How to Surgically Reduce Ileal Impactions Using Intraluminal Injection of Commercially Available Carboxymethylcellulose

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1. Introduction

Ileal impactions have previously been described as a common cause of colic, seen most notably in the southeastern United States. The impaction occurs within the ileum at the level of the ileocecal orifice and may extend up to 90 cm in an oral direction. Ileal impactions have been reported as the most frequent cause of non-strangulating small intestinal obstructions and account for 6.5–7.4% of all colic cases and 2.2–23% of small intestinal colic cases.1–4 A strong association has been made between the development of ileal impactions and the feeding of Coastal Bermudagrass hay, accounting for the regional distribution of the disease.1,3,5

Ileal impactions have varying degrees of pain as manifested by typical signs of colic in a horse. The disease process is unique in that the pain cycle is biphasic. The first phase of pain is actually caused by intense muscle spasms that occur within the ileum in response to the formation of the developing impaction. In cases where the spasm is ineffective in moving the impaction through the ileocecal orifice, the impaction is compressed and becomes more firm and dry. As the impaction remains unresolved, fluid begins to accumulate oral to the impaction, resulting in subsequent small intestinal and gastric distension, giving rise to the second phase of the pain cycle. Depending on the progression of the impaction and individual variation, these horses present with widely varying levels of pain.

Medical treatment of ileal impactions has been previously described and is considered preferable to surgical treatment in most cases.6 For this reason, it is imperative to differentiate ileal impactions from strangulating diseases of the small intestine as quickly as possible. If caught early, a diagnosis by transrectal palpation of the impaction is possible, assuming that significant small intestinal distension has not occurred yet. In the presence of small intestinal distension confirmed by rectal palpation or abdominal ultrasonography, a presumptive diagnosis is possible by attaining a normal peritoneal fluid sample in conjunction with a history of ingestion of Coastal Bermudagrass.

In many cases, however, when medical management fails or when a diagnosis cannot be made by examination and history alone, a definitive diagnosis is made during an exploratory celiotomy. Sur-
gical procedures described for correction of ileal impactions range from resection or bypass of the diseased bowel to manual reduction alone in the presence of the non-compromised ileum. Initial reports advocated removing the ileum to prevent future impactions; more recent studies, however, advocate that the less aggressive technique of manual reduction has comparable results with less risk of postoperative complications. Techniques that involve resection of bowel are technically more difficult and time consuming with the horse under general anesthesia. Manual reduction by extraluminal massage alone can result in significant ileal trauma and edema in large firm impactions, thus greatly increasing the risk of postoperative ileus and intra-abdominal adhesion development.

Intraluminal injection of saline alone or in combination with dioctyl sodium sulfosuccinate (DSS) has been described to help break down the impaction before reducing it through the ileocecal orifice. This has been used with success over extraluminal massage alone; however, DSS is noted to be very irritating if it leaks onto the serosal surface of the bowel. Intraluminal injection of 1% sodium carboxymethylcellulose, however, has the benefit of being able to break down the impaction similarly to saline and DSS but can be used on the serosal surface as well to facilitate handling of bowel and prevention of intra-abdominal adhesions. In the presence of a non-compromised ileum, this technique is effective at breaking down a majority of ileal impactions, requires minimal instrumentation, can be performed in a relatively short amount of time, and has the potential to reduce the occurrence of postoperative complications.

2. Materials and Methods

The horses considered for surgical reduction aided by the use of intraluminal carboxymethylcellulose all presented with acute onset of abdominal pain. The patients were administered broad-spectrum antibiotics and analgesics before being placed under general anesthesia. The horses were anesthetized and positioned in dorsal recumbency in a routine manner for exploratory celiotomy. On exploration of the abdomen, an ileal impaction was confirmed by intra-abdominal palpation and exteriorized for visualization by tracing the dorsal band of the cecum to the anti-mesenteric border of the ileum. The ileum was examined to ensure that no vascular compromise had occurred and that a resection was not necessary.

Intraluminal injection of the carboxymethylcellulose was accomplished by placement of a 16-gauge 1.5-in needle through the ileal wall into the lumen near the anti-mesenteric border. Sterile intravenous infusion tubing with a luer lock facilitated injection from a 60-ml syringe (Fig. 1). After the ileum was infused with copious amounts of carboxymethylcellulose, the infusion set and needle were removed, and the injection site was oversewn with 2-0 absorbable sutures. Gentle extraluminal massage was used to break apart the impaction within the ileum. Once the impaction palpated loosely in the ileum, small amounts at a time were manipulated into the cecum. Sterile carboxymethylcellulose was applied to the serosal surface to facilitate minimizing friction on the serosa of the ileum during handling and reduction of the impaction. Re-injection of the ileum was performed if additional intraluminal carboxymethylcellulose was needed.

On successful resolution and clearance of the impaction, the fluid sequestered in the small intestine was stripped into the cecum to reduce the risk of developing a postoperative ileus. Once the exploration was complete, the abdominal viscera were returned to their proper placement, and the abdomen was closed in a routine manner.

3. Results

One of the authors (R.H.) has performed this technique on >30 horses with ileal impactions. Subjectively, these cases seem to have less difficulty in reducing the impaction and less ileal edema as a result of excess tissue handling, as well as a reduction in the overall amount of time under anesthesia needed to achieve surgical correction. No immediate intra-operative or postoperative complications associated with the use of carboxymethylcellulose were seen, and all horses treated in this manner by one of the authors (R.H.) survived to discharge from the hospital.

4. Discussion

Intraabdominal adhesions are the most common postoperative complication in horses, causing repeat episodes of colic after small intestinal surgery, thus limiting long-term viability. As such, it is the
authors’ opinion that any practical steps that can be taken to minimize this risk are worth the effort. Compared with extraluminal massage alone or in combination with injection of saline and DSS, extraluminal massage and intraluminal injection of carboxymethylcellulose is not cost prohibitive and requires a similar amount of time and experience. Additionally, intraluminal use of carboxymethylcellulose can be easily combined with direct serosal application to further minimize trauma associated with handling and reduction of the impaction. Carboxymethylcellulose is an inexpensive non-toxic water-soluble polymer derived from cellulose. It can be prepared from commercially available powder and autoclaved for surgical use.

Reduction of ileal impactions is often further complicated by the presence of ileal edema that forms in response to the impaction and reflex muscle spasm and manipulation in surgery. The edema results in a narrow ileocecal orifice, thus making the impaction even more difficult to reduce. The former cause of edema can be reduced by minimizing the attempts made to reduce the impaction by manipulation. Initial filling of the entire ileum with carboxymethylcellulose to the point of ileal distension is important in that it allows for the impaction to be penetrated and partially dissolve before reduction. It is the authors’ opinion that this technique actually works better than simple saline or DSS injection, in that it has similar wetting and penetrating abilities, however, the lubricating properties of carboxymethylcellulose are seemingly superior. In the authors’ experience, the benefits of this technique are a reduction in surgical time and manipulation followed by a short-term reduction in postoperative ileus and adhesion formation. Furthermore, as with any surgery, a reduction in postoperative complications should correlate with a decreased overall cost to the owner and shorter length of hospitalization.

This technique has helped our practice because the theorized advantages of the use of carboxymethylcellulose seem to be real. The ileum appears less traumatized after breakdown of the impaction with this technique, resulting in faster reduction of the impaction and more short-term success postoperatively, with fewer complications related to the ileus and further abdominal pain.

Ileal impactions present a difficult decision for the practitioner. Although they can often be managed medically, thus eliminating the complications of abdominal surgery, in some cases, surgical intervention is needed. When presented with an ileal impaction during surgery, the surgeon has several options. Intraluminal injection with carboxymethylcellulose is an important technique for our colleagues to consider. In the authors’ experience, reduction of ileal impactions with carboxymethylcellulose results in less postoperative morbidity and mortality than other methods and should be considered as a viable means of reduction.

References and Footnote


Carboxymethylcellulose; Hercules, Aqualon Division, Wilmington, DE 19894.