Making the decision – surgical versus medical management

Louise L. Southwood, BVSc, PhD, DACVS & DACVECC

Associate Professor, Large Animal Emergency & Critical Care, Department of Clinical Studies, New Bolton Center, University of Pennsylvania, Kennett Square, Pennsylvania, USA

General indications for surgery

Medical management with oral fluids, laxatives and lubricants; analgesic drugs; and intravenous fluids, if indicated, is performed initially on most horses with colic. There is a positive response to medical management in the majority (~95%) of horses. The decision regarding whether or not to undergo an abdominal exploration on a horse with colic can be challenging. While some horses are severely painful and emergency surgery or euthanasia is indicated, other horses may respond temporarily to analgesia and the need for surgery may not be so apparent. Care should be taken with the use of analgesics in horses with colic that are not particularly painful and for which a diagnosis has not been made so as to not treat signs of pain that indicate the need for surgery.

Exploratory surgery is a diagnostic as well as a therapeutic procedure. The earlier a horse with a surgical lesion is treated, the better the prognosis and the fewer and less severe are the postoperative complications. Therefore, the decision to undergo exploratory surgery should be made as early as possible during the course of treatment. On the other hand, colic surgery is an expensive and an invasive procedure that should not be performed without careful consideration of several factors not the least of which is the financial resources and expectations of the client. Careful patient assessment is necessary to make the best decision. Emphasis on the criteria used in decision-making for horses/foals with abdominal pain will also vary somewhat in different geographical regions based on common causes of colic observed at a particular practice. Modifications to the general indications for surgery are also made for horses with a specific diagnosis for the cause of colic.

Persistent or severe abdominal pain

The most important indication for exploratory celiotomy, particularly on an emergency basis, is severe or persistent abdominal pain and lack of response to treatment with analgesic drugs. Recurrence of abdominal pain when analgesic drug effects have worn off is also an indication for surgery. Most horses with colic signs have been treated with flunixin meglumine (and/or Buscopan®) at least once. Flunixin meglumine should not be administered at the high dose rate more frequently than every 12 hours. A sedative-analgesic drug is usually selected if the horse remains painful during this 12 hour time period. As a guideline, if a horse with an undiagnosed cause of colic that has been administered flunixin meglumine requires sedation with xylazine with or without butorphanol less than every 1-2 hours for several doses and/or pain recurs within 1-2 hours following treatment with detomidine exploratory surgery should be considered. Ancillary diagnostic tests can be used to further refine the decision-making process.
Lack of response to medical management

Indications that a horse is responding to medical management include resolution of signs of pain; bright, alert and responsive demeanor; heart rate decreasing to within normal limits; improved intestinal borborygmi; resolution of abdominal distention; and defecation. The horse should have a good appetite and willingly graze. Palpation per rectum findings should returned to within normal limits. The response to medical management should occur over a 6-36 hour period and is often gradual. Either a lack of improvement or worsening of clinical signs including pain, demeanor, tachycardia, tachypnea, hypomotile to absent borborygmi, worsening abdominal distention, and signs consistent with intestinal obstruction are indications for surgery.

Signs of complete or partial intestinal obstruction

In addition to persistent or recurrent abdominal pain, nasogastric reflux, worsening abdominal distention, lack of fecal output, and deteriorating intestinal borborygmi are indications of a complete intestinal obstruction. Occasionally a horse’s signs of pain will temporarily abate with flunixin meglumine (or Buscopan®) administration, but if there is no improvement in gastrointestinal tract function surgery may also be indicated.

Reflux following nasogastric intubation can be an indication of a small intestinal obstruction. Horses with a mechanical obstruction, particularly involving the distal jejunum and ileum, tend to have volumes of nasogastric reflux that are initially low (<2 L) and then gradually increase over time. Ancillary diagnostic tests are generally indicated to differentiate strangulating from non-strangulating small intestinal obstruction.

Unresolving or worsening abdominal distention is typically an indication of large intestinal obstruction (although horses with marked distention of the entire small intestine can present with abdominal distention). Right sided distention may indicate cecal disease and horses with a nephrosplenic entrapment of the large colon often have left sided distention. Generalized distention can be observed associated with large (ascending) or small (descending) colon obstruction. Lack of fecal output particularly with initiation of treatment can indicate an obstruction or generalized ileus often associated with serious disease. An absence of intestinal borborygmi, particularly if persistent, is associated with the need for surgery.24

Partial obstruction can be caused by intramural hematoma, colonic displacement, foreign body obstruction, adhesions, or neoplasia. Clinical signs consistent with a partial obstruction include mild to moderate pain that is responsive to treatment with flunixin meglumine but recurs, scant soft to liquid feces, and reduced appetite and intestinal borborygmi.

Ancillary tests

Sonographic examination can be used to evaluate the volume and character of the peritoneal fluid, intestinal distention and thickness, and anatomical aberrations. Diagnosis of the cause of colic can direct medical versus surgical treatment. Some lesions for which sonography can be a useful for diagnosing include: peritonitis; hemoabdomen; small intestinal distention (proximal enteritis versus strangulating obstruction); nephrosplenic ligament entrapment; right dorsal...
displacement; large colon volvulus; cecal versus colonic impaction; sand colic; typhlocolitis; abdominal and perirectal masses. It is critical, however, to interpret sonographic findings in light of the horse’s clinical signs and findings on peritoneal fluid analysis.

Peritoneal fluid analysis is most useful for distinguishing strangulating from non-strangulating obstructions, diagnosing peritonitis and hemoabdomen, and rarely identifying neoplastic cells. Peritoneal fluid color, total protein concentration, nucleated cell count, and lactate concentration (initial and change over time) are used to help distinguish between some types of lesions and the need for surgical treatment. Surgery is indicated for horses with serosanguineous fluid. The ratio of total protein concentration and nucleated cell count can be used to differentiate strangulating from inflammatory lesions (see below). High peritoneal fluid in relationship to plasma lactate concentration or increase in peritoneal fluid lactate concentration with serial measurement is often an indication for surgery.\textsuperscript{15}

**Indications for specific lesions**

**Small intestinal lesions**

It can be particularly challenging to determine when surgery is necessary for horses with small intestinal lesions. Strangulating lesions and simple (e.g. ileal impaction) or functional obstructions (e.g. proximal enteritis) occur with different frequencies in different geographical regions and can, at least initially, present similarly with mild to moderate signs of colic that are often responsive to analgesia, tachycardia, distended loops of small intestine on palpation per rectum, and nasogastric reflux. Therefore, other diagnostic tools are often necessary including transabdominal sonographic examination, peritoneal fluid analysis, and laboratory data.

Strangulating obstruction - Horses with small intestinal strangulating lesions tend to have persistent pain that is only temporarily responsive to analgesic drugs; tachycardia (>52 beats/minute); intestinal borborygmi that are markedly decreased or absent; increasing volume of nasogastric reflux with failure of gastric decompression to resolve signs of pain; and variable palpation per rectum findings with often none or only 1-2 loops of distended small intestine palpable. Serosanguineous peritoneal fluid is generally indicative of a strangulating obstruction and the need for surgery. Abdominal sonography can reveal an increase in volume of peritoneal fluid and amotile distended small intestine of variable thickness.

Proximal enteritis - Horses with proximal enteritis are typically managed medically. Briefly, clinical signs include pain progressing to quiet demeanor; large volumes of nasogastric reflux,\textsuperscript{18} multiple loops of distended small intestine on palpation per rectum and transabdominal sonographic examination; and yellow to orange peritoneal fluid with high total protein (>4 mg/dL [40g/L]) and nucleated cell count within normal limits (<10,000 cells/µL [<10 x 10\textsuperscript{9} cells/l]).\textsuperscript{11} Horses may be pyrexic (rectal temperature >101.5°F[38.5°C]). Horses with proximal enteritis or ileus typically have a large volume of nasogastric reflux (>7 L) on the initial evaluation which decreases during treatment. Signs of pain and tachycardia improve with gastric decompression. Horses are treated with intravenous fluid therapy. Care should be taken with use of analgesic and motility modifying drugs during the initial 24 hours or until a definitive diagnosis of proximal enteritis is obtained. Exploratory celiotomy is indicated in horses that have
persistent signs of pain, clinical deterioration, and with reflux rates consistently ≥ 4 L/hour for a 24-48 hour period. Surgery is primarily a diagnostic procedure for horses suspected of having proximal enteritis. Although surgical decompression was generally not shown to be beneficial for horses with proximal enteritis, 25% of horses did cease refluxing postoperatively.

Ileal impaction - Horses initially present with intermittent, moderate to several abdominal pain that is responsive to treatment with analgesics. The pain is thought to be associated with intestinal spasm in the region of the impaction. The temperature, pulse, and respiratory rate are within normal limits and intestinal borborygmi are present. There is usually no reflux following nasogastric tube passage at this point in the disease process. Small intestinal distention develops in cases that are not resolved with medical management within 8-10 hours of obstruction. With the progression of small intestinal distention, abdominal pain becomes persistent, intestinal borborygmi decrease, and the horse becomes non-responsive to analgesia administration. Nasogastric reflux develops in 15-20% of cases. Medical treatment can be pursued initially when a diagnosis is made based on history and palpation per rectum findings, and when the abdominal pain and small intestinal distention have not progressed or in cases where economics preclude surgical management. Surgery is indicated in patients that are persistently or moderately to severely painful, have small intestinal distention, and/or any signs of cardiovascular deterioration. The impacted material can be massaged into the cecum. If the intestinal wall is edematous and hemorrhagic, an enterotomy may be necessary; however, this should be reserved for severe cases.

Large colon impaction

Horses with a large colon impaction are typically managed with oral water/electrolytes/laxatives and analgesia. The prognosis for survival of horses with a large colon impaction undergoing exploratory celiotomy was reported to be only 58%. The main reason for non-survival was colonic rupture at surgery. Horses with large colon impactions often get extremely painful when the impacted ingesta is rehydrated and may even begin refluxing; therefore, signs of pain may not be an indication for surgery in these cases and other clinical findings should be used. Horses with large colon impaction should be either taken to surgery early in the course of treatment if it is clear they are not responding to treatment or medical management should be pursued until the impaction resolves. Some of the clinical features that should be considered when deciding on medical or surgical treatment of the horse with a large colon impaction include: the degree of abdominal distention; presence of intestinal borborygmi; fecal output; heart rate; presence and volume of nasogastric reflux; and abdominal palpation per rectum findings.

Horses with an impaction that are responding to medical management do not have obvious abdominal distention and have intestinal borborygmi that are within normal limits or hypermotile. Horses will generally be passing even small volumes of feces and have feces in the rectum upon palpation. Depending on the frequency and volume of oral fluid administration, an impaction should resolve within 24-72 hours and should be checked for improvement on palpation per rectum.

Horses may develop a right dorsal displacement during treatment for an impaction and this will be apparent based on persistent or worsening abdominal pain, palpation per rectum, lack of
defecation, and increasing abdominal distention. Surgery is indicated if this occurs. Surgical correction of large colon impactions can be challenging. A large celiotomy incision should be made to avoid rupture of the heavy, distended, friable colon during exteriorization. The pelvic flexure enterotomy can also be performed prior to complete exteriorization of the colon to reduce the tension on the colonic wall.

**Cecal impaction**

While somewhat controversial, many surgeons recommend managing horses with cecal impactions surgically because of the risk of cecal perforation even with minimal preemptive clinical signs. Of horses presenting to a referral hospital with a cecal impaction, about 25% result in cecal perforation: 10/114 (9%) had ruptured at admission; 7/54 (13%) of horses treated medically ruptured; and 12/49 (24%) of horses were euthanized at surgery because of cecal rupture. Subsequent reports of cecal impaction, 40-60% of horses had cecal rupture. Owners must be provided with sufficient information to make an informed decision - (1) Horses with cecal impaction can be successfully managed medically with a good (80%) survival rate; however, impaction resolution may take several days. (2) There is a risk of cecal rupture which is fatal and can occur with little warning. (3) Prognosis for survival with surgery is excellent (96%). The only difference between horses managed medically compared with those managed surgically was that horses treated surgically were significantly more likely to have signs of moderate or severe pain than were horses treated medically. There were no significant differences in peritoneal fluid total protein concentration or nucleated count between medically and surgically treated horses, indicating that evaluation of abdominal fluid was seldom useful in assessing whether surgery is necessary.

Surgery is, therefore, strongly recommended in horses with a cecal impaction with: signs of pain; moderate to marked cecal distention; tachycardia; lack of feces; high PCV or blood lactate concentration.

Surgery involves evacuation of the cecum through a typhlotomy only or typhlotomy combined with bypass via an ileo-/jejuno-colostomy. There was no difference in survival between horses treated using the two surgical techniques.

**Small colon impaction**

Horses with small colon impaction can respond to medical management. However, because of the distal location of the small colon along the gastrointestinal tract and its function being water resorption and formation of fecal balls, it can be extremely difficult to provide sufficient water per os to hydrate the impacted material. Horses with small colon impaction are predisposed to reimpaction suggesting either an intestinal motility disturbance causing the impaction or as a result of the associated inflammation. Diarrhea and salmonellosis have been associated with small colon impaction and may either be a cause or a consequence of the small colon impaction. Similar to horses with a large colon impaction, signs of persistent pain, a lack of feces, absent intestinal borborygmi and abdominal distention are indications of the need for surgery. Surgical correction most commonly involves a high enema. Some horses may require a small colon enterotomy. A pelvic flexure enterotomy is recommended to prevent reimpaction.
Postparturient mare

The periparturient mare can be challenging to both diagnose and treat. Sonographic examination is particularly useful in the pregnant mare because palpation per rectum is usually unrewarding. Abdominocentesis carries the risk of amniocentesis with the potential for abortion and sonographic guidance for abdominocentesis is recommended in late term pregnant mares. Exploratory celiotomy also is not without difficulty in term pregnant mares because the fetus occupies the vast proportion of the ventral abdomen.

Postpartum mares can also be somewhat of a diagnostic dilemma. Two of the more common reasons for colic postpartum are hemorrhage into the broad ligament which is managed medically and large colon volvulus warranting immediate surgical correction. Palpation per rectum and sonography can usually be used to differentiate between the two causes of colic. Key distinguishing clinical features include: mares with postpartum hemorrhage tend to be slightly older; were admitted to the hospital closer to parturition; and were more likely to have anemia, hypoproteinemia, and hypofibrinogenemia compared to mares admitted for other reasons.4

Peritonitis

Peritonitis is defined as a peritoneal fluid nucleated cell count >10,000/uL (<10 x 10⁹/l).5 There are numerous causes of peritonitis. Peritonitis associated with Actinobacillus equuli respond favorably to medical management.8 However, peritonitis can also be caused by ischemic intestine, which requires surgical resection and anastomosis for the patient to survive; the early surgery is undertaken the better the outcome. Several clinical features have been identified to determine which equine cases with peritonitis respond to medical treatment and cases that require surgery.19 Absence of colic signs, normal intestinal borborygmi, normal feces during hospitalization, no nasogastric reflux, and yellow/orange peritoneal fluid are associated with survival to discharge without surgery. Moderate to severe pain, fever during hospitalization, absent intestinal borborygmi, less than normal or no feces during hospitalization, and distended small intestine on palpation per rectum were associated with a concurrent abnormality often necessitating surgery for correction.19

Transabdominal sonographic examination may provide useful information in horses with peritonitis to determine the necessity for surgery. The usefulness of peritoneal fluid lactate in horses/foals with peritonitis is unlikely to be useful and considerably more research into markers of ischemic intestine in horses with peritonitis is necessary.

The decision for euthanasia without surgical treatment

The most common reasons for euthanasia without surgical treatment are (1) financial limitations imposed by the owner and (2) the perception that the horse would not do well with surgery.

With the increasing expense associated with veterinary care, clinicians need to be fiscally responsible when managing complicated colic cases. Keeping expenses associated with medical and surgical treatment of horses with colic to a minimum without compromising patient care
may allow more owners to pursue treatment of their horses. Careful consideration of several aspects of treatment can keep expenses of reasonable: necessity, duration and rate of intravenous fluid therapy; duration of peri-operative antimicrobial drugs; use of plasma as a colloid and antiendotoxin therapy; duration of general anesthesia and surgery; early referral and surgical treatment when necessary prior to the patient being critically ill.

Some horses are euthanized because of a history of recurrent colic, particularly recurrent colic that has been managed with multiple surgical procedures. The age of the horse is also another reason for owners deciding to euthanize their horse rather than pursuing surgical treatment. Recently, however, it was shown that geriatric horses with strangulating small intestinal lesions do as well as younger mature horses. While geriatric horses with large intestinal simple obstructions had a lower survival than younger mature horses, the prognosis was still good to excellent for the geriatric horses. In any horse with recurrent colic, intestinal biopsy during surgery should be obtained in an attempt to determine the cause.

**Prognostic indices**

There are several prognostic indices that can be used to predict, with modest accuracy, survival and the likelihood of a complicated recovery. While these clinical findings may provide owners with some indication of outcome and cost of treatment, there are many cases that require surgery to determine lesion severity and the likelihood of a favorable outcome. It is recommended, except in extreme cases, to determine the prognosis for survival at surgery. These clinical measurements, however, can be very useful when used in combination and in conjunction with mean arterial pressure and changes in plasma lactate concentration, packed cell volume, and total plasma protein during anesthesia to help the owner make an informed decision regarding whether or not to complete the procedure and recover the horse.

The most notable prognostic indices are heart rate, packed cell volume, and plasma lactate, creatinine and glucose concentrations. These indices reflect the level of pain and the patient’s cardiovascular status which are related to the extent of intestinal damage and likely the duration of illness. Plasma lactate concentration has most recently received attention with regard to prognosis. Horses admitted on an emergency bases with a high plasma lactate concentration had a worse prognosis compared to horses with a lower lactate concentration. Plasma lactate was particularly useful for predicting survival in horses with serious disease such as colitis or large colon volvulus. Plasma lactate concentration was significantly lower in survivors (2.98+/−2.53 mmol/L) compared with non-survivors (9.48+/−5.22 mmol/L) with large colon volvulus and lower in horses with a viable colon (3.30+/−2.85 mmol/L) compared with horses with a non-viable colon (9.1+/−6.09 mmol/L). Plasma lactate concentration <6.0 mmol/L had a sensitivity of 84% and a specificity 83% for predicting horse survival.

**Gastrointestinal tract perforation**

The prognosis for survival of horses with gastrointestinal tract perforation is grave. Euthanasia is indicated in almost all cases and can be performed prior to surgery if the diagnosis can be confirmed. The classic presentation of a horse with gastrointestinal perforation is that of severe signs of pain followed by subsidence of pain with progression to dull demeanor, profuse
sweating, endotoxemia (injected to red to purple mucous membranes, injected sclera, fever), shock (tachycardia, tachypnea, cool extremities, poor jugular refill), and death. Horses with gastrointestinal perforation are often reluctant to walk, have a frantic appearance, and may become recalcitrant as signs of shock progress. Palpation per rectum findings consistent with perforation include collapsing of the rectum around the arm and a floating sensation associated with loss of negative intraabdominal pressure. Crepitus or a roughened serosal surface may also be appreciated in some horses. Perforation leads to severe leukopenia and progressively increasing packed cell volume despite intravenous fluid therapy and worsening hypoproteinemia/hypoalbuminemia. Plasma lactate and creatinine concentrations are usually high and increases with progression of shock.

Perforation is usually suspected based on history as well as clinical and laboratory findings. Confirmation of the diagnosis is made using peritoneal fluid analysis with or without transabdominal sonographic examination. Abdominal sonographic examination may reveal a moderate to marked increase in intraperitoneal fluid volume. Ingesta may be visible. Abdominocentesis reveals green-brown peritoneal fluid with particulate matter particularly if performed using the teat cannula method. Cytological analysis of the fluid is necessary to differentiate peritoneal contamination from enterocentesis. Key cytological findings in horses with a perforated gastrointestinal tract are large numbers mixed intracellular bacteria and damaged or lysed nucleated cells (cells are often damaged almost beyond recognition). It is important to keep in mind that peritoneal fluid nucleated cell count and total protein may be within normal limits in horses with gastrointestinal perforation, most likely because of dilution but also because of nucleated cell lysis. Exploratory celiotomy is necessary in some cases to confirm the diagnosis of gastrointestinal perforation. Euthanasia is indicated for humane reasons.

Note: These notes have been modified from Southwood LL: Medical versus surgical treatment of the horse with colic. In Southwood LL: Practical Guide to Equine Colic, Wiley-Blackwell, Ames IA, p. 164-172.

References