AN OVERVIEW OF OVER THE GROUND ENDOSCOPY FOR THE HORSE

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Introduction
Dynamic upper airway diseases are common performance limiting problems seen in all horses. Common clinical signs seen in horses with dynamic upper airway disease include exercise intolerance, abnormal respiratory noise while performing and/or coughing while performing. Some of the more common dynamic upper airway diseases include: left laryngeal hemiplegia, dorsal displacement of the soft palate, axial deviation of the aryepiglottic folds, vocal cord collapse and pharyngeal collapse. Methods of evaluating horses with abnormal respiratory noise or exercise intolerance include history, physical examination, resting endoscopy, treadmill endoscopy, laryngeal ultrasound and over the ground endoscopy. Over the ground endoscopy and/or treadmill endoscopy are the gold standard for obtaining an accurate diagnosis, which is the most important step in treating dynamic upper airway disease.

How does over the ground endoscopy work?
There are several different types of over ground endoscopy systems that are used to evaluate the horse’s upper airway while they are performing. The parts of the upper airway that can be seen with an over the ground endoscopic system include nasopharynx, larynx and upper most portion of the trachea, all together making up the horse’s “throat”. Over ground endoscopy will not provide image of the nasal passages or middle and lower trachea. Each over the ground endoscopy system is attached to the horse/rider a little differently. Some over ground endoscopy systems are completely mounted on a modified halter with the endoscope computer on one side of the horse’s face and the flushing mechanism and light source on the opposite side of the horse’s face. This modified halter will fit over the horse’s bridle. Other systems have the endoscope mounted on the horse and a backpack that contains the endoscope computer, light source and flushing mechanism, which is worn by the rider or placed on the harness for horses pulling a cart. All over ground endoscopy systems have the common thread of allowing the veterinarian to record video of the upper airway while the horse is performing in its natural training or performance environment. Over ground endoscopy systems are portable and allow the veterinarian to go to the location where the endoscopy exam will take place (racetrack, horse show, barrel race, clinic, etc).

Horses generally accept the endoscope being placed in the nasal passage with minimal resistance and perform very well while the endoscope is in the upper airway. Restraint used while placing the endoscope in the horse’s nasal passage includes 3-5 mls of local anesthetic and a twitch. The local anesthetic (lidocaine or carbocaine) is sprayed into the nasal passage that the endoscope is going to be placed 5 minute prior to placing the endoscope. A nose twitch is placed on the horse just prior to placing the endoscope in the nasal passage, which was blocked with local anesthetic. Some horses may require a very low dose of sedation (xylazine) to get the endoscope properly positioned in the upper airway, however this is uncommon.

Generally it will take 10-15 minutes for the horse to get used to the endoscope after it has been placed in their nasal passage. Once the horse is settled and tolerating the endoscope (not throwing or shaking their head), the rider will mount up. Once the rider is on the horse they will make sure that the scope is not interfering with the bridle. If the rider has adequate control, the scope it checked one last time to make sure it is in properly positioned in the upper airway and the record button on the endoscope computer is pressed and the horse is allowed to perform. After the exam the recording is stopped and the disk is removed from the endoscope computer and place in a lap top computer to watch the video of the horse’s upper airway in slow motion or frame by frame. Some over the ground endoscopy systems allow you to watch the endoscopy exam live via telemetry, which has the advantage of being able to make adjustments if the scope position changes during the exam as well as watching the horse’s performance and comparing that to what is taking place in the upper airway.
Advantages of over ground endoscopy

Over the ground endoscopy has many advantages over the other diagnostics used to evaluate the horse’s upper airway. These systems allow veterinarians to: 1) examine the horse’s upper airway while they are performing at a very high level in their natural environment, 2) perform the evaluation at a lower risk of injury to the horse, 3) decrease overall cost of the evaluation to the owner/trainer and 4) provide this service in a convenient setting for the horse and owner/trainer.

It has been well documented that horses with a normal upper airway endoscopy at rest with a history of poor performance or abnormal noise while exercising, frequently will have abnormalities seen during an over ground and/or treadmill endoscopic exam. An example of this would be dorsal displacement of the soft palate. Every horse will displace their soft palate during a resting endoscopic exam, however the significance of this finding is hard to predict unless you can see the horse displace their soft palate during an over ground endoscopy exam and exhibit the chief complaint (abnormal upper airway noise or decrease in performance) while the soft palate is displaced. Other dynamic upper airway abnormalities that can be missed during resting endoscopy, but seen during an over ground endoscopic exam are mentioned in the introduction.

Another method of evaluating a horse with a dynamic upper airway disease is scoping the horse right after exercising, while the horse is still breathing hard. This can give the diagnosis on some cases with dynamic disease, but a lot of times the horse will correct the upper airway abnormality prior to the endoscope being inserted into the upper airway which could lead to a false negative result.

Before over ground endoscopy became available as a diagnostic tool, treadmill endoscopy was used to evaluate horses that had a dynamic upper airway disease. Based on the history the treadmill endoscopy exam is tailored to mimic the horse’s level of performance or head flexion that normally causes the horse to display the dynamic airway disease.

Some disadvantages of treadmill endoscopy are the expense of the equipment and trained personal needed to exercise a horse on the treadmill, time to train the horse to work on the treadmill and risk of injury to the horse while performing on the treadmill. Treadmill endoscopy cannot replicate the environmental conditions that horse normally performs (show, race track, roping arena, ect), which may be the only time the horse displays any upper airway abnormalities. There is also an inconvenience to the owner or trainer having to bring the horse to the clinic where the treadmill is located.

With over ground endoscopy we are able to go to the track, training stable and/or show arena and scope horses in their natural environment. This allows us to take an accurate history prior to examining the horse and then develop a plan that will include the environmental factor(s) that may trigger the horse to display a dynamic upper airway disease. This usually requires the veterinarian traveling to the race track, horse show or barrel race to perform the endoscopic exam in a more natural environment. For example a race horse may only display signs of upper airway disease when they are racing and get beat by a faster horse towards the end of the race. In this case when examining the horse with the over ground endoscope, I would breeze the horse being examined in company against a faster horse. This will increase the chances of getting an accurate diagnosis by mimicking the environmental factors that are causing the horse to display upper airway disease.

Upper airway abnormalities can be intermittent and the trainer and/or owner need to understand that it may take a 2-4 examinations with the over ground endoscopy system in order to get the diagnosis. I find this to be quite common when examining show horses and barrel horses. Race horses tend to show the problem during the first examination. The key is to be patient and persistent.

When to use over the ground endoscopy

The 2 most common reasons to scope a horse with the over ground endoscope are when the horse is making an upper airway noise while performing or shortly after performing, or the horse is exhibiting signs of exercise intolerance and/or poor performance. For the horses making noise while performing, a standard upper airway work-up should be performed prior to scoping the horse with the over ground endoscopy. For the horse that are showing poor performance a decision needs to be made as to what is the most likely cause the poor performance (musculoskeletal, upper airway, lower airway, etc) and a full examination of that body system.
should be performed to rule out causes of poor performance. One key thing to remember while working up a horse for poor performance is that not all horses with an upper airway abnormality will make noise.

**Conclusion**

Reasons for performing a dynamic endoscopy include:
- Normal upper airway during resting endoscopy, but horse is making an upper airway noise when exercising
- Abnormal upper airway during resting endoscopy and you want to assess the affects at exercise
- Poor performance with or without abnormal respiratory noise

Dynamic upper airway disease can be difficult to diagnose in horses. The key is to get the most accurate diagnosis in order to provide the best possible therapy. While over ground endoscopy give the best chance of getting the diagnosis, we cannot forget to use the information gained from our history, physical exam, standing endoscopy and laryngeal ultrasound when coming up with a therapeutic plan.

Dynamic upper airway diseases are usually intermittent and the horse may not show the problem during the initial over ground endoscopy. It may be necessary to examine the horse several times with the over ground endoscopy system in order to get the diagnosis. Mimicking the environment which causes the horse to make the noise, while examining the horse with the over ground endoscopy, will improve the accuracy and efficiency of the exam.

The safety of the horse and rider should always be considered when doing an over the ground endoscopy. It may be necessary have the horse wear the scope for several minutes while walking in the shed row or paddock, before allowing the rider to get on the horse. This can require time and patience, but most horses will get used to the scope and allow us to examine their upper airway while they are performing.
Upper airway obstruction is a common problem seen in athletic horses. Upper airway obstruction frequently results in exercise intolerance, upper airway noise (rattles, wheezes, whistle, honking), and nasal discharge. Some of these clinical signs are specific for certain types of obstruction, while others are seen in horses that are suffering from some other illness or disease. This overlap in clinical signs stresses the importance of getting the proper diagnosis prior to initiating therapy. Diagnostic modalities available for upper airway obstruction in horses include: standing endoscopy, dynamic endoscopy, laryngeal ultrasound, laryngeal and nasopharyngeal radiographs and laryngeal palpation. More times than not a combination of these diagnostics modalities are needed to arrive at the correct diagnosis.

Standing endoscopy is the most commonly utilized diagnostic tool for horse with suspected upper airway obstruction. Standing endoscopy allow the veterinarian to directly examine the nasal passage, nasal pharynx, larynx and trachea. There is a wealth of information that can be obtained with standing endoscopy, but this should not be the sole diagnostic tool used to evaluate a horse’s upper airway.

Laryngeal palpation should be performed on any horse presenting for a potential upper airway obstruction. The muscular process of the arytenoid, thyroid cartilage lamina, the cricoid cartilage and cricoarytenoideus dorsalis muscle should be palpated on the left and right side of midline. With practice a veterinarian should be able to appreciate changes in the shape and size of the laryngeal cartilages, asymmetry between the left and right sides of the larynx, as well as atrophy of the cricoarytenoideus dorsalis muscle.

Dynamic endoscopy (Over the ground endoscopy or treadmill endoscopy) is a great diagnostic tool that can be used to examine the horse’s nasopharynx and larynx while they are exercising. Horses with a history of exercise intolerance or making noise only while exercising, combined inconclusive standing endoscopy findings are candidates for a dynamic endoscopic exam.

Ultrasonography of the larynx is one of the most informative, but under-utilized diagnostic tools for upper airway obstruction in a horse. Ultrasonography of the horse’s larynx is a minimal invasive procedure that can be done standing with or without sedation. Garrett et. al. found that ultrasonography of the larynx had a higher sensitivity and specificity for diagnosing recurrent laryngeal neuropathy compared to standing endoscopy (1). Garrett et. al. also found laryngeal ultrasonography to be beneficial in both diagnosing and therapeutic planning in horses with arytenoid chondritis (2). Finally Garrett et. al used ultrasonography to identify horses with laryngeal dysplasia (3). Prior to Garrett’s publication on ultrasonography for horses with laryngeal dysplasia, it was nearly impossible to differentiate a horse with laryngeal dysplasia from a horse with recurrent laryngeal neuropathy.

Radiographs can be used to evaluate the cartilages of the larynx; the bones within the hyoid apparatus; distention of the guttural pouches with either air, fluid or chondroids; and mass with the upper airway. Radiographs can aid in identifying radiopaque foreign bodies that can be lodge in the base of the tongue, subepiglottic tissue or in the cranial esophagus. Horses with a foreign body in any of these...
location may be dysphagic, display hyper-salivation, or cough frequently when eating and drinking. Radiographs are the best diagnostic tool when examining a horse with a collapsing trachea. If the cervical trachea is collapsing, the radiograph should be taken during inhalation. If the thoracic trachea is collapsing the radiograph should be taken during exhalation.

Some of the more common cause of upper airway obstruction include: recurrent laryngeal neuropathy, arytenoid chondritis, dorsal displacement of the soft palate, nasopharyngeal collapse, vocal cord collapse, axial deviation of the aryepiglottic folds, and soft palate instability. Many times a horse will have a combination of 2 or more upper airway obstructions listed above. It is important to identify all causes of upper airway obstruction in each case and devise a therapeutic plan that will address each one. As mentioned earlier, a combination of diagnostic test is usually needed to identify all causes of upper airway obstruction in each case.

Therapy for horse with recurrent laryngeal neuropathy includes a ventriculocordectomy alone, laryngoplasty with a ventriculocordectomy or partial arytenoidectomy. The therapy chosen depends on the level of work the horse is being used for and comfort level of the surgeon with a particular procedure. Horses in low level work are candidates for the ventriculocordectomy alone, this will decrease the upper airway noise but not the exercise intolerance that the horse will experience with this disease (4). Horses in a higher level of work need to have a laryngoplasty with a ventriculocordectomy or an arytenoidectomy. These treatment options will resolve both the upper respiratory noise as well as the exercise intolerance.

A horse with arytenoid chondritis can be treated with medical therapy or an arytenoidectomy. Medical therapy involved systemic and local anti-inflammatory medication and systemic antibiotics for 2-4 weeks. If medical therapy is unsuccessful, then an arytenoidectomy will need to be done.

Current therapies for a dorsal displacement of the soft palate include a rest and medical therapy, sternothyroideus myectomy with a laser palatoplasty, and laryngeal tie forward with a laser palatoplasty. The laser palatoplasty can be replaced with a thermopalatoplasty, both techniques are used to promote fibrosis and stiffening of the soft palate. The laryngeal tie forward carries an 80-90% prognosis for a full recovery following surgery. The sternothyroideus myectomy procedure results in 60% prognosis for a full recovery. Medical therapy includes systemic anti-inflammatory medication, local anti-inflammatory medication. Systemic antibiotics can also be added to the therapeutic regimen, if there is evidence of a lower airway inflammation or infection. 30-50% of horses will return to full athletic function with medical therapy.

Soft palate instability can be a disease all onto its own or a precursor for a horse that is going to dorsally displace their soft palate with more exercise. A dynamic endoscopy exam is needed to diagnosis soft palate instability and differentiate which category the soft palate instability belongs. 50% of horses with soft palate instability will make noise while they are performing. A laser palatoplasty is needed, if the horse has soft palate instability without a dorsal displacement of the soft palate. A laryngeal tie forward is needed if the soft palate instability is a precursor to a dorsal displacement of the soft palate.

Axial deviation of the aryepiglottic folds is a disease that can only be diagnosed with a dynamic endoscopy. This disease will result in the horse making a raspy, rattling/whistling upper airway noise during inspiration. The noise is similar to a horse with recurrent laryngeal neuropathy, but a higher pitch. Therapy for horses with this disease involve a laser resection of 50-80% of the left and right
aryepiglottic fold. 80-90% of horse will return to full athletic use with minimal upper airway noise and exercise intolerance.

In conclusion, a complete diagnosis is key to a proper therapeutic plan for a horse with an upper airway obstruction. Upper airway endoscopy alone is usually insufficient to arrive at a complete diagnosis for a horse with upper airway obstruction. Dynamic endoscopy and laryngeal ultrasound are 2 adjunctive diagnostic tools that can be very useful but underutilized, when working up a horse with upper airway disease. The best therapeutic plan is one that with address all upper airway diseases, when 2 or more are present.