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How to Flush Guttural Pouches in the Field Without the Use of an Endoscope

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1. Introduction
The guttural pouch is an anatomical structure unique to perissodactyls, including equids, tapirs, a South American forest mouse, and some species of rhinoceros, bats, and hyraxes.1 Unfortunately, it has also become a medical issue for the horse because this blind-ended sac can hold fluid, infectious debris, and fungal growths. Access to the pouch has historically been difficult for a solo practitioner because it typically requires an endoscope and involves two or three assistants. The procedure often requires sedation for safe endoscopic examination because there are numerous delicate structures contained therein that could be damaged. This paper will outline a simple way to enter the guttural pouches, without sedation in most cases, and offer the opportunity to medicate the pouch inexpensively.

Anatomy
The guttural pouch is an extension of the equine Eustachian tube that connects the pharynx to the middle ear. This pouch is located between the base of the skull dorsally and the pharynx and esophagus ventrally (Fig. 1). It is covered laterally by the pterygoid and digastric muscles and the parotid and mandibular salivary glands. The floor lies mainly on the pharynx and also covers and molds to the retropharyngeal lymph nodes and stylohyoid bone, which presents a raised ridge within the guttural pouch and divides it into its lateral and medial compartments. The left and right guttural pouches are separated by a thin median septum. Its function is unknown, although it has been hypothesized to be associated with pressure equilibration across the tympanic membrane, contribution to air warming, a resonating chamber for vocalization, a flotation device, and for cooling of the brain of the horse.1 Internal structures of the guttural pouch will be described in further detail below.
Indications to Flush Guttural Pouches

Diseases involving the guttural pouch include fungal empyema, *Streptococcus equi* subspecies equi infection, chondroid formation, and bacterial empyema. Contamination can occur from a penetrating exterior wound. Trauma can lead to a fractured stylohyoid bone. In addition, the guttural pouch should be investigated in cases of head tilt, epistaxis, or cranial nerve dysfunction.\(^2\)

Diagnosis of a problem within the guttural pouch requires endoscopic visualization. Entrance into the guttural pouch with the endoscope typically involves utilizing an assistant to manipulate the endoscope and the use of a probe or stylet passed through the endoscopic channel to lift the pharyngeal orifice of the Eustachian tube to gain entrance to the guttural pouch (Fig. 2). Using a video camera and screen makes the process easier because both participants can visualize at the same time. Without a video screen, communication between the veterinarian looking through the ocular end and the assistant passing the endoscope is paramount to give directions to the assistant.

Typically, the horse requires sedation to pass the probe and endoscope into the guttural pouch. The endoscope is passed in the ventral meatus until the pharyngeal orifice is visualized. At this point, the probe is passed through the scope channel and advanced beneath the flap and forward into the guttural pouch. The scope is then rotated clockwise to enter the left pouch and counterclockwise to enter the right pouch while advancing simultaneously. Once the endoscope has entered the guttural pouch, the probe is retracted back into the channel to avoid inadvertent trauma to any of the structures. At this point, a complete exam of the guttural pouch and relevant structures can be undertaken. The inside of the guttural pouch is lined with glistening epithelium and should appear as such. There is not normally any fluid, mucus, or muco-purulent or plaque-like material associated with the lining of the guttural pouch. The guttural pouch is divided into a large medial and smaller lateral compartments by the stylohyoid bone. The medial compartment is further divided into medial and lateral recesses. Structures that are associated with each compartment and that should be identified on endoscopic exam are described as one might see on endoscopic exam. On entering the guttural pouch, the dorsal aspect of the lateral recess of the medial compartment is encountered. The large stylohyoid bone is usually readily noted. Clinically relevant structures that can be seen in the medial and lateral compartments are as follows: atlanto-occipital articulation, glossopharyngeal nerve (c.n.IX), internal carotid artery, and cranial cervical ganglion (c.n.X) dorsal and medial to the internal carotid artery; other structures to note are the paracondylar (jugular) process of the occipital bone, the occipitohyoid-eus muscle, and the rectus and longus capitus muscles. The floor of the medial compartment should be examined for enlargement and/or drainage of the medial retropharyngeal lymph nodes that lie just below the floor of the guttural pouch. The chorda tympani (a branch of c.n.VII which joins c.n.V) is seen at the proximal extent of the stylohyoid bone, coursing dorsally and laterally within the lateral compartment of the guttural pouch. The large facial nerve (c.n.VII) can also be seen in the lateral compartment. The external carotid artery is large, coursing laterally, and can be identified by its pulsing motion; the caudal auricular artery can often be identified as a branch of the external carotid artery that courses dorsally and caudal to the facial nerve. The maxillary vein can also be identified passing behind and lateral to the external carotid artery. Though not visualized directly, c.n.XI and c.n.XII are also closely related to the guttural pouch and may be affected by disease processes involving the guttural pouch (Figs. 3 and 4).\(^1\)

Samples can be taken with an aspiration catheter or cytology brush, utilizing instruments that could pass through the endoscope channel. In addition, basket forceps can be used to remove chondroids, or rat-tooth grabbing forceps can be used to remove foreign bodies.

Once a diagnosis is made, medication of the guttural pouch may be indicated. Sedating on a daily basis and repeating the above procedure can be cost-
prohibitive to many horse owners and is technically demanding. Placement and management of an indwelling Bivona tube or large-bore catheter for daily lavage performed by the owner can also be expensive and requires skill and compliance of the owner. A less expensive, technically easy technique will increase client compliance and make case management more successful.

Method of Flushing Guttural Pouches Without an Endoscope

Treatment without the use of an endoscope is easily accomplished in the vast majority of horses and is typically performed without sedation. Equipment required includes a twitch and a Chambers catheter. This catheter is stainless steel, 56 cm in length, slightly curved, with a finger rest and luer slip adapter (Fig. 5). It is typically used to infuse the uterus, but its length allows it to be used to flush the guttural pouch (Fig. 6).

Once the animal is restrained with the twitch positioned to open a nostril (ie, rope or chain twisted away from the nostril), the catheter is passed slowly up the ventral meatus. The catheter is rotated along the wall of the pharynx to open the entrance of the guttural pouch and then advanced into the guttural pouch (Fig. 7). The Chambers catheter is then slowly backed out of the pouch and withdrawn out of the nostril. The twitch is then released and retightened in the opposite direction, opening the other nostril, and the process is repeated for the contralateral guttural pouch.

Confirmation of the location of catheter can be accomplished by rotating the catheter in a circular fashion. If the catheter is properly located inside the guttural pouch, the catheter will be unable to completely rotate because it will be obstructed by the lateral or medial wall. Additionally, when fluids are passed through the catheter, coughing will ensue if the catheter is not within the pouch as the fluid enters the laryngeal area of the horse.

Potential side effects or possible injuries can occur when flushing guttural pouches. Trauma and/or irritation to the mucosal lining or to the structures within the pouch are potential problems. Direct contact from the catheter to any of the structures within the guttural pouch could lead to inflammation, carotid artery rupture, or neuritis; however, trauma within the guttural pouch probably is not due to the restricted reach of the Chambers catheter. More likely, trauma occurs in the ethmoid area as the result of inappropriate restraint and/or dorsal advancement of the catheter. Irritation within the guttural pouches resulting in inflammation of the mucosa or neuritis typically results from caustic substances flushed into the pouches, such as strong iodine solutions or hydrogen peroxide.

The guttural pouch can hold a volume of approximately 350 mL, but only 100 mL can be instilled in
a 500-kg horse before the fluid begins to flow back out the entrance while the catheter is still in place. Antibiotics, antifungal medications, acetylcysteine, anti-inflammatory solutions, and large volumes of isotonic fluids can be instilled through a Chambers catheter by using syringes or hooking up an extension set for large-volume flushing. The author typically uses 120 mL to flush the guttural pouches after an initial high-volume flush of 250 to 400 mL.

The authors have used this technique on hundreds of horses for numerous types of clinical cases, including strangles outbreaks, fungal infections, upper respiratory infections, and traumatic injury with contamination. A typical scenario for its use in a case of strangles infection is as follows: a diagnosis of strangles is made by positive polymerase chain reaction (PCR) on a nasopharyngeal flush and endoscopic findings confirm enlarged retropharyngeal lymph nodes and/or purulent material within the guttural pouch. Antibiotic solutions can be flushed into the guttural pouches and repository antibiotics made into gelation can be left for extended treatment. Other treatments that can benefit from this technique include fungal empyema, foreign body contamination from penetrating wounds, or inflammatory debris from upper respiratory disease. The author also commonly uses this technique with many horses at the conclusion of antibiotic therapy to remove any residual bacterial contamination in the guttural pouch. This technique can also be used to treat cases of pharyngitis and is particularly useful in cases of dorsal displacement of the soft palate caused by pharyngeal inflammation.

Balanced electrolyte solutions with acetylcysteine, dimethyl sulfoxide (DMSO), or a combination of antimicrobials can be used to flush the guttural pouches. Dilute povidone-iodine solutions (1%) are also used; however, iodine can be neutralized by exudates. Dilute chlorhexidine gluconate for equine guttural pouch lavage. In Proceedings, Am Assoc Equine Pract 2007,53:81.

References and Footnote

"Jorgensen Laboratories, Loveland, CO 80538."