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POLYPROPYLENE MESH VERSUS NYLON MOSQUITO NET MESH FOR EXTERNAL ABDOMINAL HERNIAS REPAIR IN CATTLE AND BUFFALOES

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ABSTRACT

Herein, the effectiveness of locally sourced and autoclaved nylon mosquito net mesh for the repair of external abdominal hernias was investigated. Eleven animals (7 cattle and 4 buffaloes) having hernial ring sizes of 8 to 30 cm in diameter were divided into two Groups 1 (5 animals) and Group 2 (6 animals). In Group 1, nylon mosquito net mesh was used, and in Group 2, polypropylene mesh was used for the repair of defects. The animals were sedated with xylazine HCl and given local anaesthesia during surgery. Over the external hernial sac, an elliptical skin incision was made. The internal hernial sac was bluntly dissected and freed down to the hernial ring. The internal hernial sac was opened, and the hernial ring was repaired with nylon mosquito net mesh or polypropylene mesh using the inlay technique. After hernioplasty, the sac and subcutaneous tissue were repaired with prolene suture material. The skin incision was closed with simple interrupted mattress sutures using monofilament polyamide suture material. Antibiotics and analgesics were given postoperatively, and povidone iodine was used to treat the suture line daily. The skin sutures were removed on the 10th to 15th postoperative day, depending upon the wound condition. Mild inflammatory swelling in Group 1 was observed at the incision line, which had completely subsided by the 15th postoperative day. The wounds healed by first intention in both groups. In any case, no recurrence was seen in a follow-up period of 3 months. Without clinical signs of wound dehiscence, infection, or recurrence, all animals recovered uneventfully.

Keywords: *Bubalus bubalis*, buffaloes, nylon mosquito net mesh, polypropylene mesh, external abdominal wall hernias, cattle

INTRODUCTION

Surgeons face a clinical problem when trying to repair large abdominal wall defects in animals. When the hernial ring is larger than 3 cm in diameter, the literature on human surgery stresses the use of prosthetic materials during hernioplasty (Kingsnorth and LeBlanc, 2003). One of the most popular prosthetic materials for the

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repair of abdominal wall hernias is polypropylene mesh. When compared to primary suture repair, the prosthetic material's ability to do tension-free repairs considerably lowers the likelihood of hernia recurrence (Burger *et al*., 2004). However, the biggest barriers to treating large abdominal wall defects in veterinary patients are its high cost and accessibility. Finding a less expensive method of treating the patients is necessary. In cases when the cost of implants is greater than the cost of the animal, nylon mesh or nylon mosquito mesh might be a cost-effective substitute for expensive commercial mesh implants used to repair hernias in veterinary patients. With varying degrees of success, nylon mesh has been used to repair abdominal wall defects in cattle (Wintzer, 1962; Bouisset *et al*., 1982), buffaloes (Kanade *et al*., 1988; Varshney and Singh, 1991; Kumar *et al*., 2002) and goats (Wilhelm *et al*., 2007). Herein, an innovative, cheap nylon mesh developed from nylon mosquito nets was used and compared with polypropylene mesh to repair abdominal wall defects in large animals.

MATERIALS AND METHODS

Animals

Eleven animals (7 cattle and 4 buffaloes) clinically affected with external abdominal hernias were included in this study. Table 1 lists the breed, sex, and age of the animal, as well as the size and location of the external abdominal hernias. Palpation, radiography, and ultrasonography all confirmed hernias to be present (Figure 1). The hernial ring diameter varied from 8 to 30 cm. Keeping in view the large size of abdominal wall defects, it was decided to perform hernioplasty using sterilized nylon mosquito nets in 5 animals (Group 1) and polypropylene mesh in 6 animals (Group 2).

Preparation of nylon mosquito net mesh

The mesh was cut to the desired size in a single layer, and the edges were folded and sutured with nylon suture (Figure 2a and 2b). The mesh was cut to the desired size in two layers, and the edges were inverted and sutured with nylon suture (Figure 2c and 2d). This prepared double-layer mesh was used for hernioplasty in large animals.

Surgery and implantation

Prior to surgery, all animals were denied food for 24 h. Each animal received an intramuscular injection of an antibiotic (20000 U/kg streptopenicillin) and an analgesic (0.5 mg/kg meloxicam) prior to surgery. The animals were sedated with an intramuscular injection of 0.1 mg/kg xylazine HCl and positioned in dorsal or lateral recumbency, depending on the location of hernias. Circular infiltration analgesia around a hernia was performed using 2% lidocaine HCl, and the surgical site was aseptically prepared. An elliptical incision was made over the hernial sac after the appropriate analgesia. The fascia and muscles were separated from the hernial ring. The adhesions were detached by blunt dissection, and the hernial contents were reduced into the abdominal cavity. The hernial ring was freed and repaired with a single- or double-layered sterilized nylon mosquito net using the inlay graft technique in Group 1 animals. The details of the surgical procedure in Case 1 are presented in Figures 3 (a-f). In Group 2 animals, polypropylene mesh was used to repair the abdominal wall defects. The details of the surgical procedure in Cases 6 and 7 are presented in Figures 4 (a-f) and 5 (a-f), respectively. The sterilized nylon mosquito net and polypropylene mesh were sewn to the hernial

ring using horizontal mattress sutures. A standard fashion was used to close the skin incision and subcutaneous tissue. All of the animals received normal saline solutions perioperatively. To protect the surgical site from the outside environment and reduce postoperative oedema, the ventral abdomen of each animal was moderately compressed with a sterile bandage. Streptopenicillin 10000 U/kg twice daily intramuscularly was given to the animals for another seven days, and meloxicam 0.5 mg/kg once daily intramuscularly was given to them for an additional three days. For 12 days, the bandage was changed every day. During that time, the suture line was dressed in a dilute povidone-iodine solution. Sutures were removed on 10 to 15 postoperative days, depending upon the completion of skin wound healing.

RESULTS AND DISCUSSIONS

All the animals recovered without any complications and showed no clinical signs of infection or wound dehiscence. With the help of sterilized nylon mosquito nets, we were able to successfully repair large abdominal wall defects with no recurrence for at least 3 months. Large hernias necessitate safe closure because they obstruct normal parturition and are aesthetically unpleasant (Attinger *et al*., 2000). A tension-free closure is essential for wound healing, superior collagen regeneration, and recurrence prevention in abdominal wall defect repair. In a buffalo heifer, Varshney and Singh (1991) recorded successfully treating a ventral hernia using a nylon mesh. Kumar *et al*. (2002) reported the management of two unusually large hernia cases using nylon mesh. The surgical intervention involved two layers of nylon mesh cut to the desired size and applied as an inlay graft by continuous nylon sutures, which anchored the inverted edges of the mesh. Both animals recovered and did not show any untoward reactions. The findings of the current study supported the observations of past studies and shown that nylon mosquito nets can be a viable option for the treatment of large abdominal wall defects. The results of this study suggest that sterilized nylon mosquito nets could be used in place of alloplastic meshes to reconstruct large abdominal wall defects in cattle and buffaloes at a lower cost.

Similar to this, nylon mesh was successfully used to repair a massive ventral hernia in a crossbred female calf with a hernial ring that was around 15 cm in diameter (Kumar *et al*., 2003). The animal did not exhibit any unwanted reactions 2 months after surgery, and a smooth recovery was seen. The approach of using nylon mesh in surgical repair is a promising technique, especially for large hernia cases where conventional apposition surgery may not be very successful. Freudenberg *et al*. (2006) studied the possibility that inexpensive, commercial mesh implants for hernia repair in human patients could be replaced by inexpensive, locally accessible nylon mosquito nets. Over the course of 3 months, a clinical, randomized, double-blind study was conducted. Thirty-five patients with a total of 40 inguinal hernias were randomly assigned to receive either a commercial graft (Ultrapro) or a piece of sterilized nylon mesh available as a mosquito net in most African village markets for hernia repair. Prior to and 30 days following hernia surgery, the patients' quality of life and the surgeons' comfort level with the meshes were assessed, as well as the prevalence of complications. The clinical short-term success of the hernia treatment or the surgeons' comfort level using the two different materials did not differ significantly. In comparison

Table 1. History, types, ring size and contents of cases with hernia.

S.N.	Species	Breed	Age (months)	Sex	Type of hernia	Ring size	Contents	Applied mesh	Out come
1	Bovine	Crossbred	12	F	Ventral	15 cm diameter	Omentum, intestines	Nylon	Cured
2	Bovine	Crossbred	5	M	Umbilical	10 x 15 cm	Intestine	Nylon	Cured
3	Bovine	Crossbred	60	F	Right vento-lateral	30 cm in diameter	Intestine	Nylon	Cured
4	Bovine	Non-descript	24	F	Umbilical	15 cm in diameter	Omentum, intestine	Nylon	Cured
5	Bovine	Crossbred	8	M	Umbilical	8 x 10 cm	Intestine	Nylon	Cured
6	Bovine	Crossbred	8	F	Ventro- lateral	12 cm diameter	Intestine	Polypropylene	Cured
7	Bovine	Crossbred	12	F	Umbilical	10 x 12 cm	Omentum, intestine	Polypropylene	Cured
8	Bubaline	Crossbred Murrah	8	F	Umbilical	10 cm in diameter	Intestine	Polypropylene	Cured
9	Bubaline	Crossbred Murrah	5	F	Umbilical	10 cm in diameter	Intestine	Polypropylene	Cured
10	Bubaline	Crossbred Murrah	5	M	Umbilical	5 x 7 cm	Intestine	Polypropylene	Cured
11	Bubaline	Crossbred Murrah	3	M	Umbilical	6 x 8 cm	Intestine	Polypropylene	Cured

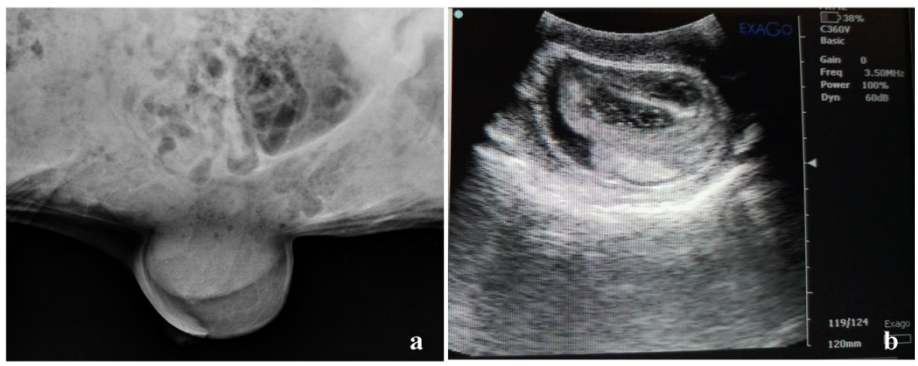

Figure 1. Abdominal radiograph showing hernial ring and content (a), sonograph showing hernial ring and content (b).

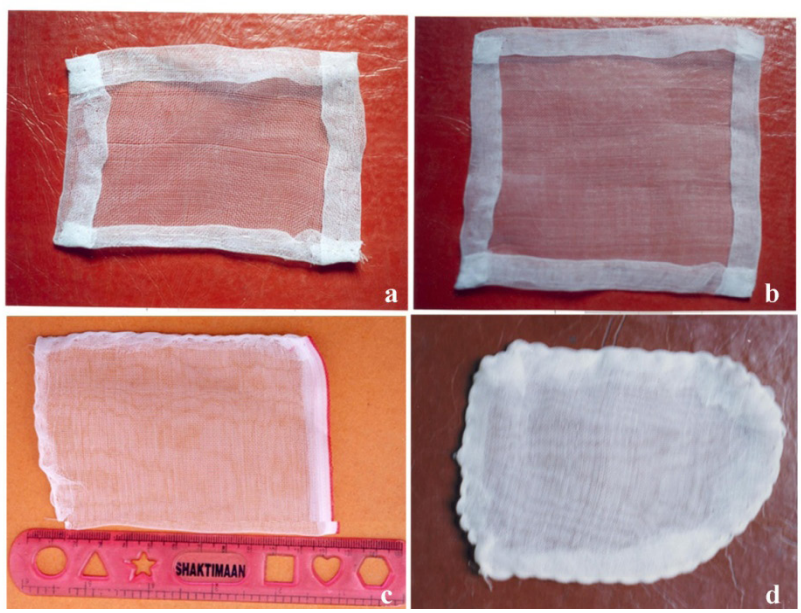

Figure 2. Single layer of nylon mosquito net with folded edge sutured by nylon suture (a-b), double layer of nylon mosquito net with inverted edges sutured by nylon suture (c-d).

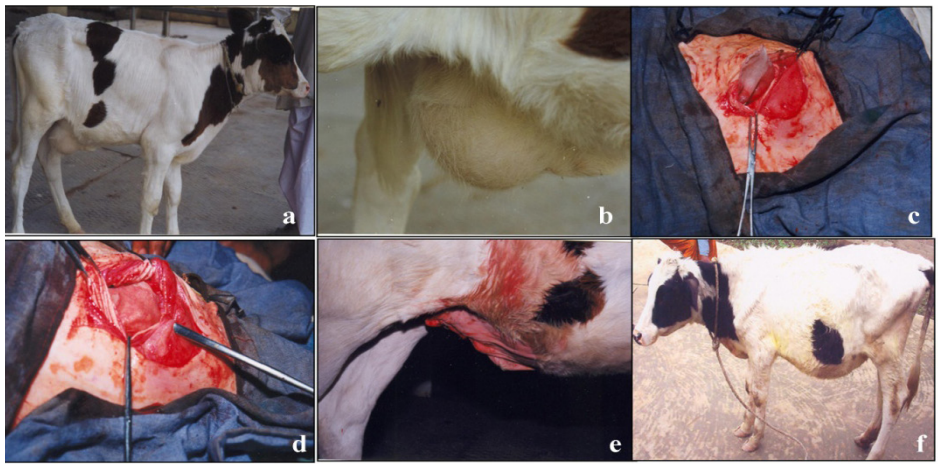

Figure 3. Heifer showing large ventral hernia (a), close view of large ventral hernia (b), opening of hernial sac and placing of nylon matrix for repair of hernial ring (c), complete closure of hernial ring with nylon mosquito net mesh using inlay technique (d), complete closure of defect after skin suturing (e), excellent recovery after two months postoperatively (f).

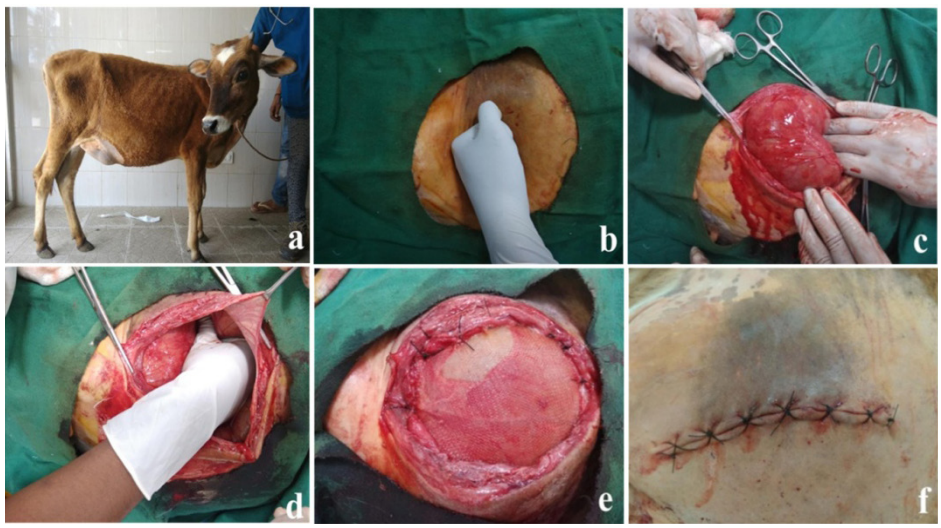

Figure 4. Heifer showing large ventro-lateral hernia (a), showing large hernial ring size (b), opening of the hernial sac (c), opening, and placing of polypropylene mesh for repair of hernial ring (d), complete closure of hernial ring with polypropylene mesh using inlay technique (e), complete closure of defect after skin suturing (f).

Figure 5. Heifer showing large umbilical hernia (a), showing large ring size of hernia (b), opening of the hernial sac (c), opening and placing of polypropylene mesh for repair of hernial ring (d), complete closure of hernial ring with polypropylene mesh using inlay technique (e), complete closure of defect after skin suturing (f).

to the commercial mesh, which cost 108 US dollars, the locally purchased nylon mesh cost just 0.0043 US dollars. The use of a nylon mosquito net may be an option in cases when better hernia repair outcomes depend on the use of a mesh prosthesis but commercial material is not readily available or inexpensive. The majority of developing countries are unable to use imported prosthetic mesh for hernioplasty due to its prohibitive costs and scarcity. The next step was to determine the results, consequences (including unnecessary pain, wound infection, recurrence, and mesh extrusion), and financial effects of using untreated mosquito net during an inguinal hernioplasty. According to Oribabor *et al*. (2015), tension-free inguinal hernia repairs were performed on human patients using untreated mosquito net mesh. For this study, a total of 130 adult patients were enrolled, 115 of whom were male and 15 of whom were female. Forty-four (41.53%) of the participants had inguinal hernias, and 76 (58.46%) had inguino-scrotal hernias. They were all successfully repaired, and the surgical outpatient department was followed up for complications for a period of 6 weeks to 6 months. Hernioplasty with locally sourced and autoclaved mosquito-net mesh is a viable alternative, particularly where commercial mesh is not readily available or affordable. In the current study, we found no discernible difference between the two groups' rates of healing. The cost of the mesh, though, makes a huge difference. The findings of the current study supported previous findings and shown that nylon mosquito nets can be a viable option for the repair of abdominal wall defects. The results of this study suggest that sterilized nylon mosquito nets could be used as a less expensive alternative to polypropylene meshes for the abdominal wall defects reconstruction in bovines. Additional research is advised to assess the long-term effects of different mosquito nets

materials.

CONCLUSION

An effective substitute for hernioplasty is locally-sourced and autoclaved nylon mosquito net mesh, particularly in circumstances where commercial mesh (polypropylene mesh) is not easily accessible or affordable.

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