

*BACTERIAL AND FUNGAL DISEASES OF EQUINE GUTTURAL POUCH:
RECENT SURGICAL ADVANCES*

**LES AFFECTIONS BACTÉRIENNES ET MYCOSIQUES
DES POCHE GUTTURALES DU CHEVAL:
DÉVELOPPEMENTS CHIRURGICAUX RÉCENTS**

Par Olivier M. LEPAGE⁽¹⁾
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SUMMARY

Fungal and bacterial pathogens can cause very serious diseases of the guttural pouches in horses. Guttural pouch mycosis may cause severe and unpredictable epistaxis, which sometimes requires emergency measures. Transarterial embolization of the affected arteries is the most effective treatment to date. In severe or chronic bacterial infection, it is important to drain the empyema or the pus concretions as best as possible. The modified Garm technique has been shown recently to provide good drainage of the whole pouch, and specifically of its lateral compartment. This technique is performed in tranquilized horses under endoscopic guidance.

Keywords: horse, guttural pouch, transarterial embolization, mycosis, empyema, modified Garm technique.

RÉSUMÉ

Des agents mycosiques ou bactériens sont parfois responsables de pathologies très graves des poches gutturales chez le cheval. Dans le premier cas, l'épistaxis en rapport avec la mycose est imprévisible et peut nécessiter, du fait de son intensité, une intervention d'urgence. Actuellement, le traitement le plus efficace de cette affection est l'embolisation trans-artérielle des artères impliquées. Lors d'une affection bactérienne sévère ou chronique, il est important d'obtenir le meilleur drainage possible de l'empyème ou des concrétions. Il a été récemment montré que la technique modifiée de Garm permet un bon drainage de toute la poche, et plus spécifiquement du compartiment latéral. Cette technique est effectuée chez le cheval tranquilisé et sous contrôle endoscopique

Mots-clés: cheval, poche gutturale, embolisation transartérielle, mycose, empyème, technique modifiée de Garm.

(1) Professeur titulaire de l'École Nationale Vétérinaire de Lyon, Professeur associé de l'Université de Montréal, DMV, IPSAV, DES, MSc, Privatdozent (Universität Bern), Diplôme European College of Veterinary Surgeons, HDR (Université de Lyon I), Université de Lyon, Lyon, F-69003, France; École Nationale Vétérinaire de Lyon, Département Hippique, Marcy l'Étoile, F-69280, France.

INTRODUCTION

For the anatomist, the guttural pouches of the horse are two out-pouchings of the Eustachian tube located in the parotid region under the base of the skull and the atlas bone (Barone & Tagand, 1964). They are in contact with each other by a thin membrane in the median plane for the rostra portion, and through the longus capitis and rectus capitis ventralis muscles for the caudal portion. Guttural pouches have important anatomical relationships with other neighbouring structures, particularly the retropharyngeal lymph nodes, vascular structures and nerves. Clinicians need to observe the normal appearance of the adjacent anatomic structures when scoping the guttural pouches (Lepage 1994). Some advances in understanding of the functional anatomy and the physiological role of the guttural pouches have been made (Baptiste *et al.* 2000), however their implication in a number of pathological conditions, including mycotic and bacterial development still raises more questions than answers (Lepage *et al.* 2004).

It is suggested that guttural pouches contributes to regulation of the temperature of arterial blood (Baptiste 1998), cooling the circulation to the brain, thereby protecting this sensitive organ from thermal shock and keeping it below body temperature. Baptiste proposes that the guttural pouches act in conjunction with the intracranial cavernous venous sinuses to cool the blood supply to the brain, particularly during exercise.

Several microbiological investigations of the normal flora of the guttural pouches cavities have been published and in particular a retrospective study performed at the Veterinary School of Lyon (France) based on 18 horses hospitalized for treatment of guttural pouch mycosis and in which direct microscopic examination and culture were performed on samples obtained from mycotic lesions during endoscope examination. The study revealed *Aspergillus fumigatus*, *Aspergillus niger*, and *Aspergillus versicolor* (Ludwig *et al.* 2005). Opportunistic fungi, such as *Aspergillus* spp is present in normal equine airway and exist as an organism in soil, decaying vegetation or animal matter and tissues but they usually require a host that is debilitated or immune-suppressed to establish infection which is usually not the case with horses affected with guttural pouch mycosis. Diagnosis of Aspergillosis in the early stages of the disease is also very difficult. At the moment only endoscopy helps the veterinarian in the diagnosis and it is usually only performed, when clinical signs are present which often means a well established lesion in one or both guttural pouch (Lepage 2007).

Parallel to an increase understanding of guttural pouch fungal or bacterial infection, new therapeutic options are proposed. We resume here two options recently developed at the Equine Department of the National Veterinary School of Lyon in collaboration with colleagues from the Universities of Ohio and Copenhagen. Discussion and description of other therapeutic approaches are discussed elsewhere by the author (Lepage, 2004; Piccot-Crezollet & Lepage, 2006) and is not the main focus of this paper.

RECENT SURGICAL OPTION FOR FUNGAL INFECTION OF THE GUTTURAL POUCH

A transarterial coil embolization (TCE) technique for occlusion of the internal carotid (ICA), external carotid (ECA) and maxillary arteries (MA) in ten normal horses (Léveillé *et al.* 1999) has been developed and evaluated with the goal to prevent haemorrhage in horses affected with guttural pouch mycosis (GPM). The *premortem* angiography of these normal horses confirmed complete occlusion of all vessels and coils that were positioned as intended. Histologically, all horses had partially maturing to mature, continuous thrombi filling at the site of the coils. Ophthalmic complications were not observed. It was concluded that transarterial coil embolization provided a safe, rapid and effective method for ICA, ECA and MA occlusion technique in normal horses. These results were confirmed a year later in affected horses (Léveillé *et al.* 2000).

In 2005, a retrospective study on horses treated with this new technique was performed. The clinical and surgical features of horses with GPM presented at the Veterinary School of Lyon during a 28 months period were studied and evaluate for immediate to long term results of TCE as a treatment. Medical records of all horses with GPM treated with TCE between February 1999 and July 2002 were analyzed. To be included in the study no other surgical or medical treatment for the mycosis could be administered. Subject details, case history, results of initial clinical examination and endoscopy were reviewed. For all individuals, evaluation of long term complications and case evolution was based on owner or trainer interviews between 24 and 41 months after surgery. Thirty one horses were identified with uni- (n = 25) or bilateral (n = 6) GPM affecting only the medial (n = 28), only the lateral (n = 2) or both compartment simultaneously (n = 7). Of the 23 individuals presented with epistaxis, 20 showed complete resolution of the problem. In the 19 horses presented with neurological symptoms, two were subjected to euthanasia for persistence of severe dysphagia. It was concluded that after TCE the prognosis for survival is excellent (84 %) and prognosis for return at the level expected by the owner or trainer is good (71 %). TCE is therefore an effective method of preventing haemorrhage and resolving the majority of mycotic lesions without further specific treatment (Lepage & Piccot-Crezollet, 2005). Based on these results recommendations have been published in the French professional literature (Piccot-Crezollet & Lepage, 2006).

NEW SURGICAL APPROACH FOR BACTERIAL INFECTION OF THE GUTTURAL POUCH

Surgical access to the guttural pouch is often required to treat some complicated cases of bacterial infection causing empyema, of one or both guttural pouches. The principal factor contributing to the chronicity and re-occurrence of guttural pouch empyema is the difficulty of completely removing all material, specifically from the lateral compartment. Currently, the sur-

gical methods used to approach the guttural pouch include hyo-vertebrotomy, Viborg's triangle and the two Whitehouse methods. These approaches have been around for nearly 200 years and mostly successful (Freeman, 1999). But all these techniques gain access to the guttural pouch's medial compartment. What remains a surgical challenge is to adequately assess and resolve those cases of guttural pouch disease that involve the lateral compartment.



Figure 1: Sagittal view of a horse head showing (finger) the direction of soft tissue dissection during a Modified Garm's technique approach before placing at that location a drainage-lavage catheter. (Cliché ENVL-DH).

Sur une vue latérale de la tête d'un cheval, le doigt montre la direction de la dissection des tissus mous réalisée pendant l'approche chirurgicale par la technique de Garm modifiée, avant de placer, à cet endroit, le cathéter de drainage-lavage.

A Norwegian veterinarian (Garm 1946) felt drainage would be much improved if an opening could be made in the rostra part of the lateral compartment such that a drain could be placed in a more straight line. However, this approach was never introduced into other language than Norwegian and since not been discussed and assessed. Collaboration between the Equine Department of Lyon Veterinary School and Keith Baptiste from the Kongelige Veterinær-og Landbohøjskole of Copenhagen concretises into a study performed by Juan Munoz as one objective of his equine surgery residency program. In this study feasibility, efficacy and complications following lavage and drainage of the equine guttural pouch lateral compartment (GPLC) after a modified Garm's technique (MGT) approach was assessed (Munoz Moran *et al.*, 2007).



Figure 2: Ventral view of horse head (rostral is at the right) showing a 2 weeks old skin incision from a left approach with the Modified Garm's technique and a new approach on the right side with a drainage-lavage catheter. (Cliché ENVL-DH).

Vue ventrale de la tête d'un cheval (l'avant est à droite de la figure) montrant l'incision de la peau à gauche, deux semaines après l'approche chirurgicale réalisée par la technique de Garm modifiée et la nouvelle approche sur le côté droit avec la mise en place du cathéter de drainage-lavage.

It is a two step prospective study. Study 1 is performed kin six horse cadaver and study 2 *in vivo* on four adult standing horses. In study 1 iatrogenic damage was evaluated by dissection of cadaver heads after a MGT approach. In study 2 a lavage/drainage tube was placed during three days into each GPLC after a MGT in standing horses (**figures 1 and 2**). Lavage/drainage efficacy and iatrogenic damage of the guttural pouch was evaluated endoscopically during the three days post-surgery and two weeks later. In both studies, the procedure offered access to the lateral and medial compartments of the GP. In study 1 no obvious iatrogenic damage to vessels or nerves was recorded. In study 2, lavage of the entire GP was easily performed and nearly all lavage solution was collected trough the drainage opening. The only major complication encountered was the development in one horse of emphysema of the lateral wall of one GPLC and secondary collapse of the mucous membrane. Time for secondary wound healing was approximately 2 weeks with a small scar remaining. We concluded that the MGT can be performed safely in standing horses for lavage and drainage of the GP. Therefore the MGT approach can be used to drain and remove material from the lateral compartment such as in cases of empyema or guttural pouch concretions (Lepage 2002) with the limitation of being able to introduce an endoscope into the affected GP.

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