Partial typhlectomy and ileocolostomy for treatment of nonreducible cecocolic intussusception in a horse

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- Cecocolic intussusception in horses is diagnosed on the basis of history, clinical signs, and intraoperative findings. Palpation per rectum and serum biochemical analysis usually are not useful for establishing a diagnosis of cecocolic intussusception.
- Thickness of the cecal wall and serosal discoloration can indicate viability of tissue involved in an intussusception.
- Partial typhlectomy and eversion of the cecal stump may require an ileocolostomy. Incision through the flank is preferred to ventral midline celiotomy when total typhlectomy is performed or when access to the base of the cecum is required in combination with an ileocolostomy.

A 2-year-old 400-kg male Standardbred horse was admitted with a 3-day history of signs of abdominal pain, manifested by lying down and rolling, tachycardia (50 to 60 beats/min), and hyperthermia (rectal temperature, 39°C). Treatment with flunixin meglumine (dosage unknown) had kept the horse comfortable for approximately 6 hours after administration of each dose, but the frequency and intensity of the signs of pain were increasing. At the time of admission, examination revealed the rectal temperature was 38.9°C, heart rate was 90 beats/min, and respiratory rate was 32 breaths/min. The horse had signs of intermittent mild abdominal pain, which consisted of looking at its flank and pawing the ground. Mucous membranes were pink, and capillary refill time was 3 seconds. Auscultation revealed a lack of abdominal sounds on the right side and a decrease in anticipated number and volume of abdominal sounds on the left side. Examination per rectum revealed distended large colon, with a tight band extending from the right cranial portion of the abdomen to the left cranial portion of the abdomen. The cecum and pelvic flexure of the colon were not palpable.

The PCV at the time of admission (51%) was consistent with dehydration, stress-induced splenic contraction, or a combination of both conditions, and total plasma protein (TP) concentration was within reference range values (6.3 g/dl). Analysis of peritoneal fluid, plasma electrolytes, and venous blood gases yielded results within reference range values. To determine the cause of the persistent abdominal pain and distended large colon, ventral midline exploratory celiotomy was recommended.

Fluids (lactated Ringer’s solution, 20 L, IV), sodium penicillin (50,000 U/kg of body weight, IV), and gentamicin (2.2 mg/kg, IV) were administered. Nonsteroidal anti-inflammatory drugs were not given at that time, because the horse had received a dose of flunixin meglumine 3 hours prior to referral. The horse was sedated with xylazine (0.85 mg/kg, IV), and anesthesia was induced with diazepam (0.04 mg/kg, IV) and ketamine (2.1 mg/kg, IV). Using an out-of-circle vaporizer, isoflurane in oxygen was used to maintain anesthesia.

A ventral midline incision was made, and exploration of the abdomen revealed cecocolic intussusception. Palpation and partial visual examination of the cecal junction revealed that most (>90%) of the cecum was located within the lumen of the right ventral colon (Fig 1). Ileocecal and cecocolic junctions were obstructed, and attempts to

Figure 1—Photograph of the ventral portion of the right ventral colon of a 2-year-old male Standardbred horse with cecocolic intussusception.

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in an inverting pattern. An ileocolostomy\(^a\) was performed adjacent to the previous colotomy, and the anastomosis was oversewn with 2-0 polyglycolic acid 910. The abdomen was lavaged with 20 L of lactated Ringer’s solution containing 10 million U of potassium penicillin. Sodium heparin (loading dose, 100 IU/kg, iv) was administered to improve colonic blood flow\(^1\) and reduce intra-abdominal adhesion formation.\(^2\) To promote drainage of excess peritoneal fluid that was anticipated to accumulate as a result of diffuse peritonitis, and to allow collection of peritoneal fluid samples after surgery, an abdominal drain\(^d\) was placed in the peritoneal cavity, penetrating the abdominal wall just cranial to the incision. The abdomen was closed in a routine manner, and a stent bandage was applied.

After surgery, the horse was given potassium penicillin (40,000 U/kg, iv, q 6 h), gentamicin (2.2 mg/kg, iv, q 8 h), and metronidazole (7.5 mg/kg, po, q 6 h) to prevent infection. Heparin (40 IU/kg, sc, q 8 h) was given for 48 hours, and flunixin meglumine (0.75 mg/kg, iv, q 12 h) was given for 96 hours because of its anti-inflammatory and analgesic properties.\(^3\)

The horse became anemic (PCV, 16%) and hypoproteinemic (TP, 4.1 g/dl) during the first 2 days after surgery, and plasma (5 L, iv) was administered. On the second day after surgery, the horse also developed watery diarrhea that contained large amounts of blood, which persisted until day 6. The abdominal drain was removed 2 days after surgery because of loss of patency. Heparin was discontinued on day 3 after surgery, and PCV and TP concentrations slowly returned to within the reference range during the next 14 days. On day 6 after surgery, the horse developed thrombophlebitis involving the left jugular vein and edema and signs of pain on palpation of the right jugular vein. A catheter was placed in the right lateral thoracic vein and maintained for 4 additional days.

During the first postoperative week, the horse was inappetant, febrile (39 C), had signs of depression, and lost 40 kg of body weight, all of which were attributed to peritonitis. Peritoneal fluid obtained via abdominocentesis 3 days after surgery had total protein concentration within the reference range (< 2.5 g/dl), but had a high nucleated cell count (95,000 cells/μl; reference range, < 5,000 cells/μl). Bacteriologic culturing of the fluid yielded Escherichia coli, Klebsiella pneumoniae, and Proteus vulgaris. A CBC analysis revealed an acceptable WBC count (10,500 cells/μl; reference range, 6,000 to 12,000 cells/μl), but mild neutrophilia (8,300 cells/μl; reference range, 3,000 to 6,000 cells/μl). On day 6 after surgery, total protein concentration of peritoneal fluid was 3.0 g/dl, and the nucleated cell count had increased to 190,000 cells/μl, but bacteria were not isolated. A CBC anal-

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\(^a\) Vicryl, Ethicon Inc., Somerville, NJ.
\(^b\) Auto Suture, TA-90, US Surgical Corp., Norwalk, Conn.
\(^d\) ReliaVac, Davol Inc., Cranston, RI.
ysis on day 9 after surgery revealed leukocytosis (WBC count, 20,600 cells/μL). Examination of WBC revealed a high neutrophil count (16,000 cells/μL) and mild toxic changes.

The IV administration of fluids was discontinued on day 10 after surgery because of thrombophlebitis and the inability to maintain a patent catheter. Continuation of antibiotic treatment was deemed necessary because of peritonitis and the possibility of abscess formation at the intussusception site. Antimicrobial susceptibility of isolated organisms and the need for oral administration of antibiotics prompted the switch to chloramphenicol (20 mg/kg, PO, q 6 h).

From the second through fourth week after surgery, the horse gradually regained its appetite and gained weight, and fecal output returned to expected amounts. The horse was discharged 4 weeks after surgery, with instructions to the owner to administer chloramphenicol for 2 additional weeks and to monitor the horse’s attitude, appetite, and fecal output. The owner was instructed on the necessity for precautions during the handling and administration of chloramphenicol. We recommended that the trainer treat the horse at least once each year for tapeworm infection, using twice the recommended dosage of pyrantel pamoate. One year after surgery, the trainer reported that the horse was in excellent body condition, was in training, and was performing up to expectations.

Age, breed, and duration of signs of abdominal pain manifested by the horse of this report were typical of horses with cecocolic intussusception. Inconclusive findings on palpation per rectum and clinicopathologic examination were not supportive of a specific diagnosis, which was similar to other reports.

We were unable to manually reduce the intussusception; therefore, we performed an enterotomy in the large colon and partial typhlectomy, as has been described. It became evident that the intussusception involved the entire cecum and ileocecal junction, requiring partial typhlectomy and ileocolostomy. Robertson and Johnson reported success when evertting the cecal stump after partial typhlectomy, but attributed this success, in part, to the viability of the base of the cecum. On the basis of the palpable consistency, thickness of the cecal wall, and serosal discoloration, we were reasonably certain that the cecal base was necrotic, and elected to use the bypass procedure. Extension of the abdominal incision allowed access to the site of cecal invagination, which we were able to oversee. In situ fixation of the intussusception, by oversewing the site of invagination, has been alluded to by Huskamp, although reports of success of this procedure are lacking. Most reports concerning cecocolic intussusception indicate numerous tapeworms in the cecum and colon, the importance of which remains uncertain. Barclay et al reported that lesions attributable to tapeworm attachment are consistent with a mechanical model for the initiation of intussusception.

The horse of this report had a prolonged postoperative recovery, which was complicated by fever, peritonitis, thrombophlebitis, anemia, hypoprothrombinemia, and weight loss. Fever was attributed to peritonitis and thrombophlebitis, which also could explain, in part, the hypoprothrombinemia. Low PCV and TP concentrations were probably caused by blood loss during surgery. Fluid administration at a high rate, and intraluminal blood loss that was presumably associated with sloughing of the cecal stump. In addition, treatment with heparin decreases PCV by causing RBC aggregation; however, because RBC aggregation usually takes 3 to 5 days to develop, its contribution to the low PCV was undetermined.

Complete cecal bypass is a practical and effective technique in horses, and it was used on the horse of this report instead of a partial bypass procedure because of involvement of distal ileum in the intussusception and because we assumed that the cecal base had vascular compromise. A report of ileocolostomy for treatment of intussusception did not include details of the procedure, and the horse of that report died 3 weeks after surgery. Another horse with concurrent ileocecal and cecocolic intussusceptions was euthanized, because the entire cecum was believed to be compromised. Partial typhlectomy and ileocolostomy could be considered in such situations. Horses are reported to tolerate complete typhlectomy and ileocolostomy; however, the combined procedures require a surgical approach through the right flank that involves resection of the 16th rib.

We believed that partial typhlectomy was essential to decrease size of the colon and remove as much devitalized tissue as possible. Presumably, the portion of cecum that invaginated within the colon sloughed and was passed in the feces. Although completely oversewing the cecal base at the point of intussusception was difficult because of the use of a ventral midline approach, we believed that 3 or 4 interrupted sutures placed in the cecal base helped to prevent eversion of the necrotic cecal stump, and ensured some stability until fibrinous adhesions could seal the area during the next several days. On the basis of the palpable thickness of the intestinal wall, surgeons should place sutures in the base of the cecum in a nonpenetrating manner to prevent leakage of intestinal contents; however, correct suture placement may be difficult because of lack of adequate exposure obtained by the use of a ventral midline approach.

References
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Clinical Report 327
Effects of polymyxin B and Salmonella typhimurium antiserum on horses given endotoxin intravenously

Polymyxin B and an antiserum against an Rc mutant Salmonella typhimurium were evaluated for protective effect in an equine model of endotoxemia. Six 3- to 5-month-old foals were given endotoxin (0.25 μg/kg of body weight) iv after no pretreatment, or pretreatment with polymyxin B (6,000 U/kg, iv) or S typhimurium antiserum (1.5 ml/kg, iv). When given without pretreatment, endotoxin caused transient recumbency and increases in rectal temperature, and heart and respiratory rates. In addition, leukopenia and increases in circulating tumor necrosis factor (TNF) and interleukin 6 activities were detected. Compared with results obtained when endotoxin was given alone, pretreatment with polymyxin B resulted in significantly (P < 0.05) lower maximal plasma TNF and interleukin 6 activities, and significantly lower rectal temperature and respiratory rate. In contrast, compared with effects of endotoxin given without pretreatment, use of antiserum was associated with significantly (P < 0.05) higher respiratory rate, maximal plasma interleukin 6 activity, and total TNF response (as determined by areas under curves of plasma TNF vs time). These results indicate that polymyxin B may have potential as a treatment for equine endotoxemia. Salmonella typhimurium antiserum had no positive effect in this model, and, under certain conditions, may exacerbate the actions of endotoxin.—M. M. Durando, R. J. MacKay, S. Linda, et al in Am J Vet Res 55 (July 1994).