Colic Me Maybe

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Introduction

Equine colic is defined as abdominal pain commonly attributed to the gastrointestinal tract or other abdominal viscera.[2] It has been previously described as a disease syndrome associated with management.[7] Horses were evolved as hindgut fermenters, meant to graze forage for up to 18 hours a day while constantly moving.[7] However, domestication and management by humans have altered this grazing behavior by implementing regular stall confinement and meal feeding, which alters the physiology of the gastrointestinal tract by both its motility and microbiome.[7] Despite our best efforts, colic remains one of the most common reasons for equine practitioners to receive emergencies, closely followed by wounds and lameness.[2] Previous studies estimate that the incidence of colic are 4.2 to 10.6 colic events per 100 horses per year.[2] That leads to a total economic impact of approximately $115.3 million US dollars per year.[2] Overall, 76% of cases are considered mild, or noncritical.[2] However, 24% of cases require surgery, intensive medical management or humane euthanasia.[2] The most common causes of colic include gas or spasmodic colic, large colon impactions and large colon displacement.[2]

There are five classifications for the types of colic lesions that are described, including: strangulating obstruction, physical nonstrangulating obstruction, functional nonstrangulating obstruction, inflammatory nonstrangulating and other.[2] The specific classification that will be focused on is physical nonstrangulating obstruction, specifically large colon displacement.

Right dorsal displacement of the large colon is described as displacement of the large colon lateral to the cecum.[5] In general, large breed horses are predisposed, while ponies and miniature horses are uncommonly affected.[5] Right dorsal colon displacement has been associated with impaction of the right dorsal colon and a variable degree of rotation along the long axis.[5] A

retrospective study published in 2021 supports that displacement of the large colon has a much lower prevalence than other gastrointestinal disorders causing colic episodes in equine.[6]

Signalment, History, and Presentation

Update is an approximately 10-year-old Warmblood gelding that presented to Mississippi State University College of Veterinary Medicine (MSU-CVM) Equine Emergency Service on May 14, 2020, after displaying an acute onset of colic seen by his owners around 6:00 PM. Update is a show horse used for jumping. He had access to both his stall and pasture. His diet consists of Bermuda grass hay and senior pro force. Update had a history of a previous colic episode within the last year. Fortunately, it resolved medically with intravenous (IV) fluid therapy.

Update was initially seen by his primary veterinarian earlier that evening prior to presenting to MSU-CVM. He received flunixin meglumine (Banamine) and detomidine hydrochloride IV prior to arrival. Following administration of the medications for analgesia and sedation, his primary veterinarian placed a nasogastric tube in his right nostril, but no net reflux was appreciated. However, decreased gut sounds were noted, specifically on Update's right side. Following a heart rate of 52 beats per minute (bpm), his veterinarian performed a rectal examination. Upon finding a heavily distended colon, he was referred to MSU-CVM for further evaluation and treatment.

Upon presentation, Update was bright, alert and responsive. He weighed 1300 pounds and had a body condition score of 5/9 (ideal). He had a normal temperature of 98.9 degrees Fahrenheit, a normal heart rate of 36 beats per minute and a normal respiratory rate of 12 breaths per minute. The oral mucous membranes were pink and moist with a normal capillary refill time of less than two seconds. Unilateral epistaxis was noted in his right nostril from the prior nasogastric tube

placement. His heart and lung sounds auscultated normally with no murmurs, arrhythmias, crackles or wheezes. Abnormal borborygmi (gut sounds) were noted as decreased in all four quadrants, but especially on the right side. In addition, Update appeared to have bilateral abdominal distention. Normal digital pulses were palpated in all four limbs.

Pathophysiology

While pathophysiology of right dorsal colon displacement is not completely understood, it has been suggested that changes in motility or even gas distention of the large colon can result in an abnormal migration of the pelvic flexure.[5] Gastrointestinal motility is initiated at the pelvic flexure pacemaker cells which cause longitudinal shortening of the large colon and sometimes movement of the pelvic flexure towards the diaphragm occurs.[4]

This anomaly has been described two ways. First and most commonly, the pelvic flexure moves cranially until it crosses the abdomen toward the right body wall.[5] Then it proceeds laterally to the cecum and arrives at the caudal aspect of the cecum, where it once again sits cranially to the level of the sternum causing discomfort.[5] The second and less common way involves the pelvic flexure migrating clockwise.[5] It will initially move towards the right body wall caudal to the cecum and continues to the level of the sternum.[5] Regardless of which path the pelvic flexure takes, variable degrees of rotation around the long axis are possible, but luckily the volvulus produced is generally non-strangulating.[5]

Soluble carbohydrate rich diets can also play a role in the development of large colon displacements. This can lead to excessive fermentation causing gas distention, large colon migration and change in fecal microbiota.[4] Due to the potential for all discussed theories to alter colonic motility, it is suspected that any number of these theories could collectively be

responsible for large colon displacements.[4] Unfortunately, the cause of large colon displacement is often unknown for most horses presenting with colic.[4]

Despite the lack of knowledge surrounding the specific pathophysiology of right dorsal colon displacement, preparation to assess a horse with colic is essential. The ability to properly and efficiently work-up a colic case can help owners determine whether referral, if optional, is required.

Diagnostic Approach

A practitioner should be well equipped to determine the cardiovascular status of a patient as well as be able to differentiate the type of colic likely. This can be done by combining a detailed history, thorough physical examination, nasogastric intubation, rectal examination in combination with potential imaging and clinicopathologic data.[2] As previously stated, it is important to communicate with an owner the likelihood of successful management or necessity to refer the case.[2]

Taking a detailed history is vital when assessing an equine patient for colic. In general, always take note of signalment, management and environmental factors as these have been associated with an increased risk of colic and lesion type.[2] Additionally, certain risk factors have been linked to specific colic lesions based on age, gender, breed, behavior, housing and turnout practices, as well as any feed supplemented.[2] Duration of acute colic should not be ignored as it can be an important factor related to cardiovascular status of the patient and is associated with survival.[2] Information such as fluid intake or loss, as in diarrhea, sweat or reflux, should be considered and has critical importance in fluid therapy formulations.[2]

Thorough physical examination (PE) should be performed with special emphasis on evaluating certain parameters including pain level, the cardiovascular system and the presence or absence of gastrointestinal motility.[2] Cardiovascular parameters have been associated with critical outcomes. To evaluate them adequately, focus should be on mentation, heart rate, pulse quality, jugular refill time, mucous membranes and their color, capillary refill time, urine output and extremity temperature.[2] Volume depletion and dehydration are not interchangeable and may co-exist in colic cases, so clinical markers should not be solely relied on to evaluate hydration status.[2] To identify critical cases as well as monitor response to treatment, refer to pain scales.[2] There are several pain scales that can be used and found elsewhere in literature.[2]

Horses fall into a category of species that cannot vomit or regurgitate; therefore, nasogastric intubation (NGT) is a diagnostic tool that can also be used.[2] NGT is used to determine and quantify the amount of gastric reflux.[2] NGT should be a priority in any case with tachycardia (specifically above 60 beats per minute), if spontaneous reflux is seen, if small intestine are palpated on rectal examination or if significant abdominal pain is present.[2] NGT should not be performed without chemical (drug) or physical (twitch, etc.) restraint in place or a combination of both depending on the nature of the patient, personnel available to help, cardiovascular status of the horse and preference of the practitioner.[2]

If it can be safely accomplished, rectal palpation (RP) should always be performed on a colicky horse. Based on a study evaluating horses for abdominal pain, a combination of a thorough PE with rectal palpation was sufficient to make a working diagnosis for most practitioners.[2] Rectal palpation should never be performed without first evaluating the horse's age, size, temperament, and the facilities available.[2] This diagnostic is very advantageous but can also be quite dangerous for both the practitioner and patient, so safety of both is the main priority. Pharmaceutical drugs

should be used every time a horse is to be examined rectally. Drugs like alpha-2 agonists combined with butorphanol provide sedation that is adequate for most equine patients.[2] N-butylscopolammonium bromide (Buscopan 0.3mg/kg IV) is often recommended as a method to alleviate straining and rectal pressure.[2] By eliminating both, the practitioner may gain a more valuable diagnostic evaluation.[2] Diagnosis via rectal examination is possible and large colon impactions and displacements are the most common.[2] If distended small intestine is ever palpated rectally, there should be an increased concern for a possible strangulating obstruction.[2] However, a practitioner cannot differentiate strangulating or nonstrangulating obstructions by rectal palpation alone.[2]

Plasma lactate (PL) should always be checked. PL can be measured with lactate meters that come in several models, can be used in any setting, have shown accuracy, and provide results within a minute.[2] Practitioners should have a lactate meter on hand to assist them in determining the need for fluid therapy, to monitor response to treatment, and to predict survival based on the patient's PL concentration.[2] Normal PL in healthy horses is less than 2 mmol/L.[2] Due to previous studies, increased PL concentrations have been associated with poor prognosis specifically for cases of equine colic.[2] A previous study supported that survival of horses with PL less than 6 mmol/L was 90%, and horses with a PL concentration greater than 7 mmol/L had a much lower survival rate at only 30%.[2]

Additional diagnostics can be employed, however access to all of them may not be available. Radiology can be beneficial specifically when diagnosing sand enteropathy or enterolithiasis as the cause of colic.[2] Ultrasonography is the most sensitive and specific for identifying small intestinal strangulating obstructions.[2] Increased colon wall thickness has been described as more challenging to interpret due to the variety of conditions it is caused by.[2] However, significant

thickening, greater than or equal to 9mm, has been associated with cases of colitis that require intensive care when interpreted in combination with clinical signs.[2]

Bloodwork and peritoneal fluid analysis may also be used. In acute colic cases, bloodwork provides several clinicopathologic variables that can be evaluated to determine the need for medical or surgical management.[2] Peritoneal fluid analysis helps to determine the need for surgery, support a diagnosis, monitor response to treatment and determine need for euthanasia.[2]

On presentation, Update received a thorough physical examination including rectal palpation. At rectal examination, the colon was distended and filled most of the caudal abdomen only allowing the examiner to be able to advance her arm up to the level of her wrist. Buscopan (140 mg IV) was administered, allowing the examiner to palpate only to her elbow confirming a heavily distended bowel present. A lactate test was performed showing a systemic lactate of 0.9 mmol/L, which is ideal. Another nasogastric tube was placed. Additionally, abdominal ultrasound was performed which showed a small section of small intestine between the spleen and left body wall. The median band vessel of the right dorsal colon was viewed on the right side, suggesting right dorsal displacement.[8] Update had a jugular catheter placed and he was started on 1 L/hour of lactated ringers solution (LRS). He remained comfortable in his stall until the following morning.

At approximately 6:00AM on May 15, 2020, Update again began showing signs of colic. He was seen laying down and rolling in his stall. A brief physical was performed that showed an elevated heart rate at 68 beats per minute. Update was promptly refluxed, but it did not alleviate his signs. Another rectal examination was attempted, but again the examiner's arm could not be fully inserted to complete a thorough examination. Upon entry, a large gas distended viscus was felt filling the caudal abdomen while simultaneously tight bands were felt going from the right

caudal abdomen to the left cranial abdomen. Unfortunately, due to the severely of the gas distended viscus, it was not possible to palpate past the pelvic inlet. Update remained on13mls of Flunixin meglumine (1.1 mg/kg) IV every 12 hours. At this time, he was also started on omeprazole (Gastroguard, 2mg/kg) by mouth as a gastroprotectant therapy.

Another full physical was completed at 8:00AM. Update's temperature was 100.5 degrees Fahrenheit, his heart rate remained elevated at 56 beats per minute and his respiratory rate was at 12 breaths per minute. His mucous membranes remained pink in color and his capillary refill time continued to be less than two seconds. Due to his continuous elevated heart rate and discomfort, surgical correction was introduced to the owner as potential treatment. To help alleviate his pain and discomfort, Update was started on a lidocaine constant rate infusion (CRI) at 88 mls/hour (0.05 mg/kg/min).

At 12:00PM Update had a net reflux of five liters. Approximately an hour later, an ultrasound confirmed distended small intestine and large colon with free fluid in the dorsal abdomen. At this time, surgery was decided upon due to Update continuing to reflux and demonstrating signs of discomfort.

Treatment and Management

Medical management is frequently attempted to treat colic if pain and distension are not severe. A combination of fluid therapy and anti-inflammatory therapy with analgesics are often prescribed. If severe pain is witnessed or the horse appears to be unresponsive to attempts of medical management, surgery should be discussed as an option.[5] Surgical exploration is the only way to definitively diagnose right dorsal colon displacement and surgical correction is the only way to confirm successful treatment.[5] Surgical therapy is advantageous by allowing inspection of

all bowel surfaces and to provide the opportunity for resection when necessary.[1] Sadly, re-displacement is a possible complication and is reported to happen as early as 48 hours following surgical correction.[5] In cases that recurrent displacement becomes a problem, colopexy and large colon resection have been suggested for surgical colic prevention procedures.[5] Neither one comes without potential complications as both are potentially life-threatening and not recommended before re-displacement is confirmed at surgery a second or third time.[2] Colic after an exploratory celiotomy is a potential complication of performing the surgery. Typically, colic will occur within 48 hours following surgery as refeeding is started.

On May 15, 2020, Update was prepped for surgery, received 39 mLs of gentamicin (6.6mg/kg) IV, 26 mLs of potassium penicillin (22,000 IU/kg) IV, and an exploratory laparotomy was performed. Upon entering the abdomen, a markedly gas-distended large colon and distended small intestine were readily identified. Next, the cecum, which was also markedly distended, was located, exteriorized, and decompressed with a 14 gauge needle and active suction. The same technique was used to decompress the large colon. Following further palpation in the abdomen, the tail of the spleen was revealed to have been displaced medially. Additionally, the pelvic flexure was displaced cranially and the colon was identified lateral to the cecum. The pelvic flexure and large colon were exteriorized. By tracing the ileocecal band, the ileum was located and exteriorized displaying a moderately gas and fluid filled distended small intestine. The small intestines were exteriorized and decompressed in an oral to aboral direction, into the cecum. During small intestinal manipulation, one liter of carboxymethylcellulose was used to coat the small intestines to prevent adhesions. The remainder of the abdominal content including the diaphragm, spleen, liver, small colon, transverse colon, colon base, cecal base, mesenteric root, bladder and stomach were palpated within normal limits. Prior to closing, the cecum was

decompressed a second time with the same technique as previously used. The large colon and cecum were replaced into their correct anatomical positions and Update's small intestine was replaced into the abdomen medial to the cecum. Based on the position of the intestines, Update had a confirmed diagnosis of right dorsal colon displacement and gas tympany.

Case Summary

During surgery, bloodwork performed on Update revealed an elevated creatinine of 2.04 mg/dl (reference range: 1.20-1.90), indicating an acute renal injury, therefore, his intraoperative fluid rate was increased. After surgery, Update received 26 mls of potassium penicillin (22,000 IU/kg) IV every six hours, which he remained on until May 17th, when he was switched to 39 mls of enrofloxacin (6.6mg/kg) IV every 24 hours.

On May 16th, Update was introduced to a mash which he ate readily, was started on two scoops of Platinum Balance (probiotic) by mouth twice daily, and his Gastroguard was discontinued. However, on May 17th Update had a decreased appetite, decreased gastrointestinal motility in the left dorsal quadrant and watery feces. A thoracic ultrasound was performed showing no signs of aspiration pneumonia. He had minor comet tails near the heart on his left side and his right side was normal. His abdominal ultrasound showed a normal wall colonic thickness with gas cap. There was also some thickened small intestine noted as well.

A nasogastric tube was placed, and no net reflux was attained. Due to his thickened intestine, he was started on 39 mls of enrofloxacin (6.6mg/kg) every 24 hours. As a precaution for enterotoxaemia, polymyxin B was started by adding (3,000 IU/kg or 4 vials) in 5 liters of LRS IV as a bolus every 8-12 hours. LRS was continued at 3 L/hour to improve his glomerular filtration rate while administering the polymyxin B. Update's feet were iced every 2 hours to

provide digital cryotherapy for laminitis prophylaxis, a known side effects of enterotoxaemia. Additionally, he was switched to misoprostol (5ug/kg) for gastroprotection.

On May 18th, 2020, Update's appetite had improved remarkably, he was fed a combination of Bermuda grass and pelleted feed and his polymyxin B was discontinued. His feces remained a cowpie consistency. However, his creatinine remained within normal limits, so his fluid rate was decreased to 2 L/hour. At approximately 10:00 PM Update began rolling and showing signs of colic. An hour later, nasogastric intubation was performed, and he was refluxed with a total of 18 liters net reflux obtained. Beginning at 12:00 AM, he was refluxed every 2 hours, and his heart rate was monitored every 2 hours.

On May 20, 2020, Update produced no net reflux, his NG tube was removed, digital cryotherapy was discontinued, and his IV fluids were decreased. The following day he continued to look much better. He was slowly challenged with a slower, gradual re-feeding protocol of alfalfa mash and fresh grass. Update's lidocaine CRI and flunixin meglumine were both discontinued.

Over the course of the next five days, Update continued to improve. His feces slowly began to return to normal. His feedings were gradually increased to include two pounds of alfalfa pellets every six hours and half a flake of Bermuda grass hay every four hours. Careful monitoring, 15-minute walks, grazing every four hours and extra salt in his diet were added. On May 25, 2020, his hernia belt was removed, and his bandage was changed. A slight amount of discharge was noted at the middle 1/3 of his incision. His wound was cleaned with Tris-EDTA + chlorhexidine solution. A new bandage was placed, and his hernia belt was reapplied.

Case Outcome

On May 26, 2020, after going several days without any colic episodes, Update was discharged from MSU-CVM Equine Service to go home. He was eating small frequent meals regularly and had regular GI motility in all four quadrants. Update happily loaded on to the trailer that day and headed back towards Memphis, Tennessee with specific discharge instructions. His feedings were to be divided into 3-4 times per day for three weeks to gradually work up to his normal diet. He was also on strict stall rest and exercise restriction followed by a slow, gradual rehabilitation program over the next 12 weeks.

Resources

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