Epiglottic abnormalities in mature nonracehorses: 23 cases (1990–2009)

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Objective—To identify history, clinical signs, endoscopic findings, treatment, and outcome of mature (> 8 years old) nonracehorses with epiglottic abnormalities.

Design—Retrospective case series.

Animals—23 horses with an epiglottic abnormality.

Procedures—Medical records of horses examined between 1990 and 2009 because of an epiglottic abnormality were reviewed to obtain information on signalment, history, clinical signs, clinical examination findings, upper airway endoscopic findings, diagnosis, surgical procedure, clinical management, postoperative care, and outcome.

Results—Mean ± SD age was 16 ± 6 years (range, 9 to 30 years). Sixteen of the 23 (70%) horses had a primary complaint of a chronic cough. Thirteen (57%) horses had epiglottic entrapment, 7 (30%) had a subepiglottic granuloma, and 3 (13%) had a subepiglottic cyst. All 23 horses were treated surgically, with 1 (4%) requiring further surgical treatment. Follow-up examinations and conversations with owners indicated resolution of the primary complaint in 17 of the 23 (74%) horses, with 4 (24%) requiring prolonged medical treatment because of postoperative subepiglottic inflammation. Of the 6 horses without complete resolution, 4 (67%) had signs of recurrent airway obstruction and 2 (33%) developed persistent dorsal displacement of the soft palate following laryngotomy and subepiglottic membrane resection.

Conclusions and Clinical Relevance—Results suggested that coughing is a common complaint in mature nonracehorses with epiglottic abnormalities. Therefore, upper airway endoscopy is recommended in the evaluation of older horses with a cough. Surgical treatment can be beneficial in most horses, with some requiring further postoperative medical treatment. (J Am Vet Med Assoc 2011;238:1634–1638)

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M any abnormalities associated with the epiglotitis have been documented in horses. The most common of these are epiglottic entrapment, epiglottic hypoplasia, subepiglottic cysts, subepiglottic granulomas, epiglottitis, and dorsal epiglottic abscesses.1 Epiglottic abnormalities can cause partial obstruction of the rima glottis, causing respiratory noise and exercise intolerance in Thoroughbred and Standardbred racehorses.2,3 Epiglottic entrapment can also precede development of DDSP in racehorses.2,4

The most common complaints in racehorses with epiglottic abnormalities are respiratory noise and exercise intolerance, rather than coughing and nasal discharge.5,6 In contrast, epiglottic abnormalities in nonracehorses are less likely to compromise exercise capacity to the same degree as in racehorses, and these horses are more likely to have other abnormalities.7,8 To our knowledge, clinical abnormalities and outcome of treatment in mature nonracehorses with epiglottic abnormalities have not been reported previously. Therefore, the purpose of the study reported here was to identify history, clinical signs, endoscopic findings, treatment, and outcome of mature (> 8 years old) nonracehorses with epiglottic abnormalities.

Abbreviations

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<tr>
<th>Abbreviation</th>
<th>Definition</th>
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<tr>
<td>CI</td>
<td>Confidence interval</td>
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<td>DDSP</td>
<td>Dorsal displacement of the soft palate</td>
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<td>RAO</td>
<td>Recurrent airway obstruction</td>
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Materials and Methods

Medical records of the George D. Widener Hospital at New Bolton Center were searched to identify nonracehorses > 8 years of age admitted between April 1990 and August 2009 with a primary diagnosis of epiglottic entrapment, subepiglottic granuloma, or subepiglottic cyst. Horses were included only if the diagnosis had been made on the basis of results of upper airway endoscopic examination with the horse at rest. Any horses that were in race training or had raced in the preceding year were excluded from the study.

Medical records were reviewed to obtain information on signalment, history, clinical signs, clinical examination findings (including results of upper airway endoscopy and results of testing for lower airway disease, if performed), diagnosis, clinical management, surgical procedure, perioperative care, and outcome. Patient outcome was determined by telephone conversations with owners when available or on the basis of reexaminations performed at New Bolton Center or by the referring veterinarian when the owner could not be contacted.
Continuous data were summarized as mean ± SD. Categorical data were summarized as percentage and 95% CI, with CIs calculated by use of an online calculator.¹

Results

Signalment and history—Twenty-three horses met the criteria for inclusion in the study. Mean ± SD age was 16 ± 6 years old (median, 15 years; range, 9 to 30 years). There were 16 (70%; 95% CI, 47% to 85%) geldings and 7 (30%; 95% CI, 14% to 53%) mares. There were 9 (39%) Thoroughbreds, 4 (17%) Quarter Horses, 4 (17%) warmbloods, 3 (13%) Arabians, 2 (9%) Standardbreds, and 1 (4%) Thoroughbred cross. Of the horses were used for light pleasure riding, 4 were used for all-purpose riding (ie, dressage, jumping, and hunting), 4 were retired, 3 competed in dressage, 2 competed in show jumping, 1 was used for polo, and 1 was used as a pleasure driving horse.

Sixteen of the 23 (70%; 95% CI, 47% to 85%) horses were examined because of coughing, 9 (39%; 95% CI, 20% to 61%) were examined because of an abnormal respiratory noise during exercise, 5 (22%; 95% CI, 8% to 44%) were examined because of exercise intolerance, 3 (13%; 95% CI, 3% to 35%) were examined because of nasal discharge, 1 (4%; 95% CI, 0.2% to 23%) was examined because of a history of respiratory obstruction, and 1 (4%; 95% CI, 0.2% to 23%) was examined because of dysphagia. In 7 of the 16 (44%; 95% CI, 21% to 69%) horses with a history of chronic cough, coughing was the only clinical abnormality. All 5 horses with a history of exercise intolerance also had a history of making an abnormal respiratory noise. One 25-year-old Standardbred mare had no signs of upper respiratory disease; epiglottic entrapment was identified incidentally during an upper airway endoscopic examination performed in response to marked stertor that developed following administration of xylazine (0.5 mg/kg [0.23 mg/lb], IV, once).

All 23 horses included in the study had previously been examined by a referring veterinarian who had performed a complete physical examination. Five horses had been treated for lower respiratory disease prior to referral, and 3 of these 5 horses had been referred following upper airway endoscopy that was performed by the referring veterinarian after the horses failed to respond to standard medical treatment for lower respiratory disease. The 2 other horses had a history of RAO and were being appropriately managed at the time of referral to New Bolton Center.

Clinical and endoscopic findings—All horses underwent a general physical examination in addition to upper airway endoscopy. In addition, 4 horses underwent testing for lower respiratory disease, including rebreathing examination (n = 4) and thoracic radiography (1); results in all 4 horses were unremarkable.

Thirteen of the 23 (57%; 95% CI, 35% to 76%) horses were determined to have epiglottic entrapment, 7 (30%; 95% CI, 14% to 53%) were determined to have a subepiglottic granuloma, and 3 (13%; 95% CI, 3% to 35%) were determined to have a subepiglottic cyst. In all 13 horses with epiglottic entrapment, the entrapment was considered to be chronic on the basis of moderate to marked thickening with ulceration of the entrapping aryepiglottic fold and associated blunting and folding of the tip of the epiglottis. In the 7 horses with subepiglottic granulomas, the granulomas ranged from shelf-like thickenings of the subepiglottic mucosa to discrete masses on the ventral aspect of the epiglottis with associated areas of mucosal inflammation and ulceration (Figures 1 and 2).

Surgical and medical treatment—All 23 horses were treated surgically, with 1 (4%; 95% CI, 0.2% to 24%) horse requiring a second surgical treatment. Three
horses with epiglottic entrapment underwent general anesthesia and subepiglottic membrane resection via a laryngotomy. The remaining 10 horses with epiglottic entrapment underwent transendoscopic axial division of the aryepiglottic fold with a diode or Nd:YAG laser used in contact fashion. Five of the 7 horses with subepiglottic granulomas underwent general anesthesia and resection of the granulomatous subepiglottic membrane via a pharyngotomy (n = 1), laryngotomy (1), transoral approach with Gigli wire (1), or transoral approach with a transendoscopic laser (2). The remaining 2 horses with subepiglottic granulomas were sedated and underwent transendoscopic laser resection while standing. Samples from 3 of the 7 horses were submitted for histologic examination, which revealed chronic, inflamed granulation tissue with ulceration. One of the 3 horses with subepiglottic cysts underwent general anesthesia and cyst excision via a transoral approach with Gigli wire. The remaining 2 horses with subepiglottic cysts underwent transendoscopic resection with a diode laser used in a contact fashion. Samples from 1 of the 3 subepiglottic cysts were submitted for histologic examination, which revealed hyperplastic pharyngeal mucosa with submucosal endothelial hypertrophy.

Horses that underwent general anesthesia received penicillin G procaine (22,000 U/kg [10,000 U/lb], IM, q 12 h for 3 doses) perioperatively as well as dexamethasone (20 mg, IV) and phenylbutazone (4.4 mg/kg [2.0 mg/lb], IV) intraoperatively to decrease surgically induced laryngopharyngeal inflammation. Horses that underwent laser resection in a standing position were sedated with xylazine (0.4 to 0.6 mg/kg [0.18 to 0.27 mg/lb], IV) or detomidine (6 to 10 µg/kg [2.7 to 4.5 µg/lb], IV), with additional doses administered as needed to maintain an appropriate plane of sedation. A topical spray6 (benzocaine 14%, tetracaine hydrochloride 2%, and butamben 2%) was used as a local anesthetic, and anti-inflammatory medications were administered IV.

Postoperatively, horses that underwent general anesthesia were administered antimicrobials PO for a minimum of 7 days. All 23 horses received NSAIDs for at least 4 to 7 days. Horses that underwent laser surgery also received a topical throat spray (dimethyl sulfoxide, glycercin, and dexamethasone solution) for at least 7 days. In addition, 3 of the horses that underwent laser surgery while standing received a tapering dose of prednisone (0.8 mg/kg [0.36 mg/lb], PO, q 24 h reduced to 0.4 mg/kg, q 48 h over 13 days).

Outcome—For 16 of the horses, outcome was determined through telephone conversations with the horses’ owners. In the remaining 7 horses, outcome was determined by reexamination. Follow-up time ranged from 1 month to 14 years (mean ± SD, 28 ± 42 months; median, 12 months). In 17 of the 23 horses (74%; 95% CI, 51% to 89%) horses, clinical signs resolved and the horse was able to return to its previous level of work. One of these 17 horses underwent a second surgery to correct re-entrapment of the epiglottis as well as secondary DDSP, consisting of a tie-forward procedure and transoral transendoscopic laser resection of the aryepiglottic fold. Four of the 17 horses (24%; 95% CI, 7% to 50%) horses with a successful outcome were also treated for extended periods (additional 2 to 3 weeks) postoperatively with antimicrobials and anti-inflammatory drugs to treat postoperative subepiglottic inflammation. One (4%; 95% CI, 0.2% to 24%) horse with a subepiglottic granuloma that underwent general anesthesia and transoral laser resection, along with extended postoperative medical treatment, was found to have ulceration on the ventral surface of the epiglottis during an incidental endoscopic examination 4 years later, despite resolution of coughing 2 months after surgery.

Of the 6 horses (26%; 95% CI, 11% to 49%) in which clinical signs did not completely resolve, 2 (33%; CI, 6% to 76%) developed persistent DDSP following subepiglottic membrane resection via laryngotomy to resolve epiglottic entrapment. The displacements persisted for 2 months after surgery, at which time the horses were lost to follow-up. The remaining 4 horses (67%; 95% CI, 24% to 94%) horses with only partial resolution of clinical signs included those horses determined to have RAO before or after surgical treatment. Despite only partial resolution of clinical signs, these 4 horses returned to their previous level of work, according to the owners.

**Discussion**

Results of the present study suggested that similar to the case in racehorses,1 the most common abnormality in mature (> 8 years old) nonracehorses with an epiglottic abnormality was epiglottic entrapment (13/23 [57%]), followed by subepiglottic granuloma (7/23 [30%]) and subepiglottic cyst (3/23 [13%]). None of the other types of epiglottic abnormalities—epiglottic hypoplasia, epiglottitis, and dorsal epiglottic abscesses—that have been reported were found in these horses. Surgical treatment for epiglottic entrapment is indicated in horses to reduce clinical signs such as respiratory noise and to improve racing success.9,10 Methods for surgical correction of entrapment that have been described previously include transendoscopic laser axial division, transnasal or transoral axial division by use of a curved bistoury, transendoscopic electro-surgical axial division, and surgical excision via laryngotomy.5,9,11 Recently, axial division of the entrapment tissue has been advocated because of reports5,11 that fewer horses achieved a satisfactory outcome following treatment via a laryngotomy, and it has been suggested that the less invasive axial division leads to decreased cost of treatment, shorter hospitalization time, and a lower rate of complications, including re-entrapment and DDSP.11 In the present study, most (10/13) of the horses with epiglottic entrapment were treated via axial division of the aryepiglottic fold with the horse standing. One horse required additional surgery to correct re-entrapment and DDSP. In contrast, of the 3 horses treated for entrapment via laryngotomy, 2 developed persistent DDSP.

Subepiglottic granulomas were diagnosed in 7 of the 23 (30%) horses in the present study, all of which were examined because of coughing. The surgical approach to resection of subepiglottic granulomatous tissue varies on the basis of surgeon preference as well as the size and appearance of the tissue. Approaches that have been described include resection via a pharyngotomy or laryngotomy, transoral transendoscopic laser resection, transnasal...
transendoscopic laser resection with the horse standing, and trnasoral resection with a Gigli wire. No clear conclusions can be reached about the relative benefits of the various surgical techniques that were used owing to the small sample size and variability of the lesions. As in a previous report of subepiglottic thickening, extensive granulomas were observed to elevate the tip of the epiglottis into the rima glottis, resulting in coughing.

Complete surgical resection is generally recommended for subepiglottic cysts. In the present study, removal with a Gigli wire via a transoral approach was used for 1 cyst, whereas the remaining 2 cysts were removed by means of transcendoscopic laser surgery with the horse standing. The advantage of resection with the horse standing is the ample room for manipulation of the mass and instrumentation in the nasopharynx relative to the oropharynx if the mass can be consistently held. Other methods of removal, such as via a laryngotomy or transorally by means of electrocautery, reportedly have been associated with good success rates.13,14 Alternatively, subepiglottic cysts can be treated by means of intralesion formalin administration.15 The etiology of the various epiglottic abnormalities identified in the horses in the present study was not determined; however, inflammation of the subepiglottic and pharyngeal mucosa is thought to be a predisposing factor in the development of subepiglottic granulomas and cysts.7 Thus, steroidal and nonsteroidal anti-inflammatory drugs are commonly used intraoperatively and postoperatively in conjunction with surgical management of these abnormalities to treat existing and surgically induced subepiglottic inflammation. Whether inflammatory changes also precede the development of epiglottic entrapment is unknown; however, once entrapment develops, the entrapped membranes typically become thickened over time,12 and in approximately 45% of horses, the tissue also becomes inflamed and ulcerated, leading to the associated clinical signs.7,16 Owing to the less demanding nature of their occupations, mature nonracehorses likely have clinical manifestations of epiglottic abnormalities that are related more to the accompanying inflammatory changes, such as coughing or nasal discharge, and are less likely to have clinical manifestations related to mechanical obstruction, such as exercise intolerance or abnormal respiratory noise, which are commonly observed in racehorses.

A cough as a primary complaint or clinical sign is often associated with lower respiratory tract disease, such as pneumonia, pleuropneumonia, RAO, lung abscesses, or exercise-induced pulmonary hemorrhage.17-19 Thus, the diagnostic evaluation of horses with coughing is traditionally aimed at the lower respiratory tract. Although coughing is a reflex pulmonary mechanism for expulsion of exudates and debris from the airway, it is also a response to mucosal irritation.20 It is often associated with and potentiated by airway inflammation at the level of the larynx and in the lower respiratory tract. Findings in the present study do not allow us to determine whether coughing was a cause or a result of the epiglottic abnormalities. However, we propose that inflammatory changes in the subepiglottic tissues associated with the development of entrapment, a granuloma, or a cyst were inciting factors in the production of coughing. As such, it is not that surprising that 4 of the 17 (24%) horses with a successful outcome in the present study required additional weeks of antimicrobial and anti-inflammatory treatment because of subepiglottic inflammation. Concurrent RAO is clearly a confounding condition in older horses, and physical examination and other ancillary diagnostic testing should be used to assist in differentiating between lower and upper respiratory abnormalities that can cause coughing.

It has been widely recognized that epiglottic abnormalities cause upper airway obstruction and result in abnormal respiratory noise and compromised exercise capacity in racehorses.17,18,20,21 Sixteen of the 23 (70%) horses in the present study had a history of coughing. Calculation of the 95% CI suggested that between 47% and 83% of mature nonracehorses with epiglottic abnormalities will be examined because of coughing, emphasizing the importance of a comprehensive diagnostic evaluation, including upper airway endoscopy, in horses examined because of coughing. Furthermore, although none of the horses received medical treatment alone, meaning that we cannot comment on the efficacy of medical treatment, surgical treatment was beneficial in resolving clinical signs in 17 of the 23 (74%) horses, although 4 of these 17 (24%) horses required an additional 2 to 3 weeks of postoperative medical treatment.

b. Cetacaine spray, Cetylite Industries Inc, Pennsauken, NJ.

References


From this month’s AJVR

Evaluation of experimentally induced injury to the superficial digital flexor tendon in horses by use of low-field magnetic resonance imaging and ultrasonography

William M. Karlin et al

Objective—To evaluate tendon injuries in horses over a 16-week period by use of ultrasonography and low-field magnetic resonance imaging (MRI).

Sample—Tendons of 8 young adult horses.

Procedures—The percentage of experimentally induced tendon injury was evaluated in cross section at the maximal area of injury by use of ultrasonography and MRI at 3, 4, 6, 8, and 16 weeks after collagenase injection. The MRI signal intensities and histologic characteristics of each tendon were determined at the same time points.

Results—At 4 weeks after collagenase injection, the area of maximal injury assessed on cross section was similar between ultrasonography and MRI. In lesions of > 4 weeks’ duration, ultrasonography underestimated the area of maximal cross-sectional injury by approximately 18%, compared with results for MRI. Signal intensity of lesions on T1-weighted images was the most hyperintense of all the sequences, lesions on short tau inversion recovery images were slightly less hyperintense, and T2-weighted images were the most hypointense. Signal intensity of tendon lesions was significantly higher than the signal intensity for the unaltered deep digital flexor tendon. Histologically, there was a decrease in proteoglycan content, an increase in collagen content, and minimal change in fiber alignment during the 16 weeks of the study.

Conclusions and Clinical Relevance—Ultrasonography may underestimate the extent of tendon damage in tendons with long-term injury. Low-field MRI provided a more sensitive technique for evaluation of tendon injury and should be considered in horses with tendinitis of > 4 weeks’ duration. (Am J Vet Res 2011;72:791–798)