Abdominal Ultrasound and Palpation *per Rectum* as Complementary Modalities in Diagnosing Equine Abdominal Pain

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1. *Introduction*

The main goals when performing diagnostics on a horse with abdominal pain are to determine a diagnosis, choose an appropriate therapeutic plan (which may involve surgery), and provide the owner with a prognosis. Palpation of the abdominal contents per rectum has long been considered a mainstay in the diagnostic evaluation of horses with acute or chronic abdominal pain. It was once held that ultrasonographic evaluation of the abdomen had no utility in the diagnosis of acute abdominal pain in horses, but that view has changed dramatically over the last 20 years. The ready availability of portable sonographic equipment and better protocols for rapid transabdominal sonography has made percutaneous ultrasound an increasingly utilized modality in the diagnosis of acute colic. Sonographic evaluation is especially helpful in evaluating colicky horses in which rectal palpation is impossible or unacceptably risky. In horses amenable to palpation per rectum, ultrasonographic evaluation offers additional information about parts of the abdomen unavailable to palpation. Rather than viewing these diagnostic modalities strictly independently of each other, however, it is useful to think about how they each contribute to answering questions about the state of the anatomy within the abdomen. Each one is a powerful diagnostic tool, but together, they provide information that neither could alone.

2. *Strengths and Limitations of Each*

Abdominal palpation per rectum is useful for examination of the caudal aspect of the abdominal cavity. Indications include acute and chronic colic, fever of unknown origin, urogenital problems, reproductive evaluation, weight loss, inappetence, and other problems in which abdominal disease is suspected. Adequate restraint and the liberal use of lubricant are required minimums for performing a safe examination in any animal and the utility and safety of rectal palpation are often enhanced by the use of sedative, anesthetic, and antispasmodic medications. No special equipment is required and skill is readily developed with practice and basic knowledge of the anatomy.

There are several limitations to the use of rectal palpation in horses. Palpation per rectum is not appropriate for very small or very fractious patients,
in which circumstances of the safety of the patient and/or veterinarian is likely to be compromised. Very large horses may be also difficult to palpate, especially for smaller veterinarians. It is estimated that the caudal 1/3 of the abdominal contents are available for examination via palpation, but veterinarians palping large horses or veterinarians with short arms may find that only 1/4 of the abdominal contents can be reached. In addition, a late term fetus, bladder distention, or colonic and cecal gas distention may obstruct palpation of other structures.

The most dreaded complication of rectal palpation is rectal tear. Specific breeds, horses >9 years of age, and mares have been shown to be at increased risk for this complication. The evaluation and treatment of rectal tears have been covered elsewhere in numerous excellent resources. Although we as veterinarians are often more concerned about potential concerns to our patient’s well-being, another potentially serious consequence of rectal palpation of a horse is injury to the veterinarian through kick or crush injury. Care must be taken in providing the safest environment for both patient and practitioner.

Ultrasound is a portable noninvasive imaging modality. It is estimated that the peripheral 2/3 of the abdomen of an average horse can be sonographically imaged with a percutaneous technique. Most abdominal sonography is performed percutaneously, but scanning per rectum can also augment the information gathered during rectal palpation, especially when the left kidney, urinary bladder, ureters, reproductive tract, or caudal abdominal vasculature are suspected as causes of abdominal pain. A good working knowledge of abdominal anatomy and image optimization is necessary to obtain diagnostic sonographic images in colic cases; that said, with practice and guidance, abdominal sonography is not difficult to learn. Newer protocols for scanning acute colic cases, such as the fast localized abdominal sonography of horses exam, provide guidance for performing rapid, consistent examinations that yield useful information in these cases.

As with any diagnostic modality, there are limitations to the application of sonographic evaluation to colic. Image quality can be affected by hydration, perfusion, and ambient temperature, as well as the horse’s skin thickness and density, degree of adiposity, and haircoat. Patient preparation, which includes grooming, clipping the hair if needed, and the application of gel or isopropyl alcohol, is necessary for adequate image quality. Gas within the bowel prevents sound wave penetration and so the greater the gas distention of the viscera, the fewer structures that may be imaged. Not all ultrasound units have battery power, so access to a power source may be required. In addition, although more affordable units and probe options are becoming increasingly available, there is cost involved in obtaining optimum equipment. However, even using a standard rectal probe, some useful information may be obtained.

3. Evaluation of the Large Colon and Cecum

Diseases of the large colon are common causes of colic and include impaction, spasm, displacement, volvulus, intussusception, and colitis/typhlitis. Impaction of the large colon, particularly the pelvic flexure, is easily palpated per rectum, as is impaction of the cecum. Impactions are less likely to be identified using ultrasound than via palpation. Large colon displacement and volvulus comprised 1/3 of all cases requiring surgical intervention in one study. For conditions such as displacement or volvulus of the large colon, the band direction of the colons may be palpated, although severe gas distention may confuse the findings.

In normal horses, palpation per rectum of the nephrosplenic area reveals the left kidney, the spleen, and the nephrosplenic ligament. In horses with nephrosplenic entrapment, the colon is palpable dorsal to the ligament and the spleen may feel enlarged and/or displaced medially and ventrally by the colon. Sonographic evaluation reveals gas-filled bowel dorsal to the spleen, with the view of the kidney partially or wholly obscured. The spleen is displaced ventrally and the dorsal border of the spleen has a straight horizontal border that extends from the paralumbar fossa to the 10th to 12th intercostal space.

Right displacement of the colon is characterized on rectal palpation as colonic bands coursing horizontally across the abdomen and the colon may be detected lateral to the cecum. However, severe gas distention in the colon can obscure the exam findings. The additional sonographic identification of colonic vessels on the right side of the abdomen is highly sensitive and specific for right dorsal displacement or 180° colon volvulus.

In cases of vascular compromise and inflammation, sonographic assessment can add diagnostic and prognostic information, which is critical when providing information to clients leading to surgical decisions. Colonic wall thickness has been shown to be a predictor of colonic volvulus and may help to differentiate this condition from simple displacement. Colon wall thickness has been shown to be a predictor of colonic volvulus and may help to differentiate this condition from simple displacement. Colon wall thickness has been shown to be a predictor of colonic volvulus and may help to differentiate this condition from simple displacement. Colon wall thickness has been shown to be a predictor of colonic volvulus and may help to differentiate this condition from simple displacement. Colon wall thickness has been shown to be a predictor of colonic volvulus and may help to differentiate this condition from simple displacement. Colon wall thickness has been shown to be a predictor of colonic volvulus and may help to differentiate this condition from simple displacement. Colon wall thickness has been shown to be a predictor of colonic volvulus and may help to differentiate this condition from simple displacement. Colon wall thickness has been shown to be a predictor of colonic volvulus and may help to differentiate this condition from simple displacement. Colon wall thickness has been shown to be a predictor of colonic volvulus and may help to differentiate this condition from simple displacement. Colon wall thickness has been shown to be a predictor of colonic volvulus and may help to differentiate this condition from simple displacement. Colon wall thickness has been shown to be a predictor of colonic volvulus and may help to differentiate this condition from simple displacement. Colon wall thickness has been shown to be a predictor of colonic volvulus and may help to differentiate this condition from simple displacement. Colon wall thickness has been shown to be a predictor of colonic volvulus and may help to differentiate this condition from simple displacement. Colon wall thickness has been shown to be a predictor of colonic volvulus and may help to differentiate this condition from simple displacement. Colon wall thickness has been shown to be a predictor of colonic volvulus and may help to differentiate this condition from simple displacement. Colon wall thickness has been shown to be a predictor of colonic volvulus and may help to differentiate this condition from simple displacement. Colon wall thickness has been shown to be a predictor of colonic volvulus and may help to differentiate this condition from simple displacement. Colon wall thickness has been shown to be a predictor of colonic volvulus and may help to differentiate this condition from simple displacement. Colon wall thickness has been shown to be a predictor of colonic volvulus and may help to differentiate this condition from simple displacement. Colon wall thickness has been shown to be a predictor of colonic volvulus and may help to differentiate this condition from simple displacement. Colon wall thickness has been shown to be a predictor of colonic volvulus and may help to differentiate this condition from simple displacement. Colon wall thickness has been shown to be a predictor of colonic volvulus and may help to differentiate this condition from simple displacement. Colon wall thickness has been shown to be a predictor of colonic volvulus and may help to differentiate this condition from simple displacement. Colon wall thickness has been shown to be a predictor of colon wall health or compromise is useful when trying to form a prognosis to advise clients and set expectations.
4. Evaluation of the Stomach

The stomach is not palpable on per rectum examination. An assessment of the size, position, and fluid content of the stomach may be helpful in making management decisions about when to manually evacuate the stomach in cases of small intestine obstruction. In addition, gastric impaction can be sonographically diagnosed by detecting a markedly enlarged stomach, which may encompass 5 or more intercostal spaces on the left and may even be visible in the right abdomen. Although rarely a cause of acute colic, gastric masses can also be sonographically visualized if the mass is located along the greater curvature of the stomach, which lies along the left body wall, or if the stomach is filled with fluid contents to transmit the sound waves.

5. Evaluation of the Small Intestine

Disorders of the small intestine causing acute colic include simple luminal obstruction, which may be functional or physical, and strangulating lesions. The small intestine is not palpable in the normal horse; the discovery of distended or thickened small intestinal loops on rectal palpation is abnormal. Percutaneous ultrasound of the normal equine abdomen may reveal several loops of small intestine, especially if the horse has been held off of feed or has been administered an α-2 agonist sedative. However, the presence of multiple loops of distended submotile or amotile small intestine on sonographic evaluation is abnormal. This finding is most commonly seen in the inguinal regions of the ventral abdomen but may be seen in various other locations. Motility assessment can be sonographically evaluated, as described by several authors, but in the acute colic, so many factors can potentially influence motility that the clinical utility of this information is in question.

The appearance of the small intestine can offer valuable information about the nature and chronicity of small intestinal disease. In addition, sonographic assessment may be more sensitive than palpation per rectum at detecting abnormal small intestine, especially early in the course of the disease. Distal obstructions may fail to produce nasogastric reflux or palpable loops of small intestine until ample time has elapsed to build fluid that fills the intestine in an oblique direction.

It has been suggested that small intestinal wall thickness measurements may be a poor predictor of the etiology of small intestinal pathology because of the small area measured and the difficulty in accurate measurement of a curved line, but the presence of edema in the wall of dilated small intestine in a horse with acute abdominal pain is suggestive of inflammation or vascular compromise in the visualized loops. Distended fluid-filled loops seen in conjunction with thickened amotile small intestine is consistent with a focal strangulation. Diffusely fluid distended small intestine, which appears as multiple circular loops stacked in multiple areas of the abdomen, may be seen with small intestinal mesenteric volvulus, global ileus, or proximal duodenitis/enteritis. Grossly thickened small intestinal wall seen focally may suggest the cause of an obstruction, as in the case of an intramural tumor or intramural abscess.

Sonographic visualization of abnormal small intestinal loops can also reflect the duration of an obstruction. Sedimented feedstuff in intestinal loops indicates complete stasis or obstruction of the loops for a period of time sufficient to allow settling of particulate matter out of suspension. The location of distended small intestinal loops can be suggestive of the etiology of the disorder. Several authors have noted that epiploic foramen entrapment is associated with finding distended small intestinal loops in the right abdomen and, particularly, in the dorsal right abdomen. Rarely, distended, atonic, and/or edematous loops of small intestine are identified in the nephrosplenic and gastroplenic spaces. Although the presence of small intestine in these spaces is generally considered a normal finding, the small intestine can become incarcerated in these ligaments and thus abnormal bowel in these locations should alert the practitioner to the possibility of entrapment.

Small intestinal intussusception is rare in adult horses, but has been reported in horses from 6 months to 3 years of age. The most common site for small intestinal intussusception is the ileum, but jejunojejunal intussusception has also been described. These lesions may be palpated per rectum, depending on their location in the abdomen. Sonographically, they have the same general appearance as intussusception of the large bowel.

6. Evaluation of the Peritoneal Space

Palpation per rectum of the caudal abdomen yields information about the caudal peritoneal and retroperitoneal spaces. Pneumoperitoneum secondary to bowel rupture can be palpated as a dorsal emptiness in the abdomen, with the rectum snug against the examiner’s arm. Sometimes, emphysema of the serosal surfaces can be detected as crepitus and free ingesta within the abdomen gives the peritoneal surfaces a gritty texture. Pneumoperitoneum is readily detected sonographically, and with leakage or rupture of the gastrointestinal tract, increased peritoneal fluid containing free gas echoes and particulate matter is ventrally visualized.

Increased peritoneal fluid is very readily identified sonographically and the fluid can be character-
ized by its sonographic appearance. Anechoic fluid indicates lower cellularity, while turbid fluid is consistent with highly cellular fluid. Cellular fluid with evidence of fibrin and/or adhesions is consistent with peritonitis. Swirling homogeneous cellular fluid is seen with hemo-abdomen; the kidneys, spleen, liver, ovaries, and broad ligament (mares) should be interrogated to determine the source of the bleeding. Fluid volumes of less than 10 L are generally not detectable on palpation per rectum.4

7. Evaluation of the Solid Organs

Other than the caudal spleen and the left kidney, the solid organs of the abdomen are not typically palpable per rectum. Although uncommonly implicated as the cause of acute abdominal pain, sonographic evaluation of these organs can provide important information about them that can help determine a diagnosis. Kidney or ureteral stones, renal hemorrhage, choleliths causing main bile duct obstruction, hepatomegaly from diffuse hepatic disease or hepatic abscess, or splenic hematoma are all solid organ problems that can manifest as acute abdominal pain.

8. Summary

Ultimately, in evaluating a horse with colic, the results of all diagnostics, including physical exam, evaluation of hydration status, nasogastric intubation, palpation per rectum, ultrasonographic scanning, and abdominocentesis fit together to form a data set that gives the practitioner diagnostic and prognostic information that hopefully leads to a successful therapeutic plan. Performed together, palpation per rectum and sonographic examination provide complementary information about lesion location, etiology, and severity.

Acknowledgments

Conflict of Interest

The Author declares no conflicts of interest.

References