

Surgical management of bovine inguinal herniation

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Abstract

Inguinal herniation is not a rare occurrence in cattle, there are on average one to two cases per year in the authors' experience, and surgical management is required if the goal is correction of the problem. Bovine inguinal hernias are classified as either congenital or acquired. Acquired hernias are further differentiated as direct or indirect depending on pathogenesis and whether or not there is damage to the tunic. Two surgical approaches are described below and can be successfully utilized for repair. Following surgery and recovery, bulls often return to breeding without incident.

Keywords: Bovine, bull, hernia, surgical repair

Introduction

Bovine inguinal hernias are classified as either congenital or acquired based on when they occur in the life of a bull. Congenital inguinal hernias occur in neonatal calves and are considered hereditary. Surgical repair can be performed; however, bilateral castration is recommended at the time of the procedure. Acquired inguinal hernias occur in adult bulls and are classified based on their potential pathogenesis or what structures they disrupt. Indirect inguinal hernia is the most common and occurs when abdominal contents exit through the normal, but dilated opening of the inguinal ring. Conversely, direct inguinal hernias occur when normal anatomy is disrupted, and abdominal contents enter the scrotum through an acquired defect in the peritoneum or body wall.¹⁻³ Herniation tends to occur more frequently on the left side. This is hypothesized to be related to the weight of the rumen and the propensity of cattle to lie in right sternal recumbency with the left rear leg abducted, according to Wolfe and Rodning.⁴

Presentation of the patient varies based on the nature of the hernia. Because indirect inguinal hernias technically occur through a normal, but dilated opening, they often do not present with urgent and life-threatening clinical signs. The most common complaint is swelling of the scrotum often with a characteristic hourglass appearance.⁴ Due to the lack of clinical signs, indirect inguinal hernias often go unnoticed and can become chronic leading to adhesion formation which can result in compromise of the bowel and abdominal pain.

Direct inguinal hernias more often present acutely with signs of abdominal pain or hypovolemia.⁴ This is due to the nature of direct inguinal hernias occurring through a traumatic rupture of the peritoneum. The peritoneum can be damaged and torn by the bull fighting with other bulls or attempting to jump over a fence resulting in the viscera escaping retroperitoneally into the neck of the scrotum.⁵ Direct inguinal hernias are emergent as incarceration of the intestine is a common sequela.⁴

Diagnosis of inguinal hernias can be achieved through transrectal palpation of the dilated inguinal ring or body wall defect while appreciating intestine exiting through the ring or body wall. More accurate clinical diagnosis can be made through ultrasonography of the swelling and identifying loops of bowel within the scrotum.^{1,2,5}

Once diagnosed, an approach to repair can be considered based on the value of the bull and plans of the producer. The following are discussions of the methods of surgical correction of this condition in the bull.

Inguinal approach

The patient fasts 36–48 hours prior to surgery with water removed in the last 12 hours preceding surgery. An IV catheter is placed for induction of anesthesia as this procedure is performed under general anesthesia. The patient is placed in right lateral recumbency, and the left rear leg is hoisted

vertically. The inguinal area and scrotum are then clipped and aseptically prepared. A curvilinear incision is made in the inguinal region (Figure 1) to allow access to the hernia contents and expose the inguinal ring for partial or complete closure. Dissection continues until the hernia sac is identified (Figure 2). Once encountered, the sac should be opened, and its contents examined for evidence of incarceration and adhesions (Figure 3). If no intestinal compromise is identified, then the herniated bowel is reduced through the inguinal ring into the abdomen (Figure 4). If the herniated bowel is strangulated, a resection and anastomosis must be performed to remove the affected tissues. If a resection is required, the prognosis decreases substantially. Following reduction of the hernia, the surgery can proceed in one of two different approaches; hemicastration of the affected side or partial closure of the inguinal ring to spare the testicle.^{1,2,5}

When performing hemicastration of the affected testicle along with inguinal hernia repair, the inguinal incision is extended over the spermatic cord and an elliptical-shaped portion of the skin is removed from the lateral aspect of the scrotum. After isolating the testicle and placing Reimer emasculators, two circumferential ligatures (Miller's knots) and one transfixing ligature are placed, the testicle is removed, and the stump is examined for hemorrhage before allowing it to retract into the abdomen (Figure 5). The inguinal ring can then be closed by pre-placing #4 non-absorbable polyamide (Braunamid, B. Braun, Bethlehem, PA) or polyglactin 910 (Vicryl®, Ethicon, Bridgewater, NJ) suture in either simple interrupted or cruciate pattern from the medial to lateral border. Primary closure typically begins by tightening the suture in the center and working outward.¹

When attempting to spare the testicle, the incision in the parietal tunic must be closed after inspection of the herniated contents. The fascia of the internal abdominal oblique muscle is then identified and secured to the caudal aspect of the inguinal ring over and under the spermatic cord for added security of the closure (Figure 6). The inguinal ring is only partially closed as described above leaving room for the spermatic cord and 3–4 cm of additional space. The sutures are again pre-placed in either a simple interrupted or cruciate pattern and secured one-by-one starting near the center of the closure (Figure 7). Care must be taken while closing to ensure that the cord and two fingers (3–4 cm) are capable of passage through the ring.¹

Following either of the above approaches, the subcutaneous layer is closed using #2 absorbable suture (Catgut, B. Braun) in a simple continuous pattern. The skin is closed in a Ford interlocking pattern using #4 non-absorbable polyamide suture (Braunamid).

Standing flank approach

This approach is most utilized for treatment of an indirect inguinal hernia, which is often not life-threatening and thus can be performed on an elective basis (Figure 8).⁵ However, it is also an option for direct inguinal hernias. Advantages for this approach are obvious. It does not require surgical level anesthesia or the surgical theater necessary for the inguinal approach. Additionally, because the inguinal ring is only partially closed from inside the abdomen, it may be easier to preserve the involved testicle.

Following the pre-surgical preparation of the left paralumbar fossa either an inverted-L or paralumbar block is used for local

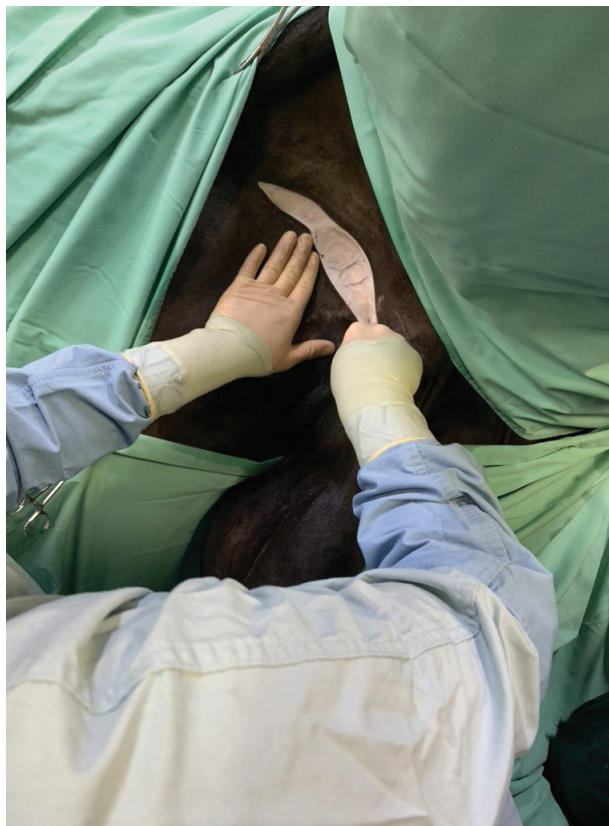


Figure 1. Curvilinear incision made to approach inguinal hernia repair.



Figure 2. Isolated hernia sac after careful dissection.



Figure 3. Opened hernia sac examination of intestinal contents before replacing into abdomen.

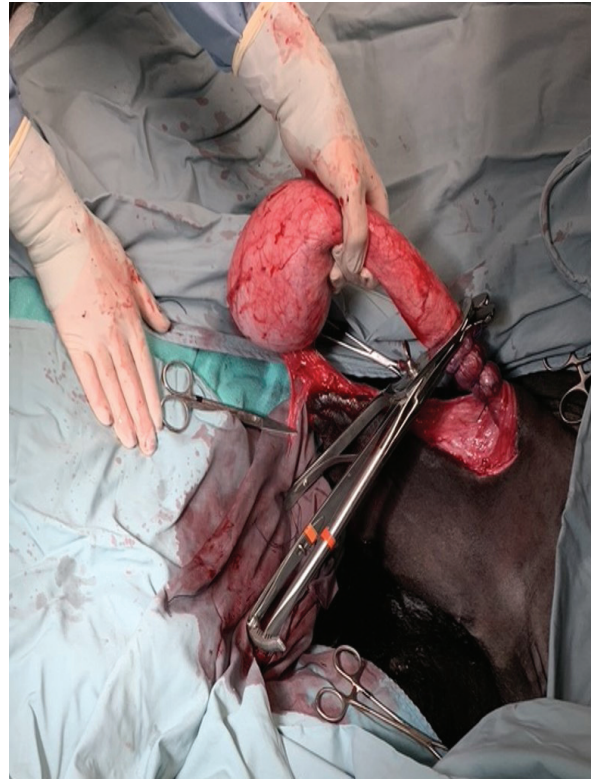


Figure 5. Hemicastration of the affected testicle. A circumferential and transfixing ligature are placed above the site for placement of the emasculator.

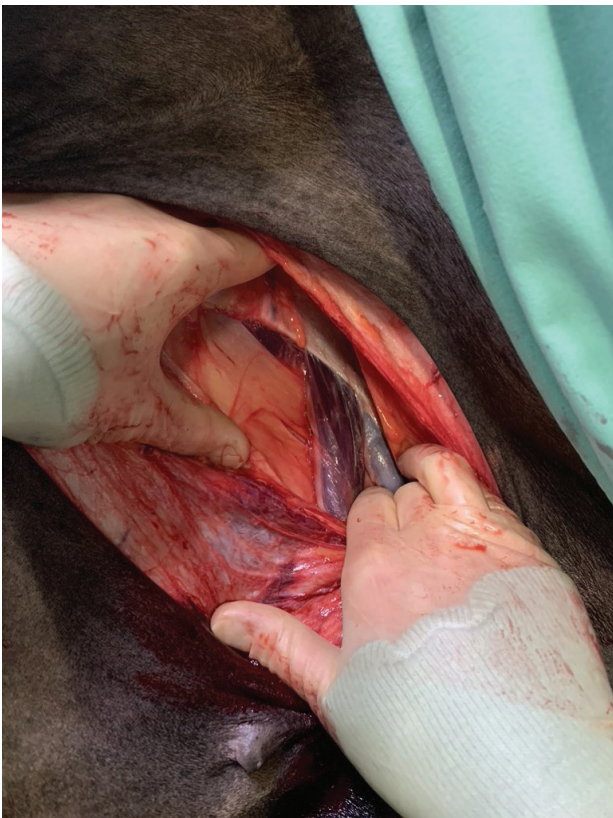


Figure 4. Inguinal ring with herniated contents reduced.



Figure 6. The fascia of the internal abdominal oblique muscle is secured to the caudal aspect of the inguinal ring over and under the spermatic cord for added security of the closure.

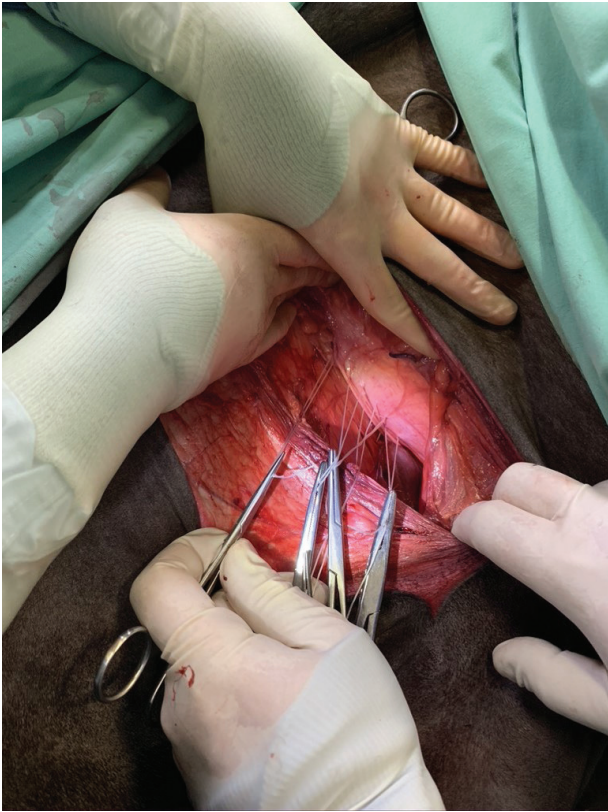
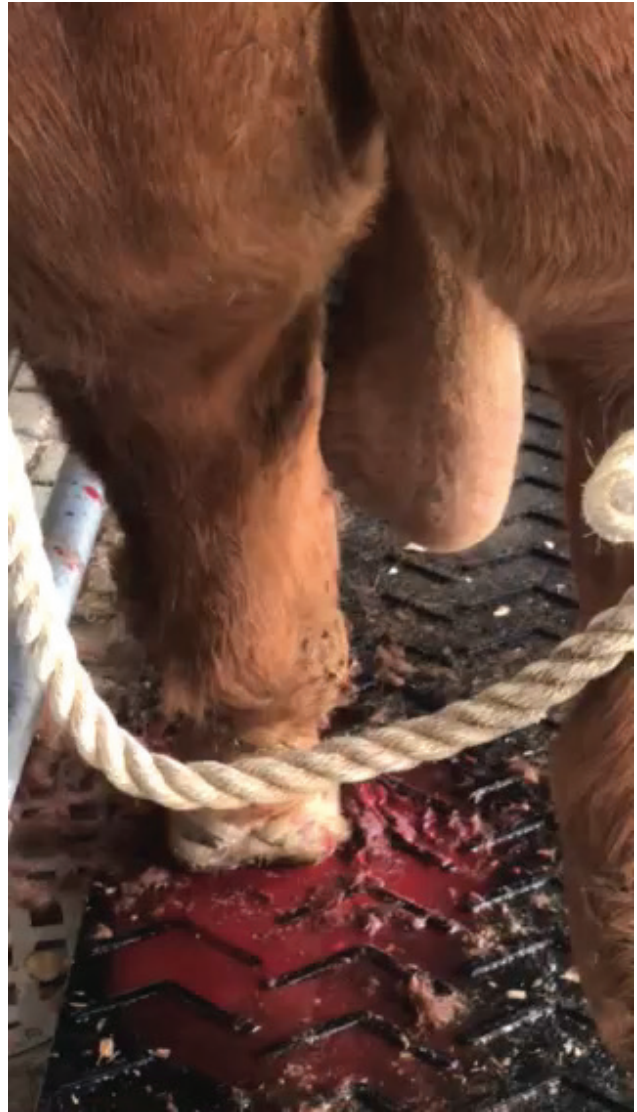


Figure 7. Preplaced sutures through the medial and lateral borders of the inguinal ring.



Video 1. This video demonstrates the application of traction to the herniated contents through the standing flank approach. Resistance was felt likely due to adhesions.



Figure 8. Classic appearance of indirect inguinal hernia in the bull.

anesthesia.⁵ Adequate sedation can be accomplished by utilization of the commonly used 'standing' or 'K-State' stun (xylazine 0.02 mg/kg, butorphanol 0.01 mg/kg, ketamine 0.05–0.1 mg/kg). This is administered via an intravenous route or alternatively the dosage can be doubled and given intramuscularly. The abdomen is then entered in a routine manner and the inguinal ring is identified. The herniated bowel is grasped, and traction is applied to reduce the hernia. Resistance is likely due to adhesions and a decision should be made as to how much traction is employed (Video 1). In spite of efforts to avoid trauma to incarcerated intestines, tearing of the intestine can occur, but can be repaired following reduction and exposure (Figures 9 and 10). Failure to reduce the hernia by traction at this stage will require transition to the inguinal approach. Authors recommend once the hernia is reduced, a small tube (1/4" i.d., 3/8" o.d., 7' length), gas sterilized, (Portex Equine Stomach Tube, Foal, Jorgensen Laboratories, LLC, Loveland, CO) is introduced at least 8–10 cm (or as far as can be advanced atraumatically) into the inguinal ring. This is done so that 40–60 mL of a carboxymethylcellulose 1% solution and 15 grams oxytetracycline hydrochloride soluble



Figure 9. Identification of incarcerated intestines on standing flank approach.



Figure 10. Resection and anastomosis of the incarcerated intestine.

powder (Tetroxy[®] HCA-280, Bimed, Inc., Le Sueur, MN) mixture can be delivered into the space formally occupied by the herniated viscera. The purpose of this is to decrease the potential for fibrosis. It also serves to fill what is a potential space, thus decreasing the possibility of hematoma formation. This is followed by closure of the inguinal ring, which is performed by blindly placing 2–3 interrupted sutures (a vertical mattress pattern is recommended by the authors) or by utilizing the continuous blind suture technique with #2 or #3 non-absorbable suture (Vicryl or Braunaamid). If a short continuous pattern is utilized, then it is recommended that the final pass of suture exits ipsilateral to the initial tie to avoid laxity in the suture line that results when a knot with tension is made across an opening. Also, care must be taken during closure of the inguinal ring to avoid the vasculature entering and exiting through the ring. The flank is then closed in a routine manner.^{2,5}

Post-op care

Parental antibiotics and NSAIDs are recommended pre- and post-operatively. The authors recommend 6.6 mg/kg ceftiofur crystalline free acid (Excede[®], Zoetis, Kalamazoo, MI) administered once subcutaneously in the posterior aspect of the ear and 1.1 mg/kg flunixin meglumine (Banamine[®], Merck Animal Health, Madison, NJ) administered once intravenously pre-operatively. Following surgery, the authors recommend meloxicam tablets (Meloxicam Tablets, Zydus Pharmaceuticals Inc., Pennington, NJ) 1.1 mg/kg administered orally once daily for three consecutive days followed by 0.55 mg/kg every other day as needed post-surgically.

Also, the authors suggest the snug, but not tight bandaging of the scrotum with Elasticon[™] (Figure 11). This helps decrease post-operative swelling and/or control local post-surgical hemorrhage (Figure 12). The bandage should be removed in 24–48 hours, and it is beneficial to carefully move the single testis or, following procedures in which a hemi-castration is not performed, both of the testes up and down within the scrotum at this time and once daily for 3–5 days. The authors recommend isolation from other cattle and sexual rest for 60 days.

Choosing a patient and an approach

The authors contend that bulls presenting with indirect inguinal hernia make reasonable surgical candidates if scrotal swelling is the only complaint and intestinal peristalsis can be appreciated on ultrasonography of the herniated abdominal contents. Prognosis is good for return to breeding soundness. If the testicle on the herniated side has any evidence of degeneration or fluid surrounding the testicle, it is the authors' recommendation to perform hemicastration of that testicle while completing the hernia repair. If a hemicastration is to be performed, an inguinal approach would be appropriate. For sparing of the testicle, either the inguinal approach with partial closure of the inguinal ring or the standing flank approach can be utilized. The standing flank approach is most appropriate for indirect inguinal hernia. If the patient is presenting with a possible direct inguinal hernia, an inguinal approach should be considered for better exposure of the defect in the peritoneum and access to the intestines in case a resection and anastomosis are required.

For patient selection, it is the authors opinion that bulls presenting with indirect inguinal hernia not intended for sale as



Figure 11. Bull with Elastikon wrap following hemicastration and inguinal hernia repair.



Figure 12. Postoperative swelling in a bull following inguinal hernia repair.

a breeding bull can be successfully treated with surgery and return to breeding. If hemicastration is necessary, it is found that the remaining testicle can produce up to 75% of the production by both testicles by compensatory hypertrophy.⁶

Advantages of the inguinal approach are that it provides better exposure of the inguinal ring and visualization of closure of the ring. It also affords the ability to extend the incision and hemicastrate if necessary. Disadvantages of the inguinal approach are that it requires general anesthesia and lateral recumbency which carry risks of other complications such as aspiration pneumonia and radial nerve paralysis.

Advantages of the standing flank approach are that the bull does not require general anesthesia or recumbency, the incision is in the flank instead of on the ventrum decreasing incisional complications and dehiscence. Disadvantages of the standing flank are that visualization of the inguinal ring is not possible and closure is therefore done blindly. It may also be difficult to reduce the herniated viscera depending on the extent of herniation. The standing flank approach would also make a hemicastration difficult to perform during the same surgical procedure.

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Author's contributions

Richard Hopper describes the standing flank approach. Darcie Sidelinger describes the inguinal approach and wrote the introduction and post-op care sections. All authors edited and verified the articles accuracy.

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