Equine Sand Colic

by Honor Ame Walesby, DVM, MS, DACVS, Jill M. Blackmer, DVM, MS, DACVIM, DABVP, Ashley Berthelot, DVM

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**Abstract**

Sand colic is abdominal pain secondary to ingesting sand. Horses that are fed on the ground or kept in regions with sandy soil or overgrazed pastures are at risk. Sand can accumulate within the large bowel, causing irritation and intermittent colic and possibly resulting in complete obstruction. Diagnosis is based on fecal sedimentation, abdomino­centesis, rectal palpation, abdominal auscultation, and ultrasonography. Management with laxatives and decreased ingestion reduces sand accumulation. Surgery is indicated for intractable pain, failure to respond to medical management, and progressive physiologic deterioration. Veterinarians must identify horses at risk and prevent sand ingestion while facilitating removal of existing accumulations.

Management and exposure are key risk factors for sand ingestion and accumulation.1 The indiscriminate gathering action of the equine upper lip directs sand and small particles into the mouth. Horses fed on the ground or kept in regions with sandy soil, overgrazed pastures, or heavily stocked pastures are forced to graze close to the ground, increasing the likelihood of sand ingestion.1-4 Horses fed on the ground in holding pens, indoor arenas, or stall floors ingest particulate matter, as do stalled horses that drop feed onto the ground and spend hours picking through bedding for small particles of feedstuff.5 Some horses deliberately ingest sand and dirt secondary to boredom or salt deficiency.5 Over time, these animals consume large quantities of particulate material that accumulate within the lumen of the large colon.2

Regional differences in the sand content of the soil account for geographic variation in the reported incidence of sand colic.3,6 Areas with loose sandy soil, such as California, Arizona, and Florida, attribute greater than 30% of the overall colic caseload to sand.3 A risk factor assessment for colic in the Michigan equine population found that 77 (2.4%) of 3,175 horses had colic over a 2-year period; of these 77 horses, four (5%) were diagnosed with sand colic.6 In this same study, 42 (55%) of the 77 with colic were fed forage individually on the ground, whereas 31 (40%) were fed forage in groups on the ground.6 A multicenter retrospective study of risk factors in 2,385 cases of equine colic at universities reported a total incidence of 56 (2.3%) cases of sand colic over a 5-year period.7 Thus the incidence of sand colic varies with geographic location and management practices that place horses at risk of sand ingestion and accumulation.

**Clinical Findings**

All ages and breeds of horses are reportedly affected by sand colic.3,6-8 In one study of 48 horses with sand colic, ages ranged from 1 to 20 years, with a mean of 7.8 years; in another study of 40 horses, ages ranged from 2 months to 30 years, with a mean of 9.5 years.3,8 Pulse characteristics vary with severity of mucosal irritation, degree of luminal obstruction, and pain.3,8 Heart rates reportedly range from 28 to 120 bpm, with a mean of 62.3,8 Rectal temperatures reportedly range from 97.7°F to 103.1°F (36.5°C to 39.5°C), with a mean of 99.7°F (37.6°C).8 Respiratory rates can be elevated in response to pain and can range from 10 to 52 respirations per minute, with a mean of 21.8 A packed cell volume (PCV) greater than 45% and total plasma protein in excess of 7.5 g/dl were present in 19 horses (40%); elevations in blood urea nitrogen of 25 to 45 mg/dl and creatinine concentrations of 2.5 to 7 mg/dl were present in six (13%) horses from a retrospective study of 48 cases of sand colic.8

Historically, abdominal pain associated with sand colic is mild to moderate, frequently intermittent, and typically resolves with analgesic therapy but recurs in a few days to weeks.1 The pain is secondary to tension on the mesentery secondary to the tremendous weight of the sand.1 To relieve discomfort associated with mesenteric tension, horses stand in a stretched position or are laterally recumbent for prolonged periods.1 Pain becomes acute, severe, and intractable in cases with concurrent bowel obstruction, colonic torsion, or displacement of the colon.1,3 Concurrent colon torsion and displacement has been described in 25% to 54% of horses with sand colic that required surgical intervention.3,8 The weight of the sand-filled segment of bowel causes it to rotate ventrally and assume a gravity-dependent position; this segment then serves as a pivot point around which the colon can twist.3 Complete bowel obstruction results in secondary gas and fluid distention cranial to the obstruction, which stretches the bowel wall, causing severe pain.1

Sand accumulation in the gastrointestinal (GI) tract can cause diarrhea in horses.9,10 Large accumulations of sand cause mucosal inflammation secondary to continuous mucosal abrasion by the sand within the bowel lumen.9 Constant irritation reduces the absorptive surface area of the bowel, leading to chronic diarrhea and weight loss.9 Affected horses typically have loose, dark, sandy feces for 7 to 10 days before the onset of signs of colic.2 Resolution of diarrhea frequently corresponds with clinical signs of abdominal discomfort.2 In addition to chronic diarrhea, persistent mucosal irritation and inflammation associated with sand ingestion and accumulation can lead to depression, anorexia, lethargy, and chronic abdominal distention.3,9

**Diagnosis**

A retrospective study in which 40 horses were treated surgically for sand colic reported a diagnosis of sand in the GI tract before surgery in 23 horses (58%) and during exploratory celiotomy in 17 horses (43%).3 Methods used to detect intestinal sand before surgery included finding sand in the feces (11 horses), obtaining or feeling sand during abdominocentesis (13), abdominal auscultation (four), rectal palpation of a sand-filled viscus (three), and abdominal radiography (two).3 Sand was detected presurgically by more than one method in nine horses (22.5%) and by only one method in 14 horses (35%).3 Horses in which sand was not detected before surgery usually had clinical signs and histories indicating a need for immediate surgery and therefore offered less opportunity for presurgical sand detection.3

Results of peritoneal fluid analysis are often normal or may indicate a slight rise in the protein concentration.1 The weight of sand pressing the impacted bowel against the ventral body wall combined with tension on the colon wall makes it easy to perforate the bowel with either a needle or teat cannula.1,3,5 Therefore, sand can be obtained from a bowel tap during abdomino­centesis if the needle penetrates the portion of the bowel containing sand1 ([Figure 1](https://www.vetlearn.com/compendium/equine-sand-colic)). Although this is not desirable because of possible complications from leakage, it does provide a diagnosis.1,3,8 Abdominocentesis conducted on 46 affected horses resulted in enterocentesis in six horses, three of which contained sand.8 In another study of 40 horses, paracentesis was conducted in 13 horses, all of which contained sand.3 The peritoneal fluid leukocyte count for 46 affected horses was 100 to 240,000/µl, with five horses having counts of 10,000/µl or more.9 Twenty-eight of 46 affected horses had peritoneal fluid total protein values less than 2.5 g/dl, and 18 had values of 2.6 to 7 g/dl.9 Complications associated with paracentesis include septic peritonitis, lacerated bowel wall, and focal abscessation.3,5,8

Rectal palpation for sand impaction is not conclusive because impactions occur most frequently in areas that are not within reach.5 When they do occur in segments of bowel that are normally palpable, the weight of the sand causes the bowel to rest out of reach in the ventral abdomen.5 Gas distention secondary to sand impaction of the large colon and cecum was palpable in 40 of 46 affected horses in one retrospective study.8 However, a definitive diagnosis of sand impaction was determined per rectum in only seven of these 46 horses.9 During palpation, sand impactions feel extremely hard and do not indent easily.5,8 Impactions with coarse sand can be felt coating the lumen of the rectum during palpation and often remain on the surface of the examiner's sleeve, whereas fine sand is rarely palpable and does not coat the examiner's sleeve.1,5 Sand within the feces may not be grossly evident but can be detected with a fecal sedimentation test1,3,5,8,11 ([Figure 2](https://www.vetlearn.com/compendium/equine-sand-colic)). Controlled studies have shown that fecal sedimentation tests correlate poorly with the presence of sand in the colon and are therefore associated with a high incidence of false-negative results.11,12

Abdominal auscultation has been used to diagnose sand colic.3,11-13 Auscultation of the ventral abdomen in the area just caudal to the xiphoid region may reveal a characteristic sound.13 Sand sounds have been described as similar to those produced by a paper bag that is partially filled with sand and rotated slowly.13 Sand sounds are "gritty" and of variable intensity and duration.13 The sound is generated by friction between sand particles or by sand rubbing against the intestinal mucosa during intestinal contractions.13 For sand sounds to generate, there must be intestinal motility, and the sand-filled bowel must be in direct contact with the ventral abdominal wall.13 A controlled study, in which sand was administered to 15 horses, found abdominal auscultation to be an effective way to detect sand accumulation in horses.13 Investigators concluded that the intensity of the sand sound is directly proportional to the size of the sand accumulation, coarse sand generates louder sounds than fine sand, and a prolonged auscultation time (up to 5 minutes) in several regions may be required to detect sand sounds.13

Abdominal radiography can be used to diagnose sand accumulation within the large colon.3,5,10-13 Abdominal radiography can replace rectal palpation in foals, ponies, and miniature horses and may provide information that cannot be obtained using other methods9,11,12 ([Figure 3](https://www.vetlearn.com/compendium/equine-sand-colic)). The cranioventral abdomen can be radiographed using a right-to-left standing lateral view.11,12 Four overlapping exposures are needed to cover the GI tract of a mature horse.12 The diaphragmatic and sternal flexures as well as some portions of the dorsal and ventral colon can be visualized in most cranioventral views.12 Radiographic determination of the exact location and approximate amount of sand accumulation remains subjective and is based on topographic anatomy of the abdomen.11,12 Determining change in shape, size, and location is not necessary from a clinical standpoint; however, these changes have proven useful in monitoring resolution of sand accumulation and confirming the efficacy of medical treatment.11,12

Ultrasonography can be used to detect sand im­pactions by imaging the ventral portion of the abdo­men.14,15 Normal sacculations are lost as the weight of the sand presses the bowel wall against the ventral body wall.14,15 Sand grains along the mucosal surface of the large intestine cast small acoustic shadows in varying directions, depending on the angle of the probe15 ([Figure 4](https://www.vetlearn.com/compendium/equine-sand-colic)). Ultrasonography can be used to detect sand within the colon, but it is not diagnostic for location, volume, or response to therapy.14

**Treatment**

**Medical Management**

The goals of treating sand colic are as follows4:

* Lubricate and disrupt the obstructing mass
* Relieve pain and inflammation
* Support normal body functions
* Prevent recurrence

If sand is detected in the feces, mineral oil, ionic cathartics, or psyllium should be given to purge the colon, provided the bowel is patent.1 Medical management typically starts with administering psyllium hydrophilic mucilloid via a nasogastric tube or as a top dress on the feed.1 Psyllium in the form of flakes or powder has been used most successfully at a dose of 500 g/1,000 lb in 2 gal of water.1,5,11 This treatment is normally repeated at least two times at 2- to 3-day intervals.1,5,11,16 Psyllium is believed to have a better ability to penetrate, hydrate, and disrupt sand impactions than other laxatives and cathartics.1,2 Psyllium is nontoxic and can be used for 1 to 3 weeks.1,3,11 With prolonged use (e.g., 4 to 5 weeks or continuous administration), colonic flora begin to degrade psyllium, thereby decreasing efficacy for sand clearance.2,3,11,14 The response to psyllium is highly variable, ranging from no response to complete resolution.11,12 Serial abdominal radiographs are recommended to confirm response to therapy.11,12

Magnesium sulfate (MgSO4) with or without concurrent administration of mineral oil has been used to treat sand accumulations in horses unresponsive to psyllium.2,5,12,16 MgSO4 is classified as a saline laxative and assumed to increase fecal bulk and water content through an osmotic response to the poorly absorbed magnesium ion.16 The increase in water content within the intestinal lumen is thought to lubricate and disrupt the sand.1,5,12,16 The dose of MgSO4 reported to be most effective for sand accumulation is 1 g/kg administered via nasogastric tube once daily for 3 days, then again 7 days later.1,5,12,16

Mineral oil (4 L via nasogastric tube as needed) has been used alone and in combination with MgSO4 (1 to 3 L via nasogastric tube once daily) for treating non­psyllium-responsive sand accumulations or as initial therapy.1,3,5,11,12 Mineral oil acts as a boundary lubricant to facilitate the passage of sand particles and reduce mucosal inflammation.1,11 However, mineral oil alone is not as effective as water-based laxatives because it does not penetrate the water-soaked sand mass and does little to remove accumulated sand.1

Dioctyl sodium sulfosuccinate has been used to treat sand accumulation and sand impaction. The drug reduces surface tension and allows water to penetrate impacted material, increases intestinal secretion, and alters mucosal permeability, but the laxative effect may be limited.12,16 The dose for dioctyl sodium sulfosuccinate should be 10 to 25 mg/kg diluted in 4 to 8 L of water.12,16 Larger doses cause diarrhea and abdominal pain.12,16 It has been suggested that dioctyl sodium sulfosuccinate be contraindicated for treating sand accumulation and impaction because the drug can further solidify sand impactions.10

Interrupting sand intake combined with turning out the patient to a grass pasture has been used to treat horses unresponsive to prolonged laxative therapy.11,12 When horses are not exposed to sand continually, normal intestinal motility can dislodge and remove most of the sand; however, removal is gradual and may not be indicated in horses actively showing clinical signs of colic.11,12 Interrupting sand intake combined with making grass available can be used as adjunct therapy to facilitate passage of sand remaining in the colon after primary laxative therapy.11,12

**Surgery**

Horses that do not respond to medical treatment may require surgical intervention. Surgery is recommended in patients with abdominal pain and distention that fail to respond to medical therapy within 48 to 72 hours and have progressive physiologic deterioration, with changes in the peritoneal fluid indicating degeneration of the bowel wall.1,8,13 Surgery is also recommended in cases in which rectal palpation reveals large colon and cecal gaseous distention consistent with displacement and torsion.1,8,13 A retrospective report of surgical treatment of sand colic described 61 sand accumulations or obstructions in 40 horses, with multiple accumulation sites occurring in 20 horses (50%).13 In this report, the most common sites for sand accumulation (in descending order of frequency) were right dorsal colon (26 of 40), transverse colon (10 of 40), left dorsal colon (9 of 40), pelvic flexure (five of 40), sternal flexure (four of 40), left ventral colon (three of 40), right ventral colon (two of 40), and small colon (two of 40).13 Although impactions of the stomach, ileocecal junction, and cecum have been described, none was encountered in this case series, leading investigators to conclude that involvement of these sites is less common than previous reports indicate.13 Of these 40 horses undergoing exploratory celiotomy for GI sand, 10 (25%) had concurrent colonic displacement or volvulus.13 A second retrospective report of surgical treatment of sand colic described 48 cases of sand accumulation or obstruction.8 Of these 48 cases, 26 horses (54%) had multiple sites of accumulation, and 26 (54%) had concurrent colonic displacement or torsion.8 In this report, the most common sites for sand accumulation were the right dorsal colon (18 of 48), pelvic flexure (14 of 48), transverse colon (12 of 48), and left dorsal colon (two of 48).8

Surgical treatment of a sand impaction requires physical removal of the sand from the bowel lumen through a pelvic flexure enterotomy, coupled with liberal intraluminal lavage with water through a nasogastric tube or garden hose.8,13 Intraluminal injection of lubricants, fluid, or osmotic agents combined with external massage can disrupt the impaction but has proven to be an inadequate technique for treating sand impactions.1,8,13 The standing flank laparotomy does not allow adequate access to affected bowel segments, and the large colon cannot be exteriorized adequately for evacuating the impaction through a pelvic flexure enterotomy.13 Complete removal of all the sand is not possible; therefore, all horses in the study were treated postoperatively with laxatives and intestinal lubricants.13

The most frequent postoperative complication encountered in one study was transient diarrhea in 16 horses (35%), three (18%) of which cultured positive for *Salmonella* spp.13 Intraabdominal adhesions, septic peritonitis, and incisional hernias secondary to incisional infections have been reported in a small number of horses undergoing surgery to relieve sand impaction.8

**Incidence and Prognosis**

The overall survival rate for horses in a retrospective study of 4,644 cases of equine colic was 59.8%, whereas the survival rate for horses affected by sand colic was 69.6%.7 This study examined risk factors and positive predictive values for objective data in relation to predicting outcome in cases of equine colic.7 Heart rate, PCV, and total plasma protein concentration have been found to have significant positive predictive value for differentiating survivors from nonsurvivors in horses with colic.7,8,13,17 In a prospective study of the Michigan equine population, the case fatality rate for horses treated surgically for colic was 31%, whereas the rate for horses with nonsurgical colic was 10%.6 In this study, only four horses reportedly had colic associated with sand: Three were treated medically and survived, and one was treated surgically and did not survive.6 Factors associated with increased risk of developing colic in this study were increasing age, foaling, deworming, show activities, and water management practices.7 A retrospective study of 40 surgical cases of sand colic reported that 86% of treated horses were allowed to recover from anesthesia (i.e., short-term survivors) and 71% survived 12 months or more, with a mean survival time of 32.6 months (i.e., long-term survivors).13 In this study, a comparison of PCV and heart rate values between long-term and short-term survivors showed that long-term survivors had lower PCV values (i.e., 37% versus 42%) and lower heart rates (i.e., 56 versus 71 bpm) than short-term survivors.13

**Prevention**

Horses should not be fed on the ground. Nets and elevated bunkers are of little help if there are no troughs below to catch the smaller particles of hay and grain that fall.1,5 Most fallen material is leafy and palatable, and horses spend idle hours collecting this material from the ground.1,5 The time after feeding is when many horses ingest much of the sand and dirt that collects in the large colon.1,5 Prolonged feeding or management practices that predispose horses to ingesting sand and dirt lead to accumulation and eventual impaction by overwhelming normal clearance mechanisms.1,3-5,11,12 Interrupting sand intake allows gradual removal of sand from the large intestine.11 When horses are not continually exposed to sand, normal intestinal motility dislodges and removes most of the particulate material within the bowel lumen.11 Prevention is key; therefore, horses should be removed from sandy pastures and stalls and grazed on lush forages and should not be grazed in short pastures or fed off the ground. If removal from sandy pastures or stalls is not possible, placing rubber mats on the stall floor or in the area where horses are fed can reduce sand ingestion by preventing exposure. Increasing the size and depth of feeding troughs and bins can reduce spillage of feed material onto the ground. Separating aggressive and dominant horses from their subordinates or reducing the number of horses per feed trough can reduce sand ingestion by allowing less dominant horses to eat from feeders rather than the ground. Administering psyllium as a daily or weekly supplement has been suggested as a preventive measure, but the efficacy has not been proven.11

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