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Comparative studies on use of polypropylene mesh vs. mosquito net nylon mesh for large ventral (Abdominal) hernia repair in cattle

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Abstract
Large Ventral abdominal hernias are one of the infrequently encountered and difficult to treat surgical conditions in cattle under field conditions and hernioplasty with polypropylene mesh is considered as gold standard. In developing countries, cost of the prosthesis is a significant factor in health care delivery. A clinical trial on 12 cattle, suffering from large ventral abdominal hernia operated by tension free hernioplasty technique was undertaken using conventional standard Polypropylene mesh (Group I, n=6) and autoclave sterilized Mosquito Nylon Net (MNN) Mesh (Group-II, n=6) and to evaluate and compare the safety, complications, recurrence rate and the cost benefit. The mean follow up period of the patients was 3 months. Post-operatively, all the animals showed uneventful recovery with minimal postoperative complications in both the groups. Post-operatively, there was inflammatory swelling and formation of edema at the surgical site in all the animals. The incidence of seroma formation in group I was 33.33% (n=2) whereas in group II it was 50% (n=3) which resolved in 3-5 days with conservative treatment. None of the group animals suffered the superficial or deep infections and recurrence. The cost of MNN mesh was approximately Rs 50/animal and that of Polypropylene varied depending upon size from Rs 1520.00 (10cm X 15cm) to Rs 5520.00 (30cm X 30cm). To conclude autoclave sterilized MNN is a safe and very cost effective alternative to commercial Polypropylene mesh.

Keywords: cattle, hernioplasty, mosquito net nylon mesh, polypropylene mesh

Introduction
Ventral abdominal Hernia, a condition in which a part of organ of the abdomen is either migrated or protruded along with the intact peritoneal layer through a natural or pathological weak opening in abdominal wall at stifle skin fold level and has intact skin (Amare and Haben 2020) [1]. Ventral or abdominal hernias are usually acquired one and the most common cause of ventral abdominal hernia might be due to severe trauma (kicks, horn thrust, violent contact with a blunt object and sudden jump) to the abdominal wall which results in hernia either in lower flank region, sometimes behind the costal arch or between the last few ribs (Doijode and Beerappa, 2019) [3]. The hernial content of the ventral hernia depends on the side of hernia. The most common side observed is on right side and herniated organs are the loops of intestine, omentum, uterus, and urinary bladder (Krishnamurthy, 1995) [9].
Earlier, ventral abdominal hernia repair and abdominal wall reconstruction were frequently done using tense sutures (vest over pant or horizontal mattress) to approximate and close the hernia defects (Fahd *et al.* 2007) [5] but such repair led to frequent complications of muscle tearing, recurrence, wound dehiscence and non-healing of the wound (Ober *et al.* 2008) [10]. Large hernias in adult animals require safe tension free closure because they interfere with the physical activity or parturition (Elce *et al.* 2005) [4]. Use of non-absorbable synthetic mesh material to achieve a tension-free closure (Hernioplasty) of these abdominal wall defects is the most widely used reconstruction technique.
Polypropylene mesh is one of the most commonly used prosthetic materials for large ventral hernia repair in large animals. Its advantages include pliability, elasticity, inertness, strength, low rate of rejection and well-formed resistant tissue (Tulleners and Fretz, 1983 and Finan *et al.* 2009) [6, 15]. However, the use of polypropylene mesh for ventral abdominal hernia repair in bovines is restricted to a few cases due to high cost of the mesh (Singh *et al.* 2012) [13]. The objective of the present study is to evaluate the safety, complications and recurrence rate of tension free repair using locally available autoclaved Mosquito net nylon (MNN) mesh and compare the cost benefit with conventional standard Polypropylene mesh repair.

Materials and Methods

Twelve animals presented to the veterinary hospital, UAS Dharwad, Karnataka and diagnosed to be cases of large ventral abdominal hernia with history of trauma and sudden onset were selected for the present study. Here, we compared two different treatment protocols for ventral abdominal hernia repair in cattle. These were compared for the effectiveness, outcome and chances of recurrence.

- Group T_1: (n = 6) - Hernioplasty with Polypropylene Mesh (Fig. 1 to 3).
- Group T_2: (n = 6) - Hernioplasty with autoclaved Mosquito Net Nylon Mesh (Fig. 4 to 6).

All the animals were fasted for 24 h and pre-medicated with Xylazine @ 0.1 mg/kg, I/M. Preoperatively, all the animals were given inj. Ringers lactate solution, inj. Streptopenicillin (@ 10000 IU/Kg, I/M) and inj. Meloxicam (0.2 mg/kg, I/M). Animals were positioned in dorsal recumbency and were aseptically prepared for surgery. 2% Lignocaine hydrochloride was infiltrated at the surgical site in elliptical manner around neck of hernia. An Elliptical incision was made on the skin over the herniated mass. Hernial sac was bluntly dissected; fascia and muscles were separated from the hernial ring. The adhesions were removed by blunt dissection, and the hernial contents were pushed back into the abdominal cavity through the hernia ring. The omentum was reached and brought below the hernia ring to cover the viscera

The size of abdominal hernia ring varied between 16cms long × 8 cms wide to 28 cms long to 14 cms wide in all the cases. Hernioplasty in each case was done using mesh (polypropylene or 4 layered autoclaved MNN) and the mesh size was adjusted as per the hernial defect. The mesh was sutured to the muscle all along the circumference of hernial ring using Polypropelene No - 1 suture in interrupted horizontal mattress pattern in an inlay graft technique. The subcutaneous tissue was sutured using catgut (No.2) in a simple continuous pattern. The skin was closed with Polyamide suture no 1 suture in horizontal mattress pattern. Post-operative care included antibiotics inj. Streptopenicillin (@ 10000 IU/Kg, I/M) and Analgesic injection Meloxicam (@ 0.2 mg/kg, I/M) once in a day for 7 days. Light amount of fodder and water intake was advised. In the animals where ever possible a pressure bandaging was also applied using broad cotton tape to reduce pressure on the suture line and to avoid accumulation of fluid in the dead space. The antiseptic dressing of the wound was advised with povidone iodine and flies repellant ointment. The skin sutures were removed on 15th post-operative day. Post operatively, different treatment group's animals were evaluated for complications, curative rates and chances of recurrence up to 90th day.

Fig 1: Large ventral abdominal hernia near xiphoid region in a cross breed cow

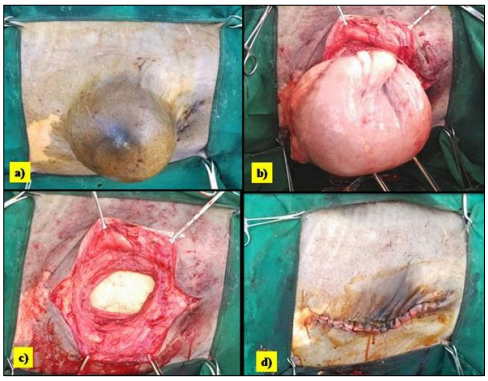

Fig 2: Large ventral abdominal hernia near Xiphoid - cow : a) aseptically prepared for surgery, b) hernial contents - abomasum and omentum, c) Polypropylene mesh placed below the muscle layer after repositioning of hernia contents and d) closure of surgical wound.

Fig 3: Completely recovered cross breed cow following hernioplasty with polypropylene mesh

Fig 4: Large ventral abdominal hernia near lower flank in a Holstein Friesian Heifer

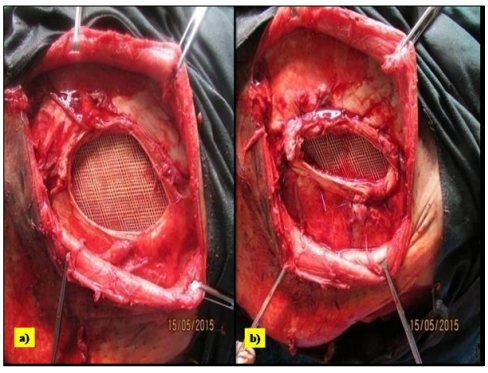

Fig 5: Hernioplasty with MNN mesh: a) positioning of the mesh below the muscle layer after repositioning of the hernia contents through hernia ring and b) Fixing the mesh to abdominal muscle wall circumferentially with interrupted horizontal mattress sutures.

Fig 6: Appearance of the Holstein Friesian Heifer following large ventral abdominal hernial repair with MNN mesh

Fig 7: Large ventral abdominal hernia near lower flank in a Holstein Friesian cross Heifer

Fig 8: Appearance of the Holstein Friesian Heifer following large ventral abdominal hernial repair with MNN mesh on 2nd post-operative day. Note the seroma accumulation.

Results and Discussion

Large ventral abdominal hernias are common surgical problems in large animals which occur wherever the abdominal wall is severely traumatized. Any trauma caused by kick, horn thrust in cattle or violent contact with blunt objects or automobile accident or an abscess in the abdominal cavity may lead to weakening of the abdominal muscles or by an abdominal distension due to pregnancy or violent straining during parturition may lead to ventral hernia (Kamcak and Stashak, 1995 and Krishnamurthy, 1995) [8, 9]. This is causing huge financial loss to the farming community as it leads increased culling rates, expensive treatment cost and decreased milk production and reproduction of the affected animals (Das *et al.*, 2012) [2]. In the present study, all the animals had the history of trauma for the occurrence of ventral hernia.

Mesh implants are used to repair large hernias that cannot be closed by direct apposition of the body wall. A large number of surgical meshes are available for abdominal wall defect reconstruction. The benefits of mesh implants include strength, non-bioreactivity, lack of degradation, and elasticity that allow a more even distribution of load (Hilbert *et al.*, 1978) [7], but most of the prosthetic meshes available in market are very costly for dairy farmers in developing nations. The four layered autoclaved MNN mesh was used in the present study to have an economical (approximately Rs 50/- per patient) and effective alternative to other commercially available synthetic meshes for reconstruction of hernia defects. The cost of poly propylene mesh depending upon the size varied from Rs 1520.00 (10cm X 15cm) to Rs 5520.00 (30cm X 30cm).

In both the groups, the suture pattern here adopted to anchor the mesh to the abdominal muscle wall was interrupted horizontal pattern using Polypropylene suture. The preferred positioning of the mesh was outside of the abdominal wall subcutaneously (Elce *et al*. 2005 and Singh *et al*. 2012) [4, 13]. In the present study both the types (Polypropylene and MNN) of mesh were placed below the muscle layer. This way of anchoring of the MNN mesh was not only easy, it also prevented weight of viscera falling on the already weakened muscle and allowed even distribution of weight. Formation of post-operative seroma was also less because of the small cavity between the muscle and subcutaneous tissue. To prevent adhesions between the abdominal bowels and mesh, omentum was transposed in between them.

The mesh not only act as substitute to the abdominal wall, it also acts as a scaffold and stimulator for fibroblast proliferation and fibroblast migration which enables the latter to form thick fibrous tissue in and around the mesh, thereby correcting the abdominal defect and strengthening the abdominal wall. When Polypropylene mesh was used for repair of abdominal wall in animals, and upon histology found that the Polypropylene mesh was surrounded with delicate layer of fibrous tissue and collagen fibers which later became dense (Singh *et al*., 2012) [13].

Sharma *et al.* (2015) [12], observed significantly greater inflammatory cells in mosquito net group, but grade of collagen deposit was almost identical between mosquito net and polypropylene groups, suggesting similar wound strength between the two groups. Mosquito net, being a copolymer of polyethylene, exhibits the similar properties of commercial meshes. Sanders *et al*. (2013) [11] assessed the material and mechanical properties (polymer type, filament characteristics, pore size, weight, linear density, elasticity, and tensile strength) of mosquito net and compared it with commercial meshes and found them substantially equivalent to those of commonly used commercial meshes. Stephenson and Kingsnorth (2011) [14] opined that MNM meshes can be easily sterilized by steam autoclaves without the loss of their properties. Hence autoclave sterilized MNM mesh was used in the present study.

Post-operatively, all the animals showed uneventful recovery with minimal complications. Post-operatively, there was inflammatory swelling and formation of edema at the surgical site in all the animals which might be due to local inflammatory reaction of the mesh which acts as foreign body and formation of edema due to arterial and venous compromise (Doijode and Beerappa, 2019) [3]. The incidence of seroma formation in group A was 2 (33.33%) whereas in group B (Fig. 7 and 8) it was 3 (50%) which resolved in 3-5 days with conservative treatment which included drainage by 16G needle, application of pressure bandage and anti-

inflammatory drugs.

Although the chances of infections are higher after mesh application (Elce *et al*. 2005) [4], fortunately none of the animals in both the groups in the present study showed infection. In the present study infection was checked with proper pre and post-operative antibiotic therapy, strict aseptic technique, haemostasis and reduction of dead space during surgery. The incidence of wound dehiscence and recurrence in both the groups (MNN mesh and Polypropylene) was 0%.

To conclude, in this study, in the cases that needed hernioplasty, use of cost effective, economically feasible and easily available MNN mesh has proven low complication rate, no recurrence rate and a good safety profile with good healing that is comparable to polypropylene mesh. So, autoclaved MNN mesh is a very cost effective but equally efficacious alternative to polypropylene mesh for use in cattle with large venral abdominal hernia.

References

1. Amare E, Haben F. Hernias in Farm Animals and its Management technique- A Review. International Journal of Clinical Studies & Medical Case Reports 2020;4(4):1-9.
2. Das BC, Nath BK, Pallab MS, Mannan A, Biswas D. Successful management of ventral abdominal hernia in goat: a case report. International Journal of Natural Sciences 2012;2(2):60-62.
3. Doijode V, Beerappa GBM. Hernioplasty for treatment of ventral hernia using nylon mesh in ruminants. Journal of Entomology and Zoology Studies 2019;7(3):433-436.
4. Elce YA, Kraus BM, Orsini JA. Mesh herniplasty for the repair of incisional hernias of the ventral body wall in large horses. Equine Veterinary Education 2005;17:252-56.
5. Fahd A, Al-Sobayil, Ahmed FA. Surgical treatment for different forms of hernias in sheep and goats. Journal of Veterinary Science 2007;8:185-91.
6. Finan KR, Kilgore ML, Hawn MT. Open suture versus mesh repair of primary incisional hernias: a costutility analysis. Hernia 2009;13:173-182.
7. Hilbert BJ, Slatter DH, Mcdermott JD. Repair of a massive abdominal hernia in a horse using polypropylene mesh. Australian Veterinary Journal 1978;54:588-90.
8. Kamcak CE, Stashak TS. Predisposing factors, diagnosis, and management of large abdominal wall defects in horses and cattle. J. of American Vet. Med. Assoc 1995;206:607-611.
9. Krishnamurthy D. Hernia. In Ruminant surgery, Ed By Tyagi and Jit Singh, 2nd edn., C.B.S. Publishers and Distributors New Delhi 1995, 225-237.
10. Ober C, Muste A, Oana I, Mates N, Beteg F, Veres S. Using of prosthertic biomaterials in large animals: Modern concepts about abdominal wall defects approach. Journal of Central European Agriculture 2008;9:575-80.
11. Sanders DL, Kingsnorth AN, Stephenson BM. Mosquito net mesh for abdominal wall hernioplasty: a comparison of material characteristics with commercial prosthetics. World J Surg 2013;37(4):737-745.
12. Sharma M, Sharma DB, Shiv Kumar C, Sharma D. Histopathological Comparison of Mosquito Net with Polypropylene Mesh for Hernia Repair: An Experimental Study in Rats. Indian J Surg 2015;77(2):511-514.
13. Singh K, Mahajan SK, Sangwan V, Kumar V, Anand A, Saini NS. Hernioplasty using nylon mesh for massive ventral abdominal hernia in adult bovine. Indian Journal of Animal Sciences 2012;82(10):1153-1155.
14. Stephenson BM, Kingsnorth AN. Safety and sterilization of mosquito net mesh for humanitarian inguinal hernioplasty. World J Surg 2011;35(9):1957-1960.
15. Tulleners EP, Fretz PB. Prosthetic repair of large abdominal wall defects in horses and food animals. J of American Vet. Med. Assoc 1983;182:258-62.