Use of cecal bypass via side-to-side ileocolic anastomosis without ileal transection for treatment of cecocolic intussusception in three horses

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Case Description—Three horses were evaluated for signs of colic; cecocolic intussusception was detected.

Clinical Findings—Abnormalities detected included diminished intestinal sounds, inflammatory leukogram, dehydration, unremarkable findings via rectal palpation, and ultrasonographic evidence of large intestine intussusception. Laparotomy revealed cecocolic intussusception.

Treatment and Outcome—Cecal bypass via side-to-side ileocolic anastomosis without ileal transection was performed in each horse by use of an intraluminal anastomosis stapler device. Postoperative complications were minimal, and all horses recovered rapidly and were clinically normal at >12 months after surgery.

Clinical Relevance—Cecal bypass via side-to-side ileocolic anastomosis without ileal transection seemed to offer 2 potential advantages over traditional surgical techniques for treating this condition. The risk of abdominal contamination was far less than with techniques in which the colonotomy is needed to enable resection of the cecum or techniques in which the ileum is transected. Also, it was technically simpler to perform because there was no need to transect the ileum, oversew the ileal stump, perform cecal resection, or close the mesenteric space created by relocating the jejunal stump to the right ventral colon. (J Am Vet Med Assoc 2008;232:574–577)

A 410-kg (902-lb) 2-year-old Standardbred filly (horse 1) was admitted for evaluation and treatment of colic. Ten hours earlier, the filly had developed signs of abdominal pain (rolling and getting up and down) and was nonresponsive to IV administration of flunixin meglumine (1.1 mg/kg [0.5 mg/lb]).

On admission, the filly’s heart rate was 54 beats/min, respiratory rate was 32 breaths/min, and rectal temperature was within reference limits, but intestinal sounds were diminished. Oral mucous membranes were slightly tacky, and capillary refill time was 2 seconds. An IV catheter was placed in the right jugular vein, and lactated Ringer’s solution was administered immediately to correct an estimated 2.5% dehydration. Palpation per rectum was nondiagnostic because only a loose band could be felt in the central portion of the abdomen, which coursing from the right dorsal quadrant to the left ventral quadrant. Soft feces were found in the rectum. Abdominocentesis was attempted, but no peritoneal fluid could be obtained. Passage of a stomach tube did not provide any gastric reflux. A CBC revealed a moderate inflammatory leukogram, characterized by unremarkable WBC count (6,800 WBCs/µL; reference range, 4,900 to 13,700 WBCs/µL), regenerative left shift (1,020 band neutrophils/µL; reference range, 0 to 100 band neutrophils/µL), and mild hyperfibrinogenemia (fibrinogen concentration, 5 g/L; reference range, <4 g/L). Serum biochemical analyses revealed low total protein concentration (48 g/L; reference range, 60 to 77 g/L) and low albumin concentration (24 g/L; reference range, 25 to 36 g/L). Abdominal ultrasonography revealed a characteristic target-like large intestine pattern on the right side of the caudoventral portion of the abdomen (Figure 1). The ultrasonographic findings suggested cecocolic intussusception as a presumptive diagnosis.1-3 On the basis of results of physical examination, abdominal ultrasonographic evaluation, and reoccurring signs of abdominal pain, an exploratory laparotomy was performed. Twenty liters of lactated Ringer’s solution, flunixin meglumine (0.5 mg/kg [0.23 mg/lb], IV), sodium penicillin (22,000 U/kg [10,000 U/lb], IV), and gentamicin (6.6 mg/kg [3 mg/lb], IV) were administered before surgery.

The horse was positioned in dorsal recumbency via general anesthesia. A ventral midline celiotomy was performed. Peritoneal fluid was obtained. The caudoventral portion of the abdomen was explored (Figure 1B). The site of intussusception was identified and submitted for surgical exploration. A jejunostomy was placed in the small intestine 12 cm cranial to the ileocecal valve. The central portion of the cecum was exteriorized, and a mesenteric space was created by relocating the jejunal stump to the right ventral colon. The cecocolic intussusception was manually reduced, and the ileocolic anastomosis was performed without ileal transection by use of a stapling device (Figure 1C). After the ileocolic anastomosis was performed, the cecum was reduced, the cecum was assessed, and the cecum was returned to the abdominal cavity. The cecocolic anastomosis was performed and verified with ultrasonography. A jejunal tube was returned to the small intestine and removed after the abdominal cavity was closed.

Figure 1—Transverse ultrasonographic image of the right caudoventral portion of the abdomen of a horse. The image was obtained with a 3.5-MHz convex transducer at a displayed depth of 20 cm. Notice multiple concentric circles representing the large colon or intussusceptum (c) and the cecum or intussucipiens (a). The anechoic center of the image corresponds to peritoneal fluid.
formed, and exploration of the abdomen revealed a cecocolic intussusception in which only the base of the cecum could be palpated. The entire body of the cecum had intussuscepted into the right ventral colon through the cecocolic orifice. The aboral part of the ileum's antimesenteric band was palpated as it passed through the cecocolic junction. Careful exploration of the entire abdominal cavity revealed no other abnormalities. Attempts to reduce the intussusception by manipulation of the right ventral colon and application of traction on the ileum were unsuccessful. A decision was made to carry out an incomplete bypass of the cecum via side-to-side ileocolic anastomosis. The large colon was exteriorized as much as possible, and gas was removed with a 16-gauge needle and suction. The colon was empty; therefore, no enterotomy was needed to evacuate feces, and it was repositioned in the abdomen, leaving only the orad portion of the right ventral colon accessible to perform the anastomosis, aboral to the intussusception site. The ileum and the distal portion of the jejunum were aligned between the medial and lateral free bands of the right ventral colon and secured with a pair of stay sutures. The ileum was clamped with a noncrushing occlusal clamp aboral to the site for anastomosis, and the proposed surgical site in the right ventral colon was kept elevated with a pair of stay sutures. The ileum and colon were positioned in an antiperistaltic position, so that ingesta flowed in the opposite direction to normal. Stab incisions (2 cm) were made through the antimesenteric border of the ileum and through the right ventral colon, close to the aboral stay suture. The arms of an intraluminal anastomosis stapler device were passed through the stab incisions, and the anastomosis was created by activating the device once. The stab incisions were closed with a simple continuous appositional pattern followed by a continuous Cushing pattern, each with 2-0 polydioxanone. The anastomosis created with the stapler was reinforced with 2-0 polydioxanone in a continuous Cushing pattern. The potential mesenteric hole created by translocating the small intestine to the large colon was not sutured. The abdomen was lavaged with 6 L of saline (0.9% NaCl) solution before closure. Abdominal closure was routine, and recovery from anesthesia was without complications.

The filly was maintained on fluids administered IV for the first 12 hours following surgery with regular monitoring of the PCV. Flunixin meglumine (0.5 mg/kg, q 12 h, IV) was administered for 5 days. Sodium penicillin (22,000 U/kg, q 6 h, IV), gentamicin (6.6 mg/kg, q 24 h, IV), and metronidazole (20 mg/kg [9 mg/lb], q 6 h, PO) were administered for the first 3 days after surgery.

Intestinal sounds were present from the first postoperative day on, and the horse started passing feces within 24 hours after surgery. Water and feed (grass hay) in small amounts were fed at 24 hours after surgery, and the amounts were progressively increased over time. The only postoperative complication was the development of right jugular vein thrombophlebitis 3 days after surgery. At that time, a CBC revealed a mild inflammatory leukogram characterized by an unremarkable WBC count (7,200 WBCs/µL; reference range, 4,900 to 13,700 WBCs/µL), mild regenerative left shift (510 band neutrophils/µL; reference range, 0 to 100 band neutrophils/µL), and hyperfibrinogenemia (fibrinogen concentration, 7 g/L; reference range, < 4 g/L). As a result, the antimicrobial was switched to trimethoprim sulfamethoxazole (25 mg/kg [11 mg/lb], q 12 h, PO) for 2 weeks to empirically treat the suspected septic right jugular vein thrombophlebitis.

The horse was discharged 8 days after surgery. Abdominal skin sutures were removed at 2 weeks. Follow-up (telephone conversation) revealed the filly to be free of signs of abdominal pain and in good body condition at > 12 months after surgery.

The horse was anesthetized and positioned in dorsal recumbency. A ventral midline celiotomy was performed. Abdominal exploration confirmed the presumptive diagnosis of cecocolic intussusception, which could not be reduced manually. The entire body of the cecum had intussuscepted into the right ventral colon through the cecocolic opening. The aboral part of the ileum was palpated going through the cecocolic junction. The large colon was exteriorized as much as possible, and its contents were evacuated through a pelvic flexure enterotomy, which was then closed with 2-0 polydioxanone in a simple continuous pattern oversewn with 2-0 polydioxanone in a continuous Cushing pattern. After the pelvic flexure enterotomy, the surgical technique performed was similar to horse 1, and recovery from anesthesia was without complications.

Postoperative care was similar to horse 1. Intestinal sounds were present from the first postoperative day onward, and the horse passed feces within 24 hours. A CBC was performed 4 days after surgery and yielded results within reference ranges. No postoperative problems were detected.

The horse was discharged 8 days after surgery. Follow-up (telephone conversation) revealed the horse to be free of signs of abdominal pain and in good body condition at > 12 months after surgery.

A 345-kg (759-lb) 1-year-old Standardbred filly (horse 3) was admitted for evaluation and treatment of persistent signs of abdominal pain. Twelve hours earlier, the filly had
developed signs of abdominal pain, and it was nonresponsive to IV administration of flunixin meglumine (1.1 mg/kg). On admission, the horse had signs of pain and attempted to lie down and roll. The horse was estimated to be 3.3% dehydrated, with dark pink mucous membranes, a heart rate of 48 beats/min, and no borborygmi. Results of transrectal palpation of the abdomen were unremarkable. Laboratory findings indicated mild leukocytosis with moderate to marked neutrophilia and a moderate regenerative left shift. Analysis of peritoneal fluid yielded results within reference ranges (nucleated cell count, 3,900 cells/µL; reference range, < 5,000 cells/µL; total protein concentration, 2 g/dL; reference range, < 2.5 g/dL). Thorough abdominal ultrasonographic examination could not be performed because the horse was agitated and frequently attempted to lie down. Subsequently, an exploratory laparotomy was performed. Prior to surgery, the horse received lactated Ringer’s solution, sodium penicillin, gentamicin, and flunixin meglumine, IV.

The horse was positioned in dorsal recumbency via general anesthesia. A ventral midline celiotomy was performed. Palpation deep in the abdomen revealed a cecocolic intussusception. The entire cecum had intussuscepted into the right ventral colon through the cecocolic opening. Palpation revealed that the distal part of the ileum’s antimesenteric band passed down through the cecocolic junction. Attempts to reduce the intussusception by manipulation of the right ventral colon and application of traction to the ileum were unsuccessful. The large colon was exteriorized as much as possible and its contents evacuated through a pelvic flexure enterotomy, which was then closed with 2-0 polydioxanone in a simple continuous pattern oversewn with 2-0 polydioxanone in a continuous Cushing pattern. A side-to-side ileocolic anastomosis was conducted with the same stapling technique as described. Abdominal closure was routine, and recovery from anesthesia was without complications.

Postoperative care was similar to that of horses 1 and 2. Intestinal sounds were present from the first postoperative day, and the horse passed feces within 24 hours after surgery. Laboratory findings 3 days after surgery indicated a mild inflammatory leukogram with a moderate regenerative left shift and mild hyperfibrinogenemia. Five days after surgery, values were within reference ranges. Follow-up (telephone conversation) indicated that the horse had no signs of abdominal pain and was in good body condition at >12 months after surgery.

**Discussion**

Cecocolic intussusception is a typically uncommon but well-documented cause of colic in horses.2,3,8 Young horses and Standardbreds appear to be overrepresented.2,3 In this report, the 3 horses were Standardbreds <3 years of age, but this could be a reflection of our hospital population. Clinical signs are diverse; some horses develop acute severe colic, and others have low-grade, intermittent colic and chronic wasting.2,9 A preoperative diagnosis of cecal colic intussusception is difficult to determine. This condition might be suspected on the basis of finding a mass or edematous intestine in the right caudodorsal aspect of the abdomen during rectal palpation.2,9 However, in the 3 horses of the present report, results of rectal palpation did not suggest the diagnosis. A presumptive diagnosis of cecal colic intussusception was based on multiple concentric rings identified via transabdominal ultrasonography of the right caudoventral quadrant in 2 horses, as previously reported.1–3 However, the definitive diagnosis of cecocolic intussusception can only be made during laparotomy.2,9

Various surgical procedures have been used for this condition, including reduction of the intussusception, partial typhlectomy, colotomy and partial typhlectomy, and jejunooileocolostomy with jejunum-ileum transection.2,3,7,9 In the 3 horses reported here, reduction of the intussusception was attempted by massaging the edematous right ventral colon and intussuscepted cecum, and traction was applied to the ileum. After 10 to 12 minutes of unsuccessful reduction by manipulation, a decision was made to carry out an incomplete bypass of the cecum by side-to-side ileocolic anastomosis. This approach seems to offer 2 potential advantages over traditional surgical techniques. First, the risk of abdominal contamination is far less than techniques in which the colonotomy is needed to enable resection of the cecum or techniques in which the ileum is transected. Second, it is technically simpler to perform because there is no need to transect the ileum, oversew the ileal stump, perform cecal resection, or close the mesenteric space created by relocating the jejunal stump to the right ventral colon.

Complete cecal bypass via ileocolostomy with ileal transection has been recommended in preference to incomplete cecal bypass for surgical management of equine cecal impaction.4 We believed that complete bypass was not necessary because there was a natural obstruction of flow of ingesta by compression of the ileum in the intussusception (which does not occur in equine cecal impaction). However, occlusion of the lumen of the proximal portion of the ileum without ileal transection can be accomplished by placing 4 rows of staples across the lumen of the ileum adjacent and aboral to a jejunoileocolostomy site. This technique has been recently evaluated, and it could be considered an alternative surgical treatment for cecocolic intussusception that provides obstruction of the flow of ingesta aboral to the anastomosis without ileal transection.10

Results of previous studies indicate that oversewing the cecal base for cecocolic intussusception is unnecessary to obtain good results.3,6,9 Nevertheless, the intussusception of the cecum in the right ventral colon might not be completely sequestered from the rest of the abdominal cavity. In addition, strangulation of the intussusception (with subsequent necrosis and leakage into the abdomen) may occur with subsequent peritonitis and adhesion formation after surgery.2 In the 3 horses reported here, the complete nature of the cecocolic intussusception (with involvement of the ileocecal valve) made it technically difficult to oversew the orad portion of the intussusception site, so it was decided not to perform that procedure.

Time for the intussusceptum to undergo complete necrosis or atrophy has not been accurately established. There are few reports, and they are conflicting. In 1 horse, the intussusceptum did not slough within a 3-month follow-up period after ileocolostomy (necropsy findings).2 Other authors have reported that 2 months after ileocolostomy, no remnant of the intussuscepted cecum could be felt in the lumen of the right ventral colon during a second laparotomy. This suggests that the inverted part of the cecum may have sloughed or atrophied within 2 months.1 Further investigation appears to be necessary to accurately describe the progression of this condition.

Protracted antimicrobial treatment may be needed to counteract possible bacterial translocation while the
intussuscepted part of the cecum undergoes necrosis or atrophy. However, on the basis of results of physical examinations and postoperative CBC for the 3 horses reported here, proctored antimicrobial treatment was not considered necessary. Only horse 1 received antimicrobials (for 2 weeks) to empirically treat a potentially septic right jugular thrombophlebitis.

It is possible that a portion of the small intestine could become trapped in the potential space formed between the ileocecal fold, aboral jejunum, and right ventral colon, but Ross et al. suggest that it would not likely become strangulated. In addition, there are recent reports of complete cecal bypass techniques in which it was thought that leaving a large hole rather than one partially closed would be better because a small hole may increase the likelihood of intestinal incarceration.

The 3 horses in the present report were free of signs of abdominal pain and in good body condition after > 12 months, which suggested that this technique did not result in adverse effects. Although this was a small sample, the technique used for creation of an incomplete cecal bypass appeared to be an acceptable option in cases of nonreducible cecocolic intussusception. Evaluation of more horses with the same condition and surgical treatment is necessary to determine potential complications and long-term success of this approach to cecocolic intussusceptions.

References


Selected abstract for JAVMA readers from the
American Journal of Veterinary Research

Effectiveness of administration of phenylbutazone alone or concurrent administration of phenylbutazone and flunixin meglumine to alleviate lameness in horses
Kevin G. Keegan et al

Objective—To determine the effectiveness of administering multiple doses of phenylbutazone alone or a combination of phenylbutazone and flunixin meglumine to alleviate lameness in horses.

Animals—29 adult horses with naturally occurring forelimb and hind limb lameness.

Procedures—Lameness evaluations were performed by use of kinematic evaluation while horses were trotting on a treadmill. Lameness evaluations were performed before and after a 12 hours after administration of 2 nonsteroidal anti-inflammatory drug (NSAID) treatment regimens. Phenylbutazone paste was administered at approximately 2.2 mg/kg, PO, every 12 hours for 5 days, or phenylbutazone paste was administered at approximately 2.2 mg/kg, PO, every 12 hours for 5 days in combination with flunixin meglumine administered at 1.1 mg/kg, IV, every 12 hours for 5 days.

Results—Alleviation of lameness was greater after administration of the combination of NSAIDs than after oral administration of phenylbutazone alone. Improvement in horses after a combination of NSAIDs did not completely mask lameness. Five horses did not improve after either NSAID treatment. All posttreatment plasma concentrations of NSAIDs were less than those currently allowed by the United States Equestrian Federation Inc for a single NSAID. One horse administered the combination NSAID regimen died of acute necrotizing colitis during the study.

Conclusions and Clinical Relevance—Administration of a combination of NSAIDs at the dosages and intervals used in the study reported here alleviated the lameness condition more effectively than did oral administration of phenylbutazone alone. This may attract use of combinations of NSAIDs to increase performance despite potential toxic adverse effects. (Am J Vet Res 2008;69:167–173)