NEONATAL COLIC: HOW TO TREAT AT THE FARM

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Abstract

Neonates commonly show signs of abdominal discomfort. They are less tolerant to pain compared to adult horses, thus they often show severe signs of colic. Practitioners frequently struggle with defining the cause and managing these cases at the farm. Some specific causes are seen only in neonates, such as meconium impaction, and frequently the gastrointestinal tract is not the only system affected. Pathologies involving the umbilical remnants (eg, omphalophlebitis) and urinary tract (eg, uroperitoneum) can also present with signs of abdominal discomfort. Commonly, they can be resolved with medical therapy, such as supportive care, anti-inflammatory/analgesics, and antimicrobial medications; nevertheless, surgical lesions are sometimes present and rapid identification of these lesions gives a better prognosis.

Keywords: colic, neonates, equine

INTRODUCTION

Frequently, newborn foals demonstrate signs of colic and it can be a challenge for the veterinarian to determine the cause and develop a treatment plan. As foals are less tolerant to pain, they often time demonstrate severe signs of pain, which can be interpreted as if they have a strangulating lesion of the gastrointestinal (GI) tract, however, foals have the particularity of

demonstrating the same clinical signs with diseases that are not related to the GI tract, but rather related to the urinary tract or the umbilical remnants.

INITIAL EXAMINATION

The initial physical examination of a foal with colic signs has great importance as those findings can determine an adequate therapy and/or prompt referral to a hospital.

Signalment and history

Owners should be questioned about the pregnancy of the dam, if there was any health problems and if she had been vaccinated/dewormed appropriately; as well as regarding the foaling, if it was assisted and if the birth happened without major concerns/abnormalities; and, if there was any other events happening post-parturition, as these can lead to hypoxic events in the foal that can produce severe lesions in different organs. Additional information should involve the current colic episode of the foal. The age at the onset of the signs is important to know, as causes of colic in foals can vary with the foal's age. The duration of the clinical signs, severity of colic, and specific clinical signs exhibited by the foal are all important information to obtain. Further, asking about urination and defecation, consistency of any feces passed, medication administered, and if concentration of immunoglobulin G (IgG) was measured after birth. Knowing the farm history and health history of current and/or previous foals can be extremely important to get to a diagnosis. Some congenital abnormalities usually become apparent within hours after being born; meconium impactions can manifest as abdominal pain in the first 24-48 hours of life; and, in cases of uroperitoneum, the foal can start to exhibit colic signs at 2-5 days old.[1]

Physical examination

A complete physical examination should be performed in combination with additional tests to determine a diagnosis. The foal should be evaluated from a distance and observed when nursing. It is important to notice if the foal is nursing appropriately and if shows any signs of discomfort immediately after nursing, or if it is not interested in nursing at all.

If abdominal pain is severe and cannot be controlled, chemical restraint should be applied. Foals with uncontrollable pain, despite administration of pain medication, should be suspected of presenting a strangulating lesion of the GI tract. Often times, foals will exhibit behaviors that may be indicative of the source of pain such as, dropping to the ground in a rapid motion (may indicate an intestinal pathology), rolling into dorsal recumbency (suspect gastric ulceration), and straining to urinate (indicative of uroperitoneum) or defecate (may indicate impaction). Foals are less tolerant of abdominal pain compared to adults, thus the severity of pain in a foal is not a sensitive indicator of the severity of disease neither specific for the cause of colic. Foals show colic signs as straining, bruxism, laying down more than usual, pawing, and adopting abnormal positions. Young foals with meconium retention or impaction may strain to defecate, are restless, and tail flagging. Discerning between straining to defecate versus stranguria is important, with the latest being present in foals with uroperitoneum or urachitis. Severe signs of colic include kicking at the abdomen, thrashing, repetitive rolling, tachycardia and tachypnea, and they may have abdominal distention (easier to noticed in newborn foals).[2]

Vital parameters may aid in ruling-out differential diagnoses. Foals with persistent tachycardia and tachypnea, despite administration of pain medication and procedures to alleviate pain, are more likely to have a strangulating lesion of the GI tract. Fever can suggest sepsis or an infectious pathology. Hypothermia suggests severe systemic compromise and may indicate

necrotic bowel or advanced peritonitis and sepsis. Examination of the mucous membranes aids in assessing their hydrations and cardiovascular status; changes in the color may indicate shock or systemic inflammation. Assessing peripheral pulse quality, temperature of extremities, heart rate, and mucous membranes are good indicators of their hydration status.

Auscultation of the GI tract may reveal increased intestinal activity, such as in cases of gastroenteritis, or decreased or absent sounds that can be indicative of ileus. Abdominal distention can indicate gas or fluid accumulation in the intestinal tract or stomach, and progression of this may indicate a surgical lesion.[3] External palpation of the abdomen (inguinal rings and ventral abdomen) is important for evidence of infection, swelling/heat, or herniation. A normal external umbilicus does not exclude infection of the internal umbilical remnants. In neonates, abdominal ballottement can be performed and, detection of fluid waves can be indicative of excessive peritoneal fluid. Rectal examination cannot be performed in foals, however sometimes digital palpation can give important information; with meconium impaction, the impaction can be felt digitally, or in cases where no fecal staining is obtained after digital examination, thus atresia coli can be then suspected.[4] The veterinarian should monitor the foal for progressive changes in clinical signs. Closely monitoring of the severity of pain, vital parameters, mucous membranes, and degree of abdominal distention, may be imperative to determine if there is a strangulating-type lesion or if more intensive care is required.

DIAGNOSTIC PROCEDURES

Chemical restraint

Performing a thorough examination is imperative in foals with colic, thus the use of sedation is sometimes required if restraining is difficult. Newborn foals can be sedated with benzodiazepines (diazepam or midazolam: 0.05 - 0.4 mg/kg IV PRN or 0.02 - 0.1mg/kg IV PRN,

respectively). In older foals, alpha-2 adrenergic agonists can be used to restrain and control pain (xylazine: 0.2 – 1 mg/kg IV; detomidine: 0.002 – 0.01 mg/kg IV or IM). Foals with severe colic signs may need an opioid to aid with pain control (butorphanol tartrate: 0.01 - 0.02 mg/kg IV).

Gastric decompression

Passage of a nasogastric tube can be easily performed in neonates, with appropriate restrain. Can be useful as a diagnostic tool and therapeutic procedure. Relief of pain and resolution of clinical signs after intubation may indicate that gastric distention is one of the causes of pain. Moderate amount of enterogastric reflux can be obtained from foals with delayed gastric emptying, enteritis, and small intestinal ileus. A soft, rubber, male urinary catheter can be used in neonates, and a small-bore equine nasogastric tube can be used for older foals. A 60ml catheter tip syringe can be used to check for reflux.

Laboratory analysis

In neonates, measurement of serum IgG concentrations should be performed during the first 12-36 hours of being born to assess adequacy of passive immunity. Most of the practitioners can perform a complete blood count (CBC), serum biochemical analysis, and/or blood gas analysis readily. With the onset of sepsis or intestinal devitalization, leukopenia and neutropenia may be seen. Inflammation associated with long-standing problems will be reflected in an increase in fibrinogen concentrations and leukocytosis. Dehydration may lead to increased creatinine, protein, and lactate values. Electrolyte abnormalities may occur with diarrhea and with uroperitoneum. Blood glucose may be increased by stress or endotoxemia, or decreased by inappetence or endotoxemia.

Abdominal ultrasonography

Trans-abdominal ultrasound examination is easy and fast to perform. A 5.0 to 7.5 MHz transducer provides optimum image quality, either using a sector, linear, or convex probe. The stomach should be evaluated for distension, and the small intestine should be evaluated for motility, intestinal distension, and wall thickness. Gas within the intestinal wall may indicate an infectious cause with gas-producing bacteria. Excessive peritoneal fluid may indicate peritonitis, ruptured viscus, or free urine in the abdomen. The internal umbilical remnants should always be imaged for evidence of infection. Meconium impaction appear as intraluminal echogenic masses in the large or small colon.[1,2]

Peritoneal fluid analysis

Abdominocentesis can be difficult and enterocentesis is more likely to occur as a complication of this procedure in foals. However, if free peritoneal fluid is observed during ultrasonography, a sample should be collected to guide therapy. With proper restraint, peritoneal fluid can be obtained using a teat cannula. This can be done with the foal standing or in lateral recumbency, and under sedation. Evaluation of gross appearance, measure concentration of protein, and obtaining a cell count is important; reference intervals are similar to that in adult horses.

Abdominal radiography

In foals, the abdomen can be evaluated more extensively due to their smaller size. Can be valuable in determining presence of gaseous distention of the small intestine, and to localize the lesion, however not the cause of the colic signs. Contrast studies using barium are indicated to evaluate potential duodenal stricture, or motility disorders, as well as to identify and localize meconium impactions in the terminal colon or rectum.

Gastroscopy

Aids in the diagnosis of gastric ulceration and monitoring of response to treatment. The esophagus can also be evaluated if suspected reflux esophagitis or obstruction. In neonates, a 1m scope may be long enough to reach the stomach, and a 2m scope in older foals.

DIFFERENTIAL DIAGNOSES FOR ABDOMINAL PAIN IN FOALS

Possible causes of abdominal discomfort not related to the GI tract include fractured ribs, neurologic disease, uroperitoneum, abdominal or umbilical abscesses, and less frequently, pneumothorax or pleuritis. Similar clinical signs can present from a minor condition, such as skin irritation that causes rolling. Mild signs of colic can be indicative of enteritis, gastroduodenal ulceration, or a simple intraluminal obstruction. Severe signs of colic can be indicative of a strangulating lesion, or can also occur with non-surgical lesions, such as impending colitis, intestinal obstruction, or enteritis. The list of differentials for enteritis include nutritional, antibiotic-induced diarrhea, neonatal septicemia, overfeeding or carbohydrate intolerance, and infectious causes such as, rotavirus, salmonellosis, clostridiosis, and cryptosporidiosis. A few conditions are specific to the neonate and those include meconium retention or impaction, congenital defects, hypoxic enteritis/necrotizing enteritis, and foal heat diarrhea. Some common congenital abnormalities that cause colic include hernias (inguinal, diaphragmatic, umbilical, or scrotal), atresia ani/coli/recti, ileocolonic aganglionosis (Lethal white foal syndrome), and myenteric hypoganglionosis.

TREATMENT AT THE FARM

Most cases of colic in foals can be successfully managed medically. Therapy is similar to that in adults but with some special considerations: blood glucose checks, electrolyte abnormalities are common, and measure IgG is extremely important.

Control of abdominal pain

Pain control is imperative and can be achieved with use of non-steroidal anti-inflammatory drugs (NSAIDs). Care must be taken with dose administered and frequency, as neonates may have impaired renal function initially and are more sensitive to side effects, such as gastroenteric ulcerations, especially foals that are systemically compromised. Flunixin meglumine is the most common NSAID used for pain management (dosage: 1,1mg/kg IV q12-24h). Other options include firocoxib paste (0.1 mg/kg PO q24h), and opioids such as butorphanol tartrate. Alpha-2-adrenergic agonists can be used in older foals. A spasmolytic drug commonly used, maybe more in older foals, is N-butyl scopolamine bromide (Buscopan®; 0.3 mg/kg IV).

Correct causative lesion

The use of enemas is indicated in cases of suspected meconium impaction and is useful both as a therapeutic intervention and a diagnostic test. Sodium phosphate enemas are commonly used because of their availability in a commercial human preparation and ease of administration. Common side effects include hyperphosphatemia caused by excessive administration, thus it should not be administered more than twice in the first 24h of life. Soapy water enemas given by gravity flow are more commonly used. Common side effects include rectal irritation and limited efficacy, thus they should not be used repeatedly. Administration of Buscopan® may be helpful to treat meconium retention. Another type of enema used is acetylcysteine retention enema, however this has become a more cost prohibitive procedure and may not be as effective.[5] These enemas can be prepared using commercially available acetylcysteine (N-acetyl-L-cysteine powder) by adding 8g of acetylcysteine to a solution of 20g of baking soda in 200ml of water. The foal has to be sedated and placed in later recumbency. Using a 30-Fr Foley catheter with a

30-ml balloon, this is placed 2.5-5 cm into the rectum, the balloon is filled, and the acetylcysteine solution is infused using gravity flow to a volume of 100-200ml and left within the rectum for 30-45 minutes. This procedure can be repeated as many as three times, usually at 12-24h intervals, as this procedure is not highly irritating. A personal preference is the administration of cathartics via NG tube, using mineral oil mixed with milk of magnesia (or individually). Care must be taken that upon passage of the NG tube, no enterogastric reflux is obtained prior to administering the mix.

Foals are at higher risk of developing secondary bacterial infections (sepsis) with GI diseases, and especially those neonates with failure of passive transfer (FPT). The most common organisms isolated from foals with sepsis are: *E. coli*, *Klebsiella pneumonia*, *Actinobacillus spp*., *Enterobacter spp*., and other gram negatives; as well as gram positive organisms such as, *B-hemolytic streptococci*, *Staphylococcus spp*., *Clostridium spp*, and *Enterococcus spp*. Likewise, the most common infectious organisms that can cause diarrhea in foals are: *Salmonella spp*., *Clostridium perfringes* or *C. difficile*, rotavirus or coronavirus, and less commonly, parasites (small strongyles). Due to this, prophylactic broad-spectrum antimicrobial therapy are commonly used as part of the therapy.

Gastroprotectants

Foals are more sensitive to stress secondary to illness and excessive manipulation, thus prone to develop gastric or duodenal ulcerations. For this reason, prophylactic antiulcer therapy is often administered to clinically ill foals or those receiving NSAIDs. Foals are more likely to develop glandular and pyloric/duodenal ulcers due to impaired mucosal protection. Options for acid suppression and mucosal healing available to use in foals are: H2-receptor antagonists (cimetidine HCl: 6.6.mg/kg IV q8h or 20mg/kg PO q8h; ranitidine HCl: 2mg/kg IV q8h or

6.6mg/kg PO q8h), proton-pump inhibitors (omeprazole: 4mg/kg PO q24h), coating/binding agents (sucralfate: 20mg/kg PO q6-8h), mucosal healing/blood flow stimulants (misoprostol: 2.5ug/kg PO q8-12h), and antacids (aluminum/magnesium hydroxide: 120-240ml PO q4-8h).[6]

Provide supportive care

Dehydration and hypovolemia, as occurs in severe sepsis or high-volume diarrhea, needs to be addressed early in treatment and carefully, as ill neonates do not handle large fluid loads well.[7] Electrolyte disturbances are common in compromised foals and are especially frequent in conditions such as ruptured bladder and diarrhea. It is important in these cases to use fluids with a normal strong ion difference, as those with no strong ion difference (eg, saline), have a significant acidifying effect and should be avoided. Using balanced ionic solutions, such as Normosol-R or Plasmalyte, tends to normalize the strong ion difference. Fluid boluses of 20 ml/kg over 10 to 20 minutes with re-evaluation of clinical response and perfusion after each bolus to decide how many to give, are most efficient. If the foal is known or suspected to be hypoglycemic, 50% dextrose can be added to the solution administered as boluses. Care must be taken to make a 1% dextrose solution, but no more than a 5% dextrose solution.

The volume of fluid required to maintain fluid balance depends on many variables, such as GI losses. Neonates may need up to 10% of their body weight daily as fluids (80-100ml/kg/d). The Holliday-Segar formula calculates a “dry” maintenance fluid rate avoiding fluid overload, and is as follows: 100ml/kg/d for each of the first 10 kg bwt, 50ml/kg/d given for each kg of bwt between 11-20 kg, and 25 ml/kg/d given for each kg of bwt >20kg. By 24h, critically ill foals that cannot receive enteral nutrition may be placed on parenteral nutrition, which requires a more intensive care. Plasma can be used as a colloid, as part of the treatment for sepsis, or as a source of IgG in cases of FPT.

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