Foreign Body Obstruction of the Esophagus in a Foal*

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A 2-month-old, unweaned, male Swedish cold-blooded trotter foal was referred to Skara Equine Hospital because of esophageal obstruction of approximately 24 hours duration. Although the referring veterinarian had been able to pass a nasogastric tube past the obstruction and into the stomach, clinical signs of esophageal obstruction persisted.

At admission, the foal was mildly depressed. Its rectal temperature was 100.8°F (38.2°C), its heart and respiratory rates were within normal limits, and it appeared mildly dehydrated. Milk, saliva, and food particles were observed flowing from both nostrils. A firm mass was palpated in the caudal cervical region; it was most prominent on the left side of the neck but could also be palpated on the right side. Because the mass appeared to be lodged crossways in the esophagus, endoscopic retrieval was determined to be impossible. Therefore, the decision was made to surgically remove the mass.

TREATMENT AND CLINICAL COURSE

Before surgery, the foal was intravenously administered fluids (2 L of Ringer’s acetate), sodium penicillin (16 mg/kg), and flunixin meglumine (0.6 mg/kg). To facilitate intraoperative identification of the esophagus, a nasogastric tube was passed as far as the obstruction and secured to the foal’s halter with tape.

The foal was premedicated with xylazine (1.1 mg/kg IV). Anesthesia was induced with ketamine hydrochloride (2.2 mg/kg IV) and maintained with isoflurane delivered in oxygen, and the foal was allowed to breathe spontaneously. The foal was positioned in dorsal recumbency, and the ventral aspect of the cervical region was prepared for surgery. A 12-cm ventral midline incision was made, extending cranially from the thoracic inlet (Figure 1). The incision was continued through the subcutaneous tissue to expose the paired sternomandibular and sternohyoid muscles. Dissection was continued between the muscle bellies on the midline until the trachea was reached. With the use of moist sponges and a wound retractor, the trachea and the left carotid artery were gently retracted to the right and left sides, respectively. Blunt dissection was used to isolate the esophagus, and a 3-cm longitudinal incision was extended into the esophageal lumen just cranial to the obstructing mass. A triangular, 3 × 5-cm foreign body of 3-mm-thick hard plastic was removed from the esophagus with a pair of Ochsner forceps (Figure 2). Inspection of the mucosa revealed no signs of mucosal damage at the site of obstruction. The mucosa and submucosa were sutured with 2-0 polyglactin 910 suture in a simple, continuous pattern with the knots tied in the esophageal lumen. The muscular layer was closed using the same suture material in a

*A case commentary begins on page 150.
simple, continuous pattern. A fenestrated rubber drain was placed adjacent to the esophagus and allowed to exit through a stab incision just caudal to the skin incision. The ventral neck muscles, subcutaneous tissue, and skin were then closed routinely.

Sodium penicillin (16 mg/kg q12h IV) and flunixin meglumine (0.6 mg/kg q24h IV) were administered for 5 days after surgery. The foal was allowed to suckle and eat without restriction. The rubber drain was removed 2 days after surgery. Five days after surgery, the foal was discharged from the hospital. Owner instructions included stall confinement until suture removal 7 days after discharge, followed by daily access to a paddock. The owner was encouraged to pay special attention to signs of postoperative infection of the surgical site or recurrence of esophageal dysfunction.

At a telephone follow-up 3 months after surgery, the owner reported that the incision had healed uneventfully and the foal had not shown signs of esophageal dysfunction during the convalescence period.

**DISCUSSION**

Intraluminal obstruction is the most common esophageal condition in horses, with both feed impaction and foreign body obstruction being reported.\(^1\)\(^6\) Pieces of wood, wire, fishing tackle, nasogastric tube fragments, rubber balls, firmly compacted feed material, and medication boluses have been identified as obstructive foreign bodies.\(^1\)\(^2\)\(^5\)\(^7\)\(^9\) Iatrogenically induced esophageal obstruction by broken-off nasogastric tube fragments has been described in both a 3-month-old and 5-month-old foal; in these cases, the obstruction was alleviated by gastrotomy and manipulation through laparotomy followed by endoscopic retrieval, respectively. However, to my knowledge, there are no published reports of noniatrogenic esophageal foreign body obstruction in young foals. According to the owner in the case presented here, the obstructing foreign body originated from the edge of a plastic manger on which the foal tended to chew.

The technique for obtaining surgical access to the cervical esophagus for foreign body removal depends on the anatomic location of the obstruction.\(^7\) A ventral approach is recommended for obstructions involving the cranial third of the cervical esophagus, whereas a ventrolateral approach affords better access to the middle and caudal thirds of the cervical esophagus.\(^5\) Previous case reports on the surgical treatment of cervical obstructions in adult horses used a ventrolateral approach.\(^7\)\(^8\)\(^10\) In the present case, a ventral approach was used to gain access to the caudal part of the cervical esophagus, and no difficulties were experienced in reaching the esophagus and performing the esophagotomy. A positive contributing factor was that the caudoventral cervical musculature is less heavily developed in young foals than in adult horses, making the ventral approach to the caudal part of the cervical esophagus less complicated in young foals.

After esophageal surgery, it is generally recommended that feed be withheld for 48 hours, followed by 9 days of providing a pelleted feed in a slurry.\(^11\) However, because of the young age of the foal in this report, withholding and controlling feed were considered impractical. No adverse effects of this postoperative approach were observed.

Potential complications after esophagotomy include infection, dehiscence, stricture formation, development of a traction diverticulum, and laryngeal hemiplegia.\(^1\)\(^5\)
The risk for development of these postoperative complications is influenced by the presence of esophageal wall necrosis, contamination during surgery, and poor surgical technique. In this case, the relatively sharp foreign body did not seem to have damaged the esophageal mucosa, and no signs of infection were observed after surgery. At follow-up, the foal did not show signs of esophageal dysfunction.

REFERENCES

Anatomy and Physiology of the Equine Esophagus and Their Relevance to Disease

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Certain aspects related to the anatomy of the esophagus are important when a clinician considers surgical intervention to address esophageal problems. First, several vital structures (e.g., common carotid artery, vagosympathetic trunk, recurrent laryngeal nerve) run dorsolateral to the esophagus. Surgical approaches to the esophagus must avoid these structures. Except for its abdominal portion, the esophagus lacks a serosal layer. In other segments of the gastrointestinal tract, the serosa plays an important role in wound healing by promoting formation of the fibrin seal, thus allowing rapid closure of any defects that might occur. The lack of the serosal layer in the cervical esophagus is likely to play a role in the healing of surgical incisions or traumatic injuries.

The blood supply of the cervical esophagus is derived from the inferior thyroid artery via the carotid artery, whereas the blood supply for the thoracic esophagus comes from the bronchial arteries and the aorta. The abdominal portion of the esophagus is supplied by branches of the left gastric artery and inferior phrenic artery. Although the accepted dogma stipulates that the esophagus lacks extensive collateral circulation, which may adversely affect healing of surgical incisions, recent human studies have clearly shown that the esophagus has a rich intramural vasculature. In addition, long segments of esophagus detached from the segmental blood supply have been successfully used in reconstructive surgery without losing their viability. These observations suggest that a rich intramural arterial and venous network complements the segmental blood supply of the esophagus. These findings also suggest that research should be conducted to more fully characterize the mural vascular anatomy of the equine esophagus with particular regard to surgical procedures requiring mobilization or resection of portions of the esophagus.

The structural anatomy of the esophagus plays an important role in the surgical decision-making process. Of particular interest is that, at least in dogs, the submucosa is the suture-holding layer of the esophagus.
This has implications in the closure of esophageal incisions or performance of anastomosis procedures, which should be completed in two layers: the inner elastic mucosal–submucosal layer, followed by the outer muscular layer. Further considerations regarding closure of esophageal incisions include the use of either nonabsorbable or long-lasting absorbable suture material to optimize incisional healing. To reduce contamination of the suture tracts with ingesta, the use of braided suture material is not recommended.

The proximal two-thirds of the esophagus contain two helical layers of striated muscle, whereas the distal one-third is composed of smooth muscle. This anatomic distinction is important for pharmacologic manipulations of esophageal contractions in cases of esophageal obstruction. Atropine decreases contractions in the smooth muscle segment of the esophagus, thereby abolishing peristalsis, whereas it has no effect on the striated muscles in the more proximal portion of the esophagus, where most impactions occur. In contrast, oxytocin (0.11 to 0.22 IU/kg IV) may be used to decrease esophageal pressure in the proximal esophagus.7 Lidocaine (50 to 100 ml via nasogastric tube) may also be used intraluminally to relax the esophagus at the level of the obstruction.

Esophagotomy may be necessary to remove some foreign bodies or for persistent feed obstructions.8 Preoperative preparation of the patient and the surgical approach are described well in the accompanying case report. If the obstruction is caused by feed material, it may be advantageous to attempt to relieve the obstruction with the patient under general anesthesia. With this technique, a large endotracheal tube should be placed in the esophagus just proximal to the obstruction and the cuff inflated. A nasogastric tube should then be advanced within the endotracheal tube. The nasogastric tube should then be used to perform gentle, pulsatile lavage of the obstructed area with a mixture of warm water and carboxymethylcellulose. Frequent endoscopic evaluations allow clinicians to monitor the progress of the procedure, evaluate breakdown of the impaction, and anticipate trauma to the esophageal mucosa.9

In some cases, such as the one reported here, conservative means are not adequate to restore esophageal patency because either the obstructing material is solid and lodged or further attempts to move the obstruction distally would damage the esophagus. In such cases, esophagotomy may be necessary. When it is, clients should be forewarned about the possibility of certain postoperative complications, which are largely related to the anatomy and physiology of the esophagus, the degree of mucosal damage caused by the obstructing mass, and surgically induced trauma.

REFERENCES