Overground Videoendoscopy Evaluation in Performance Horses

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Introduction

A competent, normally functioning respiratory tract is crucial for horses to perform at their maximal potential. Horses that perform fast work, particularly for sustained periods, exert a tremendous demand on their respiratory system. At maximal exertion, the minute ventilation can increase 20 times that of normal resting minute ventilation. This dramatic increase must be accommodated by the upper airway. Although the equine upper respiratory tract has the greatest resistance to airflow, diseases of the lower respiratory tract can also have negative consequences on performance. Lower airway diseases such as exercise induced pulmonary hemorrhage and inflammatory airway disease can commonly affect sport horses, and must be ruled out when examining a horse with poor performance due to a respiratory abnormality. The focus of this presentation is the upper airway evaluation of the non-racing sport horse utilizing overground videoendoscopy.

Clinical signs

Horses suffering from poor performance related to upper respiratory abnormalities can be common in sport horse practices. These cases can be challenging due to the complexity of the equine upper airway, variety of conditions affecting this area, and relative difficulties in accessing and imaging the region. The most common clinical signs associated with an upper airway problem is abnormal respiratory noise during work, although in some cases only reduced performance may initially be noted.

Examination

The basis of any diagnosis is a thorough physical exam. In horses presenting with clinical signs consistent with an upper airway abnormality (noise, reduced performance, or exercise intolerance), I typically begin my examination at the nose and work caudally.

Subjective assessment of airflow through both nostrils is evaluated and any nasal discharge is noted. Facial symmetry is assessed and sinus percussion performed to determine the potential presence of consolidation within the paranasal sinuses. The horses' throat latch is then examined for the presence of surgical scars before palpating the larynx. The larynx is then palpated to assess symmetry of the dorsal aspect, primarily the muscular processes of the arytenoid cartilages. This takes some practice and subtle changes in the cricoarytenoideus dorsalis muscle can be difficult to detect, but atrophy associated with higher grades of recurrent laryngeal neuropathy can readily be appreciated by the prominence of the muscular process on the affected side. A thoracolaryngeal reflex ("slap test") can be evoked and the response subjectively compared from right to left. The physical exam is completed by thoroughly auscultating the thorax.

Endoscopy

One of the most useful diagnostics available in the evaluation of horses presenting with upper airway disease is resting endoscopy. Pathology present in the upper airway can be visualized in addition to ruling out other conditions of the airway such as guttural pouch disease or evidence of lower airway disease. Although considered a foundation diagnostic, not all abnormalities can be observed or reproduced with resting upper airway endoscopy. Conditions that can cause a functional upper airway abnormality that cannot be diagnosed with resting endoscopy include pharyngeal collapse, axial deviation of the aryepiglottic folds, epiglottic retroversion, intermittent epiglottic entrapment, palatal instability and dorsal displacement of the soft palate.¹ Videoendoscopy during exercise is extremely valuable in cases where resting endoscopy does not provide an accurate diagnosis. Horses that are candidates for dynamic endoscopic evaluation include;

- 1. Any horse making an upper respiratory noise and has a normal resting endoscopic examination findings.
- 2. Horses that have resting endoscopic examination findings that do not fit the history or clinical signs.
- 3. Those with reduced performance where other causes such as lameness have been ruled out and have normal resting upper airway endoscopic findings.

- 4. Horses that displace their soft palate easily during resting endoscopy.
- 5. Evaluation of horses following surgical procedures of the upper respiratory tract prior to return to training.

Broadly there are two methods of dynamic endoscopic evaluation, treadmill and overground, each having particular benefits and disadvantages. Evaluation using a highspeed treadmill requires the horse be transported to such a facility, and can be costly to perform due to the need for skilled personnel necessary and period of acclimation needed for the horse to perform fast work on a treadmill. Treadmill evaluation seems to be better suited for horses that perform at speed. The necessity to reproduce upper respiratory problems in sport horses while performing in their own environment, normal tack, and while being ridden has led to the development of overground telemetric videoendoscopy systems. There are a variety of systems currently available that either mount completely within a custom headstall or are incorporated into a saddle pack or back pack worn by the rider. The malleable endoscope containing the video chip is well tolerated by the horse once inserted into the upper airway. The systems all record high quality video and most have a hand held monitor for viewing real-time endoscope position within the airway, which can change depending on the horses head position during examination. The video can be transferred to a computer for editing and shared with owners or trainers when presenting the diagnosis and discussing treatment options.

Common conditions

Recurrent laryngeal neuropathy

Recurrent laryngeal neuropathy (RLN) also known as idiopathic laryngeal hemiplegia is seen most commonly in young, large breed horses when they are starting training. Depending upon the grade, horses with RLN are unable to achieve maximal arytenoid abduction during increased upper airway pressures which leads to a reduced rima glottis diameter. These horses are exercise intolerant due to the rapid development of hypoxemia, hypercarbia, and metabolic acidosis which leads to early muscle fatigue and poor performance. For consistency, the most widely utilized system for grading arytenoid function in the resting horse is based on four grades with subgrades and the description is as follows;²

- Grade I- All arytenoid cartilage movements are synchronous and symmetrical, and full arytenoid cartilage abduction can be achieved and maintained.
- Grade II- Arytenoid cartilage movements are asynchronous and/or larynx is asymmetric at times, but full arytenoid cartilage abduction can be achieved and maintained.
 - Subgrade A- Transient asynchrony, flutter, or delayed movements are seen.
 - Subgrade B- There is asymmetry of the rima glottis much of the time owing to reduced mobility of the affected arytenoid cartilage and vocal fold, but there are occasions, typically after swallowing or nasal occlusion, when full symmetrical abduction is achieved and maintained.
- Grade III- Arytenoid cartilage movements are asynchronous and/or asymmetric. Full arytenoid cartilage abduction cannot be achieved and maintained.
 - Subgrade A- There is asymmetry of the rima glottis much of the time owing to reduced mobility of the affected arytenoid cartilage and vocal fold, but there are occasions, typically after swallowing or nasal occlusion, when full symmetrical abduction is achieved *but not* maintained.
 - Subgrade B- There is obvious arytenoid abductor muscle deficit and arytenoid cartilage asymmetry. Full abduction is never achieved.
 - Subgrade C- There is marked but not total arytenoid abductor muscle deficit and arytenoid cartilage asymmetry with little arytenoid cartilage movement. Full abduction is never achieved.
- Grade IV- Complete immobility of the arytenoid cartilage and vocal fold.

A grading system for arytenoid collapse during exercise has also been described according to the following diagram;³



- Grade A- Full and maintained abduction of arytenoid cartilages during inspiration.
- Grade B- Partial or unsustained abduction of the left arytenoid cartilages to a point between full abduction and resting position.
- Grade C- Adduction of the left arytenoid cartilage from resting position, including collapse into the right half of the rima glottidis.

Recent meta-analysis suggests that there is high sensitivity and specificity for resting laryngeal endoscopy to predict dynamic laryngeal collapse at exercise.⁴ However, there has been a subset of horses reported to have grade 1 or 2 resting laryngeal function that had some form of dynamic collapse during exercise. Dynamic videoendoscopy can be very useful in evaluating horses with some degree of RLN (grade III) on resting endoscopy to determine exactly what degree of arytenoid collapse may be occurring during work. It can also provide useful information following prosthetic laryngoplasty prior to returning the horse to work, or in the identification of failed prosthetic laryngoplasty.

Dorsal displacement of the soft palate

Horses with dorsal displacement of the soft palate (DDSP) may make a gurgling sound or appear to mouth breath upon expiration due to the position of the palate dorsal to the epiglottis. There are some horses that do not make a noise and are considered "silent displacers". DDSP leads to an expiratory upper airway obstruction and exercise intolerance. Two forms are observed, intermittent and persistent, with the intermittent form being more commonly observed in performance horses. The etiology is incompletely understood and likely multifactorial with palatal instability potentially contributing in some cases. It has a relatively high incidence (10-20%) in performance horses, and sport horses that perform under extreme collection can be particularly predisposed due to the change in airway dynamics this creates.

Overground videoendoscopy can be very useful in evaluating sport horses with suspected DDSP as resting endoscopy has a poor predictive value of determining the occurrence of DDSP during exercise.⁵ For horses that perform at speed such as racehorses, treadmill videoendoscopy seems to be more reliable in identifying horses with DDSP than overground videoendoscopy likely due to the intensity of exercise during a treadmill examination protocol. Currently the gold standard for diagnosing intermittent DDSP in performance horses is based on a history of poor performance with a respiratory noise, physical exam findings, and evaluation with resting and dynamic endoscopy.⁵ Horses with DDSP reportedly can have a higher prevalence of inflammatory airway disease, therefore it is important to rule out the possibility of lower airway disease when evaluating horses and making treatment recommendations.⁶

Conclusions

Upper respiratory disease in the horse can be challenging to diagnose accurately in some cases due to the difficulty in reproducing the condition during resting endoscopy. Many conditions such as pharyngeal collapse, axial deviation of the aryepiglottic folds, epiglottic retroversion, intermittent epiglottic entrapment, palatal instability and dorsal displacement of the soft palate are not observed during resting endoscopy and can only be observed during dynamic endoscopy. Many large equine referral centers and teaching hospitals have the capability to perform dynamic videoendoscopy, either via treadmill or more commonly overground evaluation. If there is any question regarding the correct diagnosis utilizing resting endoscopy, dynamic endoscopic evaluation is highly recommended especially prior to performing any surgical procedures of the upper airway.

References:

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