Key Points

- Considerable variation exists between the endoscopic appearance of the upper portion of the upper respiratory tract (URT) of the same individual examined on serial occasions.
- Longitudinal examinations suggest that certain dynamic pathologies of the URT may be self-limiting or transient in nature.

The recent development of a number of commercially available wireless telemetric endoscopic systems allows direct visualization of the URT during ridden exercise without a treadmill (Franklin et al. 2008, Tamzali et al. 2008, Pollock et al. 2009). Horses can be safely and effectively examined in their normal training and performing environments on a number of occasions allowing longitudinal examinations to be performed in an attempt to better interpret the variation, that has been reported anecdotally, to exist between serial examinations.

Idiopathic laryngeal hemiplegia and dorsal displacement of the soft palate are the most commonly reported upper respiratory tract obstructions in horses (Brown, Derksen et al. 2004; Franklin, Naylor et al. 2006). Other causes of upper respiratory tract obstruction include pharyngeal collapse, arytenoid chondritis, tracheal collapse, epiglottic entrapment, axial deviation of the aryepiglottic folds, epiglottic retroversion, collapse of the apex of the left corniculate process, cricotracheal membrane collapse and alar fold collapse. The most frequently reported consequences of obstruction of the upper respiratory tract in the equine athlete are poor performance and abnormal respiratory noise (Morris and Seeherman 1991; Martin, Reef et al. 2000). Diagnosing the cause of such non-specific clinical signs presents a challenge.

Endoscopic examination of the upper portion of the respiratory tract (URT) during exercise has led to questions being raised about the diagnostic usefulness of endoscopy performed at rest (Lane et al. 2006). Specifically, it has been shown that misdiagnosis rates for the two most common conditions (left laryngeal hemiplegia and dorsal displacement of the soft palate) are as high as 35% (Lane et al. 2006). Despite this, resting endoscopic examination of the URT is often performed repeatedly prior to sale and then immediately after sale in virtually all Thoroughbred yearlings as a means of determining suitability for racing. As a result some horses are potentially erroneously passed; leading to horses training and racing with debilitating pathology of the airways, or erroneously failed; leading to horses with functionally normal airways being unsold and potentially euthanased. Considering that during resting endoscopy at the sales up to 67% of Thoroughbred yearlings have been observed to demonstrate findings considered abnormal in adults (asynchronous/asymmetrical arytenoid movements) (Stick et al. 2001), this has potentially major welfare and economic implications.

Furthermore it has been suggested that considerable variation may exist in the resting and dynamic endoscopic appearance of the URT of the same individual examined on a number of occasions. Specifically there may be poor correlation between individual scores of laryngeal symmetry and there is some debate as to the repeatability of other dynamic conditions including idiopathic dorsal displacement of the soft palate.
Numerous grading systems using endoscopic images of laryngeal function have been devised in order to create a standardized, repeatable interpretation method that correlates with arytenoid movement at exercise. Hackett et al (1991) demonstrated a 4-grade system that had been modified from that of Ducharme et al (1991), whilst Lane (1993) describes a 5-grade system. Concern over the huge discrepancy of grade III as a category led to the creation of the 7 grade Havemeyer system described by Dixon et al (2003) which subdivides both grades II and III.

The inaccuracy of grading horses at rest led to the development of an A,B,C system to grade RLN at exercise (Rakestraw et al 1991).

There have been several methods described for measuring the abduction of arytenoid cartilages. Rakestraw et al (1991) describes comparing cross sectional area of the Rima Glotis using left to right ratios to allow comparison between horses. This method has also been described by Ducharme et al 1991 and Hammer et al 1995.

To date, the only investigations into variability of RLN horses on two different occasions have been at rest. A study by Anderson et al (1997), on 192 1-2yr old thoroughbreds examined twice, showed 43% to have no change in grade, 29% to have improved and 28% to have worsened over a 16 month period. A recent study by Perkins et al (2009) showed that, of 120 draught horses receiving two resting endoscopic examinations in a 24 to 48 hour period, only 57% of horses received the same grade on the second occasion as they had on the first.

Such differences in grading from one examination to another at rest leads to speculation as to whether there is a similar difference during exercise. The picture is further complicated as it is unclear at present as to the incidence of progression in RLN horses (Dixon et al (2002)).

For this reason a method was devised whereby the right arytenoid cartilage was measured midline from where the arytenoid cartilage meets the aryepiglottic folds to the top where it meets the left arytenoid cartilage. That figure was then halved and used as a mid point by which to determine left and right arytenoid angles. Left to right arytenoid angle ratios (LRR) were created.
during both expiration and inspiration by dividing the left arytenoid angle by the right. This method allows for variation in absolute values and allows direct comparison within and between horses. These ratios were then compared between serial examinations of the same horse to determine intra-horse variability.

In addition to measurement of arytenoid angles all other dynamic abnormalities were recorded. Where possible horses with evidence of instability of the URT were re-examined on at least one occasion. It is clear that a large number of horses are affected by multiple dynamic abnormalities, and that in many cases the presence of these abnormalities varies from examination to examination. A significant proportion are self limiting, particularly in horses under the age of 4 years and in horses in the early part of training.

References:

