Endoscopic assisted electro-cauterization to treat an acquired pharyngeal ostium stenosis in a horse: a case report

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ABSTRACT: An 8-year-old Italian saddle-horse gelding with a history of left guttural pouch empyema was referred to the clinic. Endoscopic examination showed a stenosis of the left pharingeal ostium that was treated with an endoscopic assisted electro-cauterization. Endoscopic follow-ups were performed before discharge and at six months after stenosis removal. No recurrence was observed, confirming the patency of the pharyngeal orifice.

Keywords: guttural pouches; pharingeal ostium; empyema; ostium stenosis; horse

Guttural pouches are air-filled pharyngo-timpanic or auditory tube diverticula that, in the adult horse, have a volume varying from 300 to 600 milliliters (Munoz et al., 2008). They are located in the caudal area of the head and extend ventro-dorsally from the pharynx to the base of the skull and oro-aborally from the dorsal pharyngeal recess to the atlanto-occipital joint. Moreover, they appear divided by the stylohyoid bone into two compartments: lateral and medial. Each pouch is separated from the contralateral one by a median septum and, dorsally, by the *rectus capitis* and *longus capitis* muscles. On the lateral side, the guttural pouch confines the *pterigo-pharingeus*, *levator* and *tensor veli palatini* muscles, *stylohyoideus* and *occipitohyoideus* muscles, the ventral belly of the *digastricus* muscle, as well as the parotid and mandibular salivary glands (Getty, 1982; Hardy and Leveille, 2003). The guttural pouch is lined with a pseudostratified ciliated epithelium containing goblet cells. The main arteries (internal carotid, external carotid and maxillary arteries) and nerves (IX, X, XI and XII cranial nerves, sympathetic nerves and cranial cervical ganglion) are located inside each guttural pouch, under the mucosa fold, and are easily visualized with an endoscope (Getty, 1982; Freeman, 1999). Moreover, retropharyngeal lymph nodes and the recurrent laryngeal nerve are clearly visible in the ventral side of the medial compartment, under

the mucosa (Getty, 1982). The dorsal portion is continuous with the pharynx through the pharyngeal orifices (*pharyngeal ostium*) of the auditory tubes. These openings are equal in size and are covered by the medial cartilage lamina, placed dorso-laterally to the rynopharynx. Exudate and biological materials that may accumulate in the pouch are removed daily by a dynamic mechanism of mucociliar clearance and through the uplift of the pouch base to the pharyngeal orifice during the swallowing phase.

Guttural pouches are particularly developed in horses and donkeys, but are also present in other animals like tapirs, some rhinoceros (except for white rhinoceros), certain bats, the South American forest mouse and hyraxes (Getty, 1982; Alsafy et al., 2008). The function of the guttural pouch is not yet completely understood but different suggestions have been made, including a role in equilibration across the tympanic membrane, in inspirated air warming, as a resonance chamber for equine whinny, and as a device for head flotation (Briggs, 2000). Recently, Baptiste et al. (2000) suggested that the function of the guttural pouches may be connected with cooling the blood that supplies the brain through the internal and external carotid arteries. This mechanism would provide heat exchange between the blood that flows through arteries located under the guttural mucosa,

and the air of the pouch that, during physical activity, is refreshed more quickly because of the orifice openings (Baptiste et al., 2000). However, a more recent study by Mitchell et al. (2006) rejected this latter hypothesis based on direct measurement of extra and intracranic blood temperature. To achieve this, dedicated probes were positioned in the common carotid, in the jugular vein and close to the hypothalamus (Mitchell et al., 2006). However, no temperature decrement between the intracranic and extracranic blood was observed during physical activity or at rest (Mitchell et al., 2006).

The incidence of guttural pouch diseases in the horse, such as empyema, tympany and mycosis, is rather low (Carmalt, 2002; Schaaf et al., 2006), and reports in the literature are constituted by several articles with a small number of cases (Freeman, 2006; Perkins et al., 2006; Schambourg et al., 2006) rather than retrospective studies with large numbers of cases (Judy et al., 1999). Inflammatory processes of the guttural pouch can result in empyema, which is sometimes complicated by chondroids and exudate conglomerates. Moreover, chronic guttural pouch empyema may occasionally involve stenosis or complete closure of the pharyngeal ostium (Gehlen and Ohnesorge, 2005; Perkins et al., 2006).

We describe a chronic purulent case of gutturocystitis with stenosis of the pharyngeal ostium treated with endoscopic assisted electro-cauterization to remove the stenotic tissue.

Case description

An 8-year-old Italian saddle-horse gelding was referred to the University Clinic with a history of about 45 days of monolateral left nasal discharge and a swelling in the left retromandibular region. One month before our visit, the referring veterinarian had submitted the horse to daily flushings with physiological solution administered through endoscopic-assisted catheterization of the left guttural pouch. Following poor clinical results, 15 days before our visit, the veterinarian performed surgical drainage by creating a permanent fistula approaching the guttural pouch over the Viborg's triangle. After fistulation, the owner observed a mild reduction in the nasal discharge with a persistent swelling on the left retromandibular region with purulent material flowing out of the fistula. During this period the horse was excluded from agonistic activity and was put out to rest in the paddock.

The owner observed a slight decrease in weight, but no respiratory noises, laryngeal or pharyngeal dysfunction or dysphagia. On the day of our visit, the horse showed good general condition with no nasal discharge, hyperemic conjunctival and oral mucosae and the presence, in the retromandibular region, of a fistula with thickening edges. Emission of a purulent exudate from the fistula was also observed. Around the fistula the skin was hairless, thickening, hyperaemic and had a purulent conglomerate exudate. Standard preoperative blood parameters were within the normal range.

An x-ray exam of the retromandibular area was performed in standing position and in lateral view (kV 75 mAs 12). A thickening of the left guttural pouch wall and imperfect lap siding of the two guttural pouches were visualized. No calcification areas were observed within the pouch.

An endoscopic examination in the standing station was performed with a Pentax Eg 290-kP flexible endoscope (9.8 mm diameter) and a Pentax EG-1870 (6 mm diameter), with the patient under sedation with detomidine (Domosedan 0.01 mg/kg *i.v.*) and butorfanol (Dolorex 0.05 mg/kg *i.v.*). The examination showed mild hyperaemia of the rhynopharyngeal mucosa with a reduced dorsal pharyngeal recess. No abnormalities were visualized in the larynx with the horse at rest or after the "slap test". Normal pharyngeal tube morphology was observed and no exudate was visualized close to the pharyngeal ostium or on the pharyngeal wall and lumen. Examination of the right guttural pouch was performed, approaching through the right nostril. The pouch appeared within normal limits with no abnormalities. Examination of the left guttural pouch was performed by introducing the endoscope through the left nostril; endoscope progression was possible until the cartilage portion of the left guttural pouch opening for approximately one centimetre; after that, a ductal stenosis was visualized with the presence of whitish lined fibrotic tissue and granulation tissue in a transverse position (Figure 1). An opening of about 2 mm was visualized in the ventral side of the stenotic area of the left guttural pouch.

Following the endoscopic inspection a pharyngeal ostium stenosis of the left auditory tube was diagnosed. We concluded that the small opening would probably permit the introduction of a 2 mm catheter under endoscopic guidance (Figure 2). Removal of the stenotic tissue was recommended.

The stenosis was removed under endoscopic guidance by electro-cauterization (EXCELL 250

Figure 1. Stenosis of pharyngeal ostium

Figure 2. Indirect evaluation of stenotic area with a 2 mm catheter introduced under endoscopic guidance

MCDS – Alsa s.r.l., Italy) of the stenotic tissue. The horse was in the standing position under sedation with detomidine and butorfanol, as previously described. The aim of this procedure was to reconstruct the stenotic tube by plastic surgery. When a diameter of 1 cm was achieved, approximately 2 h after the beginning of the procedure, the Pentax EG-1870 endoscope was introduced into the left guttural pouch (Figure 3). An abundant grayish exudate was observed in the medial portion of this pouch. It was sucked out with a catheter introduced alongside the endoscope and was submitted to the laboratory for bacterial culture. The pouch-emptying manoeuvre excluded the presence of chondroids, confirming the x-ray results, and showing marked hyperaemia of the mucosa with some erosion lesions. Subsequently, a Foley catheter (30 F, 180 cm long) was introduced through the ventral meatus of the left nasal cavity under endoscopic guidance. It was pushed until it reached the pharynx and was positioned in front of the left pharyngeal ostium. The opening of the guttural pouch orifice was achieved by the introduction of

a catheter into the endoscope instrumental channel and contemporary rotation of a flexible endoscope that resulted in abduction of the fibrocartilagineal ostium and the introduction of the Foley catheter into the guttural pouch (Figure 4). The correct Foley positioning inside the guttural pouch and the distension of the catheter balloon with 10 millilitres of physiological solution were controlled using Pentax EG-1870 endoscope visualization introduced into the pouch through the fistula of Viborg's triangle. The external extremity of the Foley catheter was fixed to the lateral margin of the left nostril with a finger trap suture. Culture of the exudate from the guttural pouch resulted in the isolation of numerous colonies of *Streptococcus equi* ssp. *equi*. Postoperative treatment included antibiotics (Penicillin G procaine, 22 000 IU/kg *i.m.*, q 12 h and Gentamicin Sulfate, 3 mg/kg *i.m*., q 12 h) for seven days and anti-inflammatory drugs (Flunixin meglumine 1 mg/kg *i.v.* and Dexamethasone 0.04 mg/kg *i.m*.) for three days. For the first three days, daily flushings were performed with physiological solution through the fistula of Viborg's triangle and

Figure 3. Introduction of endoscope into the pathological guttural pouch after stenotic tissue removal
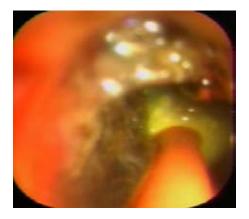

Figure 4. Insertion of Foley catheter

these were repeated through the Foley catheter for the remaining 12 days. Spontaneous closure of the fistula in the Viborg's triangle was observed during the postoperative treatments. Moreover, good clinical condition and no signs of dysphagia or respiratory noises were recorded. On the fifteenth day after resolution of the stenosis, the Foley catheter was deflated and removed and the horse was discharged and maintained at rest for a month, with subsequent progressive training. Endoscopic follow-ups were performed before discharge and at six months after stenosis removal. They excluded any recurrence and confirmed the patency of the pharyngeal orifice and auditory tube.

DISCUSSION AND CONCLUSIONS

Empyema is the most common disease affecting equine guttural pouches. It leads to a purulent collection due to the multiplication of pathogenic bacteria such as *Streptococcus* spp., for which the anatomical structure of the guttural pouches provides a perfect reservoir for months or even years, even after the apparent resolution of clinical conditions (Carmalt, 2002). Other factors can also lead to the development of this disease, such as drugs, trauma that involves the stylohyoid bone, and congenital or acquired stenosis of the pharyngeal orifice (Freeman, 1980). A final diagnosis can be achieved with correct physical examination and diagnostic imaging techniques (x-ray and endoscopy). Studies performed on a large number of clinical cases to compare x-ray and endoscopic examinations have not observed any significant difference between the results obtained using the two techniques (Judy et al., 1999); however endoscopy is preferred over radiology, because it allows direct visualization of the guttural pouch lumen and mucosa as well as pathological internal conditions (exudate or lesions). The endoscopic approach to guttural pouches is easy to perform but it may be obstructed when stenotic or fibrotic processes have occurred in the pharyngeal orifice. Stenosis of the pharyngeal orifice has been described in a few papers (Gehlen and Ohnesorge, 2005; Perkins et al., 2006). It is not a common disease but may complicate the treatment of empyema and it must be resolved in order for there to be complete recovery from pathological conditions. In our clinical case it is possible that the stenosis occurred due to chronic inflammatory processes in the guttural pouch and repeated tissue

trauma following several endoscopically assisted catheterizations. To avoid this pathological condition Perkins and Schumacher (2007) suggested, as an elective treatment for guttural pouch empyema, the introduction and fixation of a permanent catheter (Chambers catheter or Foley catheter) for the purpose of performing repeated flushings.

The selection of the correct treatment for guttural pouch empyema also requires the evaluation of the presence or absence of chondroids, or concomitant stenosis that may interfere with pouch drainage. The elective treatment of empyema that is not complicated by chondroids requires repeated flushings of the guttural pouch with polyionic balanced solutions associated with antimicrobials or antiseptics (Perkins and Schumacher, 2007). A systemic antimicrobial therapy could be administered, but the antibiotic effect inside the guttural pouches could be reduced by the presence of copious amounts of purulent exudate (Perkins and Schumacher, 2007). A rare complication of repeated flushings of guttural pouches with chondroids is pouch rupture, as previously described by Fogle et al. (2007).

However, when conservative treatment does not result in desirable outcomes, it is necessary to carry out surgical treatment, which can be performed in different ways: via a hyovertebrotomy (Schaaf et al., 2006), with the Whitehouse technique and modified Whitehouse technique (Gehlen and Ohnesorge, 2005; Perkins et al., 2006), with fistulation through the Viborg's triangle, and with the fenestration of the mesial guttural pouch septum (Perkins et al., 2006). However, these surgical techniques could result in complications, such as iatrogenic lesions of cranial nerves and subsequent neurological dysfunction, including dysphagia and/or cranial neuropathies (Perkins et al., 2006; Fogle et al., 2007).

In our clinical case, empyema of the guttural pouch did not resolve either with conservative or surgical treatment with an iatrogenic fistula through the Viborg's triangle, and, indeed, it was complicated by the development of a stenosis in the pharyngeal ostium. For stenosis treatment, a similar approach was proposed by Hawkins et al. (2001), involving laser fistulation dorsal to the pharyngeal ostium; in our case, we performed a recanalization of the pharyngeal orifice, removing the stenotic tissue with electro-cauterization under endoscopic guidance.

Our technique was chosen for three main reasons: (1) it does not create anatomical points of weakness, which could involve and contaminate other anatomical sound structures and organs; (2) it

aims at restoring the normal anatomical conformation of the pharyngeal ostium and its physiological function; (3) it avoids complications due to tube fistulation that could occur when the cartilagineal portion of the ostium is removed.

Moreover, this technique appears easy to perform and is well tolerated by the horse both during the procedure and in the post-operative period, although it requires fixation of a Foley catheter to the nostril for fifteen days. The endoscopic procedure does not require general anaesthesia for the patient, avoiding the complications often described for the other techniques (Gehlen and Ohnesorge, 2005), and it provides an easier and safer approach to the lesion compared with traditional methods. It is the authors' opinion that the good outcome observed in this clinical case was also due to the short period which had elapsed between the development of the stenosis and its diagnosis and treatment. For this reason it is emphasized that horses with empyema of the guttural pouches should be examined frequently, in order to treat the stenosis during its onset.

REFERENCES

Alsafy M, El-Kammar M, El-Gendy S (2008): Topographical anatomy, computed tomography, and surgical approach of the guttural pouches of the donkey. Journal of Equine Veterinary Science 28, 215–222.

Baptiste KE, Naylor JM, Bailey J, Barber EM, Post K, Thornhill J (2000): A function for guttural pouches in the horse. Nature 403, 382–383.

Briggs K (2000): Mystery solved. Horse 7, 74–76.

Carmalt J (2002): Guttural Pouch diseases in horse. Large Animal Veterinary Rounds 2, 1–6.

Freeman DE (1980): Diagnosis and treatment of diseases of the guttural pouch (Part 1). Compendium on Continuing Education for Practicing Veterinarian 11 (Suppl. 1), S3–S11.

Freeman DE (1999): Guttural Pouch. In: Auer JA, Stick JA (eds.): Equine Surgery. Saunders, Philapdelphia, PA. 368–371.

Freeman DE (2006): Surgical Management of guttural pouch disease. In: ACVS Symposium Equine and Small Animal Proceedings, October 5–7, 2006, Washington.

Fogle CA, Gerard MP, Johansson AM, Breuhaus BA, Blikslager AT, Jones SL (2007): Equine Veterinary Education 19, 351–355.

Gehlen H, Ohnesorge B (2005): Laser fenestration of the mesial septum for treatment of guttural pouch chondroids in a pony. Veterinary Surgery 34, 383–386.

Getty R (1982): Sisson and Grossman's The Anatomy of the Domestic Animals. W.B. Saunders Company, Philapdelphia. 724–725.

Hardy J, Leveille R (2003): Diseases of the guttural pouches. Veterinary Clinic of North America: Equine Practice 19, 123–158.

Hawkins JF, Frank N, Soika JE, Levy M (2001): Fistulation of auditory tube diverticulum (guttural pouch) with a neodymium-yttrium-alumimun-garter laser for treatment of chronic empyema in two horses. Journal of American Veterinary Medical Association 3, 405–407.

Judy CE, Chaffin MK, Cohen ND (1999): Empyema of the guttural pouch (auditory tube diverticulum) in horses: 91 cases (1977–1997). Journal of American Veterinary Medical Association 215, 1666–1670.

Mitchell G, Fuller A, Maloney SK, Rump N, Mitchell D (2006): Guttural pouch, brain temperature and exercise in horses. Biology Letters 2, 475–477.

Munoz J, Stephen J, Baptiste KE, Lepage OM (2008): A surgical approach to lateral compartment of the equine guttural pouch in the standing horse: Modification of the forgotten "Garm technique". Veterinary Journal 117, 260–265.

Perkins JD, Schumacher J (2007) Complications incurred during treatment of horses for empyema of the guttural pouch. Equine Veterinay Education 19, 356–358.

Perkins JD, Kelly G, Gomez JH, Schumacher J (2006): Standing surgical removal of inspissated guttural pouch exudate (chondroids) in ten horses. Veterinary Surgery 35, 658–662.

Schaaf KL, Kannegeiter NJ, Lovell DK (2006): Surgical treatment of exentive chondroid formation in a guttural pouch of a Warmblood horse. Australian Veterinary Journal 84, 297–300.

Schambourg MA, Marcoux M, Celeste C (2006): Salpingoscopy for the treatment of recurrent guttural pouch tympany in a filly. Equine Veterinary Education 18, 31–234.

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