How to Provide Nutritional Support Via Esophagostomy

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Esophagostomy is an alternative way to feed horses with anorexia or dysphagia. A simple surgical procedure is required and inexpensive diets can be administered, but severe complications can occur. Esophagostomy is justified when tube feeding is needed for prolonged periods. Gradual introduction of the diet is critical to prevent complications. Author’s address: Marion duPont Scott Equine Medical Center, Virginia-Maryland Regional College of Veterinary Medicine, Leesburg, VA 20177. © 2001 AAEP.

1. Introduction

Poor appetite and inability to eat are common features of many diseases. These conditions can rapidly lead to malnutrition, which is known to compromise immune function and wound healing. Nutritional support is a major part of the treatment of sick horses unable to meet their nutritional requirements by feed ingestion. Nutritional support can be lifesaving, or at least it may contribute to a speedier recovery, discharge from the hospital, and return to normal activity. If appetite is present but oral feeding is not possible, nutritional support may also contribute to the patient’s welfare simply by reducing the unpleasant sensation of hunger. Parenteral nutrition can be used in horses, but expensive sterile admixtures containing pure nutrients are required, and complications are not rare. In human medicine it is currently recommended to avoid parenteral nutrition whenever the patient can be fed by the enteral route in order to reduce morbidity, mortality, and costs. Some particularities of the horse such as its gastrointestinal tract being adapted to frequent meals of vegetal fiber, its complex gastrointestinal ecosystem and its large body size make it even more appealing to opt for the enteral route in order to avoid complication and minimize cost. For a few days it is possible to use a large-bore nasogastric tube to administer a slurry of commonly used horse feed including a significant amount of fiber. However, the tube would cause lesions in the upper airways if used for a longer period. A small-bore nasogastric tube can be safely used for prolonged periods. However, due to its small diameter it is difficult to administer any diet other than commercial liquid products, which are more expensive than homemade slurries and do not contain fiber. Another way to administer enteral nutrition is via esophagostomy. This procedure permits long-term administration of slurries via a large-bore tube inserted directly in the cervical esophagus and the upper airways are not disturbed. There are only a few reports of the use of esophagostomy in the horse, and experimentally it has been shown to be possible to feed horses with this technique for as long as 30 days. However, complications such as extensive periesophageal infection, laryngeal hemiplegia, colic, and laminitis have been reported. The pur-
pose of this article is to present some practical guidelines on how to create an esophageal stoma and use an esophagostomy tube for long-term enteral nutrition.

2. Materials and Methods

Patient Selection
A relatively normal gastrointestinal tract able to support enteral fluid therapy and nutrition is absolutely required. Conditions such as adynamic ileus and complete gastrointestinal obstruction preclude the use of enteral nutrition. Since esophagostomy is an invasive procedure and severe complications can occur, it should only be performed if the horse is not expected to be able to eat for more than one week. If tube feeding is expected to be necessary for just a few days, nasogastric feeding is preferred.

Surgical Approach
Several factors have to be considered before choosing the site to create the esophageal stoma. To minimize the risk of mediastinitis due to descending periesophageal infection, it seems reasonable to create the esophageal stoma as far as possible from the thoracic inlet. In most cases the author prefers to do it in the middle of the neck, but it can be performed at any point of the neck. If the esophagostomy is going to be performed because of an esophageal lesion it is better to do it immediately caudal to the lesion. To decide on which side of the neck the stoma should be created, esophageal location has to be verified. In most horses, at the middle of the neck the esophagus runs on the left side of the thoracic inlet. With a nasogastric tube in place, cervical palpation and ultrasonographic and radiographic examination will reveal the exact location of the esophagus. In cases of esophageal obstruction it might be impossible to pass the nasogastric tube, but the distention produced by the obstruction will help to localize the esophagus. The esophagus can be approached either by an incision in the ventral midline or just ventral and parallel to the jugular vein on the same side of the esophagus. Less tissue dissection is necessary for the ventrolateral approach. This approach also allows a better fit for the external part of the tube avoiding displacing the trachea laterally, which would occur with the ventral approach.

Stoma Creation and Tube Insertion
Surgery can be performed with the horse under general anesthesia, but in most cases it can be easily performed with the horse standing restrained in stocks. After sedative administration (e.g., detomidine 0.01–0.02 mg/kg IV), local anesthetics (e.g., 2% mepivacaine 20 ml) are injected in the subcutaneous and in the deeper connective tissue which is continuous with the esophageal adventitia. A 7–10 cm skin incision is made with a scalpel blade in the ventral midline (for the ventral access) or just ventral and parallel to the left jugular vein (for the ventrolateral access). Blunt dissection of the subcutaneous tissue and deep fascia is made with a hemostat to expose the esophageal adventitia. An Allis forceps can be used to grasp and pull the esophagus, although major disruption of the peri-esophageal tissue to maximize exposure should be avoided. It is also recommended to avoid any trauma to the region located dorsolaterally to the esophagus where the recurrent laryngeal nerve runs. A longitudinal incision approximately 2 cm long is made with a scalpel blade in the adventitia and muscular layers of the esophagus to expose submucosa and mucosa. The mucosa can be grasped with an Allis forceps, and a longitudinal incision with the minimal length required for tube insertion is created with scissors. After applying a lubricant (e.g., K-Y jelly) the tube is inserted into the caudal part of the esophagus. The tube tip can be
positioned either in the caudal esophagus or in the stomach. The distance between the stoma and the 13th rib, which corresponds to the distance between stoma and cardia, is measured externally to determine the length of tube to be inserted. However, an endoscope passed through the esophageal stoma provides a more precise measurement of the distance between stoma and cardia. In most 400–500 kg horses the distance from the stoma to the cardia is going to be about 100–150 cm. Some authors recommend that the tube tip should be positioned in the stomach, which is believed to reduce the incidence of tube dislodgement. However, this approach is associated with reflux of gastric content around the tube. It is also possible that the tube could cause mucosal damage in the cardia after prolonged use, although this complication has not been reported. To avoid gastric reflux and damage to the cardia, the author prefers to maintain the tube tip in the caudal esophagus by inserting a segment 10 cm shorter than the distance between the stoma and cardia. The external part of the tube should be fixed to the neck and halter with bandages and tape.

Diet

The daily nutritional requirements can be estimated based on requirements for maintenance, and the calculated amount of energy is likely to be sufficient to maintain body condition. The nutritional requirements for sick horses have not been investigated, but it has been recommended that horses with a severe condition such as sepsis be fed 0.88–1.20 times the amount of energy required for maintenance. A slurry based on commercial pelleted feed is the less expensive diet. To minimize slurry viscosity the pelleted feed can be ground to make a fine powder. This will reduce the amount of water required to pass the slurry and help to prevent tube clogging. Vegetable oil (e.g., corn, soybean) can be used as an additional source of energy. If the pelleted feed is poor in fiber, a source of fiber such as ground alfalfa hay or pelleted alfalfa can be added, but the viscosity of the slurry will limit the amount of fiber to be administered. Alfalfa hay is also a good source of protein and calcium. Vitamin and mineral supplements should be included to fulfill the daily requirements. In most cases the daily requirements of water (60–80 ml/kg) will be exceeded since a large volume of water is required to administer the meals, although more fluids can be administered by the tube between meals if necessary.

Adaptation to the Diet

Gradual introduction of the diet is recommended to allow the gastrointestinal tract to adapt. This is particularly important in horses that have been fasted for several days. One third of the calculated daily meal administered during the first 24 hours may be safe. The amount of feed should be gradually increased until the calculated daily diet is achieved in 3 to 5 days.

Feed Administration

The daily diet should be divided into several small meals (at least 4) because the horse evolved eating frequent small meals and has a relatively small stomach. To avoid excessive gastric distention no more than 10 l should be administered at once, and a considerable volume of water is usually necessary to pass the slurry. Feed is administered by gravity through a big funnel, which can be made by cutting the bottom of a plastic gallon jug (e.g., empty milk jug). The slurry is a suspension and sedimentation may cause tube clogging. While administering the slurry the funnel should be shaken to prevent sedimentation. To relieve tube clogging a pump can be used, but it may be necessary to remove the tube. Passing a small volume of water (0.5 l) to clear the tube after administering each meal and keeping the tube capped are also recommended to prevent tube clogging. Horses that are unable to stand should be kept in sternal recumbency to reduce the risk of reflux and aspiration.

Daily Care and Treatment Monitoring

Treatment with antibiotics (e.g., potassium penicillin 22000 UI/kg IV q 6 h and gentamicin 6.6 mg/kg IV q 24 h) should be continued for 7–10 days to minimize the risk of severe periesophageal infection. After one week granulation tissue will have formed and severe infection is unlikely to occur. The wound should be cleaned at least once every day with clean water and gauze. The wound and the neck should be carefully evaluated for signs of severe infection (swelling, pain, purulent secretion, malodor). Frequent monitoring of rectal temperature, hydration status, and plasma electrolytes is also recommended. If the tube needs to be replaced because it had been removed by the horse or to relieve a clog, special attention is recommended to ensure that it is properly inserted into the esophagus, but not in the submucosal or periesophageal space. This risk is particularly high in the first few days; the mucosa can be grasped with Allis forceps to open the stoma and facilitate tube insertion. After 7–10 days a tunnel of granulation tissue will be present, sealing the periesophageal and submucosal spaces. At that time tube reinsertion may be easier, however, wound contraction will occur very fast and a few hours after tube removal, it may be impossible to reinsert the tube. In this case progressive dilation of the stoma with instruments of different calibers is indicated. At least during the first week changes in body weight and body condition are not good indicators of nutritional status. Since the amount of fiber administered via esphagostomy is relatively small in a horse that had just stopped eating, a significant reduction in
gastrointestinal content is expected, which will reduce body weight. On the other hand, in a dehydrated horse, restoration of body water will contribute to weight gain. In a chronic case feeding is not going to immediately stop the catabolic response triggered by starvation and disease, and loss of body weight and body condition could still be seen after a few days of appropriate nutritional support.

Treatment Termination

Clinical evaluation will indicate the appropriate moment for tube removal. The horse’s appetite and ability to eat can be evaluated by temporarily removing the tube and offering feed. If necessary the tube can be reinserted and oral feeding can be tried again a few days later. Careful reintroduction of oral feeding is recommended. For at least one week dry feed such as hay and grain should be avoided to prevent esophageal impaction. A mash with the same ingredients but less water than the slurry is a good option. However, soaked pelleted feed and fresh grass seems appropriate in most cases. Immediately after tube removal a significant amount of feed may leak through the esophageal stoma after swallowing, but this leakage is usually of no consequence. A bandage covering the stoma can be used to prevent feed leakage. Maintaining feed at the level of the shoulder or even higher, forcing the horse to eat with its head elevated, also minimizes feed loss. Stoma contraction will occur quickly and after 1 or 2 days feed leakage is minimal. In most cases healing is complete after 2 weeks. However, if the tube had been kept for a long period (several weeks) healing may be delayed because granulation tissue will be more mature and fibrotic and contraction will be slower. In these cases curretage of the fistula may contribute to a speedier healing.

3. Results and Discussion

As examples, 5 clinical cases fed via esophagostomy are presented in Table 1. In all but the horse with esophageal impaction it was obvious at admission that they would benefit from extraoral feeding and esophagostomy was planned. In the horse with esophageal impaction an esophagotomy was performed caudally to the obstruction and the impacted mass was removed with a sponge forceps. However, it was thought that it would be beneficial to rest the esophagus, which looked severely damaged, and an esophagostomy tube was inserted. The author is unaware of any reports of horses fed by esophagostomy for a long period as performed in the mare with mandibular fracture (35 days) (Fig. 1). The experimental use of esophagostomy in normal horses for 30 days had been the longest period reported yet.6

In the first few days after surgery, inflammation in the region of the esophagostomy should be expected as a normal response to surgical trauma. One week after surgery granulation tissue can be seen in the wound, and its contraction will reduce the size of the stoma. At 7–10 days after surgery, pruritus is commonly seen, and the horse may remove the tube while rubbing its neck. Inappropriate placement of the tube in the submucosal or periesophageal space has been reported6 and has to be avoided by careful tube reinsertion. Soft feces, polyuria, and clear urine are commonly seen during tube feeding due to the large volume of water administered. The small amount of fiber in the diet can further explain the reduced consistency of feces.

Abrupt administration of a large amount of grain based diet or abrupt changes in diet composition can lead to gastrointestinal dysfunction such as tympany, colic, and diarrhea.3 These complications can be avoided by gradual introduction of the diet. Stoma healing is usually uneventful, although it may be slower if the tube was kept for a prolonged period. A traction diverticulum commonly forms in the esophagus at the site of the stoma, but it is usually harmless.5 Severe periesophageal infection had been reported previously,6 which can lead to marked swelling of the neck, depression, anorexia, fever, leukocytosis, and elevated plasma fibrinogen. Infection can spread caudally due to

Table 1. Signalment, Primary Disease, Surgical Access, and Outcome of 5 Horses with Dysphagia Fed by Esophagostomy

<table>
<thead>
<tr>
<th>Identification</th>
<th>Disease</th>
<th>Approach to Esophagus</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case 1</td>
<td>Tetanus</td>
<td>Ventral, middle of the neck</td>
<td>Muscular stiffness remitted, tube removed after 16 days</td>
</tr>
<tr>
<td>Horse, 10 yr</td>
<td>Mare, 8 yr</td>
<td>Ventral, middle of the neck</td>
<td>Periesophageal infection, mediastinitis, death after 6 days</td>
</tr>
<tr>
<td>Case 2</td>
<td>Pharyngeal paralysis and cachexia</td>
<td>Ventrolateral, middle of the neck</td>
<td>Worsening of tetanus, euthanasia after 3 days</td>
</tr>
<tr>
<td>Colt, 1 yr</td>
<td>Tetanus</td>
<td>Ventrolateral, Transition from middle to caudal third of the neck</td>
<td>Normal deglutition, tube removed after 15 days</td>
</tr>
<tr>
<td>Case 3</td>
<td>Esophageal impaction</td>
<td>Ventrolateral, middle of the neck</td>
<td>Fracture healed, tube removed after 35 days, laryngeal hemiplegia</td>
</tr>
<tr>
<td>Case 4</td>
<td>Bilateral mandibular fracture</td>
<td>Ventrolateral, middle of the neck</td>
<td></td>
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<tr>
<td>Mare, 4 yr</td>
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*Extensive dissection of periesophageal tissues was performed.
*Fed via nasogastric tube for 3 days before esophagostomy was performed. Total duration of tube feeding was 38 days.
gravity and lead to septic mediastinitis, which is a life-threatening condition. Minimal dissection of the periesophageal tissue and prophylactic antibiotic therapy are recommended to prevent periesophageal infection. If severe periesophageal infection develops aggressive antibiotic therapy and drainage are indicated. Laryngeal hemiplegia is a commonly reported complication attributed to damage to the recurrent laryngeal nerve while creating the esophagostomy.\textsuperscript{5,6} Surgery can be performed to overcome this complication, but careful surgical technique to minimize periesophageal trauma and preserve the recurrent laryngeal nerve cannot be neglected.

Esophagostomy is a good option for selected cases such as horses with a normal gastrointestinal tract that will not be able to eat for more than one week. Esophagostomy can be used as the sole route for nutrition for prolonged periods with relatively low costs, and helps to keep the gastrointestinal tract functioning and healthy. It seems more appropriate to use the ventrolateral approach for esophagostomy and position the tube tip in the caudal esophagus. Minimal periesophageal dissection and gradual introduction of the diet are critical to prevent complications. Careful patient selection and client communication are mandatory since severe complications can occur.

References and Footnote


"Lopes MAF, White NA. Parenteral nutrition for horses with gastrointestinal disease: A retrospective study of 79 cases. Equine Vet J, in press."