

Case Report



Treatment of Traumatic Umbilical Hernia with Peritonitis due to Intestinal Perforation in a Three-Month Old Calf

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Abstract | This clinical report is about the evaluation of complications and survival after using a modified two-layer, hand-sewn, end-to-end anastomosis technique in a calf treated for traumatic umbilical hernia with peritonitis. A cross-bred calf was presented with peritonitis due to traumatic umbilical hernia. The decision to operate the calf was made after confirmation of umbilical hernia resulted in septic shock. Animal was first stabilized with supportive treatment prior to surgical decompression. A modified two-layer hand-sewn anastomosis technique was used. Herniorrhaphy was done with sliding mattress sutures. After first 10 days post-surgical decompression and administration of fluid, antibiotics and non-steroidal anti-inflammatory drug, good outcome in the calf was obtained. There was no postoperative complication suggesting that modified two-layer hand-sewn anastomosis technique was a successful technique. It was concluded that traumatic hernia may lead to septic shock and modified two-layer hand-sewn anastomosis technique may be recommended in calves with no postoperative complications and there is a good chance for long-term survival.

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Introduction

Umbilical hernias may be congenital or acquired and are seen in foals, calves, sheep, goats and pups (Al-Sobayil and Ahmed, 2007; Priester et al., 1970) and it is one of the major surgical affections in animals. Congenitally, the anomaly of umbilical hernias in young calves is commonly observed due to chromosomal abnormality (Baird, 1993). On the other end, the etiology of acquired umbilical hernias relate primarily due to re-sectioning of the umbilical cord close to the abdominal wall and secondarily due to umbilical infection or abscess. There is no way rather than surgical correction of acquired umbilical her-

nia. The case of umbilical hernia in the present study was noticed due to trauma in as young as 3 months old cross-bred calf. In addition, to this malady, animal was also suffering from septic shock due to peritonitis because of intestinal perforation.

Peritonitis almost invariably develops in the wake of intestinal perforation. Although a wide variety of micro-organisms inhabiting the intestine can cause this condition, *Escherichia coli* is the major contributor which is a gram-negative bacterium releases endotoxins. It is now well recognized that endotoxins play a pivotal role in the development of septic shock (Morrison and Ryan, 1987). Sepsis is accompanied by

impaired regional blood flow secondary to reduced cardiac output and local vasoconstriction results in disturbed end-organ function that serves to orchestrate the body's defense mechanism and culminates in multiple organ failure (MOF) which is the leading cause of morbidity and mortality. Recent clinical data support the concept that in addition to antibiotics, an early restitution of the circulation improves oxygenation and increases the survival rate (Gow et al., 1998; Rivers et al., 2001).

There are sufficient reports for horses that have had intestinal resection and end-to-end anastomosis for treatment of impaction and strangulating large colon volvulus (Bertone et al., 1987; Harrison, 1988; Hughes and Slone, 1998; Mair and Smith, 2005). But this data is scarce in ruminants and there is no clinical and laboratory findings for intestinal perforation due to traumatic umbilical hernia been reported. Furthermore, to our knowledge, there are numerous techniques available for performing intestinal anastomosis in equines but literature is lacking such data in ruminants.

Thus, our purpose was to evaluate complications and survival after using a modified two-layer, hand-sewn, end-to-end anastomosis technique in a calf treated for traumatic umbilical hernia with peritonitis.

Clinical Report

Case description

A three-months-old cross-bred calf weighing approx. 60 kg was presented to the Veterinary Medical Teaching Hospital (VMTH), University of Agriculture, Faisalabad-Pakistan with severe depression and recumbency. History revealed that animal fell on ground two weeks back. At that time, it didn't show any abnormality but after five to six hours the umbilical region started swelling and enlarged with the time. No treatment was instituted by the owner except massaging oil on umbilicus to reduce the swelling. The animal was depressed and anorectic a day before and became recumbent on the presenting morning.

The initial physical examination at VMTH revealed dehydration (estimated to be >6%), pale mucous membrane, increased capillary refill time (>2 sec), cold extremities, increased respiratory rate (44 breaths/min) and tachycardia (120 beats/min). The rectal temperature was 105 °F. Animal was in lateral recumbency and was unable to stand. On palpation of um-

bilical area a hernial ring of two fingers insertion was present and hernial contents were partially reducible. There were some spattering sounds while reduction of hernial contents. Animal was then prepared for emergency surgery.

Hematocrit (Hct) (22%; reference values, 24% to 46%), Hb. concentration (10 g/dL; reference values, 11-15 g/dL) and serum total proteins (TP) (76 g/L; reference values, 60 to 80 g/L) were evaluated immediately. Venous blood gas analysis showed severe metabolic acidosis (pH = 6.98; reference values, 7.35 to 7.43; PaO₂: 32 mm Hg; reference range, 92-105 mm Hg; PaCO₂: 40 mmHg, reference values, 30 to 35 mmHg).

Supportive treatment

A total 300 mL of hypertonic saline solution (7.2% NaCl) @ 5 mL/kg was infused intravenously, followed by 6 liter of sterile saline (0.9% NaCl) @ 10 mL/kg, were administered for cardiac support, preoperatively. Ceftiofur sodium and metronidazole were administered intravenously @ 6 and 10 mg/kg, respectively. Flunixin meglumine (@ 1.5 mg/kg, IV). The calf was then regionally anaesthetized with modified epidural anaesthesia by administered a combination of 2% lignocaine HCl and xylazine HCl (Xylaz[®]-Prix Pharmaceutica, Holland, respectively) in the intervertebral space of 1st and 2nd lumbar vertebrae (L₁-L₂) to perform surgical decompressions.

Surgical approach

With the anaesthetized calf positioned in dorsal recumbency, a skin incision was made on ventral midline at the cranial border of umbilical mass. Laparotomy revealed evisceration of small intestine incarcerated into hernial sac along with yellowish pus. There was 2 liters of pus in the abdominal cavity. After evacuation of pus, careful examination of intestine revealed ischemia and necrosis of iliac bowel and a perforation of 2 cm was found. Contents of distal part of ileum were manually decompressed into the cecum. Ileum was then resected at the perforated site and stump was covered by moistened gauze during manipulation of the proximal bowel. Contents of the proximal part of small intestine were then decompressed through the open bowel. After removal of contents from the surrounding area of affected portion, the proximal and distal bowels were occluded distant to the proposed resection site and affected bowel was then transect-

ed and discarded. A modified hand-sewn end-to-end anastomosis was then performed. The anastomosis was accomplished using a layer of hemi-circumferential simple continuous suture pattern in the mucosa and submucosa followed by a layer of Cushing pattern in the seromuscular with USP 4-0 braided polyglactin-910 (Vicryl® - Johnson & Johnson International). Following all the procedure, copious lavage with normal saline of the abdominal cavity and further suction was then conducted. A sterilized tube of 18 F was placed on the interior side of the abdominal muscles for future drainage. Then abdominal wall was sutured using sliding mattress suture pattern with USP 0 braided polyglactin-910. The skin incision was closed using polypropylene (Prolene® - Johnson & Johnson International) in a Ford interlocking pattern and tube was also anchored to the skin with the help of a suture passing through it. No abdominal contamination was encountered during whole procedure.

Aftercare

The calf was observed 6 hourly for three consecutive days for any complication and all the parameters were recorded. Post-operative treatment was continued for 10 days with Ceftiofur sodium (Accent®; Pfizer Animal Health) at the dose rate of 6 mg/kg BW, IV, repeated 12 hourly. Flunixin meglumine (Loxin®; Selmore Pharmaceuticals, Pakistan) was administered at the dose rate of 1.5 mg/kg BW, IV, twice daily. Metronidazole (Flagyl®; Aventis) was administered at the dose rate of 10 mg/kg BW, IV, thrice daily. Exudates dribbled from the drainage tube for three days, so, abdominal cavity was regularly irrigated with normal saline for five days through drainage tube. Animal was kept under observation for any complication and all parameters were recorded at different intervals. The calf was offered nothing orally for three days and maintained on intravenous glucose infusion. After three days, calf was orally initiated with water and then milk. Calf showed good appetite on fifth day and was active. Animal was discharged on 10th day post-surgery and owner was advised to bring the animal on alternate days next 10 days for checkup at VMTH and also allowed to offer regular diet.

Results and Discussion

Hernias, either congenital or acquired, may occur independently or associated with defects of other body parts (Dennis and Leipold, 1996). Mostly, umbilical hernias are reported as congenital but the present

study was about acquired umbilical hernias due to trauma. Muscle tearing and separation occurred due to blunt trauma as abdominal wall of calf was thin and intestine was then also perforated probably due to incarceration and ischemia or pressure exerted on the hernial sac by the owner during massaging of oil.

Peritonitis is a common complication in compliance to intestinal perforation and if unnoticed lead to septic shock. *Escherichia coli* is major contributor in the development of septic shock along with other pathogens. Endotoxins or lipopolysaccharides (LPS), which are structural component of the outer membranes of gram-negative bacteria, play a pivotal role in the sepsis syndrome (Morrison and Ryan, 1987). Septic shock or endotoxaemia are systemic inflammatory response syndromes (SIRS) known to result in an activation of cascade of inflammatory mediators including tumour necrosis factor alpha (TNF- α), interleukin-1 β (IL-1 β) and interleukin-6 (Dinarello, 1996; Marshall et al., 1995). These substances have profound effects on the circulation including myocardial depression, relative hypovolemia and pronounced vasodilatation culminates in multiple organ failure (MOF) which is the leading cause of morbidity and mortality. In addition to antibiotics, early restitution of the circulation through administering fluids improves oxygenation and increases the survival rate (Gow et al., 1998; Rivers et al., 2001). It is, therefore, of great importance to restore the intravascular volume and thereby maintains an adequate cardiac output (CO) and oxygen delivery (Bone et al., 1997; Somell et al., 2005).

Hypertonic saline (7.2%-7.5% NaCl) solution (HSS) has been used successfully to resuscitate different species of animals with hypovolemic and endotoxic shock (Constable and Muir, 1991; Kreimeier et al., 1991; Velasco et al., 1980). Administration of HSS intravenously causes an initial rapid fluid influx into the vasculature due to the sudden hypertonic state of plasma in a relatively short time (Constable et al., 1996; Walker et al., 1998). Plasma volume expansion is, therefore, achieved with less free water administration seem likely to produce a more rapid response and marked hemodynamic effects than isotonic solutions (Velasco et al., 1980). In the present case, animal was stabilized with hypertonic saline (7.5% NaCl) solution followed by normal saline, preoperatively. Ceftiofur sodium was administered intravenously for encountering bacterial invasions and flunixin meglumine was typically administered of septic shock be-

cause it inhibits cyclooxygenase pathway of arachidonic acid metabolites.

Anastomoses have been suggested to result in frequent short-term postoperative complications, but in present case, postoperative complications directly attributable to the small intestinal anastomosis were minimal in the calf which showed successful application of new anastomosis technique. This technique is a modified pattern of two-layer hand-sewn suture applied successfully in jejunoileal anastomosis in horse (Loesch et al., 2001). In this technique, Loesch and his colleagues accomplished a 2-layer hemi-circumferential simple continuous suture pattern in the mucosa and seromuscular layers. We modified the technique by using a layer of simple continuous suture pattern in the mucosa followed by a layer of Cushing suture pattern in the sero-muscular layer. Advantages to this technique include shorter surgical time and uncomplicated postoperative recovery. The calf showed no complication except mild tachycardia and depression for first 48 hours postoperatively, which resolved without specific medical therapy beyond routine postoperative management. After anastomosis has been performed, animal was considered for hernia.

Numerous techniques for the closure of hernial ring are available. Either non-absorbable or absorbable suture materials can be equally used to close hernial ring but, generally, absorbable suture materials are recommended in younger animals, whereas, nonabsorbable is preferred in older animals. In addition, the size of the hernial opening has a significant effect on the type of suture material. If hernial opening is larger (>4 fingers) then it is advisable to use nonabsorbable material to give a chance for healing of the ring (Al-Sobayil and Ahmed, 2007). We used absorbable material for the closure of hernial opening because of animal was too young and hernial ring was small (two fingers breadth). In this case, success rate of surgical treatment for hernias was very high. Herniorrhaphy was done with USP 0 braided polyglactin-910 using horizontal mattress sutures in sliding fashion. There was no accumulation of fluid (Al-Sobayil and Ahmed, 2007), postoperatively, because proper drainage was provided.

As there was no postoperative complication and calf showed good recovery within few days suggesting that modified two-layer hand-sewn anastomosis technique was a successful technique and prognosis

for survival is favourable.

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