

COLIC

Gastrointestinal disease causing signs of abdominal pain in horses is commonly referred to as colic and is the manifestation of visceral abdominal pain. Colic is a frequent and important cause of death and is considered the most important disease of horses encountered by practicing veterinarians. Several classification systems of equine colic have been described including a disease-based system classing the cause of colic as :

- Obstructive
- Obstructive and strangulating
- Non-strangulating infarctive
- Inflammatory (peritonitis, enteritis).

Colic cases can also be classified on the basis of the duration of the disease: acute (< 24-36 h), chronic (> 24-36 h) and recurrent (multiple episodes separated by periods of > 2 days of normality). Risk factors for colic can be categorized as: 1) intrinsic horse characteristics; 2) those associated with feeding practices; 3) management; 4) medical history, and 5) parasite control. Signs of colic in the horse include restlessness, lying down, and getting up, groaning, rolling, sweating, kicking at the abdomen or suddenly dropping to the ground in pain.

Table illustrating the 4 major classifications of Colic and how they are manifested

Type of Colic	Etiology	Lesion	Typical Clinical Signs
Simple obstructive	Luminal Obstruction	impaction of the stomach, ileum or large intestine with dry ingesta e.g. fecolith, meconium, foreign body, sand colic or congenital atresia	Mild to moderate pain, heart rate mildly increased initially, moderate dehydration
	Mural Blockage	Haematoma, neoplasm, idiopathic muscular hypertrophy	Pain, moderate dehydration
	Extramural Blockage	Large colon displacement	Mild to moderate pain, mild dehydration and abdominal distension
	Functional	Spasm (spasmodic colic), paralytic ileus, Gastric reflux	Moderate to severe pain, moderate to severe signs of hypovolemia
Inflammation (irritation of peritoneal pain receptors)	Infectious eg Salmonella spp, Actinobacillus equuli	Peritonitis Enteritis	Mild pain, fever, toxemia, tachycardia, hypovolemia

Type of Colic	Etiology	Lesion	Typical Clinical Signs
Obstructive plus strangulation	Intestinal accidents	Intussusception, torsion , strangulation (epiploic foramen , diaphragmatic, inguinal hernias, mesenteric tear)	Intractable pain followed by profound depression, toxemia ,severe tachycardia and hypovolemia
Non strangulating infarction	Infarction , Ischemia	Thromboembolic colic, arterial occlusion (pedunculate lipoma around mesentery , detachment)	mild to sever pain , toxemia , possibly blood loss

Overview of the pathogenesis of common colics

Simple obstructive

Simple obstructive colics are those in which there is obstruction to the aboral passage of ingesta but no ischemia or strangulation of bowel. In the terminal stages there is often ischemia caused by distention of the intestine. Small-intestinal obstructive lesions include ileal hypertrophy, ileocecal intussusception and foreign body obstruction of the lumen. The course of the disease is often 24-72 hours, and sometimes longer depending on the extent of the obstruction, partial obstructions having much less severe signs and disease of longer duration. The principal abnormality is reduced aboral flow of ingesta, with subsequent distention of intestine cranial to the obstruction, causing pain and, if the distention is severe, gastric rupture. Large intestinal obstructive lesions include impaction and simple (non strangulating) displacements of the large colon. The course of disease is prolonged, often more than 72 hours: Signs of abdominal pain are due to distention of the bowel. There is progressive distention with fluid and gas and ultimately ischemia of the bowel and rupture.

Obstructive and strangulating

Diseases that cause both obstruction and strangulation as an initial event, such as torsion of the small intestine or volvulus of the large colon, result in severe and unrelenting pain that is little relieved with analgesics. Obstruction causes distention and strangulation causes ischemia, loss of barrier function and endotoxemia. These diseases have a short course, usually less than 24 hours and sometimes as short as 6 hours, and profound clinical signs. Endotoxemia and cardiovascular collapse are characteristic of these diseases.

Infarctive

Infarctive diseases, such as thromboembolic colic, are characterized by ischemia of the intestinal wall with subsequent alterations in motility and absorptive and barrier functions. Ileus causes distention of the intestines and stomach and altered barrier function causes endotoxemia. The course of the disease is usually less than 48 hours and is terminated by cardiovascular collapse and death.

Inflammatory

Inflammation of the intestine or peritoneum alters gastrointestinal motility and absorptive function leading to accumulation of fluid and ingesta, distention and abdominal pain.

Gastrointestinal Causes of Colic in Horses

Common Causes	Less Common Causes	Uncommon Causes	Toxins
Accumulation of intestinal , cecal or colonic gas	Thromboembolism	Abdominal adhesions	Cantharidin Toxicity
Hypermotility and intestinal spasms	Intestinal Foreign body	Intramural hematomas of stomach / small intestine	Dioxin
Feed Impaction, constipation	Small intestine volvulus	Stenosis or stricture of bowel lumen	Trichloroethylene - extracted feed toxicity
Meconium impaction (newborns)	Pedunculated lipoma with bowel strangulation	Botulism	warfarin
Gastric ulcers	Hernia	Tetanus	herbicides
	Nephrosplenic ligament bowel entrapment	Potomac Fever	lead
	Ascarid impaction	Exhaustion	Nitrophenyl urea (vapor)
	Massive strongyle impaction	Anaphylaxis	Phenylbutazone or other non steroidal anti-inflammatory drugs
	Gastric dilation	Rhodococcus equi	
	Anterior Enteritis	Cribbing or wind sucking	
	Peritonitis	Abdominal fibroma	
	Parasympathomemetic drugs	Segmental ischemic necrosis following mesozoic tearing	
	Irritant cathartics	Equine viral arteritis	
	Necrotizing enterocolitis	Anthrax with bleeding	
	psychogenic colic	Malignant Edema	
	Rectal Tear	Malignant mesothelioma	
	Volvulus or displacement of large bowel	Gastric or intestinal tumor	
	Rupture of stomach or intestine	Atropine	
	Ileus	Vitamin K3 deficiency	
	Intussusception		

Extraintestinal Causes of Colic in Horses

Common Causes	Less Common Causes	Uncommon Causes
Mesenteric Abscess	Urinary tract or renal disease	Perirectal abscess
Ovarian tumor , abscess or hematoma	plueritis or pericarditis (referred pain)	Pheochromocytoma
partuition	retained placenta	Purpura hemorrhagica
Acute hepatitis or hepatic lipidosis	Spermatic cord thrombosis or torsion	Biliary atresia
Diaphragmatic Hernia		Vaginal or vulval tear
Ruptured Bladder		Cholelithiasis
Uterine Torsion		White muscle disease
		Atypical myopathy
		Rabies
		Rupture of prepubic tendon
		Splenitis , splenic abscess , splenomegaly
		Cauda equina neuritis with retention of feces or urine

DIAGNOSIS AND MANAGEMENT OF COLIC IN THE HORSE

History and Signalment

The signalment of the colic patient is important when determining the specific information that should be obtained during history taking, and which physical examination and diagnostic procedures are indicated. The signalment itself can often lead to an early differential diagnosis that may be investigated during the subsequent history and physical examination. The information obtained from the owner should include both the medical history and management practices. Details of the medical history related to the current and previous episodes of colic, other illnesses or surgery, and current and previous medications administered are essential. A history of recent non-steroidal anti-inflammatory drug (NSAID) use may suggest a possible impaction of the ascending colon or right dorsal colitis. Knowledge of all analgesics and sedatives administered before presentation is crucial when interpreting signs of pain and physical examination findings, as they may alter clinical signs. A description of the current management of the horse and any changes to diet, exercise, stabling, and anthelmintic regimen is important in identifying potential risk factors for certain conditions. These include the association between the feeding of coastal Bermuda hay and the risk of ileal impaction, and the association between the behavior of crib biting and epiploic foramen entrapment.

Physical Examination

The physical examination of the colic patient should be conducted in a thorough, logical order and should not be limited to the abdomen. The measurement and recording of the temperature and the heart and respiratory rates on initial examination allows the response to medication and therapy to be quantified. The heart rate is an indicator of the physiologic response to pain, dehydration, and endotoxemia and is useful in determining prognosis in both large and small intestinal disease. Conditions associated with pyrexia include anterior enteritis, colitis, and pleuropneumonia and do not generally require immediate surgical intervention. Therefore, complete auscultation of the thorax to rule out conditions of the respiratory tract should be performed. Examination of the oral mucous membranes, including measurement of capillary refill time, aids in the determination of hydration status and the diagnosis of endotoxemia. In the endotoxemic horse, the capillary refill time is prolonged and the mucous membranes develop a brick red or purple color. A dark "toxic line" may be apparent along the gum line of the horse.

Auscultation of abdominal borborygmi allows the subjective assessment of large intestinal motility. Cecal motility may be auscultated over the right flank, whereas the pelvic flexure and ascending colon are auscultated over the left flank. Audible movements of the cecum and ventral colon include propulsive, retropulsive, and mixing contractions. Propulsive contractions of the cecum and colon occur approximately every 3 to 4 minutes but are decreased in frequency by conditions including anorexia and sedation. Ileus of the large or small intestine will result in the absence of intestinal borborygmi and is therefore a significant physical examination finding. Intestinal borborygmi can also be increased in certain conditions, including the early stages of distention and inflammation. A critical aspect of the examination of any horse presented for colic is the assessment of the degree and persistence of signs of pain. It is often easiest to observe a horse in a box stall where it may display signs of pain that are not apparent during handling or restraint in stocks. Obvious signs of pain include pawing at bedding, looking at the flank, kicking at the abdomen, repeated lying down

and standing, and rolling. Abdominal pain may also manifest itself by more subtle behavior including a dull appearance, lowered head position, and reluctance to move. The severity of pain is often related to the degree of intestinal injury, which is in turn related to the need for surgical intervention. A large colon volvulus resulting in large colon distention and ischemic injury will cause severe pain that is refractory to treatment with analgesics and sedatives. In contrast, a non-strangulating obstruction results in lower grade pain that responds to analgesia. Observation of the response to treatment with NSAIDs or sedatives is important when characterizing the type of pain. Mild pain typically responds to treatment with an NSAID alone for a period of 8 to 12 hours. In contrast, moderate pain will respond to analgesia for a limited period and requires repeated administration. Severe pain is manifest by violent behavior and may not respond to analgesia, which is frequently an indicator of the need for immediate abdominal surgery. During the physical examination, when indicated, it may be prudent to place an intravenous jugular catheter and begin fluid therapy while further diagnostic procedures are performed.

Rectal Examination

Rectal examination should be performed using a suitable combination of physical and chemical restraint to allow palpation of the cecum, left dorsal and ventral colon, pelvic flexure, descending colon, and reproductive tract. If sedation does not provide adequate relaxation to allow a safe examination, the instillation of lidocaine into the rectum or administration of N butylscopolammonium bromide can reduce straining, improve the quality of the rectal examination, and reduce the risk of rectal tearing. Careful palpation should be performed to prevent rectal tears and allow diagnosis of any existing tear. The position and size of each palpable organ may be assessed as well as the content, which may be ingesta, fluid, or gas. Entrapment of the large colon in the nephrosplenic space may be palpable in the upper left abdominal quadrant. The small intestine is not normally palpable per rectum and is therefore an abnormal finding on rectal examination. The small colon is normally distinguished by the presence of fecal balls and a broad antimesenteric band. If these features are not palpable it suggests impaction of the small colon. In the pregnant mare, the broad ligaments should be palpated to diagnose a possible uterine torsion. If a tight broad ligament is palpated, the direction of the torsion should be determined to allow correction.

Clinical Pathology

The use of clinical pathology has become a crucial part of the assessment and treatment of the colic patient. The measurement of the blood packed cell volume (PCV) and total protein (TP) can be performed using a centrifuge and refractometer to quickly assess the patient's hydration status. A high PCV has been shown to be associated with a poor prognosis in horses with both small and large intestinal disease. In contrast, a low TP has been associated with a poor prognosis in horses undergoing surgery for the treatment of small intestinal disease. The introduction of point-of-care analyzers has created widespread availability of blood electrolyte and acid-base balance information. When using a point-of-care analyzer it is important to store and prepare the cartridges for use according to the manufacturer's instructions to ensure accuracy. Although the majority of changes seen on hematology are non-specific, it is useful in diagnosing inflammation, endotoxemia, or sepsis. These changes may be evident as leukopenia, neutropenia with appearance of immature and toxic neutrophils, lymphopenia, and thrombocytopenia.

The blood electrolyte profile of horses losing fluids through gastric reflux or diarrhea often reveals abnormalities, including low sodium, potassium, calcium, and bicarbonate levels that may be addressed during fluid therapy. Because lactate is a product of anaerobic glycolysis, its measurement may reflect ischemic injury and may aid in determining the prognosis. Among horses

with large colon volvulus, a serum lactate concentration greater than 6 mmol/L has been associated with a poor prognosis for survival. Measurement of the anion gap allows the indirect measurement of blood lactate and is of value when determining prognosis.

Nasogastric Intubation

The passage of a nasogastric tube should be performed during all colic examinations to allow decompression if necessary and prevent gastric rupture. Water is flushed through the tube to begin a siphoning action, and should be measured to allow the net volume of fluid recovered to be determined. The color and smell of the fluid should be assessed. It is normal to recover up to 2 L of green, nonodorous fluid. Excessive fluid indicates either gastric outflow obstruction or decreased small intestinal motility resulting in an accumulation of fluid in the stomach. Anterior enteritis cases often yield a large volume of malodorous orange or yellow fluid. Large amounts of feed in the gastric fluid may indicate gastric impaction. Gastric outflow obstruction may also be caused by gastroduodenal ulceration or neoplasia. The cause of gastric outflow obstruction may be further investigated by endoscopy. Following decompression of the stomach, the nasogastric tube may be left in place during surgery to prevent fluid aspiration and allow intraoperative decompression.

ULTRASOUND

Ultrasonography has become an important part of the diagnosis, treatment and management of the colic patient. Abdominal ultrasonography is generally performed using a percutaneous approach following preparation of the skin by clipping and application of alcohol or coupling gel. A low-frequency (2.5 to 5 MHz) linear, curvilinear, or sector transducer will produce a diagnostic quality image while providing sufficient penetration to identify deeper structures. It is possible to identify the stomach, small intestine, cecum, and large colon and determine their size, position, wall thickness, and motility. The stomach may normally be imaged cranially on the left of the abdomen between the 11th and 13th intercostal spaces. The gastric volume can be estimated and stomach decompression confirmed by measurement of the gastric wall height at the 12th intercostal space.

The small intestine can be identified in the cranial ventral abdomen and can be examined for wall thickness, diameter, and motility. The normal wall thickness of the small intestine is less than 3 mm, and an increase may indicate enteritis or strangulating obstruction. Obstruction results in distention of small intestinal loops, which can be identified and measured ultrasonographically. The motility of these loops should be assessed, because ileus may be diagnosed as hypomotile small intestine on ultrasonographic examination. Ultrasonography has been demonstrated to be extremely useful for the diagnosis of large colon volvulus in the horse.² The colon is identified on the ventral abdominal midline, and the appearance and thickness of the wall and motility are assessed. Normally, the sacculated ventral colon with a wall thickness of less than 5 mm is identified. If a large colon volvulus of 180 or 540 degrees is present, the nonsacculated dorsal colon can be identified on the ventral abdomen.²⁴ Measurement of the colonic wall thickness has been shown to be useful in the diagnosis of large colon volvulus. A colonic wall thickness measurement of greater than 9 mm had a sensitivity of 67% and a specificity of 100% in diagnosing large colon.

Radiography

In the examination of the adult horse presented for colic, radiography is useful when the presence of radiopaque material is suspected. Therefore, abdominal radiographs are particularly useful for the diagnosis of sand accumulation and enterolithiasis. When performing abdominal radiography, adequate exposure is critical to maximize diagnostic quality and reduce the incidence of false negative examinations. The sensitivity and specificity of radiography for the diagnosis of enterolithiasis have been described as 76.9% and 94.4%, respectively. The improved image quality of abdominal radiography in the foal and small horse allows examination of the stomach and small and large intestines. Radiography can be performed using both plain film and contrast techniques to allow diagnosis of obstruction, intussusception, and radiopaque foreign bodies. Contrast radiography can be performed using 30% wt/vol barium sulfate suspension administered orally or rectally. This technique is useful for identifying delayed gastric outflow obstruction and obstruction of the small, transverse, and large colons.

Response to Treatment

The approach to diagnosis of colic signs is often tied in with management because if the animals pain cannot be alleviated, surgical interventions and specific diagnosis of displacements, torsions or volvulus, intestinal hernias, masses and adhesions are the next step. The principals of management include 1) Control of pain 2) relief of distension 3) Relief of obstruction and 4) Treatment of shock. The response to medical treatment is a fairly decent indicator of resolution of the causative mechanism of colic. Following the failure of response to medical treatment the decision for surgery is one that needs to be made or if the animal has a grave prognosis if the animal should be euthanized.

Surgery is indicated in the following situations :

1. Pain is severe and intractable or non responsive to analgesics
2. Pulse is weak and rate is over 70beats/min
3. Perfusion is poor as evidenced by poor extremities, off colour mucus membranes and c.r.t poor
4. No gut sounds auscultated
5. Bowel markedly distended
6. Large volumes of yellowish alkaline gastric reflux are present
7. Abdominocentesis indicates damaged bowel

Surgery may be contraindicated in the following situations :

1. Fever
2. Neutropenia or marked neutrophilic

3. Severe icterus or marked enzyme abnormalities indicating primary liver disease
4. Foul smelling , brownish red gastric reflux characteristic of proximal enteritis, especially when removal of reflux results in discontinuation of signs of pain
5. Evidence of extra intestinal cause not emendable to surgical correction
6. Colitis or diarrhea
7. Abnormal behavior or neurologic signs