesthetic assessments were performed through general clinical examination and blood count. According to the American Society of Anesthesiologists, the physical status of both animals was classified as ASA 1 (Portier and Ida, 2018). The animals did not receive solids and liquids for 24 hours. Immediately before the surgical procedure, extensive trichotomy was performed on the ventral abdominal region, considering the umbilical scar as the center of the region. The trichotomized area was washed with warm water and neutral soap and dried with compresses. Prophylactic antibiotic therapy was administered, using benzathine penicillin (44,000 IU.kg-1) associated with procaine (22,000 IU.kg-1) via intramuscular (IM), so as anti-inflammatory and analgesic, flunixin meglumine (1.1 mg.kg-1, IV). As pre-anesthetic medication, detomidine (0.02 mg.kg-1, IV) was used, after waiting approximately five minutes, the animals were transferred to the induction room. For anesthetic induction, diazepam (0.05 mg.kg-1, IV) and ketamine (2.2 mg.kg-1, IV) were used. Immediately after anesthetic induction, the animals were intubated. With the aid of a hoist, they were suspended and positioned in dorsal recumbency on the surgical table, and anesthetic maintenance was performed using isoflurane vaporized in 100% O2, with the dose to effect.

After prior antisepsis of the ventral abdomen with 2% chlorhexidine gluconate degerming solution and 0.5% alcoholic chlorhexidine gluconate, an infiltrative block was performed along the incision line with 2% lidocaine hydrochloride without vasoconstrictor. Following this, surgical antisepsis was performed with 0.5% alcoholic chlorhexidine gluconate and the surgical field was prepared.

A double elliptical skin incision was made around the hernia, followed by dissection of the subcutaneous tissue and removal of the skin fragment that was part of the hernial sac. The hernial sac was dissected (Fig. 1B) and repositioned in the abdominal cavity (Fig. 1C), and herniorrhaphy was performed with a modified horizontal mattress suture (Fig. 1D) using 0.50 mm double nylon suture. Subsequently, a polypropylene mesh was fixed over the defect and sutured with a simple interrupted suture to the outer

sheath of the rectus abdominis muscle using polypropylene suture n. 2 (Fig. 1E). The surgical wound was irrigated with 0.9% NaCl saline solution to remove debris. Then, the subcutaneous tissue was approximated with a simple continuous suture using polyglactin 910 n. 2, and the dermorrhaphy was performed with a simple continuous suture using nylon suture n. 1 (Fig. 1F).

In the postoperative period, the heifers received benzathine penicillin (44,000 IU.kg-1) and procaine penicillin (22,000 IU.kg-1) intramuscularly at 48-hour intervals, for a total of 3 administrations, flunixin meglumine (1.1 mg.kg-1, once daily, for three days) and dipyrone (25 mg.kg-1, once daily, for three days). The surgical wound was cleaned twice daily for six days using gauze with 0.9% saline solution, and silver sulfadiazine spray was applied around the incision due to its repellent action.

After six days, the animals were discharged from the hospital, and the stitches were removed after 14 days during a visit to the farms (Fig. 2). Both animals showed satisfactory recovery, with good healing of the surgical wounds.

Discussion

Umbilical hernias in adult heifers are not common, because surgical correction of these defects is usually performed when the animal is young, and reports of this procedure in adult animals are uncommon (Torkaman et al., 2025). The challenge in this case is due to the high body weight of the animals, which reduces the chances of surgical success, causing recurrences, eventrations, and eviscerations (Henriksen et al., 2020). This report describes the herniorrhaphy procedure in two adult female cattle, using the closed technique with the aid of polypropylene mesh, with satisfactory recovery of the animals.

Abdominal hernias can go unnoticed or be neglected by owners, especially in the first months of life, when the herniated sac is still small. This neglect may be due to the hope of spontaneous resolution or the costs associated with the procedure and veterinary fees. However, as the animal grows, the hernias tend to increase in size, and after clinical evidence of a substantial increase in the herniated region, owners seek veterinary assistance (Baird, 2016; Fubini and Ducharme, 2016).

In this case, two adult Holstein cows presenting with increased volume in the umbilical region were treated. The first animal (ANIMAL 1) was 18 months old and weighed 560 kg. The second animal (ANIMAL 2) was 10 months old and weighed 403 kg. ANIMAL 1 presented with a hernia of approximately 23 cm (Fig. 1), and ANIMAL 2 had a hernia of 14 cm. Due to the size of the hernias and the high body weight of the animals, surgical treatment was chosen using the closed herniorrhaphy technique with polypropylene mesh.

Surgical repair can be performed through open or closed herniorrhaphy technique. Open herniorrhaphy is indicated primarily for patients diagnosed with some type of complication, such as subcutaneous abscesses, since these can extend to the internal structures of the umbilical cord (Henriksen et al., 2020). Open herniorrhaphy is relatively simpler, faster, and less traumatic, and offers benefits such as the

evaluation of abdominal viscera and facilitates the removal of umbilical remnants (Sutradhar et al., 2009; Monteiro et al., 2023). However, it can also promote the rupture of any adhered structures, leading to contamination and subsequent peritonitis, either due to eventual tissue injury or environmental contamination (Hendrickson and Baird, 2013). In this case, both animals were healthy and showed no indication of compromise of the internal structures of the umbilical region, and therefore, closed herniorrhaphy was chosen.

The importance of carefully selecting the correct suture materials for both procedures is highlighted. The most indicated sutures are polyglactin 910 and polydioxanone (Hendrickson and Baird, 2013). The use of nylon for herniorrhaphy is also reported, being safe and with good recovery after the procedure, without subsequent damage to internal tissues (Silva, 2012). In this case, a double-stranded 0.50 mm sterile nylon suture was used. The choice of suture material was due to its strength, justified by the great thickness of the animals' abdominal muscles, the size of the defects, and the fact that the diagnosis occurred late.

The suture pattern used was a modified horizontal mattress suture. This suture pattern is indicated for abdominal wall closure, especially in eviscerations, eventrations, and reduction of hernial rings, as it provides better healing and prevents possible recurrences (Hendrickson and Baird, 2013). The choice of suture material and pattern is crucial for the success of the surgical procedure. The objective of the herniorrhaphy procedure is to restore the integrity, strength, and contour of the abdominal wall. It is also important to note that the material chosen for the repair must be strong enough to prevent possible recurrence (Gianlupi and Trindade, 2004).

Regardless of the case, the older the animal gets, the more difficult the surgical approach and resolution of the problem become. This is due to the increase in the size of the hernial ring as the animal grows and the total weight of the animal (Fubini and Ducharme, 2016). Complications also occur due to thickening of the abdominal musculature, more developed intestinal viscera that exerts pressure on the wall, and a greater chance of incarceration (Baird, 2016).

Certain precautions are essential for the success or failure of this type of procedure. Overfeeding during the recovery phase, lack of continuity in antibiotic therapy, keeping animals in excessively dirty stables, and failures in performing daily cleaning on the scar are some of the most frequently observed factors in field practice. The success of the herniorrhaphy procedure depends on care taken in the pre-, trans-, and post-operative periods (Silva et al., 2012; Spadola et al., 2022).

In these cases, several factors contributed to the success of the procedures. Among them, we can mention that both hernias did not have complications such as adhesions or infections; the hospital structure used, with inhalation anesthesia and a surgical block, which provided greater safety for the procedure and for the animals. Furthermore, the intensive care dedicated to the patients, being in a controlled and constantly monitored environment capable of predicting or intervening in any type of complications; restriction of movement in the postoperative period, which favors healing; careful pre-

and postoperative feeding; and, most importantly, a completely sterile procedure, which is difficult to achieve outside of a hospital setting.

Conclusion

Performing herniorrhaphy in heavy cattle presents significant challenges. Care during the pre-, trans-, and post-operative periods, such as proper feeding management, maintaining patients in a controlled and clean environment, restricting movement in the post-operative period, and, most importantly, performing a completely sterile surgical procedure was fundamental to the success. Furthermore, the use of polypropylene mesh in cattle proved effective due to the safety and reinforcement it provides.

Declarations

Conflict of interest

The authors declare that there is no conflict of interest

Animal Ethics

All procedures involving animals were performed in accordance with institutional and national guidelines for the care and use of animals. The cases described correspond to clinical treatments, and no experimental protocols were applied. Informed consent was obtained from the animal owners prior to the procedures and for the publication of this report.

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Author Contribution

All authors have contributed equally to the final manuscript.

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Data Availability

All data generated or analyzed during this work are included in the manuscript.

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Figures

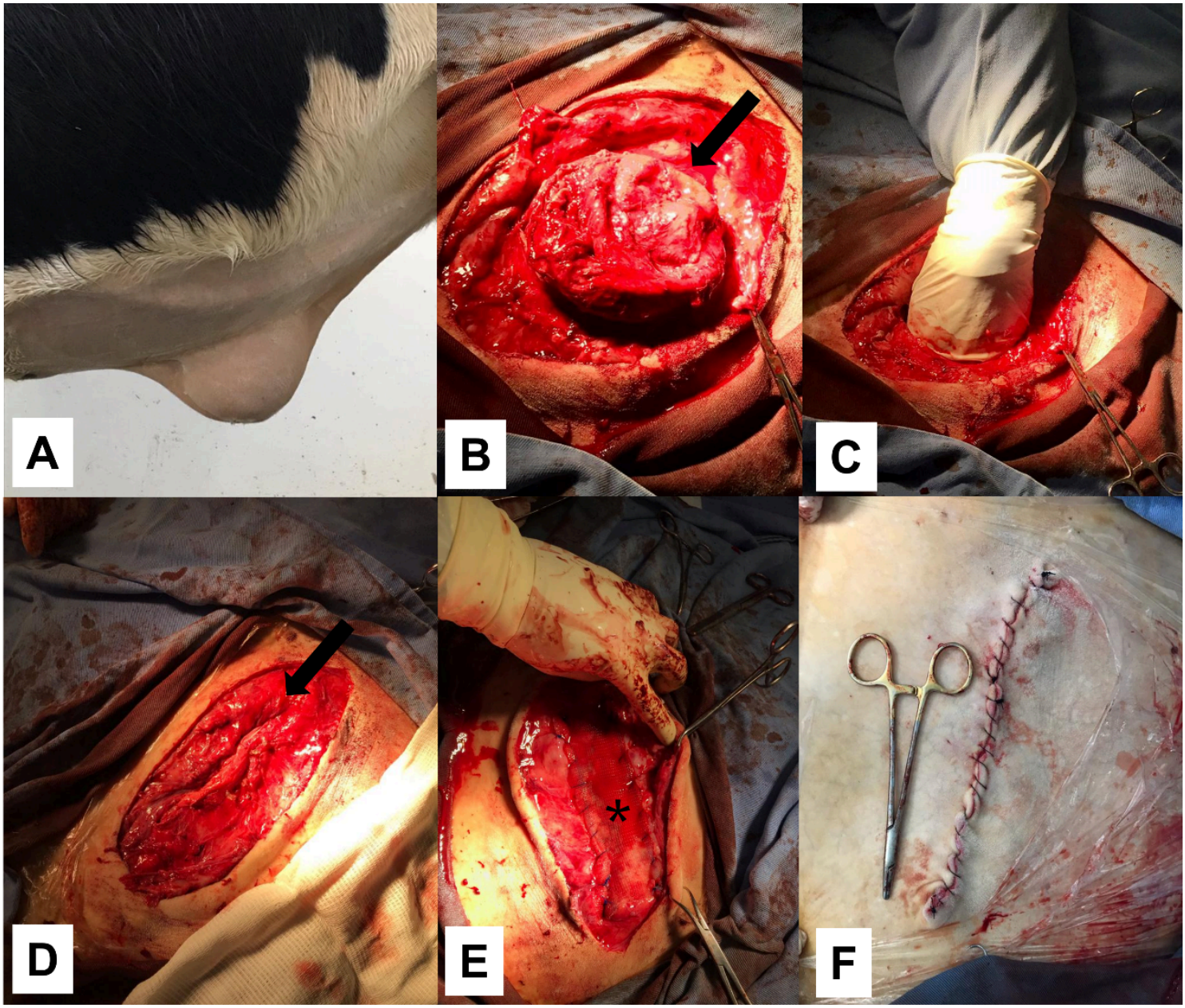


Figure 1

Umbilical herniorrhaphy in a Holstein heifer. (A) Increased volume of the ventral abdomen characterizing the umbilical hernia. (B) Identification and isolation of the hernial sac (arrow). (C) Repositioning of the hernial sac. (D) Correction of the hernial defect with Mayo suture (arrow). (E) Reinforcement performed on the abdominal wall using polypropylene mesh (asterisk). (F) Appearance at the end of the procedure.



Figure 2

Holstein heifers undergoing umbilical herniorrhaphy, post-operative removal of skin sutures. (A) Animal 1. (B) Animal 2.