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Diseases of the large colon that can result in colic

Impactions

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INTRODUCTION

The large colon, with distinct motility patterns coordinated by a myoelectrical pacemaker at the pelvic flexure has distinct non-rhythmic haustral movements and stronger well-defined rhythmic retropulsive and propulsive contractions to move ingesta along the gastrointestinal tract. These complex functions require the coordination of motility patterns to facilitate digestion as the large colon serves as the primary site for water resorption and microbial fermentation of carbohydrates to produce volatile fatty acids. Abnormal rhythmic contractions of the large colon result in partial or complete simple intestinal obstruction and often develop at sites of narrowed lumenal diameters just orad to the pelvic flexure or the transverse colon.

The pathogenesis of colonic impaction likely involves dysfunctions of the myoelectrical pacemaker at the pelvic flexure. Dissociation of the normal sequences and dysfunctions of motility patterns are theorized to result in abnormal transit and fluid resorption, predisposing the horse to functional abnormalities such as colonic impaction. In horses with colonic impaction, the digesta appears to be retained just orad to the pelvic flexure, involving a long segment of the ventral colon and does not simply involve the pelvic flexure alone. The digesta is usually firm and contains fibrous feed material, although sand and gravel can cause a similar obstructive lesion.

EPIDEMIOLOGY

In one hospital study of large colon impactions in horses, the median age of the horses was 7.1 years (range 1–29 years), with most of the affected horses being female (63%). No breed predisposition was identified. In another study impaction of the large colon accounted for 13.4 per cent of 1100 colic cases referred to a university hospital and for 9 per cent of cases in a normal farm population.

ETIOLOGY

Large colon impactions may be promoted by

- reduced water intake
- poor quality feed
- limited exercise
- participation in show activities
- foreign material in the hay
- poor dentition
- foaling
- colonic motility alterations.

Cold weather may reduce water consumption or freeze the water source entirely. Horses provided with water from tanks, buckets, and automatic waterers are significantly associated with an increased risk of colonic impaction, compared to horses that drink from natural water sources. Winter pasture may force consumption of poor quality roughage. Changes in management conditions, such as sudden restriction of exercise because of musculoskeletal injury, stable change, a move from pasture to barn housing, shipping, and systemic disease, may also predispose to colonic impaction. In one study,

more than 50 per cent of the horses examined for colonic impaction had an increase in the duration of stall confinement in the 2 weeks preceding the colic episode.

Amitraz, a formamidine acaricide that interrupts colon motility, has been used to experimentally induce colonic impactions in horses. Its mechanism of action may involve the mediation of intrinsic enteric neuromodulators that affect the coordination of myoelectrical activity from the pacemaker regions in the large intestine and, possibly, fluid and ion transport. Cockspur hawthorn fruit ingestion and naturally occurring impaction colic could have similar pathogenesis.

The incidence of colonic impaction is influenced by soil composition and geographic region. Foreign materials, such as nylon cord stripped from rubber feeders, fence pieces, or bailing twine left in hay, combine with fecal material to form impactions that usually require surgical correction. Impactions may accompany other conditions such as non-strangulating displacement of the colon.

CLINICAL SIGNS

Horses with colonic impaction usually have intermittent clinical signs of abdominal pain with a gradual onset, and are often partially or completely anorexic. Some horses show acute signs of abdominal pain while others have mild or no signs of abdominal pain. Mild signs, such as rolling the lip, playing with water, looking at the abdomen, stamping the feet, or backing up, may occur while the obstruction is incomplete. Abdominal pain becomes more severe as the mass becomes larger, heavier, the colon muscles spasm, or obstruction causes gas distension.

The heart and respiratory rates are initially normal, but increase with progressive signs of abdominal pain and endotoxemia. The mucous membranes are pink or blanched, while the capillary refill time is usually normal. These indicators of perfusion remain normal until the bowel deteriorates releasing endotoxin. Most horses with a large colon impaction have decreased or absent intestinal borborygmi on auscultation, but normal or increased intestinal sounds can occur.

Transrectal palpation is useful for diagnosing colonic impactions. In most cases, a large doughy-to-firm mass is palpable in the area of the pelvic flexure or the left ventral colon while transverse colon impactions or more isolated sand impactions are not usually palpable. Gas distention of the ascending colon or cecum is common. Nasogastric reflux may be obtained if the impaction is located in the right dorsal colon and is impinging on the duodenum.

CLINICAL PATHOLOGY

Clinical laboratory values are initially normal but abnormalities may develop over time. An increase in the systemic packed cell volume and total protein concentration may be evidence of mild dehydration in some horses. If the dehydration goes undetected or is untreated, the impaction may progress or become refractory to medical treatment. An increase in the peritoneal fluid total protein concentration and low systemic white blood cell counts can occur if the impaction causes devitalization of the colonic mucosa. Therefore peritoneal fluid total protein concentration, as an indicator of colonic wall degeneration, should be followed closely in horses that are treated medically for long periods.

DIAGNOSIS

The diagnosis is usually made on transrectal examination where an ingesta-filled pelvic flexure is palpated in most cases. Alternatively either the impaction is out of reach or gas distention of the colon and cecum prevents transrectal palpation of the impaction. Horses with a history of recent increase in stall confinement and mild intermittent signs of abdominal pain should be examined closely for large colon impaction.

TREATMENT

Colonic impaction is a common cause of colic and often responds to medical management directed at

- restricting diet
- controlling pain
- maintaining hydration
- reducing muscular intestinal spasms in the area around the impaction
- hydrating the colon ingesta to allow passage of feces and establish normal colon function.

Feed should be withheld until transrectal palpation findings are normal and there is evidence of intestinal transit. Very small amounts of hay or grazing may stimulate bowel motility, but further addition of ingesta to the impaction should be avoided. Most horses respond to sedation, analgesia, and intragastric administration of laxatives. Aggressive medical treatment for 3–5 days may be necessary, although softening and movement of the impacted mass should be felt sooner than this during transrectal palpation.

Intravenous fluid therapy may be necessary in horses that do not respond to initial treatment with analgesics

and laxatives. Most horses with colon impactions are slightly dehydrated. Aggressive oral administration of fluids (4–8 liters per nasogastric tube every 6 h) is helpful but labor is intensive. Intravenous fluid administration may increase the water content of the impacted ingesta in horses by altering the passive forces that govern transmucosal fluid transport, raising the capillary hydrostatic pressure, and decreasing plasma protein concentration. Intravenous fluids should be administered at 2–5 l/h or three to five times the recommended maintenance rate through a large bore (14-gauge × 12.5 cm) jugular catheter. Over-hydration can be monitored by assessment of the horse's packed cell volume and total protein concentration which should be maintained at 5.0–5.5 g/dl. In a study of 147 horses hospitalized with colon impactions that did not respond to initial farm treatment, the mean duration of medical treatment with xylazine, flunixin meglumine, and intravenous fluids was 2 days (range 1–8 days). Eighty per cent of these hospitalized horses responded to medical treatment.

While the ingesta is being hydrated to soften the impaction, it is often necessary to relieve visceral pain. Relief of visceral pain helps moderate the effects of adrenergic inhibition of intestinal motility. Xylazine hydrochloride, an alpha$_2$ adrenoceptor agonist, modulates the release of norepinephrine and directly inhibits neuronal firing, causing sedation, analgesia, bradycardia, and visceral pain relief. Xylazine may cause a cessation of intralumenal pressure changes and reduce jejunal and colonic motility for up to 2 hours. This effect may be beneficial in relieving intestinal spasms around the impaction mass. The latter may, in turn, allow fluid absorption and passage of gas. Treatment with xylazine (0.2–0.4 mg/kg i.v. or i.m.) can be repeated. Butorphanol (0.01–0.02 mg/kg i.v. or i.m.) or detomidine (0.01–0.02 mg/kg i.v. or i.m.) is also beneficial for similar reasons, but close monitoring of the horse is essential to ensure that the analgesics are not masking signs indicative of the need for abdominal surgery.

Flunixin meglumine reduces prostaglandin-mediated visceral pain during intestinal obstruction or distention and reduces the systemically evident effects of endotoxin without inhibiting intestinal motility. Because flunixin meglumine can mask clinical signs of endotoxemia and intestinal strangulation obstruction, careful monitoring of the horse after the drug is administered is essential. The recommended low dose (0.25–0.5 mg i.v. q. 6 h), however, enables treatment of horses with colonic impactions without masking important clinical signs that are indicative of a failing cardiovascular system. Treatment with flunixin meglumine should be continued after correction of the colonic impaction until horses are eating regularly and intestinal transit has returned to normal.

Laxatives, cathartics, and emollients are given to alter fecal consistency and to promote transit of ingesta in horses with colonic impactions. The stomach should first be siphoned and if more than 2 liters of fluid is obtained, small-intestinal ileus or delayed gastric emptying is likely. Instillation of additional fluid should be done cautiously, if at all, in these patients.

Mineral oil (2–4 liters p.o.) is a common, non-toxic emollient that acts to lubricate the ingesta and coat the intestine to facilitate the passage of ingesta through the intestine. Mineral oil can be used as a fluid marker to determine the speed of intestinal transit. The oil usually appears in the feces 12–24 hours after nasogastric administration. However, since the oil may pass around a firm mass of ingesta, the presence of oil in the feces does not always signify resolution of the impaction. Mineral oil should not be given to horses with nasogastric reflux or if strangulation obstruction is suspected.

Bulk cathartics (bran, psyllium mucilloid, methylcellulose) cause hydrophilic retention of colonic water; this retention stimulates intestinal transit. Psyllium mucilloid is non-toxic and may be used for 1–3 weeks if necessary. Bulk laxatives, however, can take days to begin working and should not be relied on for all colonic impactions. Magnesium sulfate (1 g/kg p.o. q. 24 h for 2–3 days) is a saline cathartic that acts largely via an osmotic effect to increase fecal water content. Magnesium sulfate may cause more gastrointestinal distention and thus stimulate a greater gastrocolic response than other laxatives. It can affect systemic hydration and should be administered only to well-hydrated horses, or preferably in combination with intravenous or intragastric fluid administration. Magnesium sulfate is associated with the risk of development of diarrhea, and effective safe dosing of this product is debated.

Dioctyl sodium sulfosuccinate (DSS) is an anionic surfactant that stimulates fluid secretion from the intestinal mucosa and reduces surface tension allowing water to penetrate impacted material. The usual dose is 10–20 mg/kg of a 5% solution mixed with 2–8 liters of water given via a nasogastric tube. Toxicity occurs at doses ranging from 0.5–1.0 g/kg. Repeated dosing of DSS may cause mucosal irritation, dehydration, and toxicity. For these reasons, DSS should be used no more than twice during a 48 hour interval. DSS can be used alone but is frequently mixed with mineral oil. It is not known whether mixing the two compounds is advantageous or detrimental to the treatment of impactions.

The use of prokinetic drugs to treat horses with colonic impactions is controversial. Intestinal contractions induced by neostigmine, which acts on the large

colon, may aid in breaking up impacted material. The administration of neostigmine may also cause increased pain and risk of rupture of compromised bowel.

Surgical intervention for correction of colonic impactions should be considered when medical therapy becomes prolonged or when the horse exhibits signs of uncontrollable abdominal pain, shock, peritonitis, or evidence of intestinal degeneration characterized by changes in the peritoneal fluid. Successful outcomes can still result after several days of medical therapy, provided that there is no irreversible deterioration present within the colon. The risk of colonic rupture should be considered and conveyed to the owners when surgery is contemplated as treatment for colon impaction. In the study of 147 horses, 24 (16.3%) with colonic impactions underwent surgery after medical treatment was unsuccessful. Out of the 24 horses 5 (20.8%) were euthanized after transmural tearing of the right dorsal colon occurred during attempts to exteriorize the colon.

A large ventral midline incision (40–50 cm) is necessary to aid in exteriorizing the colon. The impaction should be carefully palpated intra-abdominally before it is exteriorized to assess the colon for devitalized tissues which could rupture with manipulation. Moderate impactions involving relatively small amounts of ingesta can be softened with water and infused directly into the center of the impaction. Evacuation of the colon through a pelvic flexure colotomy may be necessary before attempts are made to manipulate the heavier segments of the colon. Filling of the abdominal cavity with sterile lactated Ringer's solution can assist in lifting heavy, diseased portions of the colons in extreme situations where necessary manipulation would result in rupture of the colon. Closure of the pelvic flexure colotomy with synthetic absorbable 1-0 suture in a two-layer closure consisting of a full thickness simple continuous pattern oversewn with a Cushing pattern, produces good anatomical alignment and healing.

OUTCOME

The prognosis for most horses with colonic impactions that receive treatment is excellent. In one study the short term survival rate for horses requiring advanced medical or surgical treatment was 95 per cent. Horses that require surgery have a significantly higher fatality rate, attributable to deterioration of the colon. In the group of 147 affected horses, mean heart rate, respiratory rate, peripheral white blood cell, blood lactate concentration, and protein concentration in the peritoneal fluid were significantly higher in non-survivors than in survivors. Cardiovascular parameters were the most accurate indices in predicting survival. The most common non-life-threatening complications for the treatment of colon impactions were jugular vein thrombosis and diarrhea.

Long term survival for horses 1 year after hospitalization and treatment for colonic impactions was 58 per cent for horses that underwent surgery and 95 per cent for horses that responded to medical therapy alone. All of the medically treated horses returned to their previous performance activity. Twenty five (30 per cent) of those treated medically had at least one episode of colic after discharge. Four of these horses died. Eight of nineteen (38%) horses requiring surgery for large colon impaction had recurrent episodes of colic and seven of these horses died. The additional colic episodes may have been the result of a dysfunctional colon which was responsible for the original impaction. Alternatively, intestinal damage caused by the impaction may have resulted in permanent colon damage and adhesions that predisposed the horse to further colic episodes.

PREVENTION

Horses that have a change in feed, activity, or are being treated for some musculoskeletal conditions are at higher risk for the development of colonic impaction. The incidence of recurrence of colonic impaction in these horses is also higher than the incidence of colonic impaction in the normal population. Careful attention to changes in management practices and feeding of a good quality high fiber diet with adequate exercise should be followed to prevent the development or recurrence of this condition.

Sand impaction

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INTRODUCTION

Horses may ingest sand either by eating from the ground in sandy locations, or because of its inclusion in hay. In certain areas sand impaction is relatively common. Horses with insufficient pasture or too little roughage in their diets are more prone to accrue sand, gravel, and/or bluestone shale while scavenging. Horses with sand impaction are more difficult to treat than horses with feed impaction and surgical intervention is required more often.

Sand impaction occurs most frequently at the pelvic flexure and the terminal aspect of the right dorsal colon.