ARS VETERINARIA, Jaboticabal, SP, v.41, n.4, 098-103, 2025. ISSN 2175-0106
DOI: http://dx.doi.org/10.15361/2175-0106.2025v41n4p98-103

TREATMENT OF ESOPHAGEAL OBSTRUCTION IN HORSES USING AN ALTERNATIVE SURGICAL TECHNIQUE TO ESOPHAGOTOMY

DESOBSTRUÇÃO ESOFÁGICA EM EQUINO UTILIZANDO TÉCNICA CIRÚRGICA ALTERNATIVA À ESOFAGOTOMIA

F. M. CAJU[1]; H. RIZZO[2*]; E. S. DA SILVA[3]; E. B. ASSIS JUNIOR[3]; M. G. OLIVEIRA[1]; N. M. S. AZEVEDO[4]; S. R. F. ARAÚJO[2]

SUMMARY

Esophageal obstruction in horses can be associated with factors of primary (food impaction) or secondary (tumors, abscesses) origin. Surgical treatment of primary cases is generally performed by esophagotomy. However, this technique has a high incidence of wound dehiscence, stenosis, and other post-surgical complications. This report aims to describe the surgical treatment, without esophagotomy, of esophageal obstruction caused by a mango pit in a horse. The diagnosis was established based on the association of history, physical examination, nasogastric intubation, radiography, and endoscopy. Due to the impossibility of displacing the foreign body using a nasogastric tube, a surgical procedure was indicated. With the animal in a standing position, sedated and under local anesthesia, the esophageal region was accessed through an incision in the cranial third of the ventrolateral cervical region. Proximal to the obstruction site, 10 mL of 50% propylene glycol was injected into the esophageal lumen, cranial to the foreign body, to promote lubrication. Afterward, successive "milking" movements were performed in a cranial direction on the distal portion of the obstructed segment until the seed reached the oral cavity, from where it was manually removed. Five days after the procedure, the animal died, and necrotizing esophagitis, gastric ulcers, and aspiration pneumonia were observed. The surgical technique used is viable, however the prognosis regarding life and function depends on the duration of the obstruction, the occurrence of aspiration, and the involvement of important organs.

KEY-WORDS: Aspiration pneumonia. Dysphagia. Esophagitis. Horses. Mango pit.

RESUMO

A obstrução esofágica em equinos pode estar associada a fatores de origem primária (compactação por alimentos) ou secundária (tumores, abscessos). O tratamento cirúrgico das obstruções primárias geralmente é realizado por meio de esofagotomia; no entanto, apresenta alta incidência de deiscência de pontos, estenose e outras complicações pós-cirúrgicas. O objetivo deste relato é descrever o tratamento cirúrgico empregado, sem esofagotomia, de obstrução esofágica causada por semente de manga em um equino. O diagnóstico foi feito por meio da associação do histórico clínico, exame físico, sondagem nasogástrica, radiografia e endoscopia. Devido à impossibilidade de deslocar o corpo estranho por meio de sonda nasogástrica, optou-se por realizar procedimento cirúrgico. Com o animal em estação, sedado e com anestesia local, a área do esôfago foi acessada por meio de incisão no terço cranial da região cervical ventrolateral. Acima do local da obstrução, foram injetados 10 mL de propilenoglicol a 50% no interior do órgão, cranial ao corpo estranho, visando à lubrificação. Em seguida, foram realizados sucessivos movimentos de "ordenha" em sentido cranial na porção distal do segmento obstruído, até que a semente chegasse à cavidade oral, de onde foi retirada manualmente. Cinco dias após o procedimento, o animal veio a óbito e foram observadas esofagite necrosante, úlceras gástricas e pneumonia aspirativa. A técnica cirúrgica utilizada é viável, porém o prognóstico quanto à vida e à função depende do tempo de obstrução, da ocorrência de aspiração de conteúdo e do envolvimento de órgãos importantes.

PALAVRAS-CHAVE: Cavalos. Disfagia. Esofagite. Pneumonia aspirativa. Semente de manga.

[1] CITEQUIM Hospital de Cavalos, Paudalho, PE, Brasil.
[2] Departamento de Medicina Veterinária (DMV), Universidade Federal Rural de Pernambuco (UFRPE), Recife, PE, Brasil.
[3] Programa de Pós-Graduação em Ciência Animal (PPGCAN), Universidade Federal da Paraíba (UFPB), Areia, PB.
[4] Departamento de Ciência Veterinária (DCV), Centro de Ciências Agrárias (CCA), Universidade Federal da Paraíba (UFPB), Areia, PB, Brasil.

Submetido: 24/02/2025 Aprovado: 16/12/2025

INTRODUCTION

Esophageal obstruction is the most common disease of the equine esophagus, followed by strictures, ulcers, ruptures, diverticula, and megaesophagus. It is classified as primary when caused by intraluminal impaction (grains, pelleted feed, hay, straw, tree bark, fruits, seeds, and vegetables) or as secondary when associated with dental problems that lead to inadequate chewing, as well as tumors, abscesses, scars, or external causes, such as neuromuscular disorders (CHIAVACCINI; HASSEL, 2010; OROZCO et al., 2011; BEZDEKOVA; JANALLIT, 2016; PINTO, 2017; LOVO et al., 2023).

It is an emergency condition that can lead to consequences if resolution is delayed, due to the pressure of the obstructive material on the esophageal mucosa, causing tissue damage and the consequent formation of scars, stenosis, or perforation. The horse's attempts to feed or hydrate predispose it to the occurrence of aspiration pneumonia, as well as dehydration and acid-base and electrolyte imbalances, leading to kidney failure. It may also be associated with laminitis, phlebitis, laryngeal paralysis, Horner's syndrome, and death (FEIGE et al., 2000; MUELLER; MONROE, 2008; KOENIG et al., 2016; LOVO et al., 2023). The initial clinical sign is dysphagia for liquids and solids, causing coughing, reflux of food contents, and thick bilateral rhinorrhea containing food particles (FEIGE et al., 2000; CHIAVACCINI; HASSEL, 2010).

The diagnosis is made based on the association of clinical examination, to identify the site of the occlusion, with better clarification as to the type of foreign body through the passage of a nasogastric tube, radiography, ultrasonography, and/or endoscopy of the airways and esophagus (BEZDEKOVA; JANALIT, 2018).

Conservative treatment can be carried out by probing to dislodge the material and by administering analgesics, anti-inflammatory agents, and smooth muscle relaxants (PINTO, 2009). Surgical treatment is performed by esophagotomy, but it has a high incidence of post-surgical complications, resulting in the need for esophagostomy and/or wound healing by secondary intention (KRUGER; DAVIS, 2013; ROSSI et al., 2022).

Considering the importance and complexity of cases of esophageal obstruction in equine medicine, the objective was to describe the surgical treatment of a case caused by a mango pit (*Mangifera indica*) removed through lubrication and “milking” of the esophagus, thus avoiding esophagotomy.

CASE REPORT

A male horse, 14 years old, mixed breed, weighing 370 kg, used for riding, was admittedon February 7, 2023, at the Large Animal Ambulatory of the University Veterinary Hospital, Department of Veterinary Medicine, Federal Rural University of Pernambuco (LAA/HVU/DMV/UFRPE), Recife, PE, with complaints of rhinorrhea with thick secretion with food particles, ptyalism and dysphagia for three days. During the anamnesis, the owner reported that four days earlier, the animal had ingested some mangoes (*Mangifera indica*) available on the pasture's soil where it is raised.

During the physical examination, the horse remained calm and in standing position, presenting a body condition score of 2 (1 to 5), bilateral seromucosal rhinorrhea (Figure 1A), congested ocular mucous membranes, capillary refill time of three seconds, thoracoabdominal breathing, rales on pulmonary auscultation on the left side, heart rate of 62 bpm, respiratory rate of 16 mpm, body temperature 37.6°C, dehydration estimated at 8% by the neck skin folding, and intestinal hypomotility. Upon inspection and external palpation of the cervical region of the esophagus, a slight volume increase was noted in the left antimere, above the jugular groove in the cranial third of the neck. During nasogastric probe, resistance and impossibility of passage through the region were noted, confirming the presence of the mango pit by radiographic examination (Figure 1B).

The clinical protocol began with intravenous hydration (IV) with 40 liters of 0.9% sodium chloride (NaCl) solution to correct dehydration, associated with 1 liter of multivitamin, flunixim neglumine at 1.1 mg/kg/IV every 24 hours for three days, benzathine penicillin 30,000 IU/kg intramuscularly (IM), every 48 hours, totaling three applications. After correction of dehydration, a blood count was performed [red blood cells: 6.06x106 mm^3, hematocrit: 29%, MCV: 47.85fL, leukocytes: 4.35x10^3 µL, with 44% (1,914 µ) segmented neutrophils, 47% (2,045µ) lymphocytes and 9% (392µ) monocytes] showing values within normal limits, and biochemical examination with normal values of total protein (8.8 g/dL) and increased fibrinogen (600 mg/dL) (PADILHA et al., 2017).

The following day, an endoscopy was performed under sedation with 1% detomidine hydrochloride (0.01 mg/kg IV), and pink mucosa was observed cranial to the obstruction. Once the diagnosis was confirmed, it was decided to perform a surgical procedure, which was performed with the horse in a standing position, restrained in a chute, and sedated with 1% detomidine hydrochloride (0.01 mg/kg IV). After the animal relaxed, a McPherson speculum was installed. A wide area was surgically prepared in the left ventrolateral cervical region, and line local anesthesia was performed above the jugular groove in the cranial third of the neck with 10 mL of 2% lidocaine hydrochloride without vasoconstrictor. Then, an incision was made in the skin, approximately 10 cm, between the anesthetic infiltration line and the jugular groove (Figure 1C).

The sternocephalic and brachiocephalic muscles were bluntly dissected until the esophagus was safely palpated, taking care not to compress the vagus nerve and jugular vein. With the esophagus stabilized between the surgeon's thumb and index fingers, the organ was probed with a number 15 nasogastric tube up to the point of obstruction to facilitate the insertion of a number 14 catheter into the esophageal lumen, passed cranially to the mango pit, to avoid aspiration of the esophageal lubrication solution. With the catheter in position, a syringe containing 10 mL of a 50% propylene glycol solution diluted in warm 0.9% NaCl was attached, which was slowly injected cranial to the point of obstruction to lubricate the region. With the solution in the esophageal lumen, the organ was massaged

to lubricate the foreign body better, and then successive "milking" movements were performed, with the tips of the thumb and index finger in a cranial direction in the distal portion of the obstructed segment, displacing the mango pit towards the oral cavity until it was possible to remove it through the mouth (Figure 1D) manually. As the mango pit moved, the nasogastric tube was removed. The suture of the muscles in the region was performed using a simple interrupted pattern, associated with dead space reduction (polypropylene 1) and skin suture (nylon 0). After removing the foreign body, a new endoscopy was performed to inspect the esophageal mucosa, and a greenish and slightly blackish color was noted at the point of obstruction.

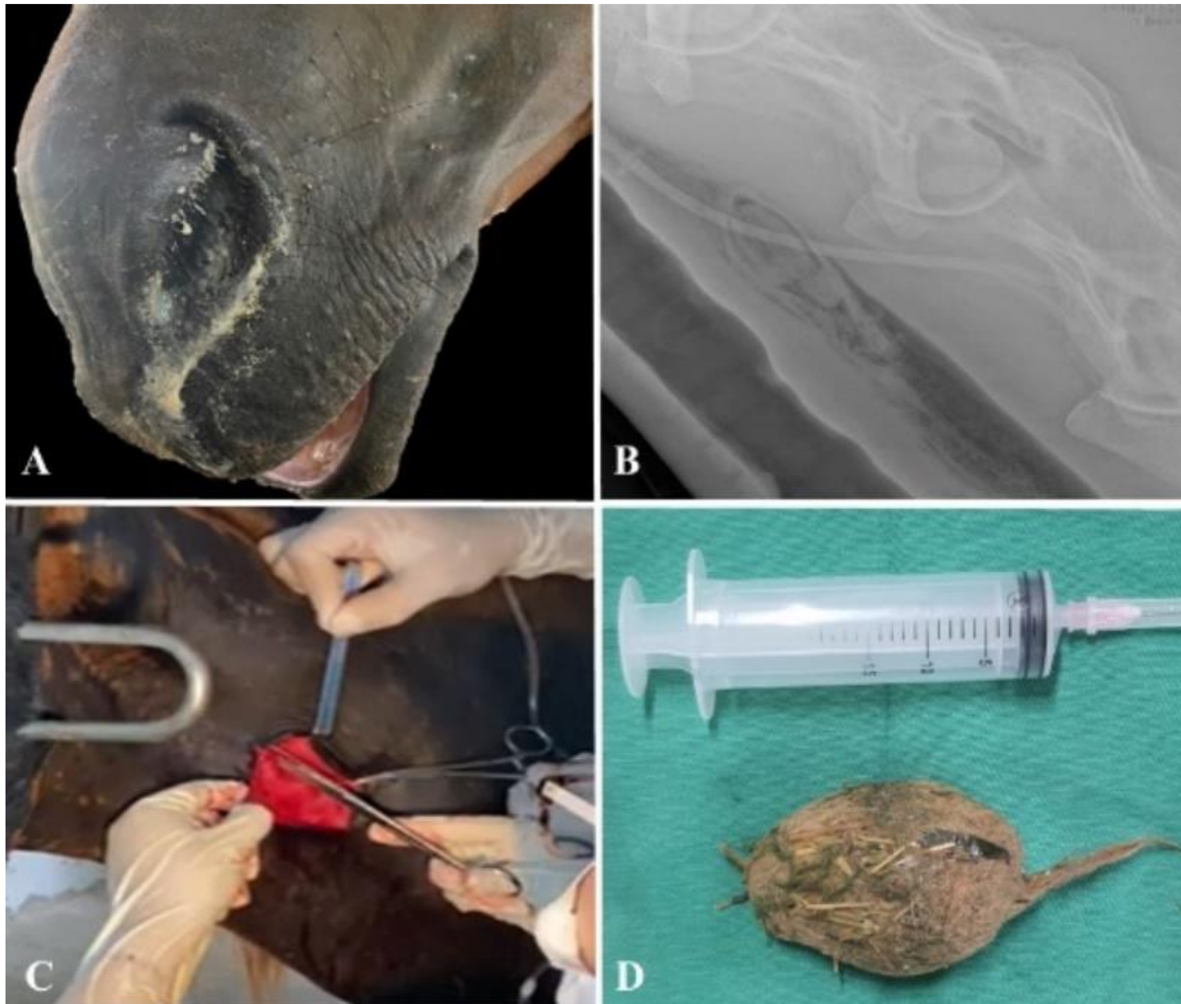

Figure 1 – Clinical and surgical management of a horse with esophageal obstruction caused by a mango pit (*Mangifera indica*). (A) Bilateral seromucous rhinorrhea. (B) Radiograph of the cranial third of the cervical esophagus demonstrating the presence of a foreign body. (C) Skin incision performed to access to the site of esophageal obstruction. (D) Mango pit (*Mangifera indica*) removed from the esophagus after lubrication and "milking".

On the first postoperative day, liquid enteral nutrition was administered, with four liters of crushed elephant grass mixed with water, offered twice a day after the insertion of nasogastric tube. On the third day after the surgery, the animal began to present purulent rhinorrhea mixed with saliva through the nostrils and mouth, in addition to dehydration, ptyalism, and regurgitation when trying to ingest food, which gradually intensified until the animal died on the fifth postoperative day.

At necropsy, an extensive blackish area was observed on the pleural surface of the left lung, from the caudal to the medial lobe, and a whitish area on the pleural surface of the medial lobe (Figure 2A). When this organ was cut, foamy, hemorrhagic content, and an area of purulent focus were observed. In the trachea, the edematous adventitial layer was observed, and after opening it, foamy liquid and food were observed (Figure 2B). There was serosanguineous and food content in the esophageal lumen, with an area of extensive desquamation in the proximal cervical third, characterizing extensive severe necrotizing ulcerative esophagitis with the presence of food content in the adventitial layer (Figure 2C). Ulcers with multifocal coalescent areas in the stomach were observed predominantly in the nonglandular region and margo plicatus (Figure 2D). In the heart, extensive multifocal areas of petechiae and ecchymoses were observed in the epicardium and endocardium, showing pericarditis and hemorrhagic endocarditis (Figure 2E and 2F). Necropsy findings indicated that the animal died from respiratory failure caused by aspiration bronchopneumonia.

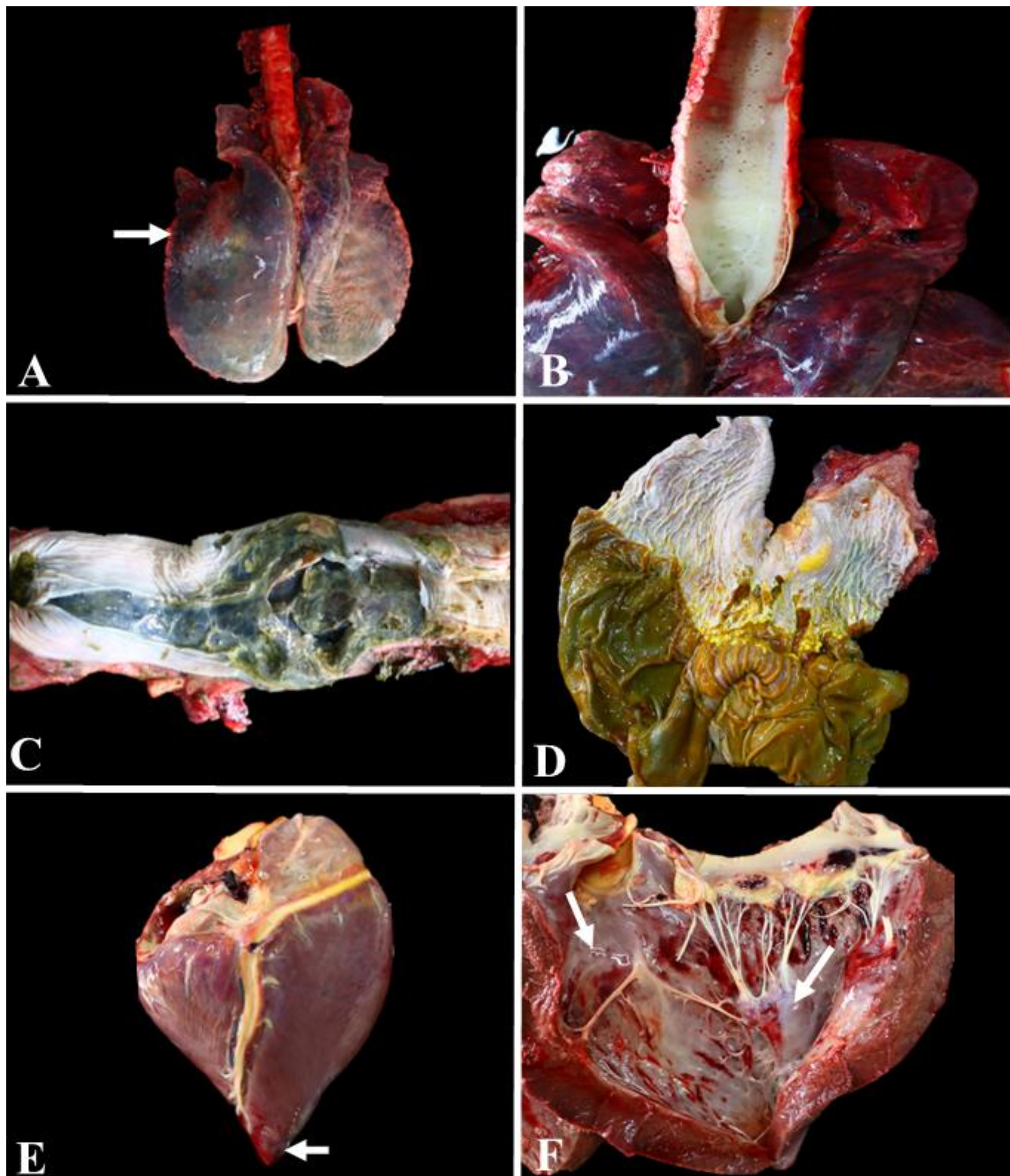

Figure 2 – Macroscopic findings of a horse with systemic involvement resulting from esophageal obstruction caused by a mango pit (Mangifera indica). (A) Lung with a blackened area on the pleural surface, predominantly on the left side (arrow) and (B) of foamy liquid in the tracheal lumen. (C) Marked necrotizing ulcerative esophagitis in the region of the initial third of the cervical esophagus and (D) stomach ulcers in the non-glandular region and margo plicatus (E) Presence of petechiae and ecchymosis at the apex of the heart (arrow) and (F) areas of petechiae and ecchymosis in the endocardium (arrows).

DISCUSSION

The etiology of esophageal obstruction related to the ingestion of fruits or vegetables (mango, apple, beet pulp, carrot) has already been described by several authors and is one of the main causes of this disease (DUNCANSON, 2006; PINTO, 2017). The fact that animals are handled extensively without supervision from owners favors the ingestion of foreign bodies, especially in pastures with fruit trees in the production season, such as mango trees, which are highly palatable to animals and used on many properties for shade and fruit production, mainly in the Northeast region of Brazil. These cases are reduced when animals are stabled due to controlled feeding management.

Among the classic clinical signs of esophageal obstruction (regurgitation, nasal secretion of saliva and food content, coughing, dysphagia, restlessness, and neck extention) (FEIGE et al., 2000), the animal in the report did not show signs of pain and respiratory difficulty, which would refer to pulmonary involvement. However, the auscultation of rales in the left lung indicated a lesion that was later confirmed at necropsy. The respiratory rate was within normal limits (16 mrpm). It could signal pneumonia if it were increased, since horses with esophageal obstruction and respiratory rate greater than 22 mrpm have been shown to have a six-fold risk of its occurrence. The time between the onset of symptoms and clearance influenced the prognosis, as horses with symptoms for more than 48 hours are at greater risk of serious esophageal injuries and/or anatomical abnormalities that will compromise the animal's recovery, as occurred with the horse in the report that was treated only 72 hours after the onset of symptoms (CHIAVACCINI; HASSEL, 2010).

The hematological values in the case described were within normal limits, except for fibrinogen. It is an acute-phase protein produced by the liver that constitutes approximately 5% of total proteins and increases in acute inflammatory processes such as that caused by a foreign body in the esophagus and aspiration pneumonia in the reported case (BASTOS et al., 2016). A total protein value greater than 7 g/dl, like that of the horse in this report (8.8 g/dl), was associated with a greater probability of the presence of pneumonia, probably related to dehydration or hyperglobulinemia, reflecting a more serious disease process (CHIAVACCINI; HASSEL, 2010).

The diagnosis was made after resistance was encountered by the nasogastric tube and confirmed by radiography and endoscopy. Care must be taken when attempting to solve the obstruction by pushing the foreign body into the stomach (BEZDEKOVA; JANALLIT, 2016), as passing the nasogastric tube increases the risk of aspiration pneumonia and damage to the esophagus, such as ruptures, and may not be able to take the foreign body to the stomach, lodging it in the thoracic esophagus, which is difficult to access (DUNCANSON, 2006). Excessive use of the nasogastric tube to push the foreign body has been responsible for ulceration and inflammation of the esophageal mucosa with a subsequent scarring reaction and irreversible stenosis of the organ, with the use of the nasogastric tube being recommended only in an attempt to dissolve the obstructive content using low-pressure water (PINTO, 2017).

Endoscopy is a procedure that directly visualizes the esophageal mucosa and can be used in diagnosis, treatment, and prognosis, as described by Orozco et al. (2011), who resolved compaction in the esophagus of a mule with the aid of blunt forceps through the working channel of the endoscope, then observed a severe ulcerative lesion caused by the grass, and recommended endoscopy after removing the mango pit in this case, making the post-surgical prognosis guarded, even with the successful removal of the foreign body without esophagotomy.

Conservative treatment was not performed on the horse in this report due to the length of obstruction that allowed the mango pit to remain adhered to the mucosa. However, it may be an option, especially in partial obstructions. Medications that act on the esophageal muscles should be used, such as oxytocin associated with scopolamine, in which the first produces relaxation of the striated muscles of the esophageal wall in the first two-thirds of the organ and the second relaxes the smooth muscles of the final third (MEYER et al., 2000; PINTO, 2009).

The attempt to remove the foreign body without performing an esophagotomy aimed to avoid complications associated with this technique, such as wound dehiscence increased due to the absence of serosa in the first two-thirds of the organ and strictures resulting from scar retraction (PINTO, 2017). These and other complications were reported in 52% (14/27) of horses undergoing surgical techniques, sometimes concomitantly, of esophagostomy, esophagotomy with primary closure, esophagomyotomy, and esophagoplasty with a median of three complications per animal, the main one being surgical site infection (71.42%, n=10), followed by aspiration pneumonia (64.28%, n=9), neck cellulitis (25.9%, n=7), and esophageal fistula, wound dehiscence and jugular phlebitis (14.8%, n=4) (KOENIG et al., 2016).

The procedure of surgical access to the esophagus and "milking" the base of the obstruction in the cranial direction after applying lubricant cranial to the foreign body, used in this case, may be an alternative to be performed before esophagotomy, as it proved to be viable for displacing and removing the mango pit. The technique allowed the manipulation of the contents of the interior of the esophagus without opening it, preserving its structure. This maneuver was made easier because it was a spherical foreign body and is not recommended in obstructions caused by sharp materials and/or with the potential for mucosal laceration during "milking" and displacement of the obstructing body.

Even with the success in unblocking the horse's esophagus, the length of time the foreign body was present in the organ, resulting from the delay in seeking veterinary care, caused severe necrotizing ulcerative esophagitis at the point of obstruction. The viability of the mucosa is a determining factor after the removal of the foreign body, and the presence of ischemia and subsequent tissue necrosis leads to a poor prognosis due to complications, such as rupture or esophageal stenosis (OROZCO et al., 2011; LOVO et al., 2023).

This prolongation of the obstruction period also led to the occurrence of aspiration pneumonia, confirmed at necropsy, being the main and most fatal consequence of esophageal obstruction (BEZDEKOVA; JANALLIT, 2016). In a retrospective study with 109 animals with esophageal obstruction, 70% presented aspiration pneumonia, which was one of the main complications that caused death, with signs consistent with aspiration pneumonia being identified in 65.8% (25/38) of the horses submitted to chest radiography (CHIAVACCINI; HASSEL, 2010). In addition to an X-ray, lung ultrasound may be an option to assist in monitoring these cases, as ultrasound images of aspiration pneumonia generally show pulmonary consolidation, particularly evident in the cranioventral lung fields, with several individual round hypoechoic zones with comet tail artifacts. Below these consolidated areas of the lung, hyperechoic regions are visible, corresponding to air inclusions (KHALPHALLAH et al., 2022).

The gastric ulcers observed may be due to the period in which the animal was without food, as long periods of fasting cause destabilization of the normal stratification of stomach contents and the dorsoventral pH gradient, allowing greater amounts of hydrochloric acid and bile reflux to reach more proximal areas of the stomach (HEWETSON; TALLON, 2021). The areas of petechiae and ecchymosis found in the pericardium and endocardium, characterizing pericarditis and endocarditis, respectively, may be due to bacteria from the respiratory tract reaching the bloodstream, generating this type of damage to the organ (PORTER et al., 2008).

CONCLUSION

Cases of horses with esophageal obstructions are always emergency conditions. The surgical technique used proved to be viable for removing an oval foreign body, with esophagotomy being an option, as both procedures share the same surgical access. However, the animal's prognosis depends mainly on the duration of obstruction, as the longer the time, the worse the condition of the esophageal mucosa, making the prognosis unfavorable. Further cases are necessary to confirm the safety of this technique.

REFERÊNCIAS

BASTOS, R. N.; MARQUES, T. L. P.; RAMOS, M. T.; COSTA, M. F. M. Avaliação das concentrações de fibrinogênio plasmático em equinos da raça Mangalarga Marchador: efeito do exercício, do gênero e da idade. **Revista de Saúde**, v.7, n.2, p.12-15, 2016. https://doi.org/10.21727/rs.v7i2.312.

BEZDEKOVA, B.; JANALIK, P. Oesophageal disorders in horses: retrospective study of 39 cases. **Equine Veterinary Education**, v.3, n.2, p.94-99, 2018. https://doi.org/10.1111/eve.12703.

CHIAVACCINI, L.; HASSEL, D. M. Clinical features and prognostic variables in 109 horses with esophageal obstruction (1992-2009). **Journal of Veterinary Internal Medicine**, v.24, n.5, p.1147-1152, 2010. https://doi.org/10.1111/j.1939-1676.2010.0573.x.

DUNCANSON, G. R. Equine oesophageal obstruction: a long-term study of 60 cases. **Equine Veterinary Education**, v.18, n.5, p.262-265, 2006. https://doi.org/10.1111/j.2042-3292.2006.tb00460.x.

FEIGE, K.; SCHWARZWALD, C.; FÜRST, A.; KASER-HOTZ, B. Esophageal obstruction in horses: a retrospective study of 34 cases. **The Canadian Veterinary Journal**, v.41, n.3, p.207-10, 2000. https://pmc.ncbi.nlm.nih.gov/articles/PMC1476298/.

HEWETSON, M.; TALLON, R. Equine squamous gastric disease: prevalence, impact and management. **Veterinary Medicine**, v.31, n.12, p.381-399, 2021. https://doi.org/10.2147/VMRR.S235258.

KHALPHALLAH, A.; ELSAYED, H. K.; MOTTELIB, A. A.; MOHAMMED, M. G. Ultrasonography as a differential diagnostic tool of bovine respiratory tract disorders with reference to serum haptoglobin and lipid profiles changes. **Journal of Advanced Veterinary Research**, v.12, n.2, p.153-165, 2022. https://advetresearch.com/index.php/AVR/article/view/921.

KOENIG, J. B.; SILVEIRA, A.; CRIBB, N. C.; PIAT, P.; LAVERTY, S.; SORGE, U. S. Clinical indications, complications, and long-term outcome of esophageal surgeries in 27 horses. **The Canadian Veterinary Journal**, v.57, n.12, p.1257-1262, 2016. https://pmc.ncbi.nlm.nih.gov/articles/PMC5109628/.

KRUGER, K.; DAVIS, J. L. Management and complications associated with treatment of cervical oesophageal perforations in horses. **Equine Veterinary Education**, v.25, n.5, p.247-255, 2013. https://doi.org/10.1111/eve.12020.

LOVO, L. M.; DERITTI, G. O.; ARANTES, M. M. F.; ANDRADE, L. M. B.; PAVAN, A. L. B.; SILVA, G. O. L.; MORAIS, B. C.; REIS, L. O.; PEREIRA, L. F.; CASAS, V. F. Insuficiência renal aguda secundária à obstrução esofágica em pônei: Relato de caso. **Pubvet**, v.17, n.5, e1382, 2023. https://doi.org/10.31533/pubvet.v17n5e1382.

MEYER, G. A.; RASHMIR-RAVEN, A.; HELMS, R. J.; BRASHIER, M. The effect of oxytocin on contractility of the equine oesophagus: a potential treatment for oesophageal obstruction. **Equine Veterinary Journal**, v.32, n.2, p.151-155, 2000. https://doi.org/10.2746/042516400777591660.

OROZCO, C. A. G.; OLIVEIRA, G. F.; ALVES, L. S. D.; ESPÍNDOLA, B. F.; SOUZA, B. G.; SEPPA, G. S. Desobstrução esofágica por via endoscópica em muar - relato de caso. **Ars Veterinária**, v.27, p.216-219, 2011. https://www.arsveterinaria.org.br/index.php/ars/article/view/414/365.

PADILHA, F. G. F.; DIMACHE, L. A. G.; ALMEIDA, F. Q.; FERREIRA, A. M. R. Blood biochemical parameters of Brazilian sport horses under training in tropical climate. **Revista Brasileira de Zootecnia**, v.46, n.8, p.678-682, 2017. https://doi.org/10.1590/S1806-92902017000800008.

PINTO, A. F. G. Obstrucción esofagica en equinos (choke). **Revista de Extension Tecnovet**, v.15, n 1, p.17-22, 2009. https://repositorio.uchile.cl/bitstream/handle/2250/122630/obstruccion-esofagica-enequinos-choke.pdf?sequence=1.

PINTO, A. F. G. Esophageal choke and its management in a Thoroughbred horse. **Journal Biomed Scientific & Technical Research**, v.1, n.2, p.360-362, 2017. https://doi.org/10.26717/BJSTR.2017.01.000194.

PORTER, S. R.; SAEGERMAN, C.; VAN GALEN, G.; SANDERSEN, C.; DELGUSTE, C.; GUYOT, H.; AMORY, H. Vegetative endocarditis in equids (1994-2006). **Journal of Veterinary Internal Medicine**, v.22, n.6, p.1411-1416, 2008. https://doi.org/10.1111/j.1939-1676.2008.0192.x.

ROSSI, G. F.; ROSALEM, M.; ZERO, R. C.; LEMES, A. P.; ROMANO, M. S. Obstrução esofágica em equino da raça quarto de milha – relato de caso. **Brazilian Journal of Development**, v.8, n.4, p.30379-30381, 2022. https://doi.org/10.34117/bjdv8n4-492.