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Variations in resting scope findings

Endoscopic examination of the upper airway is common practice in the thoroughbred athlete, and is an ideal starting point for the investigation of respiratory noise or reduced performance. It also forms an important part of the pre-purchase examination of horses intended for racing, and it is this role when the findings potentially become most contentious.

With a trained eye and the horse at rest, obvious anatomical abnormalities (e.g. cleft palate, figure 1; entrapped epiglottis, figure 2; inflamed laryngeal cartilages, figure 3) are readily identified using endoscopy. Dorsal displacement of the soft palate (DDSP) is frequently identified at rest, but this is rarely permanent and is often corrected as the horse swallows or coughs. A number of studies, using both resting and exercising endoscopy, have shown that predicting the incidence of DDSP at exercise from resting endoscopy alone to be unreliable.

Exercising endoscopy (EE), using either high speed treadmill endoscopy or overground endoscopy, is essential in the accurate diagnosis of DDSP and palatal instability. Equally, a number of other nasopharyngeal abnormalities can be diagnosed only using EE, including aryepiglottic fold collapse – also known as medial deviation of the aryepiglottic folds, or MDAF (figure 4) – nasopharyngeal collapse, crichotracheal ligament collapse and epiglottic retroversion. However, for the purpose of this article we will concentrate on the variability of resting endoscopic examination, and primarily the variability associated with the function of the laryngeal cartilages.

Assessment of laryngeal function is often the principal goal for veterinary surgeons undertaking resting endoscopy, and especially for those involved in pre-purchase examinations. In many large breeds of horses, and especially thoroughbreds, the left side of the larynx

Conducting an endoscopic examination to investigate respiratory noise

does not move as readily and completely as the right. This is due to the nerve supply to the laryngeal muscles on the left becoming dysfunctional as the horse matures.

The exact cause of the disease is not clear, but it is thought that the disproportionate length of the nerve plays a role. The nerve is called the recurrent laryngeal nerve and the disease is known as recurrent laryngeal neuropathy (RLN). RLN is also referred to as laryngeal hemiplegia, laryngeal paralysis and colloquially as terms such as 'roaring'.

As with any muscle that loses its nerve supply, the muscles that keep the larynx open reduce in size (atrophy), become weaker and eventually stop working all together. This atrophy can be palpated, and is an important part of the assessment of these horses. As the horse breathes in, the pressure in the upper airway becomes increasingly negative and the unsupported left side of the larynx gets sucked into the airway (figure 5).

Mild or early stages of RLN can be identified with the horse at rest, but many horses showing some signs of left laryngeal dysfunction at rest may actually be fully functional at exercise.

On the other hand, RLN is often progressive in nature and the clinical signs may worsen in the months to years following the initial examination.

The standard resting endoscopic examination

Over the years, convention has dictated that thoroughbred racehorses have their upper airway examined using a flexible endoscope that is passed via the right nostril, giving a view that is angled slightly from the right. The horse should not be sedated, except in exceptional circumstances when individuals become refractory to regular methods of restraint. All sedatives cause a degree of muscle relaxation that will similarly affect the laryngeal muscles, potentially giving a misleading assessment of their functional ability. Good horse holders and conventional 'twitches' are useful in achieving restraint in most individuals.

The laryngeal nerves and muscles spend most of their time inactive when the horse is resting. However, the muscles will contract when the horse coughs or swallows. Spraying of water into the upper airway, or nudging the sides of the nasopharynx with the scope can induce a swallow, and thus allow intermittent assessment of the laryngeal movement. Occluding the horse's nostrils for a few seconds will induce a large breath upon release that will allow maximal laryngeal movement to be visualised. Laryngeal muscles will often continue to contract maximally as the horse recovers from exercise, so endoscopic examination at this point can also be helpful. The exercise test will also allow assessment of any respiratory noise that the horse may produce, with a characteristic inspiratory whistle and harsh noises being synonymous with laryngeal dysfunction.

Fig 1 A congenital soft palate defect known as a 'cleft palate'

Fig 2 An epiglottis entrapped by its own sub-epiglottic tissues

Fig 3 An inflamed laryngeal cartilage, known as a arytenoid chondritis

How do we assess laryngeal function?

There are a number of grading systems for the assessment of laryngeal function including the Lane scale (grades 1-5), which has been superseded by the Havermeyer scale and provides a wider variation in position and degrees of function; with subgroups of grades 2 and 3 and grade 4 representing complete collapse. A grade 1 larynx is a fully functional, symmetrical larynx with no obvious signs of dysfunction, and with both scales grades 1 and 2 are considered the most appropriate for the equine athlete.

Most thoroughbred racehorses will have a grade 2 (or 2.1 and 2.2 on the Havermeyer scale) of laryngeal function at rest, and research has shown that most of these will have a fully functioning larynx when the horse exercises. It is the grade 3s, on either scale, that cause most concern. A much higher proportion of these horses will have a larynx that will be dysfunctional at exercise. This may be more apparent towards the end of exercise when the laryngeal muscles begin to fatigue, as with any other exercising skeletal muscle beyond a certain point. The turbulent airflow, caused by the restriction, creates noise that is most often heard as the horse breathes in. Most importantly the constriction reduces airflow to the lungs and, in turn, reduces the horse's performance. So, if a larynx begins to collapse toward the end of a race, it is unlikely the horse will be able to pick up the pace in the last few furlongs in order to improve, or even maintain, its finishing position. Grade 4s (and 5s on the Lane scale) are those with complete loss of muscular function and are unlikely to function well under racing conditions, and possibly struggle in training.

How do we work out which of the grade 3s will function at exercise? The gold standard would be to work the horse over its desired distance under racing conditions and examine it with one of the previously described methods of EE. Such examinations are not always practical, and at present are not routinely used as part of the pre-purchase examination protocols at thoroughbred sales, when most of these grade 3s will come under closest scrutiny.

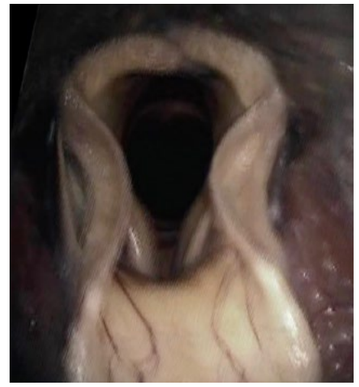

Fig 4 Medial deviation of the aryepiglottic folds (MDAF) seen using exercising endoscopy

Fig 5 Complete left laryngeal collapse with the horse at exercise

Using EE equipment with unbroken yearlings will always have potential safety risks, and many horses will not be fit enough when passing through the sales ring to allow adequate examination.

In addition, maintaining consistency of examinations submitted to a repository would always be a concern. For example, a larynx may be fully functional until passing the six-furlong point when it will then start to collapse. Therefore, if assessed over shorter distances, then some clinically affected horses could be missed. We also know that RLN can be a progressive condition and assessment weeks prior may give a false impression of the function of the horse's larynx at the time of the sale.

How reliable is the resting endoscopy?

Most clinicians would be confident in diagnosing disease in horses with complete laryngeal collapse at rest, and research has shown that the vast majority of these horses will have dysfunctional larynges at exercise.

Accurately predicting the function of all other grades is a challenge. However, most grade 2s on both scales, that do not make a noise at exercise, can be safely deduced and deemed suitable for racing at the time of examination.

However, RLN is often progressive and those grade 2s at the October yearling sales could become grade 3s by the time they begin their two-year-old season. It appears that most progression of the disease occurs early in a horse's life, so that older horses (over four years of age) are less likely to suddenly become afflicted with a more severe form of the condition.

It has also been shown that the scope findings vary between repeated examinations, with some horses able to improve their laryngeal grade at a later examination, which adds a further layer of confusion. Muscle fatigue from exercise, muscle stimulation with circulating adrenaline, anxiety and time of day may all have a role to play in this. A recent study has also shown that laryngeal function is not only variable at rest, but also when exercising, with improvements and deterioration of laryngeal function seen at differing examination times.

It is clear that different observers will also grade the larynges slightly differently, with one study showing agreement between experienced clinicians to be just less than 65%, especially with the more severe grade 2s and grade 3s.

Conclusion

Diagnosis of a limited number of conditions can be made with some degree of certainty using resting endoscopy. Definitive assessment of laryngeal function with the horse at rest is impossible in all but the most severe cases of RLN. Ensuring the horse swallows and takes a large breath during resting endoscopic examination is essential in assessing the ability of the muscles to fully open the larynx. Listening to the horse exercising and palpating the laryngeal muscles are useful adjunctive steps to help determine the suitability of a horse for racing. Repeated endoscopic examination of the airway, by a number of clinicians, may also increase the robustness of any conclusions made.

In all cases it has to be remembered that the disease is often progressive, and most of the variability may come in the weeks to months following the initial examination.