

FIELD HERNIOPLASTY USING PVC INSECT SCREEN MESH FOR TRAUMATIC VENTRAL ABDOMINAL HERNIA IN A JERSEY CROSSBRED COW IN BHUTAN: A CASE REPORT

NARAYAN POKHREL^{1*}, CHEDA¹ AND KARMA YANGKI¹

¹District Veterinary Hospital, Mongar Dzongkhag Administration, Bhutan

*Author for correspondence: vetpokhrel@gmail.com

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ABSTRACT: A six-year-old female Jersey crossbred cow weighing approximately 300–350 kg from Ngarpongtang village, Thangrong Gewog, Mongar Dzongkhag, was referred to the District Veterinary Hospital, Mongar, for further treatment of a voluminous abdominal swelling. The owner reported that the swelling developed after a fall from a cliff. Clinical examination confirmed a soft, reducible right lateral ventral abdominal hernia with a large hernial sac in the absence of ultrasonographic facilities. The hernial contents comprised loops of the large and small intestines. Surgical correction was performed under field conditions in lateral recumbency using xylazine and local infiltration anesthesia with 2% lignocaine hydrochloride. Before insertion, the Polyvinyl Chloride (PVC) insect screen mesh, which is locally available in hardware shops, was prepared aseptically by thoroughly washing with detergent, rinsing with normal saline, and soaking in povidone-iodine solution. Hernioplasty was performed by securing the prepared mesh over the hernial defect with non-absorbable suture material in a simple interrupted pattern following manual reduction of the hernial contents. After surgery, the wound was managed using gamma benzene hexachloride cream after an antiseptic dressing, followed by broad-spectrum antibiotics and non-steroidal anti-inflammatory drugs for seven days. The animal made a full recovery and was confirmed to be pregnant within three months of surgery, displaying full restoration of productive function. This case illustrates that hernioplasty using PVC insect screen mesh can be executed satisfactorily under resource-limited field conditions in Bhutan.

Keywords: Bhutan; Field surgery; Hernioplasty; Jersey cow; PVC insect screen mesh; Resource-limited settings; Ventral hernia

1. INTRODUCTION

A hernia is described as the protrusion of the contents of a body cavity through a fragile or faulty point in the containing wall (Venugopalan 1992). Anatomically, a hernia consists of three parts: the hernial ring, hernial sac, and hernial contents (Rafid et al. 2017). In cattle, the abdominal wall is a commonly affected site, with herniation occurring when a defect or fragility in the muscular layers allows the visceral contents to protrude underneath the skin (Sato et al. 2023). Ventral abdominal hernias in cattle are mostly caused by external trauma, such as falls, kicks, or other blunt forces (Roberts 1986).

Surgical repair of abdominal hernias in cattle can be performed by herniorrhaphy, which requires direct stitching of the edges of the hernial ring together, or through hernioplasty, in which a prosthetic mesh is used to strengthen the defect (Rafid et al. 2017). For large hernial defects, hernioplasty is the preferred method as it spreads tension over an extensive surface area, leading to lower recurrence rates than primary suture closure (Burger et al. 2004). Nonabsorbable synthetic mesh has become the preferred material in veterinary hernia surgery owing to its strength, biocompatibility, flexibility, and capacity to promote fibrovascular growth and long-term tissue integration (Bilsel and Abci 2012; Chandran et al. 2024).

Although polypropylene mesh is the most commonly used prosthetic material for this type of surgical intervention in resource-limited settings such as ours, where commercially made surgical mesh is either unavailable or too expensive, locally available alternatives are used in practice. These include cotton fabric/polyester (Mosbah and Abouelnasr 2015) and, as described in this study, Polyvinyl Chloride (PVC) insect screen mesh that is commonly found in local hardware stores.

In Bhutan, veterinary surgeries are primarily handled through District Veterinary Hospitals (DVHs) and Gewog livestock supervisors working under limited resources. The District Veterinary Hospital (DVH) and Gewog livestock centers do not have access to advanced diagnostic tools, specialist anesthetic facilities, and controlled surgical settings, which makes it difficult to manage complex cases in the field, such as large abdominal hernias in cattle. To the best of our knowledge, there have been no documented case reports of hernioplasty using PVC insect screen mesh in cattle under field conditions in Bhutan. The paper illustrates the effective field surgical treatment of a right lateral ventral abdominal hernia in a Jersey crossbred cow from Mongar Dzongkhag through the use of PVC insect screen mesh hernioplasty and emphasizes the clinical outcome, including the restoration of productive function.

2. Study area

The case was reported from Ngarpong tang village, Thangrong Gewog, Mongar Dzongkhag, in eastern Bhutan. Mongar Dzongkhag experiences a temperate to subtropical climate, enabling mixed farming of cereals, horticulture, and livestock for the livelihood of rural communities. Local cattle populations still dominate the cattle breeds in the region, although breed intensification

has resulted in a significant increase in the number of Jersey crossbred cattle over the years. The DVH serves as the apex animal health service provider in the district and caters to referral cases reported from the Gewog Livestock Centers. The surgical facilities at DVH are rudimentary, with minimal modern standard facilities, necessitating resource-limited veterinary practices.

3. MATERIALS AND METHODS

3.1 History and clinical observation

A six-year-old female Jersey crossbred cow weighing approximately 300–350 kg from Ngarpong tang village, Thangrong Gewog, Mongar Dzongkhag, was initially referred to the Gewog Livestock Supervisor (GLS). The GLS examined the case and observed a large abdominal swelling requiring surgical correction; and referred the case to the DVH, Mongar for detailed assessment and surgical intervention. The owner reported that the cow's abdominal area had started to swell progressively following a fall from a cliff during open grazing. Despite this condition, the animal maintained normal feed and water intake from the time of injury. There was no recent history of dystocia or parturitions.

The animal was bright, active, and responsive on clinical examination of the vital parameters. On physical examination, a soft, fluctuant, voluminous swelling was observed on the right lateral ventral side of the abdomen (Figure 1). Palpation revealed a distinct hernial ring at the dorsal margin. Manual pressure applied to the swelling demonstrated that the hernial contents were readily reducible, confirming the absence of adhesion formation and vascular compromise. The overlying skin was intact, with no evidence of ulceration, excoriation, or secondary infection. Auscultation of the hernial sac revealed bowel sounds consistent

with intestinal contents. In resource-limited settings, the diagnosis was established based on clinical observations, where a characteristic soft reducible swelling, palpable hernial ring, and auscultable bowel sounds served as a basis for confirmation, which is in consonance with the findings of Salim et al. (2015) and Kadapatti et al. (2019).



Figure 1: Voluminous reducible right lateral ventral abdominal hernia in the Jersey crossbred cow.

3.2 Surgical Intervention

3.2.1 Pre-operative Preparation

Feed and water were withheld for 24 h and 12 h, respectively, before surgery to reduce rumen fill and minimize intra-abdominal pressure, which is in agreement with the findings of Sagar et al. (2010). The hernial site on the ventrolateral abdomen was clipped, shaved, and prepared with an antiseptic scrub using a povidone-iodine solution.

3.2.2 Anesthesia

Xylazine hydrochloride (0.05–0.1 mg/kg body weight) was administered intramuscularly to ensure proper restraint during the onset of surgery. The animal was placed in the left lateral recumbency position. Local anesthesia was infiltrated around the circumference of the hernial ring in a ring-block pattern using 2% lignocaine

hydrochloride. Approximately 60–80 ml of 2% lignocaine hydrochloride was infiltrated into the skin, subcutaneous tissues, and muscle layers to facilitate smooth surgery.

3.2.3 Mesh Preparation

A Polyvinyl Chloride (PVC) insect screen mesh was aseptically prepared in the field before implantation. The mesh was cut after measuring the circumference of the hernial mass and thoroughly washed with a detergent solution to remove manufacturing residues, particulate matter, or surface contaminants.

The mesh was further rinsed copiously with sterile normal saline (0.9% NaCl) to remove residual detergents, then soaked in 10% povidone-iodine solution for approximately 15–20 minutes before use (Figure 2). This mechanical cleaning followed by chemical antiseptics represents a field-applicable decontamination approach in resource-limited veterinary surgical settings, in consonance with findings of Mosbah and Abouelnasr (2015) and Chandran et al. (2024). Povidone-iodine was used as the chemical disinfectant for the instruments used during the surgical correction of the hernia.



Figure 2: (A) Washing of PVC insect screen mesh using detergent and water; (B) rinsing with normal saline; (C) soaking in a povidone-iodine solution

3.2.4 Surgical Procedure

A linear skin incision was made through the hernial sac, parallel to and slightly below the hernial ring to facilitate the repair. The skin and subcutaneous tissue were carefully dissected using atraumatic dissection to reveal the hernial sac and outline the margins of the hernial ring (Figure 3). The hernial sac was opened, and its contents, comprising loops of the small and large intestines, were examined. No evidence of vascular compromise, strangulation, or necrosis was found, and the contents were manually retracted into the abdominal cavity. Fibrous tissues along the hernial ring were excised to freshen the wound margins for subsequent adhesion. The prepared PVC insect screen mesh was cut to extend at least 2 cm beyond the circumferential margins of the hernial defect. The mesh was placed as an onlay repair over the hernial ring and sutured to the surrounding muscular and fascial tissues using a simple interrupted suture pattern. Non-absorbable suture material nylon (polyamide) monofilament suture, USP size 1 (IRELYON PAC, M 905 LS) was placed at intervals of approximately 1.5–2 cm (Figure 4). The subcutaneous layer was closed using an absorbable suture in a simple continuous pattern, and the skin was apposed using a non-absorbable monofilament suture in a horizontal mattress pattern. The surgical site was thoroughly scrubbed and dressed with topical gamma benzene hexachloride (GBH) cream.

3.3 Post-operative Treatment and Care

For postoperative care, the wound was dressed daily using povidone-iodine solution, followed by topical application of



Figure 3: Intraoperative exposure of the hernial sac showing reducible intestinal loops prior to mesh placement.



Figure 4: PVC insect screen mesh secured over the hernial defect with simple interrupted sutures.

gamma benzene hexachloride (GBH) cream on the surgical site until healing. Broad-spectrum antibiotic treatment was administered using injectable penicillin-streptomycin at 10 mg/kg body weight intramuscularly; once daily for seven days. Non-steroidal anti-inflammatory therapy was provided using meloxicam (0.5 mg/kg body weight) intramuscularly, once daily for five days. In line with Sagar et al. (2010), the owner was advised to strictly monitor the animal and ensure intensive care by restricting strenuous activity and feeding soft, readily digestible feed during the postoperative period, preferably for approximately two weeks. Follow-up monitoring was performed for 90 days.



Figure 5: Complete wound healing at day 90 post-operation.

4. RESULTS AND DISCUSSION

The surgery was completed without intraoperative complications, and the animal recovered smoothly from sedation. There was no evidence of postoperative wound infection, dehiscence, seroma formation, or complications related to the implanted mesh during the follow-up period. Sutures were removed 15 days post-surgery, by which

time wound healing was achieved. At the 90-day follow-up, the abdominal contour had returned to its original condition with no signs of hernia recurrence, and the animal was healthy (Figure 5). Additionally, the animal was confirmed to be pregnant at the 90-day follow-up, demonstrating complete restoration of reproductive and productive function, an important outcome for smallholder dairy farming in Bhutan.

The cause of the hernia in this case was blunt traumatic injury following a fall from a cliff, which caused acute disruption of the abdominal muscles and fascia. Traumatic ventral hernias in cattle caused by external mechanical forces are well documented in the literature, and falls are a recognized cause of sudden full-thickness abdominal wall defects in large ruminants (Kiranjeet et al. 2012; Roberts 1986). The absence of early treatment and gradual enlargement of the hernia over an extended period further indicate a chronic traumatic hernia with developed fibrous margins at the hernial ring.

The diagnosis in this case was based solely on clinical grounds, as ultrasonographic facilities were unavailable. This is in agreement with the methods described in other resource-limited settings, where a combination of a large reducible swelling, a palpable hernial ring, and auscultable bowel sounds over the hernial sac provides a sufficient diagnostic basis for reducible hernias in cattle (Kadapatti et al. 2019; Salim et al. 2015). The reducibility of the hernial contents confirmed the absence of adhesion formation and strangulation, which would have significantly altered the surgical approach and prognosis of the patient.

Given the size of the hernial defect, hernioplasty was chosen instead of primary herniorrhaphy. Most studies recommend mesh reinforcement for hernial rings larger

than 3–5 cm in diameter, as primary suture closure of large defects concentrates tension along the repair line and is associated with high recurrence rates (Chandran et al. 2024; Mosbah and Abouelnasr 2015). Polypropylene mesh is the most frequently used prosthetic material for such cases in ruminant surgery due to its monofilament structure and properties of fibrovascular ingrowth, tissue integration, mechanical strength, easy handling, and relative resistance to infection (Bilsel and Abci 2012; Chandran et al. 2024). In our case, commercial surgical mesh was unavailable, and PVC insect screen mesh, commonly available in local hardware stores, was used as an alternative. This approach is in line with the general principle of resource adaptation reported in the veterinary surgical literature, wherein commercially available non-medical materials have been used as prosthetic substitutes in low-resource settings (Mosbah and Abouelnasr 2015).

The mesh was decontaminated using a series of methods, including detergent washing, normal saline rinsing, and soaking in a 10% povidone-iodine solution, in the absence of proper autoclaving facilities in the field. This preparation is consistent with field-adapted disinfection practices documented for prosthetic implants in resource-limited veterinary settings (Mosbah and Abouelnasr 2015). Povidone-iodine is a well-established broad-spectrum antimicrobial agent with proven efficacy against bacteria, fungi, viruses, and spores, and its use as a disinfecting agent for surgical equipment in the field is well demonstrated (Bilsel and Abci 2012). Detergent washing facilitates removal of the organic matter and debris, which is important because organic matter can reduce the effectiveness of chemical antiseptics (Chandran et al. 2024).

For the surgical procedure, the animal was placed in the lateral recumbency position

under sedation and local infiltration anesthesia. Lateral recumbency provides better exposure for ventrolateral abdominal hernias and easier access to the hernial sac and ring compared to the standing position, which is in agreement with other studies on large abdominal hernia surgery in ruminants (Hendrickson and Baird 2013; Rafid et al. 2017). The use of xylazine for sedation and lignocaine in a ring block for local analgesia is well established for this type of procedure in large ruminants (Kadapatti et al. 2019).

The postoperative antibiotic and analgesic protocol - injectable penicillin-streptomycin at 10 mg/kg body weight intramuscularly once daily for seven days; and meloxicam at 0.5 mg/kg body weight intramuscularly once daily for five days—is in agreement with protocols documented by other authors for similar surgeries in cattle (Kadapatti et al. 2019). The combined use of a broad-spectrum antibiotic alongside a COX-2-selective NSAID represents a logical, evidence-based perioperative care protocol tailored to the field conditions and demands of the procedure performed (Chandran et al. 2024; Kadapatti et al. 2019).

The application of gamma benzene hexachloride (GBH) cream following antiseptic dressing with povidone-iodine provides an additional layer of topical antimicrobial and ectoparasitic protection during wound healing. Gamma benzene hexachloride is an organochlorine compound with broad-spectrum activity; when applied to surgical wounds in field settings, it helps protect against flies and prevents secondary infections (Chedup et al. 2025). Chedup et al. (2025) also described this combination of topical dressing approaches in a field surgical setting in Bhutan, which proved effective in maintaining clean wound healing without complications.

No mesh-related complications were observed during the 90-day follow-up. The PVC insect screen mesh was well tolerated, as evidenced by the absence of infection, rejection, and good wound healing - a notable finding given that the material is not purpose-manufactured for surgical use. Most published information regarding biocompatibility relates primarily to polypropylene and other established surgical meshes (Bilsel and Abci 2012; Chandran et al. 2024). A formal scientific biocompatibility assessment of PVC insect screen mesh in veterinary surgical implantation has not been documented, and the positive outcome in this case should be interpreted accordingly. The confirmation of pregnancy by rectal palpation within three months of surgery implies both anatomical correction of the abdominal wall and the absence of perioperative stress or procedure-related reproductive abnormality, an outcome with significant economic implications for the farmer. This case also highlights the importance of a functional referral system from the Gewog Livestock Supervisors to the District Veterinary Hospital in achieving successful clinical outcomes for rural livestock farmers in Bhutan.

5. CONCLUSIONS

This case report illustrates the favourable field surgical treatment of a traumatic right lateral ventral abdominal hernia in a Jersey crossbred cow from Ngarpongtang village, Thangrong Gewog, Mongar Dzongkhag, Bhutan, using hernioplasty with PVC (Polyvinyl Chloride) insect screen mesh locally available in hardware stores. The animal made a successful recovery, and conception was confirmed within two months of post-surgery. Field-adapted aseptic mesh preparation by washing with detergent, rinsing with normal saline, and soaking in povidone-iodine demonstrated

efficacy in the absence of autoclaving facilities. Topical application of gamma benzene hexachloride cream after surgery contributed to clean wound healing in the present case. The result indicate that PVC insect screen mesh hernioplasty may serve as a viable, field-convenient surgical option for large abdominal wall defects in cattle under resource-limited settings in Bhutan, where commercial surgical mesh is unavailable.

Although the outcome in this case was favourable, PVC insect screen mesh is not a medical-grade implant material. Long-term biocompatibility, chronic inflammatory response, and tissue integration characteristics remain unknown in cattle. Therefore, its use should be interpreted cautiously and restricted to situations where standard surgical mesh is unavailable.

A limitation of this case report is that the exact dimensions of the hernia ring and the mesh implant were not recorded during surgery. The procedure was performed under field conditions with limited resources, where priority was given to timely surgical correction and successful recovery of the animal. The hernia defect was assessed intraoperatively and considered large, and the mesh was trimmed to ensure adequate coverage with sufficient overlap of the surrounding tissues. Although the surgical outcome was successful, documenting precise measurements would have strengthened the report and facilitated more meaningful comparisons with similar cases in future studies.

Documentation of these cases contributes to the expanding body of veterinary clinical knowledge and supports evidence-based decision-making in similar practice settings.

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