DIAGNOSIS OF RECURRENT LARYNGEAL NEUROPATHY (RLN)/ LARYNGEAL HEMIPLEGIA

A diagnosis of RLN can be suspected on the basis of history and a physical examination. Horses with RLN commonly demonstrate exercise intolerance with resultant poor performance during high-speed exercise and produce an abnormal inspiratory respiratory noise during exercise described as a nonvibratory, single-tone whistle that has resulted in the colloquial term roaring. This noise is the result of turbulence created by a narrowed rima glottidis as air passes over the affected vocal cord and ventricle, which acts as a resonator. Physical examination should include palpation of the neck and larynx because horses with significant RLN have palpable atrophy of the left CAD muscle, which manifests as a percutaneous prominence of the muscular process of the arytenoid cartilage. The larynx should also be palpated for congenital malformation and evidence of arytenoid chondritis. If there is suspicion of previous laryngeal surgery, clipping of the hair is advised to allow visual confirmation of palpable laryngotomy or laryngoplasty scars. Ultrasound examination can identify arytenoid cartilage movements but patient cooperation is essential for successful interpretation of this diagnostic mode.

A definitive diagnosis of RLN is made on endoscopic examination when there is partial or complete loss of abductor function on the affected side of the larynx. Because the various descriptions of the loss of abductor function (hemiplegia, paresis, complete or incomplete paralysis) can lead to confusion, a variety of grading systems have been developed over the past 30 years by several surgeons to describe arytenoid cartilage movements as assessed endoscopically in the resting horse. Currently a seven-grade system (Grades 1 though 4) with subgrades has been adopted by many surgeons to establish international consistency in reporting this condition. This grading system should make possible a better description of the endoscopic appearance of laryngeal movements and more accurate reporting of treatment outcomes.

To aid assessment of arytenoid cartilage movements, both the swallow reflex and nasal occlusion can be helpful. In the normal horse a momentary full abduction of the arytenoid cartilages can be stimulated by inducing

swallowing. Prolonging nasal occlusion for several attempted breaths can also induce maximal abduction of arytenoid cartilages in the normal horse. Trackside endoscopy immediately after strenuous exercise has been used to help establish a diagnosis of recurrent laryngeal neuropathy, but it is not a reliable technique. If doubt exists about the diagnosis and surgical intervention is planned, treadmill videoendoscopy or "over-ground" videoendoscopy are now the "gold standards" for accurate diagnosis. A video image can be recorded and reviewed in slow motion to accurately observe dynamic collapse of the affected arytenoid cartilage and ipsilateral vocal cord.31 When highspeed videoendoscopy is not available, momentary full abduction of the arytenoid cartilages after swallowing is thought to be more reliable than nasal occlusion at predicting which horses would demonstrate arytenoid cartilage collapse during treadmill endoscopy at speed. In many horses that cannot achieve full abduction during nasal occlusion the arytenoids will collapse at speed, but not all will. However, horses that showed full symmetrical abduction after swallowing all maintained full abduction at speed. It is well established in horses standing at rest, without clinical evidence of upper respiratory obstruction, that the arytenoid cartilages can be positioned asymmetrically and/or have asynchronous movements. Therefore, it is important to acknowledge that this asymmetry and/or asynchrony may or may not predict failure of arytenoid function during athletic exercise. Whereas the clinical significance of these variations in arytenoid cartilage movement has been controversial, it is generally accepted that as arytenoid cartilage abduction decreases, athletic performance reduces and therefore it is an undesirable finding during endoscopy of the equine athlete. Furthermore, it is recognized that horses with RLN, even after treatment with prosthetic laryngoplasty or a nerve muscle pedicle graft, often do not achieve full restoration of athletic performance.

Therefore, interpretation and significance of altered laryngeal cartilage movements identified at endoscopy falls to the veterinarian, who must make an educated prediction of how these altered movements will affect the horse's performance. Hence the veterinarian has to determine how severely affected is the larynx and answer the question: "Will these altered laryngeal movements progress to complete laryngeal paralysis?" In 1982, a study of 168 horses over

several years demonstrated there was no apparent progression from asynchronous arytenoid cartilage movements to complete paralysis.35 This led the investigators to conclude that such movements were normal. Subsequently, a four-point grading system describing arytenoid cartilage movements was developed to predict present and future arytenoid cartilage dysfunction based on resting endoscopic evaluation. Although clinical and experimental studies suggested RLN may have been progressive, no factual evidence was available in the literature. In 1997, when 109 young Thoroughbred and Standardbred horses were examined 16 months apart, 12% of horses progressed from normal laryngeal function to that indicative of RLN. In 2002, another study supported the progressive nature of RLN.37 The long-term histories and clinical findings of 351 horses suffering from RLN were examined for evidence of progression of laryngeal asymmetry. Fifty-two out of 351 cases (15%) had evidence of progressive laryngeal dysfunction over a median period of 12 months. A more recent study has also highlighted the progressive nature of the disease with successive treadmill examinations over time. The fact that 67% of foals with marked arytenoid dysfunction can show improved laryngeal function 12 months later39 supports the statement that endoscopic findings on a given day may not apply to the future, and periodic re-examination is justified. As well as RLN being progressive, many adult horses have an acute onset of exercise intolerance and loud inspiratory noise. The progression of RLN is assumed to be slow and insidious; however, clinical signs may only become apparent when sufficient muscle atrophy of the cricoarytenoideus dorsalis muscle occurs, permitting complete arytenoid collapse during exercise. This manifestation could result in a history of acute onset. However, rapid progression in as little as 6 weeks has been reported.

Variation of arytenoid cartilage movements in an individual horse has been reported to be common when the horse has multiple endoscopic examinations. This variation, whether examinations are days or even hours apart, is thought to be caused by intra-assessor variation or laryngeal muscular fatigue from multiple re-examinations. Using the seven-grade system, a high degree of reliability in assessing laryngeal movements has been shown, but variation can be seen in the same horse evaluated endoscopically on different days.

1. **Equine Surgery 4th edition by Auer & Stick**