

## Fibrous Foreign Body Impaction Colic in Young Horses

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### SUMMARY

Of 207 horses with colic seen over a 36-month period, 10 were determined to have impaction colic caused by ingestion of synthetic fencing material. In 6 cases, there was history of exposure to rubberized fencing products. All horses affected were  $\leq 3$  years of age, had signs of mild to moderate abdominal pain, and were unresponsive to usual symptomatic therapy. At surgery, each horse was found to have an impaction involving the distal right dorsal colon, transverse colon, or small colon, and in some cases, all 3 bowel segments. In 9 cases, the involved segment of bowel could not be brought out of the abdominal cavity, and in each of these cases, the foreign bodies were removed through one or more enterotomies. Five of the 10 horses survived.

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IN RECENT years, the use of rubberized fencing materials has increased, especially for paddocks used for confinement of young horses. Usually the fencing is made from strips of conveyor belting, which is often made by weaving a polyester or nylon fiber into the framework. When the finished belting is trimmed to proper width, the long strands of excess belting produced have one edge along which the cut edge of the fabric is exposed. If improperly sealed, the fabric may unravel or fray, especially if subjected to weathering or chewing by horses. Ingestion of quantities of the fiber portion of the fencing material may cause gastrointestinal dysfunction, manifested as colic.

In 1971, this type of colic occurred in 28 horses on one farm in California, after horses ingested nylon-based cording used in the construction of automobile tires.<sup>5</sup> In 1976, one case of colic due to gastroduodenal impaction with rubberized material occurred in a young horse in Michigan.<sup>8</sup> Due to the nondegradable nature of the impacting mass in this type of colic, symptomatic therapy is of no value. Thus, surgical intervention is necessary, and if the impaction is diagnosed early enough in its course, when the afflicted horse is a reasonably good anesthetic and surgical risk, surgery may be curative.

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### Case Reports

During the 36 months prior to June, 1976, members of the staff of the Large Animal Hospital of the University of Pennsylvania diagnosed fibrous foreign body impaction colic in 10 horses, 3 years of age or less. Nine of these horses were from the northeastern United States and 1 was from Canada. In the first cases, the only pertinent part of the history was unsatisfactory response to symptomatic therapy of 2 or more days' duration. As each additional horse with the impaction syndrome was seen, striking similarities between cases became apparent. Questioning about the type of fencing in the horse's environment became routine. History of exposure to rubberized fencing materials was elicited in 5 cases.

When admitted to the hospital, these horses had similar clinical signs. All horses had mild to moderate abdominal pain, as manifested by pawing, stretching, or lying down excessively. All were depressed and had been passing scant feces since the onset of signs of colic. These horses had been manifesting signs of abdominal pain for periods ranging from 2 hours (1 case) to 8 days (another case). Heart and respiratory rates were increased (heart rate, 50–60/min; respiratory rate, 16–25/min). None of the horses was violent. Abdominal pain could usually be controlled by the administration of dipyrone,<sup>a</sup> 10 ml intramuscularly and 10 ml intravenously. The degree of metabolic imbalance and dehydration varied with the duration of signs of colic; none of the horses was in profound shock. Rectal examination was performed when the size of the horse permitted. In 3 horses, a firm mass was felt; in 2 others, distended loops of small or large bowel were palpated.

Routine laboratory evaluations included a complete blood count (CBC) and abdominal paracentesis, for which samples were collected within 1½ hours after the horses arrived at the hospital. Packed cell volumes (PCV) were moderately high, with a mean value of 44% and a range from 34 to 54%. White blood cell (WBC) counts were usually high normal to moderately high, with a range from 4,900 to 17,000; differential counts reflected a shift to the left, usually without immature (band) forms of segmented neutrophils. Peritoneal fluid was obtained prior to surgery in 6 horses. The total WBC count (per mm<sup>3</sup> of fluid) was within normal limits<sup>2</sup> in 4 horses; however, in 1 horse, the WBC count was slightly increased (11,000 cells/mm<sup>3</sup>), and in another, the WBC count was markedly increased (109,000 cells/mm<sup>3</sup>). The latter horse was a

<sup>a</sup> Dipyron, 50% solution, injectable, Hart-Delta, Inc, Baton Rouge, La.

3-year-old Thoroughbred filly that had been sick for 8 days before surgery. This was the longest interval prior to definitive therapy, and serious bowel damage and accompanying intraperitoneal fluid changes could be expected.

In view of the history, duration of signs, and findings on physical examination, all horses were subjected to exploratory laparotomy. Before surgery, a polyionic balanced electrolyte solution<sup>b</sup> was administered intravenously as needed, and phenylbutazone<sup>c</sup> (2 g) was given intravenously. Four horses were treated with oxytetracycline hydrochloride<sup>d</sup> (1.8 mg/kg, BID); 3 were treated with oxytetracycline hydrochloride and neomycin sulfate,<sup>e</sup> the latter at a dosage of 1.4 mg/kg intravenously, BID. Three horses were treated with neomycin sulfate intravenously and sodium penicillin intramuscularly, BID.

In all horses, anesthesia was induced with glyceryl guaiacolate<sup>f</sup> and sodium thiopental<sup>g</sup> (intravenously), and maintained with halothane<sup>h</sup> in oxygen, administered by endotracheal tube with a semiclosed anesthetic apparatus. A ventral midline incision<sup>3</sup> was used to enter the abdominal cavity.

In all horses, the proximal small colon was obstructed; in 5 horses, the obstructing mass extended from the right dorsal colon into the transverse colon. The obstructing mass was always readily palpable through the intestinal wall within the lumen. The most proximal 12 inches of the small colon as well as the transverse colon and the most distal part of the right dorsal colon could not be brought through the ventral midline incision, due to the anatomy of the intestinal tract.<sup>7</sup>

When the obstructing mass or masses could not be exteriorized, the distal part of the right dorsal colon (as near as possible to its junction with the small colon) was brought out of the incision and carefully packed off from the rest of the abdominal contents and the skin incision, using turkish towels well moistened with warm (body temperature), isotonic balanced electrolyte solution. In 9 cases, an incision large enough to accommodate the surgeon's hand and forearm was made parallel to the long axis of the bowel in a sacculated portion of the distal right dorsal colon. The arm was extended within the bowel lumen from the right dorsal colon into the transverse colon, and the mass was carefully freed and extracted through the incision. The parallel orientation of the enterotomy incisions was important in these cases. During manipulation of the impacting mass, when the surgeon's arm was in the bowel, the incision tended to tear at either end. In one case, a transverse enterotomy incision was made. The elongated longitudinal incisions were easier to close than was the transverse incision, which, when torn, tended to divide the bowel into 2 pieces. When an

exteriorizable part of the small colon was involved, an incision was made in a packed-off portion of the small colon and the mass was extracted.

In 3 cases, it was not possible to mobilize the impacting mass through a single enterotomy site; however, by alternate pulling on the mass through incisions in both the small colon and right dorsal colon, the mass was finally extracted. In 1 horse, a large tenacious mass had to be cut into 2 pieces within the lumen of the bowel before removal.

One horse required additional surgery 8 weeks after its initial episode of colic, to remove a fibrous mass not detected during the 1st surgery, now obstructing the distal small colon. Access to the affected bowel was through a left paralumbar incision. The mare had been colicky for 4 days prior to the 2nd surgery, and the serosal surface of the involved distal small colon was hyperemic and edematous. The fibrous mass was removed through an incision at the site of the obstruction.

Each incision in the gut was closed with a simple continuous suture pattern of size 00 chromic surgical gut<sup>i</sup> in the mucosa and overlying size 00 chromic surgical gut continuous Cushing's sutures in the serosa and submucosa. The enterotomy sites were rinsed with warm, balanced electrolyte solution followed by rinsing with a similar solution containing  $40 \times 10^6$  IU of potassium<sup>j</sup> or sodium penicillin<sup>k</sup> and 40 ml of nitrofurazone solution<sup>l</sup>/L, or 1 to 2 g of neomycin sulfate<sup>l</sup>/L. Then 2 L of either neomycin or penicillin/furacin solution were dispersed in the abdomen.

The laparotomy incisions were closed as described elsewhere,<sup>3</sup> except that drains were not used. After the horses recovered from anesthesia, each surgical wound was covered with furazolidone spray,<sup>m</sup> a vaseline-impregnated gauze strip, and a 2-inch-thick cotton pad held in place by a firmly wrapped elastic adhesive belly bandage.<sup>n</sup> After surgery, antibiotics as previously described were continued for at least 5 days, and balanced electrolyte solutions were given intravenously as necessary until adequate bowel function returned.

Five of 10 horses survived the surgery and were doing well as of June 1, 1976. Three horses were euthanatized because of surgical complications. In the 1st of these 3 horses (with a fibrous foreign body impaction that was treated), the surgeons were unable to remove the long obstructing mass that was lodged in the descending and transverse colon. In the 2 other horses, the impacting masses were so tightly lodged in the proximal descending and transverse small colon that surgical manipulation ruptured the bowel, resulting in severe abdominal fecal contamination.

The 2 other horses survived the surgery but ultimately developed fatal postoperative complications. One horse became febrile and contracted severe peritonitis 48 hours after surgery. Three days after surgery, this horse also developed diarrhea. It was treated with

<sup>b</sup> Normasol-R, Abbott Laboratories, North Chicago, IL.

<sup>c</sup> Butazolidin, injectable 20%, Jensen-Salsbery Laboratories, Kansas City, Mo.

<sup>d</sup> Liguamycin, injectable, 50 mg/ml, Pfizer Inc, New York, NY.

<sup>e</sup> Biosol, 50 mg/ml, the Upjohn Company, Kalamazoo, MI.

<sup>f</sup> Gaufoenesin, Gane's Chemical Work's, Inc, Pennsville, NJ.

<sup>g</sup> Pentothal, Abbott Laboratories, North Chicago, IL.

<sup>h</sup> Halothane, USP, Halocarbon Laboratories, Inc, Hackensack, NJ.

<sup>i</sup> Sterile surgical gut Type C, USP, Ethicon, Somerville, NJ.

<sup>j</sup> Penicillin G, potassium, E. R. Squibb & Sons, Inc, Princeton, NJ.

<sup>k</sup> Penicillin G, sodium N.F., the Upjohn Company, Kalamazoo, MI.

<sup>l</sup> Furacin Solution, Eaton Veterinary Laboratory, Norwich, NY.

<sup>m</sup> Topazone Aerosol Powder, Eaton Veterinary Laboratory, Norwich, NY.

<sup>n</sup> Elastoplast, Beidersdorf, Inc, South Norwalk, Ct.

oxytetracycline hydrochloride and neomycin sulfate, according to the aforementioned regimens, until the diarrhea started. At that time, antibiotic therapy was changed to gentamicin sulfate<sup>o</sup> (0.4 mg/kg, intramuscularly, TID) and sodium ampicillin<sup>p</sup> (2.3 mg/kg, intramuscularly, QID). Despite intensive supportive therapy in the form of infusion of balanced electrolyte solutions and sodium bicarbonate solution as needed, the horse's condition worsened steadily, and it died 19 days after surgery. Postmortem examination demonstrated devitalization of the bowel involved in the original impaction and fecal peritonitis.

The last horse did well for 3 days after surgery for removal of an obstructing mass in the right dorsal and transverse colon. On the 3rd postoperative day, this horse developed profuse watery diarrhea and a temperature of 40.5 C (104.9 F). At this time, antibiotics were changed from oxytetracycline hydrochloride to chloramphenicol sodium succinate,<sup>q</sup> given intravenously, QID. *Salmonella* was isolated from the feces. Despite intensive supportive therapy, the horse died 12 days after surgery. Postmortem examination demonstrated mucosal ulceration of the small and large bowel and pseudomembranous hemorrhagic colitis. The surgical enterotomy site was intact. The postmortem diagnosis was salmonellosis.

## Discussion

Horses may be housed in a rubber-fenced area for weeks, months, or years before the onset of clinical signs of colic. Two horses had not been exposed to rubber fencing for 2 months prior to developing impaction colic, and a 3rd had been out of the rubber-fenced paddock for 2 years before requiring surgery to correct gastrointestinal impaction. Some horses in the aforementioned California series had no clinical problem for as long as 2 to 5 years after exposure to rubber tires.<sup>5</sup> These findings indicate that strands of cording may float in the bowel lumen for long periods before "amalgamating" to form an obstruction.

The impacting material removed surgically in each case was a firm concretion of ingesta surrounding a core of fibrous strands. In 9 cases, the strands were identified as the cording component of rubber fencing products. In the other case, the mass was identified as cording from rug material used to pad fenceposts at the farm. The longest mass recovered was 90 cm (36 inches), the heaviest was 6.9 kg (15 lb).

Each of the obstructing masses had a pitted, uneven surface. When the mass filled the lumen of the bowel and became lodged, the mucosa would cling tightly to it, thus contributing to the horse's inability to pass the obstruction and the surgeon's difficulty in removing it. In 2 cases, attenuation of the bowel wall over the large mass resulted in devitalization and

weakening of the intestine and predisposed the bowel to rupture during surgical manipulation.

The site of obstruction was the right dorsal colon or the transverse and descending small colon (or both) in each case, as well as in the 28 cases of nylon-tire concretion reported in 1971.<sup>5</sup> The surgical inaccessibility of these segments of bowel necessitated careful choice of an enterotomy site(s). Often the enterotomy site had to be some distance proximal or distal from the mass so that surgery involved a portion of bowel that could be exteriorized and carefully packed off. Using this technique, the obstructing mass could be approached indirectly, through the lumen of the large or small colon.

The 2 horses that died due to medical complications (including diarrhea) after surgery were both treated with oxytetracycline in the immediate pre- and post-operative periods. Tetracyclines are known to have adverse effects on gastrointestinal flora in horses and man. In 1971, an overgrowth of *Clostridia* spp in oxytetracycline-treated experimental horses was reported.<sup>1</sup> Occurrence of gastroenteritis caused by *Salmonella* during oxytetracycline treatment in a man known to harbor *Salmonella* was reported in 1955.<sup>6</sup> Diarrhea has also been reported in oxytetracycline-treated horses subjected to the stress of prolonged surgery.<sup>4</sup> Therefore, the use of this drug in these surgical colic patients is contraindicated, especially if exposure to virulent salmonella organisms or a salmonella carrier state is suspected.

In summary, when clinical signs and history suggest bowel impaction, and the horse does not respond to adequate symptomatic treatment in reasonable time, fibrous foreign body impaction should be suspected. These cases indicate that fibrous foreign body impaction in young horses may be treated successfully if the diagnosis is made early in the course of the disease and the obstruction is surgically removed.

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<sup>o</sup> Gentocin, injectable, 50 mg/ml, Schering Corp, Kenilworth, NJ.

<sup>p</sup> Totacillin-N, injectable, Beecham Laboratories, Bristol, Tn.

<sup>q</sup> Chloromycetin sodium succinate, injectable, Parke, Davis & Company, Detroit, Mi.