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# Colic: The Exam, Treatment, and Prognosis

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Horses are especially susceptible to a variety of gastrointestinal incidents, manifesting themselves as episodes of colic or abdominal pain. The anatomy of the equine gastrointestinal system is long and has marked variations in its diameter which contributes to the increased incidence of colic. Possible displacements and twisting may also be attributed to the sparse attachment of intestinal tract to the abdominal wall, which leaves areas of the gastrointestinal organs to move about freely.

There are many etiologies of colic which can be classified into broad groups: obstruction, strangulating obstruction, non-strangulating infarction, intestinal infections or enteritis, peritonitis, ulceration, and unexplained pain labelled colic.<sup>1</sup> There are also many diseases of non-gastrointestinal origin that may resemble colic, including liver disease; muscle degeneration or laminitis; pulmonary-pleural disease; urinary tract disease; toxicoses; reproductive tract problems; neurological disease; and occasionally cardiac disease. There are also many other specific problems besides these that may cause signs resembling colic.

Initial examination of a horse with colic should determine if the horse needs surgical intervention or if medical treatment can be successfully employed. Physical examination of a horse experiencing a bout of colic is the most important means of assessment. The exam should be carried out thoroughly, systematically, and quickly in order to institute the appropriate therapy.

A quick history may determine the etiology of the colic episode. A general history of management should include parasite control, feeding program, housing and environment, vaccination schedule, and the presence and status of other horses on the premises. Any recent changes in management, including feeding, pasturing, pregnancy, or medical treatments, should also be noted.

The individual history of the horse in question should be requested. This should include the

horse's behavior, manifestation and progression of pain, water consumption and appetite, and frequency of defecation and the consistency of the feces. It should be noted if the horse had been exposed to any excess feed, chemicals, toxins, or medications and details of any previous colic episodes. Other factors of importance are the age, sex, use, and presence of any vices such as cribbing or pica. Also to be considered is the monetary and emotional value of the horse to the owner, as this may be an important factor in the treatment of the horse.

The decisions concerning severity, treatment, and prognosis of the colic episode are made based on a complete physical exam. A list of differentials should be established as there are few pathognomonic signs of a specific disease. The results of the initial physical exam should be recorded for comparison with subsequent exams. Often the decision for surgery is based on changes that occur over time. Detection of these trends necessitates accurate recordings.<sup>2</sup>

## Pain

Initial observation of the horse should occur in the stall or paddock without restraint to note its behavior and manifestations of pain. Pain may be evidenced in different manners, such as pawing, stretching, lying down, looking at the flank, kicking at the abdomen, crouching, grinding of the teeth, dog-sitting, rolling, sweating, odd head positioning, groaning, or straining to urinate. The severity of pain should also be classified as absence of pain, mild pain, moderate pain, severe pain, or depression.<sup>3</sup> Previous treatments of analgesics may affect the expression of pain. Pain responses may make a complete physical exam impossible and dangerous to the veterinarian, therefore, a strong analgesia or general anesthesia should be employed. Violent severe pain that is not alleviated by analgesics is a strong indication for surgery. Severe pain may be caused by strangulation of the large colon or the small intestine, intestinal herniation and strangulation involving the gonads.<sup>4</sup> If severe pain suddenly dissipates and depression ensues, it is likely that rupture of the stomach or bowel has occurred.

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## **Abdominal silhouette**

The abdominal silhouette of the horse may suggest causes of colic. Cecal involvement may be evidenced by rounding of the right, flank while left side rounding suggests large colon distention. Generalized enlargement of the abdomen can occur with large colon torsion or small intestinal volvulus. A pear shaped abdomen suggests fluid filled. Enlargement of an umbilical hernia or of the scrotum may indicate intestinal incarceration with obstruction. External palpation or ballottement of the abdomen may help determine an etiology. Splinting of the abdomen may be associated with parietal pain from peritonitis or pleuritis. In such cases, the horse may be very resistant to movement and resentful of external abdominal pressure.

## **Temperature, Pulse, Respiration**

The temperature, pulse, and respiratory rate should be taken early in the course of the exam to help classify the type of colic. The temperature should be taken before performing a rectal exam as air introduced into the rectum will cause it to decrease. One should also remember that most non-steroidal anti-inflammatory drugs (i.e.: Banamine) are also antipyretics and may mask a fever. A normal to slightly elevated temperature (up to 101.5°) may be present with obstructions or displacements. An elevated temperature, greater than 102°, can signify an infectious agent or the presence of pyrogenic agents. Peritonitis, pleuritis, colitis, or enteritis can cause an elevated temperature. A subnormal temperature is a grave sign and can occur with severe bowel necrosis or rupture due to circulatory collapse.

The pulse rate and character is related to pain, vascular volume, cardiovascular status, and cardiovascular response to endotoxemia. Generally, the higher the rate, the greater the severity of disease. Dehydration and shock may increase pulse rate irrespective of pain. Often simple obstructions will show a mild elevation of 40 to 70 bpm in pulse rate. Early strangulations can have 50 to 90 bpm, late strangulations having 70 to 120 bpm. Enteritis or peritonitis may show rates of 40 to 100 bpm.<sup>5</sup> The pulse rate may elevate then drop to near normal with transient episodes of pain seen with spasmodic or flatulent colic.

The character of the pulse rate is important as it can provide evidence as to the cardiovascular status of the horse. A weak pulse can occur with shock or decreased circulatory volume and may

be associated with cold extremities. Arrhythmias due to electrolyte imbalances may produce an irregular pulse. If xylazine or detomidine have been administered to sedate the horse, a reduced heart rate or second degree heart block may be present. Although laminitis is not associated with acute colic, the digital arteries should be palpated as owners may confuse signs of laminitis, such as sweating, increased heart rate, and recumbency, with colic.<sup>6</sup>

The respiratory rate can be elevated due to abdominal pain and is usually shallow to reduce movement of the chest and diaphragm. Significant abdominal distension, as with colon torsions, can compromise the horse's thoracic volume, thus secondarily elevating the respiratory rate. Metabolic acidosis can also cause an elevation in the rate.

## **Mucous Membranes, Peripheral Perfusion**

A horse's mucous membranes are normally pale pink with a capillary refill time of two seconds or less. Hemoconcentration and endotoxemia may cause dark, brick red mucous membranes with an increased capillary refill time. Severe pain, causing catecholamine release and thus peripheral vasoconstriction, can cause pale, blanched mucous membranes. Pale blue-grey or cyanotic membranes are due to decreased perfusion and hypoxia due to severe shock from endotoxemia, lung compression, or compression of the caudal vena cava. Capillary refill time appears to be one of the best indicators of peripheral perfusion and cardiovascular status as they relate to survival.<sup>7</sup>

## **Auscultation**

Auscultation of the upper, lower right, and left paralumbar regions should be performed, as well as of the ventral abdomen. Colon mixing is normally heard on the lower sides while cecal noises are heard on the upper right.

Small intestinal noises are heard on the upper left. Normally, fluid gurgling mixed with gas sounds are heard. There are great variations in the frequency and amplitude of sounds in normal horses. Usually the sounds are two to four times per minute. Noise increases in frequency and amplitude with eating and decrease with the administration of certain drugs, including xylazine, butorphanol, and detomidine. Atropine administration can cause bowel stasis, and distension, possibly causing signs of colic.

Sounds are usually reduced and may be absent with severe disease such as strangulation infarctions. However, early on there may be transient active sounds due to irritation of the bowel just before death. Increased sounds may be present with spasmodic colic or with bowel irritation due to parasites or ischemia. Contractions against impaction may be associated with pain. Increased sounds can also occur during resolution of ileus or simple colic. One must be careful not to confuse progressive motility with sounds of bubbles and pings occurring in a static bowel due to movement of the horse. A patient listener may hear sounds of sand hissing or grinding in cases of sand colic along the ventral abdomen. Percussion can be performed during auscultation to determine if pockets of gas are present. Cecal tympany produces pings on the right flank, while left-sided pings can occur with large colon distension. Prolonged and extensive gas distension may indicate an obstruction which may need surgical intervention.

### **Nasogastric Intubation**

The passage of a nasogastric tube should be done early in the exam to determine if the stomach is distended with fluid or gas and to relieve pressure to prevent rupture. It may be difficult to pass through the cardia if distension is present. Blowing air through the tube, along with gentle backwards and forwards motions, may help facilitate passage of the tube through the cardia. Upon passage, tympany is released. Fluid may not readily drain, however, and a siphon should be established by pumping in water then lowering the tube to drain. Repeated attempts may be necessary, especially if the rectal exam indicates distended small intestines. Normally only a small amount of fluid is present (about 500 ml). It is usually greenish in color with a sweet odor. Food particles may be present. The pH should be three to five. Small intestinal reflux will be yellow-brown in color due to bile and have a fetid odor from fatty acids. The pH will be six to eight.

Increased amounts of reflux can occur with pyloric obstruction, with obstruction and ileus of the small intestine, or with anterior enteritis. Large colon displacements may also cause gastric reflux. Large amounts or prolonged reflux can lead to hypochloremia, usually accompanied by metabolic alkalosis due to chloride ion retention in the stomach. If pain persists or recurs after decompression, along with large amounts of reflux, surgery should be considered. In such cases, the

horse should be transported with a nasogastric tube taped in place to prevent fluid buildup and subsequent rupture of the stomach.

### **Rectal Exam**

The rectal exam is considered to be the most helpful diagnostic aid in determining the necessity of surgery but should be evaluated in light of other findings. Proper restraint and generous lubrication are necessary. Sedation may be considered for restraint. One should follow the same sequence every time and palpate the deeper structures first. The spleen, renosplenic space, and left kidney can be felt in the left dorsal abdominal or peritoneal quadrant. The mesenteric stalk may be identified on the midline. Moving to the right dorsal quadrant, the duodenum may be felt if distention is present. It is attached dorsal to the base of the cecum. On the right side, the cecum and its ventral and medial taenia can be felt. The taenia run dorsal to ventral. Ingesta within the cecum may be felt in the right ventral quadrant as it is followed forward on the ventral midline of the abdomen. The large colon may be felt in the left ventral quadrant and on midline. Soft ingesta may be present. The pelvic flexure may be felt to the left of or on midline. The small colon can be in various positions but is often in the left ventral quadrant. Formed fecal balls should be felt. The aorta should be palpable along the spine.

In mares the ovaries and uterus should be palpable. The inguinal rings in stallions can be felt on either side at the pelvic brim. As the arm is withdrawn, the bladder and rectum should be palpated.<sup>8</sup> During the rectal exam one should evaluate the feces, the presence or absence of distension, the tone, contents, and thickness of intestinal segments, the location of structures, and the presence of sacculations and taenia. Specific diagnoses of dorsal displacement of the colon, 180° rotation of the left colon, enteroliths, impaction, inguinal hernias, small bowel entrapment, volvulus, and intussusception can be made.<sup>9</sup> However, usually only distension of a specific segment of intestine or abnormal positions of structures can be felt.

In cases of small intestinal obstruction or adynamic ileus, the distension is felt as several soft tubes folding upon themselves like accordion pleats. They are usually on the midline in the center of the abdomen, although they may fill the entire abdomen. Distension of the small intestine may be due to obstruction or strangulation, requiring surgery, or from anterior enteritis, usually

non-surgical.

The pelvic flexure is normally felt in the left ventral quadrant, but when impacted it is enlarged and pushed to the right. Displacement of the large colon over the spleen can occur and can be felt on the left, filling the nephrosplenic space. With impaction or gas distension, the colon may be felt between the spleen and the abdominal wall. In cases of right dorsal displacement of the colon, the colon lies horizontally in front of the pelvic canal.<sup>10</sup> Large colon displacements generally require surgery.

Large colon torsions usually cause greater distension than do large colon displacements. The colon will be filled with fluid and gas and the wall and mesentery may be thickened and edematous. The colon may be so distended that it fills the entire abdomen making a complete rectal exam impossible. Early surgical intervention is required for torsions.

Cecal tympany will cause the cecum to be pushed back to the pelvic outlet, with the ventral band felt running diagonally from the left ventral quadrant to the right towards its mesenteric attachment.<sup>11</sup> If the cecum is impacted or fluid filled, it will be pulled ventrally and cranially to the right ventral quadrant.

Enteroliths may be felt in the small colon as hard masses in the ventral quadrants. A small colon impaction will be felt as a solid tube of ingesta with no fecal ball formation. Small colon impaction may require surgical treatment.

In the case of inguinal hernias, one may feel a strand of mesentery abnormally attached to the ring. This is usually painful when traction is applied in attempts to reduce the hernia.<sup>12</sup>

During rectal palpation the presence of sand can be felt as a gritty substance. Fecal flotation in water may allow visualization of settling sand. Uterine torsions, ovarian neoplasia or hematomas, and recent ovulations can also be palpated in mares.

With fecal contamination occurring from rupture of bowel, one may feel crepitation and granularity, with emphysema of the bowel wall. Free gas present with rupture will cause easy passage of the arm within the rectum and abdomen due to a loss of negative pressure. This, associated with signs of cardiovascular collapse, indicates a grave prognosis.

The rectal exam should be repeated periodically. This is to reveal changes in position or distension of intestinal segments that may occur over time.

## Abdominal Paracentesis

Abdominal paracentesis can help classify the type of disease present and can help determine the severity of the lesion. A sterile prep should be made on the dependent portion of the ventral midline of the abdomen. It may be performed with a needle or a blunt cannula. If a cannula is used, a stab incision should be made first with a scalpel blade through the skin; the cannula is then forced into the abdominal cavity. Sterile gauze around the cannula will help prevent blood contamination of the sample. Evaluation of the sample is based on its gross appearance, its protein content, and its microscopic contents. Normally, one to two ml of a clear, pale yellow fluid is present. It should be sterile, have a protein content of 0.5-1.5 g/dl, and have a white blood cell count of approximately 3500 cells/microliter.<sup>13</sup> Grossly, the sample can become turbid due to increased protein content, erythrocytes, or leukocytes. A serosanguinous color is due to leakage of erythrocytes through the bowel wall due to ischemia and severe degeneration and is suggestive of the need for immediate surgery. A reddish-brown sample with plant material indicates bowel rupture and thus, a poor prognosis. It is possible, however, to penetrate through the colon or cecum and get such a sample, although it will usually be yellow-green in color. Increased leukocytes, suggesting an abscess, will cause the sample to be opaque and whitish-yellow in color. Frank blood is usually a contaminant from the spleen or from a lacerated vessel. Dark blood may be venous blood in the abdomen from a mesenteric vein rupture associated with small bowel incarceration in the epiploic foramen.<sup>14</sup> Lipids may be seen due to the passage of the cannula through abdominal fat or may be associated with bowel rupture and the presence of mineral oil in the gastrointestinal tract.

A direct smear should be made of the sample. If low numbers of cells are present, the sample can be centrifuged and smeared on a slide or a cytopsin preparation can be made. The slide should be stained to measure total rbc and wbc counts a differential white cell count and cell degeneration evaluation. One should also look for bacteria and ingesta. Some mesothelial cells may be present in the sample. Greater than 5000 leukocytes per microliter is abnormally high. The peritoneal fluid is usually normal early on in the course of disease, although with peritonitis, enteritis, and non-strangulating infarctions,

changes have often occurred by the time clinical signs are seen.<sup>15</sup>

If free bacteria and ingesta are present, it may indicate bowel rupture or perforation. Bacteria may also be present, free or phagocytized within neutrophils, if bowel deterioration is severe. In cases of peritonitis, bacteria can also be present within neutrophils or free in the peritoneal cavity.

If blood was obtained during the tap, the PCV of the sample should be checked. If the spleen was hit it will be increased to approximately 65%. If a vessel was lacerated the PCV will be similar to peripheral blood and platelets will be present. In cases where intra-abdominal blood is present, erythrophagocytosis by mononuclear cells will be evident.

Increases can occur in the leukocyte count and protein content following surgery, decreasing to more normal levels in six to ten days. Similar elevations can occur with percutaneous bowel decompression.<sup>16</sup>

### **Hematology and Serum Chemistries**

Hematology is useful in determining if dehydration, sepsis, or infection is present and may indicate the type of lesion present. The PCV and total protein may be increased due to hemoconcentration due to isotonic fluid loss and sequestration into an obstructed or strangulated bowel segment or into the peritoneal cavity.<sup>17</sup> They can also increase in part due to dehydration from decreased water intake and increased fluid losses from sweat and urination in the colicky horse. An elevated PCV with normal protein levels can be due to splenic contraction in the excited and painful horse. A decreased protein level indicates possible protein loss into the peritoneal cavity because of peritonitis or infarction or loss into the bowel lumen because of enteritis. If an elevated fibrinogen value is noted, one should consider a more chronic etiology for the colic as it takes a few days for fibrinogen levels to rise. Changes in hemoconcentration are important also. In cases of gastric or cecal rupture, hemoconcentration occurs rapidly. There may be a continuous rise in the hematocrit with or without a concurrent rise in total protein.<sup>18</sup>

White cell counts and differentials are helpful in determining etiologies. Leukocytosis occurs with anterior enteritis, peritonitis, and mesenteric abscesses. However, the white cell count can be elevated due to concurrent non-gastrointestinal problems, such as pneumonia. Leukopenia often occurs with Gram-negative sepsis, endotoxemia,

salmonellosis, Potomac Horse Fever, or ruptured intestines. Serum GGT, SAP, AAT, CPK, bilirubin, BUN, and creatinine may all be helpful. Coagulation tests can help determine the severity of shock and can indicate disseminated intravascular coagulation which can accompany endotoxemia, the late stages of strangulation, and severe peritonitis and enteritis.<sup>19</sup>

### **Other Diagnostic Techniques**

Other diagnostic techniques that may be employed, depending upon individual circumstances, are endoscopy, laparoscopy, gastric or fecal occult blood, fecal culture, rectal biopsy, or the measurement of intestinal transit time with radiopaque material such as barium sulfate. Ultrasound and radiology may be helpful. Radiology may be especially helpful in the foal or miniature horse where a complete rectal exam cannot be performed. With radiology, sand or enteroliths may be visualized. Fluid-gas interfaces and distended bowel may indicate ileus. During the physical exam, it may be impossible to get a specific diagnosis. In such cases an exploratory laparotomy may be warranted and diagnosis and treatment can be given at that time. Anterior enteritis is frequently diagnosed at surgery as it is often mimics a surgical small intestinal obstruction or strangulation.

### **Surgical vs. Medical Therapy**

The decision for surgical or medical therapy should be based on the findings of the physical exam. Pain is often the most important indicator. Surgical intervention is warranted if pain returns quickly after treatment with analgesics and a diagnosis cannot be made. Other indications for surgery are moderately to severely distended intestines, moderate to severe abdominal distension, serosanguinous peritoneal fluid, and a deterioration of cardiovascular status.<sup>20</sup> One should, however, not wait for such signs to appear before opting for surgery, as the prognosis for survival decreases with time. Lack of response to initial fluid therapy and medical treatment also calls for surgical intervention.

If intestinal strangulation is suspected, surgery should be performed immediately. The earlier the problem is alleviated, the better the prognosis.

When there is gastric reflux in association with depression, fever, neutrophilia, high protein content and leukocyte numbers in the peritoneal fluid, and ileus one should consider anterior

enteritis as the causative agent of colic. Surgery is not necessary. If there are doubts as to the etiology, surgery is justified.

Large colon impaction can be treated successfully with fluid therapy, but an enterotomy may be necessary in some cases to prevent prolonged bowel distension and devitalization of the intestinal walls. Cecal impaction and sand impaction may also be treated medically, but rupture of the bowel is possible. Surgical intervention depends upon the severity, the duration, and the response to medical therapy.

The presence of pain and the response to medical treatment is very important. If colic pain cannot be controlled, if there is no response to fluid therapy, or if there is no evidence of bowel motility, surgery is indicated. If medical management is undertaken, the patient's status should be monitored very closely. If deterioration occurs, surgery should be considered.

In cases where the prognosis is grave or where the disease is untreatable or progressive, the animal should be euthanized. Euthanasia should also be considered when the owner is financially unable or unwilling to elect for surgery.

### Prognosis

There is no sign or group of clinical signs which can predict accurately the prognosis for survival of a horse with colic. The prognosis for life, for future use, and for a future free of colic should be considered.

Major complications to be considered are abdominal herniation after surgery, laminitis, and adhesion formation with small intestinal diseases, especially in foals. The best prognosis can be given when referral and medical therapy or surgical intervention occur early in the course of the disease, before the horse's status begins to deteriorate. In conclusion, a thorough physical exam is necessary to determine a list of differentials as to the cause of the colic. One must then assess this information and decide whether to treat medically or surgically. If treating medically, a lack of response or deterioration of the animal signals the need for surgical intervention. The prognosis for survival is based on many things but one must remember that the prognosis may change rapidly from good to poor due to the progression of disease. Prognosis may also improve after therapy has been instituted.

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