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It is important to realize during an upper respiratory tract evaluation of the weanling and yearling that there are subtle differences from such an evaluation of the adult horse. It can be difficult to predict future pharyngeal and laryngeal function based on one endoscopic exam of the upper respiratory tract of the weanling and yearling. Author's address: Rood and Riddle Equine Hospital, 2150 Georgetown Rd., P.O. Box 12070, Lexington, KY 40580. © 1998 AAEP.

1. Introduction

Upper respiratory tract (URT) endoscopy has become a common part of presale or postsale examinations of the young horse. At Thoroughbred sales, this has become an expected part of the presale or postsale examination of the 2-year-old in training, the yearling, and even the weanling. The author has gained familiarity with this topic through examinations of Thoroughbred yearlings and weanlings, and the subjective comments in this text are based primarily on this breed.

Opinions regarding the suitability of URT endoscopy for the intended use of the horse usually have to be rendered quickly in the sales environment. Generally, this assessment is easily made. However, some URT findings are of debatable significance. Therefore, an understanding of what is normal and what is acceptable for the young horse is essential in making these decisions.

2. Upper Airway of the Young Horse

In the upper airway of the young horse, there is a tendency to use the ideal anatomic picture of a normal mature (adult) horse as the reference point for what is normal in the immature (weanling and yearling) horse. Subtle anatomical and functional differences are seen when comparing the normal nasopharynx and larynx of the immature horse with those of the mature horse. When compared with the mature horse, the immature horse generally has a higher grade of pharyngeal lymphoid hyperplasia (PLH); a shorter, narrower, and more flaccid epiglottis; and an increased incidence of dorsal displacement of the soft palate (DDSP) when the URT is stressed by nasal occlusion. The immature horse will occasionally have a row of small raised bumps on the dorsal midline of the epiglottis. The younger the horse, the more often this is seen. I consider this a variation of normal. In addition, arytenoid movement is not as consistent and repeatable in the immature horse. Most of the subtle differences between an immature horse and a mature horse gradually disappear with age. From my observations in the Thoroughbred, this maturation process is essentially completed by the end of a horse's second year of life.
3. Purchase Examination

Over 5000 Thoroughbred yearlings and weanlings are sold each year at auction in Kentucky. A URT endoscopic examination is probably performed on over 80% of these horses, and many endure several examinations. The Thoroughbred sales companies (Keeneland and Fasig-Tipton) have written conditions in their sales catalogs that allow for the return of any yearling sold after July 1 of its yearling year to the seller if specific abnormalities are found in the URT immediately postsale. These conditions are as follows: laryngeal hemiplegia, rostral displacement of the palatopharyngeal arch, epiglottic entrapment, permanent DDSP, severe arytenoid chondritis or chondroma, subepiglottic cyst, and cleft palate. Although they are supposedly not covered by these conditions, horses sold prior to July 1 of their yearling year are generally subject to these same conditions. These conditions were intended to give the buyer some degree of assurance that the URT would be acceptable, negating the need for a presale URT endoscopy of every potential purchase. However, many veterinarians advise their clients to examine the URT presale, as there are a few endoscopic observations that pass conditions of sale but may not meet that veterinarian’s criteria for being acceptable. These URT findings of concern include the small flaccid epiglottis, frequent DDSP, and arytenoid paresis.

A very small percentage (<2%) of the yearlings at the Keeneland and Fasig-Tipton sales are found to have one of the listed unacceptable conditions during the presale or postsale URT exam. However, a slightly higher percentage of yearlings with one of the unacceptable conditions would be found in the general population. Many sellers have their horses examined before shipping them to the sales grounds and do not ship horses to sale that do not meet conditions of sale. Many veterinarians use more stringent criteria for presale URT evaluations of yearlings for purchase, thereby yielding a higher percentage of unacceptable horses.

4. Upper Respiratory Tract Findings

A. Nasal Passages

1. Epidermal Inclusion Cyst (Atheroma)
An epidermal inclusion cyst (atheroma) is an uncommon abnormality that is most frequently found in the yearling. This is a small fluctuant mass that occurs unilaterally (rarely bilaterally) at the caudal aspect of the false nostril. It is seen externally as a small lump in this area. This does not obstruct the airway, so it is essentially a cosmetic problem.

2. Malformed Nasal Septum
A malformed nasal septum is a very uncommon abnormality in which the nasal septum may be thickened or deviated from a congenital abnormality or fracture. If observed during exercise, horses with an abnormal septum usually produce an upper airway noise. Some congenital abnormalities (subtle wry nose) and fractures of the rostral aspect of the nasal bone and septum produce a visually apparent curve to the bridge of the nose. The curvature of the septum is usually digitally palpable. The endoscope is needed to identify lesions effecting the caudal three fourths of the nasal septum. The prognosis for the horse to reach its athletic potential would be considered guarded.

3. Maxillary Cyst
Although very uncommon in the horse, a maxillary cyst is found more often in the weanling and yearling than in other ages. Facial swelling on the affected side centered just rostrally and dorsally to the facial crest is usually evident. Upper airway noise is audible during exercise. It is often difficult to pass a 9.8-mm-diameter endoscope through the nasal passage of the affected side. An endoscopic examination of the other nasal passage is often normal in the early stages of this abnormality. Radiographs are necessary to determine the extent of the lesion. The nasal turbinates may become distorted to an extent that, even following the surgical resection of the cyst, enough airway obstruction remains to prevent the horse from reaching his potential as an athlete.

B. Pharynx

1. Pharyngeal Lumen Size
Narrow appearing pharynges at rest should not be overly criticized. Resistance to airflow in the URT occurs primarily at the external nares and the larynx, with the nasal passages and the pharynx, which have a relatively large cross-sectional area, contributing little to airflow resistance. Collapse of the nasopharynx during exercise can occur. However, the ability to predict this event from a URT endoscopic exam at rest is difficult at best.

2. Pharyngeal Lymphoid Hyperplasia
The average grade of PLH present in the weanling or yearling is higher than that found in the mature horse. Interestingly, DDSP appears to occur more easily and frequently during a URT exam in weanlings and yearlings with grades III and IV than with grades I and II PLH. This observation may be partially explained by recent research, which suggests that pharyngeal inflammation may adversely effect the pharyngeal branch of the vagus nerves that supply the muscles controlling soft palate function.

3. Dorsal Displacement of the Soft Palate
DDSP is noted more frequently in the immature horse during all phases of an endoscopic exam, including at rest, following nasal occlusion, and following induction of swallowing. Nasal occlusion is the current method of choice to evaluate ease of

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induction of DDSP. Nasal occlusion can induce pharyngeal and respiratory pressures that equal or exceed that achieved during high-intensity exercise. Although an interpretation of the results of the endoscopic exam is subjective, young horses, which generally have a smaller, more flaccid epiglottis and a higher grade of PLH, do tend to displace the palate more easily. Making predictions based on the results of this test for DDSP is difficult for two primary reasons. First, tissues of the pharynx or larynx seem to mature in size, stiffness, and coordination with age. Second, although a trend exists, there is not a consistent, direct relationship between size and stiffness of the epiglottis and DDSP in the immature or mature horse. In one study, of 23 horses that displaced their soft palate during exercise on the treadmill, only five had a flaccid or small appearing epiglottis noted at rest. In another study, local anesthesia of the innervation to the muscles controlling the epiglottis, creating epiglottic dysfunction, did not affect soft palate position. This causes one to question the importance of the epiglottis in holding the soft palate in a ventral position.

1. Cleft Palate
The deformed palate is a rare condition to find in a weanling or yearling, as usually the accompanying problems of chronic nasal discharge and pneumonia lead to its diagnosis as a neonate or young foal. Although it is an obviously undesirable condition, it is possible for a horse to progress to race training with this condition.

2. Entrapped Epiglottis
The incidence of an entrapped epiglottis in the yearling is less than that seen in the horse in race training. In addition, the incidence of ulcers on the entrapping tissue is much less in the yearling than in the mature racehorse. Entrapment of the epiglottis is an incidental finding without clinical signs in the immature horse. Following correction of this condition in the young horse, the epiglottis seems more flaccid and smaller than normal. However, the numbers I have encountered are too small to draw strong conclusions.

3. Subepiglottic Cyst
The subepiglottic cyst is a less commonly seen abnormality than the entrapped epiglottis. Interestingly, the subepiglottic cysts seen in yearlings are often associated with an entrapped epiglottis.

4. Arytenoid Movement
Arytenoid movement is generally the most studied area during an evaluation of the URT in the young horse. A concern lies in the ability to identify abnormal function of an arytenoid (usually the left), enabling the prediction of eventual arytenoid dysfunction and paralysis. It is generally believed that complete arytenoid paralysis is preceded by a progressive deterioration of function. It is also recognized that many normally functioning arytenoids that are not perfectly symmetrical do not become dysfunctional.

Over the past several years the ability to predict present and future arytenoid dysfunction based on resting endoscopic evaluation has improved. This has resulted from information gained from URT endoscopic studies during exercise on a treadmill, combined with clinical experience. It has also been aided by the general acceptance of a classification system for arytenoid function. Although treadmill studies have been done primarily on mature horses, the assumption is made that similar results would be found in immature horses.

The classification system for arytenoid function was devised and published by a group from Cornell in 1991, which helped to simplify and unify the language used regarding arytenoid function. The system is as follows.

1. Synchronous full abduction and adduction of the left and right arytenoid cartilages.
2. Asynchronous movement (hesitation, flutter, adduct or weakness, etc.) of the left arytenoid cartilage during any phase of respiration. Full abduction of the left arytenoid cartilage (compared with
the right) inducible and maintained by nasal occlusion or swallowing.

III. Asynchronous movement (hesitation, flutter, adduct or weakness, etc.) of the left arytenoid cartilage during any phase of respiration. Full abduction of the left arytenoid cannot be induced and maintained by nasal occlusion or swallowing.

IV. Marked asymmetry of the larynx at rest and no substantial movement of the left arytenoid cartilage during any phase of respiration.

A study examining arytenoid function before and during treadmill exercise that used this classification system was performed and yielded the following results. Grade I arytenoids maximally abducted and grade IV arytenoids collapsed during exercise; all grade II arytenoids (21/21) and 5/6 (83%) of grade III arytenoids maximally abducted during exercise. However, these horses were submitted to submaximal exercise (maximum of 8.5 m/s) on the treadmill. In a more recent report, only 6/23 racehorses (26%) with grade III arytenoids achieved maximal abduction during exercise, with maximal treadmill speeds of 11–14 m/s (<2 m/mile). Obviously, horses with grade III arytenoids deserve significant concern and should be avoided if found during a purchase exam.

Arytenoid function does not always clearly fit into the categories of this classification system. Some grade II arytenoids almost fit the grade I category, and some almost fit the grade III category. To more precisely categorize arytenoid movement at rest and to allow quicker note taking at sales, I have used a modified system, further subdividing grades II and III as follows.

IIa. Asynchronous movement (hesitation, flutter, adduct or weakness, etc.) of an arytenoid cartilage during any phase of respiration. Full abduction of the arytenoid cartilage when compared with the normal side, easily induced and maintained by nasal occlusion or swallowing.

IIB. Asynchronous movement (hesitation, flutter, adduct or weakness, etc.) of an arytenoid cartilage during any phase of respiration. Full abduction of the arytenoid cartilage when compared with the normal side, induced and maintained by nasal occlusion or swallowing, but with some difficulty.

IIla. Asynchronous movement (hesitation, flutter, adduct or weakness, etc.) of an arytenoid cartilage during any phase of respiration. Full abduction of an arytenoid cartilage cannot be induced and maintained by nasal occlusion or swallowing, but comes close.

IIlb. Asynchronous movement (hesitation, flutter, adduct or weakness, etc.) of an arytenoid cartilage during any phase of respiration. It is easily determined that full abduction of an arytenoid cartilage cannot be induced and maintained by nasal occlusion or swallowing.

Some controversy exists regarding the most accurate method to induce full arytenoid abduction. Horses maintain full abduction for a longer duration following nasal occlusion than they do following swallowing. Some horses in which full abduction of one arytenoid (usually the left) cannot be maintained following nasal occlusion can briefly achieve full abduction following swallowing. Most equine practitioners believe nasal occlusion is the best method to use in the resting horse to predict how well the arytenoids will function in that horse during exercise. This has been questioned by a recent report that compared URT endoscopic findings in horses at rest and during exercise on a treadmill. Symmetric full abduction of both arytenoids after swallowing was achieved in 9/14 standing horses that were unable to abduct both arytenoids equally during nasal occlusion. All nine horses were able to maintain abduction of the arytenoids during high-speed exercise. Even with the use of the above-modified grading system, several young horses are encountered in which arytenoid function still does not neatly fit these categories. Symmetrical, full abduction of both arytenoids may occur during the entire exam in an excited yearling. In others, the left and right arytenoids cannot be induced to fully abduct while evaluated at rest. I consider these horses normal if at least moderate abduction occurs and the arytenoids are essentially synchronous and symmetrical in their movement. In some yearlings, one arytenoid (usually the left) cannot maximally abduct to the same degree as the other but can maintain that degree of abduction. I consider such a horse normal if the arytenoid abducts to ~95% of what would be considered normal, and if it easily maintains that degree of abduction. Infrequently, arytenoid function may appear different several hours or a few days later. Yearlings’ arytenoids have been observed on the sales grounds to have changed from IIb to IIIa and from IIIa to IIb within this period of time. This means that the same horse may or may not pass conditions of sale, depending on when the URT is examined.

5. Arytenoid Chondropathy

Small reddened areas are occasionally seen on the corniculate process or near the vocal process of the arytenoid. Time and an anti-inflammatory medication usually resolve this. Very infrequently, a malformed arytenoid cartilage with reduced motion is found. These findings obviously carry a poor prognosis for a race career.

References
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