EQUINE

Evaluation of surgical treatment for signs of acute abdominal pain in draft horses: 72 cases (1983–2002)

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Objective—To determine whether heavy (≥ 680 kg [≥ 1,500 lb]) draft horses undergoing surgical treatment for acute signs of abdominal pain were at a greater risk for anesthetic and postoperative complications and lower postoperative survival rates than light (< 680 kg) draft horses.

Design—Retrospective case series.

Animals—72 draft horses.

Procedures—Medical records of draft horses that underwent exploratory celiotomy for signs of acute abdominal pain from October 1983 to December 2002 were reviewed. Medical records of draft horses in which a celiotomy was performed for correction of reproductive abnormalities were not included in the study.

Results—When compared with light draft horses, heavy draft horses had longer durations of anesthesia, more postoperative complications, and lower survival rates. Seventy-six percent of horses that recovered from anesthesia had postoperative complications. Postoperative complications associated with low survival rates included myopathy and neuropathy, ileus, diarrhea, and endotoxemia. All horses with postoperative myopathy and neuropathy died or were euthanized. The short-term survival rate for horses that recovered from anesthesia was 60%. Horses undergoing small intestinal surgery had a worse prognosis for short-term survival than those undergoing large intestinal surgery. The survival rate for horses for which long-term (> 1 year) follow-up information was available was 50%.

Conclusions and Clinical Relevance—Draft horses weighing > 680 kg that underwent surgery because of acute signs of abdominal pain had longer durations of anesthesia, more postoperative complications, and higher mortality rates than draft horses weighing < 680 kg. (*J Am Vet Med Assoc* 2006;228:1546–1550)

Acute signs of abdominal pain are frequently detected in horses.[1-6] In a study[7] evaluating causes of death of 448 horses, 21% of the deaths were attributed to acute signs of abdominal disease. Several retrospective studies[1,8-11] have evaluated short- and long-term outcomes for horses treated surgically to resolve acute signs of abdominal pain. Those studies have predominantly reported outcomes for nondraft horse breeds, which generally weigh < 500 kg (1,100 lb). To the authors' knowledge, outcomes for a large number of draft horses treated surgically for acute signs of abdominal pain have not been reported. Results of other studies[3,12] in nondraft horses indicate that survival rates vary on the basis of the segment of gastrointestinal tract involved. Short-term survival rates of horses with small intestinal and large intestinal lesions reportedly range from 34% to 80%.[1,3,11,13,14]

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Abbreviations

MAP	Mean arterial pressure
TP	Total protein

Compared with nondraft breeds, draft horses may be at greater risk for anesthetic and postoperative complications.[15] These complications may be the result of large body mass, the tendency of draft horse breeds to not have typical signs of abdominal pain, a slow metabolic rate, and prolonged periods of recumbency associated with surgical procedures.[15] Studies detailing postoperative outcomes in draft horses, regardless of the disease being surgically treated, are limited. Kraus et al[16] reported that 11 of 104 draft horses surgically treated for laryngeal hemiplegia had complications associated with general anesthesia. In that study, 1 horse was euthanized because of the inability to stand after surgery. The purpose of the study reported here was to determine whether heavy (≥ 680 kg [≥ 1,500 lb]) draft horses undergoing surgical treatment for acute signs of abdominal pain were at a greater risk for anesthetic and postoperative complications and lower postoperative survival rates than light (< 680 kg) draft horses.

Criteria for Selection of Cases

Medical records of draft horses that underwent exploratory celiotomy for acute signs of abdominal pain at Purdue University Veterinary Teaching Hospital from October 1983 to December 2002 were reviewed. Medical records of draft horses that did not have an exploratory celiotomy performed or had a celiotomy performed for correction of reproductive abnormalities were not included in the study.

Procedures

Data retrieved from medical records included anamnesis; signalment; body weight; abnormal physical examination findings; results of CBC, serum biochemical analyses, and abdominocentesis; whether nasogastric reflux (> 1 L was considered abnormal) was detected; rectal examination findings; surgical findings; postoperative complications; and discharge status.

Anesthetic management and monitoring—Horses were sedated with xylazine hydrochloride (0.5 to 1.1 mg/kg [0.23 to 0.5 mg/lb], IV). Butorphanol tartrate (0.02 mg/kg [0.01 mg/lb], IV) was combined with xylazine hydrochloride for some horses. Before 1986, anesthesia was induced with guaifenesin and thiamylal sodium. After 1986, induction of anesthesia was performed with ketamine hydrochloride (2.2 mg/kg [1.0 mg/lb], IV) in combination with diazepam (0.05 to 0.1 mg/kg [0.023 to 0.05 mg/lb], IV). Horses were orotracheally intubated. Horses were lifted by limb hobbles by use of a motorized hoist and placed in dorsal recumbency on a surgical table with two 6-inch foam support pads. All horses were maintained on a circle rebreathing anesthetic system at 100% oxygen with mechanical ventilation. Before 1986, anesthesia was maintained with halothane. After 1986, anesthesia was maintained with isoflurane. Arterial blood pressure was measured by use of a pressure transducer attached to an indwelling arterial catheter, and the Pa_{O_2} was measured with a blood gas analyzer. Inotropic therapy (dobutamine [concentration, 0.3 mg/mL], administered IV to effect) was used to maintain blood pressure. Samples for arterial blood gas analysis were collected from the arterial catheter at 30- to 60-minute intervals during anesthesia. For each anesthetic period, the mean, low, and high values for MAP and Pa_{O_2} were recorded. Duration of anesthesia and anesthetic recovery time were also recorded. Horses with an MAP < 70 mm Hg were considered hypotensive, and those with a Pa_{O_2} < 80 mm Hg while 100% oxygen was being delivered were considered hypoxemic.

Surgical findings—Type of surgical procedure performed and the surgical diagnosis were retrieved from the medical record. Additional surgical information retrieved from medical records included whether an enterotomy or an intestinal resection and anastomosis had been performed.

Postoperative treatment—Antimicrobials used included gentamicin sulfate (2.2 to 6.6 mg/kg, [1.0 to 3.0 mg/lb], IV, q 6, 8, or 24 h), potassium penicillin G (22,000 U/kg, [10,000 U/lb], IV, q 6 h), procaine penicillin G (22,000 U/kg, IM, q 12 h), and ceftiofur sodium (2.2 mg/kg, IV or IM, q 12 h). Nonsteroidal anti-inflammatory medications used included phenylbutazone (2.2 to 4.4 mg/kg, [1.0 to 2.0 mg/lb], IV or PO, q 12 to 24 h) and flunixin meglumine (0.25 to 1.1 mg/kg, [0.11 to 0.5 mg/lb], IV, q 12 h). Balanced polyionic fluids were administered IV at a rate of 50 to 120 mL/kg/d (23 to 55 mL/lb/d).

Postoperative complications—Daily physical examination sheets were reviewed to collect data concerning postoperative complications. Pyrexia, myopathy, ileus, diarrhea, incisional drainage and infection, peritonitis, neuropathy, endotoxemia, incisional dehiscence, parturition or abortion, laminitis, recurrent colic, and death were specifically noted. Necropsy findings and causes of death were recorded for horses that died or were euthanized.

Follow-up information—Follow-up information was collected from owners via telephone or a mailed survey. A minimum follow-up period of 1 year was required for cases to be considered as having long-term follow-up. Mailed surveys were used to reach 12 owners because they did not have telephones. Information regarding survival, postoperative complications, recurrence of signs of abdominal pain, whether celiotomy was repeated, previous and intended use of the horse, and owner satisfaction was requested.

Statistical analysis—Draft horses were separated into 2 groups on the basis of body weight. Draft horses weighing < 680 kg were considered as light draft horses, and horses weighing ≥ 680 kg were considered as heavy draft horses. The weight limit for heavy draft horses was arbitrarily set at 680 kg because most nondraft horses in our hospital population weighed < 680 kg.

Noncontinuous variables (discharge status, signs of abdominal pain, whether nasogastric reflux was detected, mucous membrane color, capillary refill time, sex, hypoxemia, hypotension, and postoperative complications) were compared between the 2 groups by use of χ^2 analysis or the Fisher exact test. Continuous variables (duration of anesthesia, rectal temperature, heart rate, respiratory rate, WBC count, PCV, and total protein concentration) were compared between the 2 groups by use of a Student *t* test. The probability of a horse having a postoperative complication or dying as a result of increased duration of anesthesia was evaluated by use of logistic regression analysis. For all analyses, a value of $P < 0.05$ was considered significant.

Results

Medical records of 72 draft horses, including 5 foals (< 1 month to 4 months old), were included in the study. Mean age of horses was 2.3 years (median, 5 years; range, 1 day to 16 years). Forty-five horses were females, 15 were sexually intact males, and 12 were castrated males. The most common draft breed was the Belgian (n = 49). Other breeds recorded included Percheron (n = 11), Clydesdale (5), Shire (5), and Haflinger (2). Mean body weight of draft horses was 654 kg (1,439 lb; median, 750 kg [1,650 lb]; range, 57 to 1,045 kg [125 to 2,300 lb]). Horses considered as light draft horses (n = 21) had a mean body weight of 388 kg (854 lb; median, 420 kg [924 lb]; range, 57 to 679 kg [125 to 1,494 lb]). The 5 foals included in the study had a mean body weight of 108 kg (238 lb; range 57 to 227 kg [125 to 499 lb]). Horses considered as heavy draft horses (n = 51) had a mean body weight of 822 kg (1,808 lb; median, 801 kg [1,762 lb]; range, 709 to 1,045 kg [1,560 to 2,300 lb]).

Heart and respiratory rates and rectal temperature values were recorded on admission to the hospital. Mean ± SD heart rate recorded for 70 horses was 85 ± 24.5 beats/min (median, 84 beats/min). Mean ± SD respiratory rate recorded for 68 horses was 40 ± 17.4 breaths/min (median, 36 breaths/min). Mean ± SD rectal temperature recorded for 66 horses was 38.4 ± 0.73°C (101.2 ± 1.32°F; median, 38.6°C [101.4°F]). No significant differences in rectal temperature ($P = 0.86$) and respiratory rate ($P = 0.63$) were detected between the 2 groups. When comparing heart rate by weight and age, no significant ($P = 0.27$) differences were detected between the 2 groups. Mucous membrane color was recorded for 48 horses. The mucous membrane color was recorded as

pink (n = 35); injected (7); dark-purple, congested gingiva (4); and cyanotic (2). Capillary refill time was recorded in 29 horses as < 2 seconds (n = 19) and > 2 seconds (10). No significant differences in mucous membrane color ($P = 0.88$) and capillary refill time ($P = 0.66$) were detected between the 2 groups.

Findings following abdominal palpation per rectum were available for 63 (88%) horses. Abnormalities included abnormal distension or position of the large intestine (n = 39) and small intestine (16); results of rectal examination were inconclusive for 8 horses. Rectal examination was not attempted in 9 foals and weanlings because of small body size. Nasogastric intubation was performed in 40 horses. An abnormal quantity of nasogastric reflux was obtained from 28 horses. The mean ± SD amount of reflux obtained was 8.5 ± 11.5 L (median, 8.0 L). No nasogastric reflux was obtained from 12 horses.

The plasma PCV and TP concentration was determined via centrifugation and was recorded in 69 (96%) horses. Mean ± SD PCV was 43 ± 7% (median, 43%). Mean ± SD TP concentration was 7.3 ± 0.95 g/dL (median, 7.0 g/dL). No significant differences in PCV ($P = 0.18$) and TP concentration ($P = 0.13$) were detected between the 2 groups. A CBC was obtained from 47 horses. Mean ± SD WBC count was 9.2 ± 4.65 × 10^3/μL (median, 9.5 × 10^3/μL). No significant ($P = 0.32$) differences in WBC counts were detected between groups. Neutrophilia was detected in 29 horses, and neutropenia was detected in 6 horses.

Abdominocentesis was attempted in 56 horses and successful in 37 (66%). Mean ± SD TP concentration in peritoneal fluid was 3.3 ± 1.3 g/dL (median, 3.2 g/dL). Mean ± SD WBC count in peritoneal fluid obtained from 36 horses was 1.4 ± 1.3 × 10^3/μL (median, 9.1 × 10^3/μL). Abdominal fluid color was recorded in 28 horses. The fluid was yellow in 21 (75%) horses, serosanguinous in 6 (21%) horses, and brown in 1 (4%) horse. Seventeen samples were submitted to the clinical pathology laboratory for evaluation. Eleven samples were considered as normal abdominal fluid, 5 were considered as indicative of inflammation, and 1 sample was considered as normal amnionic fluid.

On the basis of results of physical examination, abdominocentesis, and abdominal palpation per rectum, a preoperative diagnosis was made in 58 (81%) horses. A preliminary diagnosis of a large intestinal lesion was made in 40 horses, a preliminary diagnosis of a small intestinal lesion was made in 17 horses, and a preliminary diagnosis of lesions involving both the small and large intestine was made in 1 horse. The preliminary diagnosis was correct in 46 (79%) horses.

Forty-three (60%) horses had disorders involving the large intestine. Large intestinal abnormalities included right dorsal displacement of the large colon (n = 21), large colon volvulus (17), large colon impaction (4), left dorsal displacement of the large colon (1), cecal torsion (1), and cecocolic intussusception (1). Two horses had more than 1 large intestinal abnormality. Of the 43 horses with large intestinal abnormalities, 9 (21%) were in the light draft horse group. The most common large intestinal abnormalities in the light draft horse group were large colon impaction (n = 3) and right dorsal displacement of the large colon (3). Small intestinal abnormalities were diagnosed in 21 horses. Small intestinal abnormalities included small intestinal volvulus (n = 7), enteritis of the proximal portion of the small intestine (6), inguinal hernia (4), pedunculated lipoma (2), and ileal impaction (2). Horses in the light draft horse group accounted for 33% of the total number of horses with a small intestinal abnormality. The most common small intestinal abnormality in the light draft horse group was small intestinal volvulus (n = 3). Other abdominal lesions included septic peritonitis (n = 3), tympanic colic involving the cecum and large colon (3), primary gastric rupture (1), and ileus (1). Five of those 8 horses were in the light draft horse group. Of the other abdominal lesions, the most common lesion in the light draft horse group was tympanic colic involving the cecum and large colon (n = 2).

Intestinal resection and anastomosis were performed in 8 horses. Small intestinal resection and anastomosis were performed in 7 horses; jejunocecostomy was performed in 6 horses, and jejunojejunostomy was performed in 1 horse. The amount of resected small intestine ranged from 0.91 to 14 m (mean, 5.94 m). A large colon resection and anastomosis was performed in 1 horse. Of the horses treated with intestinal resection and anastomosis, 2 were discharged from the hospital. Of the 2 surviving horses, resection of the large colon was performed in 1 horse and jejunocecostomy was performed in the other. Causes of death or euthanasia in the 6 horses with intestinal resection and anastomosis included endotoxemia (n = 6), postoperative ileus (1), and incisional dehiscence (1). Four of those 6 horses had more than 1 complication. Three of the 6 horses that died or were euthanized were initially evaluated for clinical signs of endotoxic shock.

Celiotomy was repeated in 4 horses. A second celiotomy was performed in 3 horses with recurrent colic while in the hospital and abdominal surgery was performed in 1 horse admitted to the hospital on 3 separate occasions. Three surgeries (1 admission) were performed in 1 horse because of incisional dehiscence. Three of the 4 horses were euthanized or died after celiotomy had been repeated. The horse that underwent 3 celiotomies during 1 admission was euthanized during the third surgery because the body wall could not be repaired. The remaining horse was discharged from the hospital.

Of 72 horses, 12 were euthanized during general anesthesia and 2 horses died during anesthesia. Therefore, 58 of 72 (81%) horses recovered from general anesthesia. All horses that were euthanized during general anesthesia were determined to have a poor to grave prognosis for survival.

Fifty-one (71%) horses were maintained on isoflurane anesthesia, and 5 (7%) horses were maintained on halothane anesthesia. The type of inhalant used to maintain anesthesia was not recorded in the remaining 22% of horses. The MAP was recorded during anesthesia in 51 horses. Mean ± SD MAP was 71.2 ± 9.5 mm Hg (median, 72 mm Hg). Thirty-nine (76%) horses were considered hypotensive (MAP < 70 mm Hg). No significant ($P = 0.11$) difference in MAP was detected between the 2 groups. No significant differences in MAP were detected in horses in which anesthesia was induced with thiamylal and guaifenesin and horses in

which anesthesia was induced with diazepam and ketamine. Arterial blood gas analyses were performed in 43 horses. Mean ± SD Pa_{O_2} was 144 ± 110 mm Hg (median, 85 mm Hg). Twenty-eight (65%) horses were considered hypoxemic (Pa_{O_2} < 80 mm Hg). The frequency of heavy draft horses becoming hypoxic during anesthesia was not significantly (P = 0.07) different from that in light draft horses. Mean ± SD duration of anesthesia was 2.3 ± 0.91 hours (median, 2.2 hours). The duration of anesthesia in heavy draft horses (2.1 ± 0.84 hours) was significantly (P = 0.05) longer than in light draft horses (1.6 ± 0.57 hours).

Fifty-eight horses recovered from general anesthesia. Mean recovery time (the time a horse was placed into a recovery stall until it was standing) was 39 minutes (median, 41 minutes; range 11 to 150 minutes). Mean recovery time for horses in the light and heavy draft horse groups was 32 and 43 minutes, respectively. Mean recovery time for horses maintained on halothane was 53 minutes. Horses maintained on isoflurane had a mean recovery time of 38 minutes. Four horses died while in the recovery stall; endotoxemia was diagnosed in all 4 horses. Because of the small number of horses that died, statistical analyses of duration of anesthesia and anesthetic recovery and outcome were not performed, although duration of anesthesia and anesthetic recovery did not appear to have an effect on the 4 horses that died in recovery. Two horses developed upper airway obstruction while in recovery, and an emergency tracheostomy was performed. One of those 2 horses died after anesthetic recovery. For every 1-hour increase in anesthesia, the probability of a postoperative complication increased 1.3 times and the probability of death increased 1.2 times.

Of the 58 horses that recovered from general anesthesia, 14 (24%) had no postoperative complications and 44 (76%) had 1 or more postoperative complication. Postoperative complications included pyrexia (rectal temperature > 38.6°C [101.5°F]; n = 11), diarrhea (10), ileus (10), incisional infection (7), myopathy (6), abortion (5), endotoxemia (5), recurrent signs of abdominal pain (4), neuropathy (3), incisional dehiscence (3), laminitis (3), septic peritonitis (1), and death (9). Heavy draft horses had significantly (P = 0.026) more postoperative complications than light draft horses. The most common postoperative complications detected in the light draft horse group were pyrexia (n = 3) and recurrent colic (3). The most common postoperative complications detected in the heavy draft horse group were ileus (n = 8), diarrhea (8), pyrexia (8), and death (9). Ninety-three percent of horses that did not develop postoperative complications were discharged, whereas 51% of horses that developed postoperative complications died or were euthanized while in the hospital; this finding was significant (P = 0.002).

Of the 58 horses that recovered from anesthesia, 35 (60%) were discharged, 13 (22%) were euthanized, and 10 (17%) died. The percentage of light draft horses (21.6%) that died or were euthanized after surgery was significantly (P = 0.034) different from the percentage of heavy draft horses (78.38%) that died or were euthanized after surgery. Reasons for euthanasia of horses after surgery included endotoxemia (n = 7), neuropathy (3), postoperative intestinal necrosis (3), myopathy (2), postoperative ileus (2), and incisional dehiscence (1). Reasons for horses dying after surgery included cardiovascular collapse during the anesthetic recovery period (n = 4), endotoxemia (2), myopathy (1), and unknown (3). All horses with postoperative myopathy (n = 6) and postoperative neuropathy (3) died or were euthanized.

Of the 3 horses that had incisional dehiscence, 1 horse was discharged, 1 horse was euthanized during its third surgery because of the inability to repair the dehiscence, and 1 horse died in the recovery stall after celiotomy had been repeated; endotoxemia was suspected as the cause of death in this horse.

Necropsy was performed in 20 of 23 (87%) horses that died or were euthanized. Necropsy was performed in 7 of 10 (70%) horses that died after surgery and 12 of 13 (92%) horses that were euthanized after surgery. Final diagnoses in horses that died or were euthanized included enteritis or colitis (n = 7), intestinal ischemia or necrosis (2), unknown cause of death (2), septicemia (2), neuropathy (1), stomal stricture (1), myopathy (1), large colon torsion (1), peritonitis (1), congenital lymphangiectasia (1), and pulmonary edema or congestion (1).

Follow-up information was collected for 21 of the 35 (60%) horses discharged from the hospital. Fourteen horses were lost to follow-up. Follow-up information was collected from 1 to 10 years after discharge.

Ten of 21 (48%) horses were alive at the time of follow-up. Four (40%) horses had sustained mild recurrent signs of abdominal pain. Six of those 10 horses were used as broodmares. Five of the 6 broodmares were bred successfully after discharge. The other 4 horses were used for their intended function. The horse in which large colon resection had been performed had no apparent complications after surgery and had been used for its intended function

Eleven horses were dead at the time of follow-up. Nine of the 11 (82%) horses had recurrent signs of abdominal pain and were euthanized. One of those 9 horses had been discharged after jejunocecostomy had been performed. This horse lived 1.5 years but was euthanized because of recurrent signs of colic. Of the 2 remaining horses that had been euthanized, 1 horse had recurrent laminitis after abdominal surgery and the other developed tetanus, which was not associated with the abdominal surgery.

Discussion

Findings of the study reported here do not support the hypothesis that draft horses > 680 kg are at greater risk for developing anesthetic complications such as hypotension and hypoxemia. Although not significant, heavy draft horses tended to become hypoxemic during anesthesia. It has been anecdotally suggested that draft horses are at increased risk for development of hypoxemia and hypotension during anesthesia.[15,17] Kraus et al[16] reported that 59% of draft horses surgically treated for laryngeal hemiplegia were hypotensive (< 70 mm Hg). Gleed and Short[15] speculated that heavy horses are more likely to be hypoxemic and hypotensive because of the increase in circulating blood volume, difficulty in ventilating a heavy horse, or increase in body mass. However, results of our study indicated that there were no significant differences in MAP and Pa_{O_2} between

light and heavy draft horses with acute signs of abdominal pain.

In our study, significant differences in duration of anesthesia, postoperative complications, and mortality rate between heavy and light draft horses were detected. Seventy-six percent of horses had postoperative complications. Heavy draft horses had significantly more postoperative complications than light draft horses. The duration of anesthesia in heavy draft horses was significantly longer than that in light draft horses. We suspected that the overall physical size of heavy draft horses contributed to long anesthetic and preparation times. We also speculated that the size of the viscera and visceral contents in heavy draft horses resulted in long surgery times, which also contributed to the long duration of anesthesia. Of the 44 (76%) horses that developed at least 1 postoperative complication, 21 (48%) survived until discharge. A postoperative complication rate of 58% and a survival rate of 70% have been reported in nondraft horses.[10]

Heavy horses may have an increased risk of developing postoperative myopathies and neuropathies because of their large muscle mass and prolonged periods of recumbency during general anesthesia.[15-17] In our study, all horses with postoperative myopathy and neuropathy were euthanized or died. Results of 1 study[16] indicated that 7% of 104 draft horses surgically treated for laryngeal hemiplegia developed postanesthetic myopathy and that one of those horses died after surgery. In that study, horses without systemic disease underwent elective surgery, whereas in our study, horses undergoing surgery had systemic disease associated with acute signs of abdominal pain. Therefore, heavy draft horses with systemic illness secondary to acute signs of abdominal pain undergoing surgery may have a worse prognosis than draft horses without systemic disease undergoing surgery.

The incidence of postanesthetic neuromuscular disorders in nondraft horse breeds reportedly ranges from 1% to 7%.[18,19] In a study[18] evaluating 1,314 horses undergoing anesthesia, 19 horses had a serious anesthetic complication, with 15 (1%) of these horses developing postanesthetic myopathy or neuropathy. Three of those 15 horses were euthanized or died because of myopathy.[18] In another study[19] evaluating 655 horses, 6.4% of horses developed postanesthetic lameness. In that study, hypotension and duration of anesthesia were the only significant factors associated with the development of postanesthetic lameness.[19] In the study reported here, 8 of 9 horses with myopathy and neuropathy were hypotensive and the mean duration of anesthesia was 3 hours. We believe that hypotension and duration of anesthesia play an important role in the development of postoperative myopathy and neuropathy in draft horses with acute abdominal disease.

In our study, surgical findings were most commonly localized to the large colon. The most common large colon abnormalities detected were right dorsal displacement of the large colon and large colon volvulus. This finding was not unexpected in horses with a large body type. It has been theorized that large-bodied horses or broodmares are predisposed to displacement of the large colon and large colon volvulus because there is the potential for increased colonic movement.[20] Our findings appear to support the notion that large colon disorders are more commonly found in horses with a large body type.

Intestinal resection was performed in 8 horses, with 7 of 8 horses undergoing small intestinal resection and anastomosis. Only 2 of those horses were discharged from the hospital. This finding differs from results of other studies,[8,11,12] which indicate that the number of horses discharged following small intestinal resection and anastomosis was high. In our study, the low rate of survival may have been attributable to the long duration of anesthesia associated with intestinal resection and anastomosis. Four of 6 horses died or were euthanized after surgery because of endotoxemia. Three of those horses were initially evaluated for clinical signs of endotoxic shock. Survival rates in horses undergoing intestinal resection and anastomosis in the 2 groups could not be compared because of the small number of horses in each group. However, 6 of 8 horses that underwent intestinal resection and anastomosis were in the heavy draft horse group.

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