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Mesh repair of a large ventral hernia with interposition of omentum in a calf: a case report

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ABSTRACT: A one-month-old, Piedmontese female calf was admitted to the Department of Veterinary Sciences, University of Turin, for repair of a large ventral hernia. A large ventral hernia, approximately 20 cm long and 15 cm large was noticed extending from 3 cm caudal to the umbilicus down to the pubis. At ultrasonography the hernia content was represented by small intestine and omentum and no adhesions to the hernial sac could be detected. The hernial sac was composed by skin only. Because of the large dimensions of the defect and the economic value of the animal, surgical correction was recommended to the owner. A prosthetic implant with a polypropylene mesh was elected due to the dimension of the abdominal defect. The implant was placed intra-abdominally with the interposition of the omentum between the mesh and the underlying viscera. Two and six months after surgery follow-ups were performed and a positive outcome was confirmed. This is the first report of ventral hernia repair in large animals that combines the use of a tension-free polypropylene mesh with the interposition of the omentum between the viscera and the mesh. This procedure is safe, cost-effective and not associated with major complications.

Keywords: bovine; soft tissue surgery; herniorraphy; adhesion; polypropylene

Case description

A one-month-old female Piedmontese calf, weighing 60 kg, was referred to the Department of Veterinary Science, University of Turin for evaluation and repair of a large ventral hernia. The calf was visited by the referring veterinarian two weeks prior to admission for sudden appearance of a ventral hernia 20 cm long and 15 cm wide, extending from 3 cm caudal to the umbilicus down to the pubis (Figure 1). Upon admission a complete clinical, haematological and ultrasonographical examination was performed. Clinically, the presence of an uncomplicated hernia was confirmed, and other concurrent diseases ruled out. No alterations were detected in the haematological profile. At ultrasonography the hernia content was represented by small intestine and omentum and no adhesions to the hernial sac were detected. The hernial sac was composed of skin only. The edges of the torn abdominal wall could be detected at the periphery of the sac. Because of the large dimensions of the hernia and the economic value of the animal, surgical correction was recommended to the owner. Food and water were withheld 12 h before the surgery. After clipping and aseptic preparation, an intra-

Figure 1. Appearance of the ventral hernia at admission

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venous catheter was inserted into the left jugular vein. The region around the first intercoccygeal space was clipped and after sterile skin preparation, the patient received epidural anaesthesia with 2% xylazine (0.05 mg/kg) and 2% lidocaine (0.2 mg/kg). After the loss of tone of the hind limbs, the calf was maintained in sternal position for 10 min and then placed in dorsal recumbency on a surgical table. The abdominal wall was clipped and a local inverted V-block was performed using 2% lidocaine cranial to the umbilicus to provide additional analgesia of the ventral abdominal wall. The abdomen was aseptically prepared and draped for surgery. Starting 3 cm caudally to the umbilicus, a 20 cm incision was made towards the pubis. To preserve the integrity of the mammary gland, the incision had a Y shape with the two branches extend laterally to the udder. Incision of the skin resulted in immediate entry to the abdominal cavity. A full examination of the abdominal cavity was performed and no other abnormalities were noticed. The torn edges of the abdominal wall were identified but were so contracted that they couldn't be completely opposed, leaving a defect approximately 12 cm long and 7 cm wide. Caudally, the defect extended to the pelvic bones, leaving only a strip 3–5 mm wide of fascia that was not enough to safely anchor sutures under tension. For these reasons a tension-free mesh implantation was considered the best option. A 17 × 13 cm polypropylene mesh (Bard® Soft Mesh, Davol Inc., Cranston, RI, USA) was cut approximately in the shape of the defect. The omentum was reached and brought caudally to cover the viscera down to the pelvis. Several USP 1 nylon[b] (Monosof™ suture, Covidien, Segrate Milano, Italy) sutures were placed in the omentum along the perimeter of the hernia, leaving the strands approximately 10 cm long (Figure 2). The mesh was overlapped to the omentum and the strands passed, with removable needles, through the mesh and then through the fascia. Mosquito forceps were used to clamp the suture strands as they were applied to keep them in position before being tied. Particular care was taken to apply the mesh without any tension and wrinkles. When the mesh was in place, the nylon sutures were tied. Excess skin of the hernia sac was trimmed with scissors. A subcutaneous layer with polyglactin 910 (Vicryl suture, Ethicon, Johnson & Johnson, Norderstedt, Germany) was made before closing the skin with a simple continuous suture pattern with USP 1 nylon (Monosof™ suture, Covidien, Segrate Milano, Italy). The duration of surgery was approximately 90 min. Recovery from sedation was uneventful and no postoperative complications or signs of pain were detected.

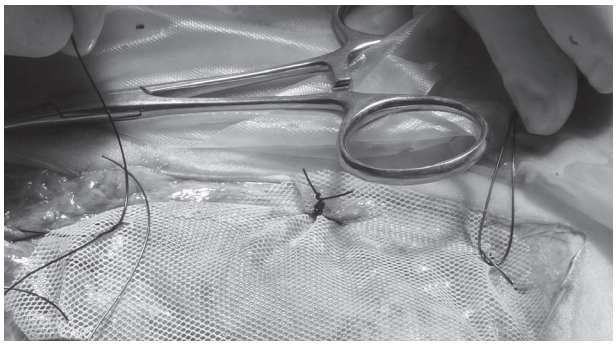

Figure 2. Suture tying detail with the omentum underlying the polypropylene mesh

Clinical findings. The patient was discharged on the same day. The calf was isolated in a single box for 10 days, checked daily by the referring veterinarian and was administered Penicillin G, 20 000 IU *i.m. s.i.d.* for three days and flunixin meglumine 1.1 mg/kg *i.v. s.i.d.* for two days. No complications were reported and weight gain was normal two and six months after surgery.

DISCUSSION AND CONCLUSIONS

Ventral hernia is a term that is used to describe a hernia through any part of the abdominal wall other than the umbilicus or inguinal canal (Tirgari 1980; Kawcak and Stashak 1995). Ventral and incisional hernias are common surgical problems in large animals and may occur due to midline or paramedian incision, or wherever the abdominal wall is severely traumatised (Wintzer 1962; Tirgari 1980; Kawcak and Stashak 1995). In young large animals the defect could be congenital or traumatic due to external manipulation during foal or calf delivery (Witte et al. 2008). Trauma was the most probable cause in our case, as the hernia appeared 15 days after the birth of the animal. Although small abdominal wall defects can be treated with good results, the outcome for larger defects is variable, both in humans (Sorour 2014) and large animals (Elce et al. 2005; Whitfield-Cargile et al. 2011).

Typically, large ventral hernias exhibit depletion of muscular and fascial tissues (Kawcak and Stashak 1995). The muscle of the abdominal wall is atrophic, contracted and deviated from the midline (Kawcak

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and Stashak 1995). This condition may lead the surgeon to prefer a mesh implant, although it is demanding in terms of surgical skills and time, more expensive and may lead to higher complication rated compared with suture repair (Williams et al. 2014). In horses similar results have been obtained with sutures and mesh implantation in ventral hernia repair (Elce et al. 2005; Whitfield-Cargile et al. 2011), whereas in cattle mesh implantation has been associated with a higher complication rate in umbilical hernias (Kawcak and Stashak 1995). Nevertheless, simple repair with suture alone may not be effective in repairing large defects, and this could lead to recurrence of the hernia or muscle tearing (Tulleners and Fretz 1983; Elce et al. 2005; Whitfield-Cargile et al. 2011). In the case reported, the defect was large and a simple repair was not achievable due to the lack of sufficient tissue for safe anchoring of the sutures under tension. An intra-abdominal mesh repair was elected for, because a retroperitoneal placement was not feasible, due to the absence of the peritoneum in the defect (Witte et al. 2008; Whitfield-Cargile et al. 2011).

The ideal mesh stimulates tissue grown from overlying fascia without the development of adhesions at the visceral mesh surface (Bernard et al. 2007). Synthetic materials of high tensile strength have been used to produce meshes for the repair of abdominal wall defects. The characteristic of these materials make them the best choice for use in large animals with large abdominal defects (Tulleners and Fretz 1983).

Generally, the prognosis of ventral hernia repair with a tension-free mesh implantation is associated with a fair-to-good prognosis even for defects up to 30 × 20 cm but complications such as wound infection, seromas, sinus formation, mesh extrusion, and fistula formation may arise (Tulleners and Fretz 1983; Elce et al. 2005; Bernard et al. 2007; Whitfield-Cargile et al. 2011). Polypropylene mesh is one of the most commonly used prosthetic materials for large ventral hernia repair in large animals (Tulleners and Fretz 1983; Finan et al. 2009). Its advantages include pliability, elasticity, inertness, strength, low rate of rejection, well-formed resistant tissue, and lower cost compared to expanded polytetrafluoroethylene mesh (Sorour 2014). The choice of a polypropylene mesh is also favoured by the structure of the mesh itself which is defined as a knitted mesh. This characteristic is desirable in closing large abdominal defects in horses and cattle, as it tends to result in fewer wrinkles, particularly when the hernial sac is lacking and only subcutaneous tissue skin covers the mesh (Tulleners and Fretz 1983), as in the present case. Most post-operative problems result from adhesion of abdominal contents to the mesh, irritation of the intestine and subsequent rupture of the bowel, and eventually persistent drainage and infection of the mesh (Witte et al. 2008; Sorour 2014). Irreversible peritonitis following mesh implantation resulted in the death of four animals in the study of Tulleners and Fretz (1983). One of the horses included in that study, treated with the polypropylene mesh, began to suffer from small intestine rubbing against the mesh that led finally to leakage of ingesta, causing diffuse fatal peritonitis (Tulleners and Fretz 1983).

Using a double layer ePTFE mesh could prevent such issues due to the anti-adhesive characteristics of the mesh that allow its intraperitoneal placement; however, costs increase enormously (Caron and Mehler 2009). The same result can be obtained in cattle with the interposition of the omentum between the mesh and the viscera. This is virtually impossible to obtain in horses, because of the small dimensions of the omentum in this species. The interposition of omentum between the mesh and underlying intestine has been proposed as a protective measure in humans and this procedure could be considered as an important step for preventing adhesion with a polypropylene mesh (Sorour 2014). It has not been reported as yet in large animals.

Placement of any permanent foreign material during surgery carries with it a high risk of infection; therefore, asepsis should be an important consideration (Williams et al. 2014). An infection could lead to formation of a non-healing tissue, purulent persistent discharge from the incision and eventually to a re-herniation (Witte et al. 2008; Whitfield-Cargile et al. 2011). This kind of surgery is carried out in humans with a higher level of asepsis that is not easily achieved in farm animal surgery under field conditions (Williams et al. 2014). Mesh implants require a high level of surgical skill and should be avoided under field conditions (Baird 2008).

The use of permanent foreign material in a calf which is destined for meat production is debatable. Either with mesh implantation or simple repair with suture alone, fibrous tissue will be formed during the healing process in the ventral abdominal region. During slaughter this fibrous tissue is likely

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to be trimmed during the process of disassembling the carcass of the animal; thus, any foreign material in this region should readily be detected. Another possibility would be to create a proper space in the animal's passport to signal that a permanent implant has been used and that care must be taken during the slaughter process to carefully remove it.

To the best of our knowledge, this is the first report that combines the use of a tension-free polypropylene mesh with the interposition of the omentum between the viscera and the mesh in large animals. In our case this procedure was safe, cost-effective and was not associated with major complications. Therefore, this method may be a viable alternative to other methods of mesh hernia repair.

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