1. Introduction
Respiratory disease is the second leading cause of lost training in the Thoroughbred racehorse, second only to musculoskeletal injuries [1]. Respiratory tract problems can be complex and multifactorial, and they often require considerable effort to reach a definitive diagnosis. Endoscopy of the upper respiratory tract plays a vital role as a first line diagnostic tool and can provide a wealth of information at the initial exam. Lesions of the subepiglottic tissue occur more frequently than commonly recognized. The purpose of this paper is to describe how to evaluate the subepiglottic area in the standing horse.

2. Materials and Methods
Between January 1, 2000 and March 31, 2003, 33 Thoroughbred racehorses in active race training were identified with subepiglottic lesions. All cases originated from two Thoroughbred racetrack practices in Southern California. One horse had undergone surgery to resect an entrapped epiglottis 6 wk before the identification of the subepiglottic lesion. The subepiglottic area can be examined with general anesthesia and endoscopy through the oropharynx. However, the subepiglottic area can be more easily examined in the standing horse with endoscopy and the use of a specially made brass probe [a] (Fig. 1). The probe is 5 mm in diameter and 65 cm in length. The tip has been formed into a forked configuration approximately 12 mm in width (Fig. 2). All surfaces must be completely rounded and smoothed to prevent scratching any mucosal surfaces. The brass material allows the probe to be bent to anatomical variations of the patient or the examiner's preferences.

The horse is sedated with a combination of 0.008 mg/kg detomidine HCl [b] and 0.01 mg/kg butorphanol tartrate; [c] some form of physical restraint appropriate to the horse is applied. Care must be taken to have the horse properly sedated. The use of experienced handlers is invaluable. Complete local anesthesia of the epiglottis is critical to this procedure. Manipulation of the tip of the unanesthetized epiglottis stimulates an immediate swallowing reflex, rendering evaluation of the subepiglottic tissue virtually impossible. Anesthesia of the pharynx is accomplished by spraying of 15 - 20 ml of 4% lidocaine HCl topical [d] into the pharynx with an 8 Fr polypropylene catheter [e] passed through the nostril into the nasopharynx. Slight elevation of the horse's muzzle while administering the local anesthetic allows the solution to pool at the epiglottis and posterior soft palate. The effectiveness of the local anesthesia can be tested by touching the tip of the epiglottis with the endoscope. If the
horse continues to swallow or displace the soft palate during the procedure, additional topical anesthesia is required. Complete local anesthesia will last approximately 30 - 60 min. Some degree of topical anesthesia may be present for up to 2 h. Care should be taken to restrict feed, hay, and water during this period. The procedure can be performed when the horse has been sedated and the local anesthesia has taken effect. Videoendoscopy greatly simplifies this procedure but the examination can be accomplished with direct fiber optic endoscopy. The endoscope is passed through one nostril and into the nasopharynx to visualize the epiglottis. The brass probe is passed through the opposite nostril into the nasopharynx. As the probe is passed ventrally and medially through the ventral meatus, resistance caused by the curvature of the probe is encountered approximately 10 - 15 cm from the nostril. At this time, rotate the probe clockwise for the right nostril (counter-clockwise for the left nostril) while continuing through the ventral meatus into the nasopharynx until the probe tip is visualized in the endoscope field of view.

When in the nasopharynx, the epiglottis is observed in the center of the viewing field for evaluation and orientation. The probe is then manipulated so that the tip of the probe can be placed ventral to the epiglottis. Once under the epiglottis, careful manipulation of the probe will allow the epiglottis to be elevated and retroflexed to expose any pathology in the subepiglottic tissue and the posterior border of the soft palate (Fig. 3 and Fig. 4). The dorsal rim of the soft palate and aryepiglottic folds should be carefully examined at this time for any possible abnormalities [2]. The use of the probe allows for excellent visualization of the subepiglottic tissue and any other lesions that may be present in adjacent tissues. The most common findings are ulceration of the subepiglottic tissue, granulation tissue, scarring, and cysts. The posterior border of the soft palate, a frequent location of mucosal erosion and ulceration, can also be examined with this technique (Fig. 8B). On completion of the exam, careful removal of the probe is necessary, taking care not to disrupt the mucosal surface of the nasopharynx. This may require rotating the probe in the same fashion as was necessary to introduce the probe.

3. Results and Discussion
There are several indications for examining the subepiglottic area with this technique. Any abnormality of the epiglottis, such as swelling or deformity, is a clear indication for a subepiglottic examination. However, the dorsal surface, tip, and base of the epiglottis can appear normal, although the underlying tissue has extensive pathology. The anatomical position of the soft palate and epiglottis often prevents visualization of any diseased tissue. A gagging cough while eating or when the horse is bitted up is also a sign of an epiglottic lesion. If no other abnormalities can be found with the standard endoscopic examination, the subepiglottic tissues need to be examined. We perform an examination of the subepiglottic area on any horse with an undiagnosed upper respiratory noise. Additionally, a subepiglottic examination should be performed on any horse with a persistent, dorsally displaced soft palate. We routinely perform the examination before recommending sternothyroid muscle/tendon resection for dorsally displaced soft palate (DDSP) [3]. The technique can also be used to evaluate tissue healing after resection of an entrapped epiglottis.

We have identified numerous lesions in subepiglottic tissue and the posterior soft palate with this technique. The lesions appear in all degrees of severity, but even extensive lesions may not be visible with the standard endoscopic examination. The most common finding is ulcerated subepiglottic tissue (Fig. 5B and Fig. 6B). Excessive granulation tissue can develop (Fig. 7B). Ulceration on or near the posterior border of the soft palate is a frequent finding (Fig. 8B). The posterior soft palate ulceration is commonly associated with subepiglottic abnormalities appearing as a "kissing lesion". We are unsure of the relationship of subepiglottic ulceration to the entrapped epiglottis.
The most important treatment is to take the patient out of training. Subepiglottic tissue ulceration, particularly with excessive granulation tissue, can be very difficult to heal while the horse continues to exercise; however, rest alone cannot be expected to heal the lesion. Therapy is based on the assumption that there is a bacterial component to these lesions even when inflammation is minimal. Administration of antibiotics is standard protocol when the lesion is first identified. This is particularly important with epiglottic swelling, tissue distortion, or tissue discoloration. Swollen and discolored necrotizing tissue is occasionally identified and may be associated with recently ruptured subepiglottic abscesses.

When possible, we prefer a Penicillin G Procaine [f] (20,000 IU/kg IM, q 12 h) and Gentamicin Sulfate [g] (7.5 mg/kg IV, q 24 h) combination as our first choice for initial antibiotic treatment. Long-term antibiotic therapy is often required to obtain complete healing and prevent recurrence. This is particularly true if an epiglottic cartilage chondritis develops because of an extension of the infection from the subepiglottic tissue. For prolonged antibiotic therapy, we prescribe trimethoprim/sulfa double strength [h] (30 mg/kg PO, q 24 h). We have continued this level of antibiotics for many months effectively without complication. Acutely systemic steroidal and non-steroidal anti-inflammatories may be necessary to reduce swelling. Various throat flushes seem to be helpful. We prefer a solution consisting of 200 ml glycerin, 200 ml propylene glycol, and 100 ml dimethyl sulphoxide (DMSO). Steroids may be added if necessary. The subepiglottic area is relatively easy to treat with a throat spray, because any medication administered with a pharyngeal catheter into the naso-pharynx will reach the subepiglottic tissue if the muzzle is elevated during administration of the medication. Although we will occasionally add antibiotics to the throat flush solution, we seldom add corticosteroids until the ulcerated tissue is epithelialized.

The subepiglottic tissue can scar (Fig. 9) while healing, and we have seen a number of horses develop deformation of the epiglottis after severe or chronic infections. Retroversion and elevation of the epiglottis as described is necessary to evaluate the effectiveness of treatment and the degree of healing. Additionally, surgical debridement is occasionally necessary but it is not recommended in the acute phase [4]. Tissue debridement with laser surgery has been effective in a small number of cases.

The etiology of subepiglottic ulceration is unknown. Mucosal irritation caused by dorsally displaced soft palate, upper respiratory tract infection, trauma to the tissue from foreign bodies while swallowing (i.e., dirt, roughage, oats), or dynamic epiglottic entrapment while training are possible causes [5]. The fact that training greatly inhibits the healing process suggests that subepiglottic tissue may be irritated with training. We do not know how frequently subepiglottic ulcerations occur in otherwise normal horses, but we hope to better characterize the lesion in the future.

The standing endoscopic examination of the subepiglottic area is a useful and simple technique for the practitioner. We believe that the technique is particularly useful in diagnosing upper respiratory disease in athletic horses.

Footnotes
[a] Tovar Farrier Products, Victor Tovar, 236 E. Walnut, Unit K, Monrovia, CA, 91016.
[c] Torbugesic®, Fort Dodge Animal Health, Fort Dodge, IA 50501.
[d] Lidocaine hydrochloride topical solution USP 4%, Roxane Laboratories Inc., Columbus, OH 43216.
[e] 8 FR, 56 cm Polypropylene Catheter, Sherwood Medical, St. Louis, MO 63103.
[h] Sulfamethoxazole and Trimethoprim Tablets, USP, Double Strength (800 mg/160 mg).
References


All rights reserved. This document is available on-line at www.ivis.org. Document No. P0644.1103. This manuscript is reproduced in the IVIS website with the permission of the AAEP www.aaep.org