Case report: bilateral indirect inguinal herniation in a male alpaca

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Summary

Inguinal hernias are extremely rare in male South American Camelids (SACs). It is important to differentiate and classify herniation, since treatment depends on the diagnosis. Hernias can be either congenital or acquired. Congenital hernias are due to defects during embryogenesis, whereas acquired hernias occur postnatally due to trauma, dilation and/or weakness of soft tissue. Hernias are further classified as direct or indirect. Direct herniation occurs when herniated contents go through a tear or rent in tissue. Direct herniation is usually an emergency, due to strangulation of hernial content, warranting immediate surgical correction. Indirect herniation occurs when the herniated content goes through a normal anatomical structure. Although indirect herniation is usually not considered an emergency, they still warrant surgical correction. Males have a predisposition to indirect inguinal herniation; although this condition is not documented in females, they can have direct inguinal herniation. A sexually intact male alpaca was presented with a history of depression, decreased body condition score, diarrhea, and intermittent rear leg lameness. Bilateral scrotal enlargement was observed, with palpable content in the inguinal region. The condition was classified as an acquired, indirect inguinal hernia. After reducing the hernia by a prescrotal approach a bilateral orchiectomy was performed.

Keywords: Alpaca, inguinal hernia, chronic weight loss

Case presentation

History

An 8-year-old male alpaca was presented to the Auburn University College of Veterinary Medicine Small Ruminant Service with a 6-week history of depression, decreased body condition score (thinner than herd mates), diarrhea, and intermittent left rear lameness. On physical examination, the alpaca was quiet, alert, and responsive with no lameness. Vital signs were: rectal temperature 37.5°C (99.5°F), heart rate 52 beats/min, and respiratory rate 20 breaths/min. The alpaca had pink mucous membranes and a capillary refill time < 2 seconds. A fecal sample was retrieved and on a McMaster's fecal egg count (FEC), there were 8,200 eggs/gram. This animal and all herd mates were given moxidectin 0.1% oral drench (1ml per 22 pounds of body weight).

The following week, the animal was presented and bilateral inguinal hernias were apparent within the inguinal canals and scrotum, with loops of small bowels palpable within hernial sacs. However, testes and external genitalia had no abnormalities. Body weight was 50 kg (110 pounds) with body condition score 2/9, rectal temperature 38.4°C (101.3°F), heart rate 52 beats/min and respiratory rate 20 breaths/min. The alpaca had pink mucous membranes and a capillary refill time < 2 seconds. Normal urination and normal defection were observed. The alpaca was bright and alert with signs of mild abdominal discomfort. Another FEC was performed again and there were only 50 eggs per gram, indicating that moxidectin had been effective. There was mild hind limb ataxia or potential weakness. Blood was submitted for Chemistry and Hematology and results were: aspartate amino transferase 1,664 U/L (reference interval: 127 – 420 U/L), creatinine 1.3 mg/dL (1.4 – 3.2 mg/dL), erythrocytes (RBC) 5.95 x 10^6/µL (10.5 – 17.2 x 10^6/uL), hemoglobin 6.4 g/dL (11.9 – 19.4 g/dL), mean corpuscular volume 33.2 fL (22.2 – 29.9 fL), mean corpuscular hemoglobin concentration 32.3 g/dL (39.3 – 46.8 g/dL), and white blood cells 5.27 x 10^3/µL (reference interval: 8 – 21 x 10^3/µL). The interpretation was a regenerative anemia; although no obvious etiology was apparent, regeneration suggested hemorrhage or hemolysis, perhaps with early iron deficiency. Meningeal worm (*Paralaphostrongylus tenuis*) can be a cause of ataxia in SACs and had occurred on this farm. Therefore, a cerebrospinal (CSF) tap was performed at the lumbosacral junction, but no abnormalities were detected.

Bilateral inguinal hernias were apparent in each inguinal canal and a small loop of bowel could be palpated (Figure 1). However, other bowels were not in the scrotum as previously observed, indicating intermittent inguinal herniation. Ultrasonographic examination of the scrotum and inguinal canals revealed the presence of loops of bowel within protruding inguinal sacs. Attempts were made to manually replace the herniated bowel into the abdomen, it immediately returned. Therefore, surgery to correct hernias and castrate the animal was planned.

Feed and water were withheld for 48 and 8 hours, respectively, prior to surgery. After being sedated with xylazine (0.25 mg/kg) and induced with ketamine (5 mg/kg) via a jugular catheter, the alpaca was intubated and maintained under general anesthesia with isoflurane in oxygen. Once in an appropriate anesthetic plane, the alpaca was placed in Trendelenburg position and manual reduction of the herniated contents attempted, but were unsuccessful. The ventral abdomen was prepared for sterile surgery in a routine fashion. A 7-cm right paramedian skin incision was made 1.5-2 cm lateral to the distal sheath, the skin undermined and the sheath reflected off midline. An additional 7-cm incision was made through the linea alba (Figure 2). Intra-abdominal retraction of small intestine and omentum from the scrotum returned herniated contents to the abdomen. The retracted intestine was grossly normal with no adhesions. The linea alba was closed with 2-0 polydioxanone in a simple continuous suture pattern. Subcutaneous tissue was closed using 2-0 polydioxanone suture (simple continuous suture pattern) and skin closed using 2-0 poliglecaprone 25 (simple interrupted),

An open castration was performed using a prescrotal approach. The right testis was pushed cranially and a 3-cm pre-scrotal incision was made with a number 10 scalpel blade. The skin and subcutaneous tissue were incised to expose the parietal vaginal tunic. The spermatic fascia was stripped and the cauda epididymis bluntly dissected. The vaginal process was incised longitudinally to expose the internal structures of the spermatic cord. The testicular artery and vein, and ductus deferens were ligated using one circumferential and an additional distal transfixing ligature using 2-0 polydioxanone suture. The testicular artery and vein and ductus deferens were crushed with a hemostat and transected distal to the ligatures. The cremaster muscle and vaginal process were ligated together in the same manner as the testicular vasculature and ductus deferens, crushed with a hemostat and then transected distal to the ligatures. The same technique was performed to the left testis (Figure 3). It was the surgeon's preference to use a prescrotal versus inguinal approach, due to the size of hernia sacs present in the inguinal areas.

Inguinal canals were obliterated to prevent reoccurrence of inguinal hernias. The right inguinal canal was located by palpation and a 1-cm skin incision made medial to the caudal border of the external inguinal ring and extended cranially, resulting in a 5-cm incision. The incision was carefully continued through all subcutaneous layers until the peritoneum was identified. The external inguinal ring was closed in a two layers simple continuous pattern. The internal abdominal oblique muscle was closed in a single layer using 0 non-absorbable polyamide suture (simple continuous), whereas fascia and external abdominal oblique muscle were closed in a single layer using 0 non-absorbable polyamide (simple interrupted). Non-absorbable material was used to achieve permanent closure of external inguinal rings. The subcutaneous layer was closed using 2-0 polydioxanone suture (simple continuous) and skin was closed using 2-0 poliglecaprone 25 suture (simple interrupted). The left inguinal canal was similarly closed. The alpaca recovered uneventfully, with no evidence of pain upon recovery or thereafter, and only one dose 2.5 mg (0.25 ml) of butorphanol was given intramuscularly after surgery. Ceftiofur sodium 140 mg (2.8 mg/kg) of was given intravenously once daily for 5 days.

Twelve days after surgery, the alpaca was sedated with 0.2 mg/kg butorphanol and 2mg/kg xylazine added to 20 mg/kg of ketamine, administered intravenously. He was placed in dorsal recumbency and the midline and inguinal sutures removed without incident. There was no evidence of infection, inflammation, edema or pain. The alpaca was bright, alert and responsive with a normal appetite. He was able to defecate and urinate normally. Additionally, there was no lameness or ataxia after surgery, only a slight wide-based stance.

Outcome

This male alpaca had bilateral acquired, indirect inguinal hernias with heavy internal parasitism, likely *Haemonchus contortus.* The hernia was reduced by a prescrotal approach and a bilateral orchiectomy performed.

Discussion

Physical anomalies in SACs in the USA are attributed to inbreeding and reduced genetic diversity.[1] Congenital defects have potential to cause economic losses; those that are genetic in origin and not recognized may perpetuate within the narrow gene pool in North America, leading to even greater losses.[1] Inguinal hernias are extremely rare in male SACs. They are a genetic recessive disorder and therefore, should only be repaired after castration. The left side is more commonly affected. Strangulation of the intestine within the hernia, will cause abdominal pain. However, due to the stoical nature of SACs, affected animals are often found dead.[2] Inguinal hernia repair in a llama (*Lama guanicoe*) has been reported.[3] However, bilateral inguinal hernias are not common in any species.

Indirect hernias in ruminants occur on the left side ~90% of the time, due to rumen pressure and cattle commonly being in sternal recumbency with their left rear leg pulled caudally. Many affected bulls were markedly over-conditioned, followed by rapid weight loss.[4] This scenario can predispose other male species to inguinal herniation. Although SACs do not have a rumen, in recumbent animals, the third compartment of the stomach can increase abdominal pressure towards the left inguinal area. Consequently, a higher prevalence of left side inguinal herniation in SACs has been reported. Inguinal hernia results in herniation of abdominal contents (usually omentum or jejunum) through the internal inguinal ring. If this continues, inguinal hernia results, as abdominal contents move through the external inguinal ring into the scrotum, enlarging the neck of the scrotum or causing obvious enlargement of the scrotum.[5] Acquired inguinal hernia occurs in adult bulls following trauma, or due to age-related relaxation and stretching of the abdominal musculature.[5] However, indirect herniation through the inguinal ring is usually not a dire emergency, as loops of bowel are not strangulated. Inguinal herniation occurs most often in bulls and rarely in cows. Inguinal hernias occur in camelids, more often in male llamas than male alpacas, but more commonly than in female camels.[6] Correction is performed in cattle via either a standing flank laparotomy or inguinal approach and simple interrupted or continuous suture patterns used.[4]

Due to the age and physical presentation of this alpaca's hernias, the diagnosis was acquired indirect inguinal hernias. Depletion of the inguinal fat pad occurs with weight loss, enabling structures (e.g. intestines) to herniate through the inguinal ring. This alpaca's acquired indirect inguinal hernias were likely secondary to weight loss caused by heavy parasitism.

Haemonchus contortus is a hematophagous gastrointestinal parasite of small ruminants and camelids. Heavy burdens of this parasite can cause anemia, hypoproteinemia, weight loss, and even mortality. *Haemonchus contortus* is also becoming a major health concern in New World camelids.[7] Severity of parasite infection is determined by clinical signs, including pale mucous membranes, poor body condition, diarrheaand FEC (Modified McMasters).[7] It is imperative that camelids be monitored for parasites, particularly animals with poor body condition, signs of weakness, pale mucous membranes, or dependent edema. In this case, the initial weakness was attributed to anemia and muscle atrophy secondary to heavy parasitism.

Learning points

- Intact male animals (SACs, small ruminants and ruminants) with chronic weight loss and low body condition score are considered at risk for development of inguinal hernias.
- Inguinal hernia is a differential diagnosis when a male animal is presented with hind limb lameness and/or ataxia in combination with soft tissue swelling in the inguinal regions and/or a swollen scrotum.
- Parasite prevention and control must be part of routine herd work.

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Conflict of interest

No conflict of interest to declare.

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Figure 1. Bilateral inguinal hernias with a loop of small bowel within the inguinal canals. Arrows point to the most cranial border of the hernias (alpaca's head on the top of the picture).

Figure 2. A right paramedian skin incision lateral to the distal sheath with an additional incision through the linea alba (alpaca's head on the right side of the picture).

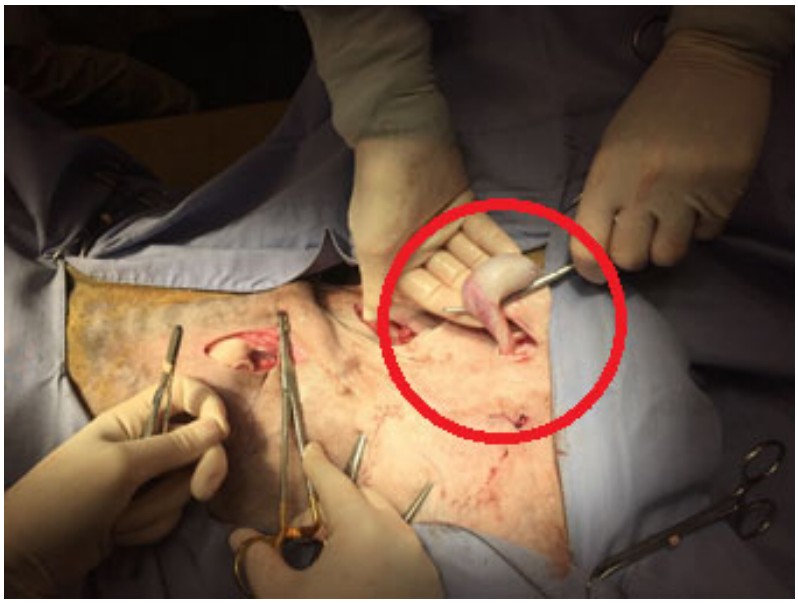

Figure 3. An open castration technique via a prescrotal approach (alpaca's head on the left side of the picture).

(Editor's note: Online edition of the manuscript has color photographs)