Clinical Commentary

Advances in diagnostic imaging of the larynx and pharynx

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Summary

Imaging of the larynx and pharynx has traditionally been limited to upper airway endoscopy and radiography. Recently, ultrasonography, magnetic resonance imaging and computed tomography have become used more widely. These modalities have increased our diagnostic yield when investigating disorders of the upper airway. The Case Report in this issue (Koenig et al. 2012) describes the diagnosis and biopsy of a laryngeal mass using ultrasonography illustrating one novel application of laryngeal ultrasonography. Increased use of laryngeal ultrasonography and advanced imaging of the larynx and pharynx will hopefully lead to a better understanding of conditions of the upper airway and improved treatment strategies.

Traditionally, diagnostic investigation of laryngeal and pharyngeal disorders is undertaken using upper airway (UA) endoscopy and radiography. Upper airway endoscopy (resting and dynamic) allows excellent visualisation of the interior of the larynx, pharynx and guttural pouches. This information is vital for the diagnosis of many UA disorders, including recurrent laryngeal neuropathy, arytenoid chondritis, dorsal displacement of the soft palate, pharyngeal collapse, axial deviation of the aryepiglottic folds or vocal folds, epiglottic entrapment, fourth branchial arch abnormalities and guttural pouch mycosis, empyema and chondroids. However, the deeper structures cannot be assessed using endoscopy. Radiography is useful if mass lesions or aeroesophagus are present, but it is often unrewarding.

During the past 5 years, diagnostic imaging of this anatomic region has become more advanced, allowing clinicians to obtain a more thorough understanding of this region. Ultrasonography, magnetic resonance imaging (MRI) and computed tomography (CT) have greatly expanded our diagnostic capabilities for clinical cases and increased our understanding of the pathogenesis of disease.

Chalmers et al. (2006b) first described ultrasonography of the normal equine larynx and examples of its use in cases of arytenoid chondritis. The same group also determined that ultrasonographically, horses with dorsal displacement of the soft palate have a more shallow basihyoid bone than horses without dorsal displacement of the soft palate (Chalmers et al. 2009), although we have been unable to duplicate these results in our hospital population. Since its original description, ultrasonography of the laryngeal region has been routinely included as part of the diagnostic plan for UA disorders at the author’s practice. In our experience, ultrasonography has assisted in the diagnosis of a variety of conditions. In cases of suspected arytenoid chondritis, most of the arytenoid cartilage, including the interior and the abaxial border, can be imaged. Horses with arytenoid chondritis have thickened arytenoid cartilages with irregular margins and increased echogenicity of their interiors. Perilaryngeal abscessation can also be identified. Ultrasonography has also been shown to be very accurate (96%) in predicting abnormal arytenoid movement during maximal exercise as observed during treadmill UA endoscopy (Garrett et al. 2011). The increased echogenicity of the cricoarytenoideus lateralis muscles in horses with this condition was first reported by Chalmers et al. (2006a). In cases with an unknown history of laryngeal/pharyngeal surgery, including prosthetic laryngoplasty or laryngeal advancement, the presence or absence of suture material can often be determined. Horses with fourth branchial arch abnormalities can be definitively diagnosed using ultrasonography (Garrett et al. 2009) and additional unusual anatomic abnormalities may be recognised (David et al. 2008; Garrett et al. 2010). Laryngeal ultrasonography can be performed in the standing horse and is inexpensive. The case report by Koenig et al. (2012) reporting on ultrasound-guided biopsy of a laryngeal mass describes an innovative use of ultrasonography. In this case, ultrasonography was vital in both reaching a diagnosis and obtaining a sample of a laryngeal mass when traditional methods were
unsucessful. There is an additional report in the literature describing intraoperative ultrasonography to locate a retropharyngeal foreign body in a horse (French et al. 1989).

Magnetic resonance imaging of the larynx and pharynx, although requiring general anaesthesia and additional expense, can typically provide more information than can be obtained using ultrasonography. Pekarkova et al. (2009) originally described MRI of the normal larynx and pharynx. While ultrasonography of the larynx is limited by the anatomic position of the mandible, gas in the airway lumen, anatomic structures dorsal to the larynx, and a limited field of view, MRI can provide a better global picture of the entire region in multiple planes. Excellent detail of the soft tissue, cartilaginous and bony structures is obtained. As the authors of this case report and others have described, MRI was able to add information in clinical cases that was not available using ultrasonography (Garrett et al. 2009, 2010; Koenig et al. 2012). In the author’s experience, the same has held true for conditions including cystic structures in the dorsal pharyngeal region and perilaryngeal masses.

Computed tomography has been widely used for disorders of the equine head, especially of the sinusal region, teeth, temporomandibular joint, stylohyoid and temporal bones and cranial vault (Puchalski 2007; Kinns and Pease 2009). The literature describing its use for clinical cases in imaging specifically the laryngeal and pharyngeal region has been limited, but recent reports discussed its use in the diagnosis of a cyst-like structure (David et al. 2008) and a parapharyngeal aneurysm (Powell 2010). It has also been used to determine variability in the shape of the cricoid cartilage (Dahlberg et al. 2011), to create a 3-dimensional model of the larynx (Perkins et al. 2010) and in assessing the effects of a tongue-tie on the position of the hyoid apparatus (Cornelisse et al. 2001). Its 3-dimensional reconstruction capabilities make it an extremely attractive option to obtain a better understanding of disorders of the hyoid apparatus and laryngeal cartilages. Although CT also requires general anaesthesia, it is a faster procedure and is generally less expensive than MRI. When weighing the benefits of CT and MRI for a specific case, the superior spatial resolution of CT and contrast resolution of MRI should be considered.

With the addition of ultrasonography, CT and MRI as tools when investigating disorders of the laryngeal and pharyngeal region, we have increased our diagnostic yield in many cases. Although significant progress has been made recently, further advances will continue to improve our knowledge base. In some cases, ultrasonography in conjunction with UA endoscopy is sufficient to arrive at a diagnosis and direct appropriate therapy. In other cases, the additional information provided by CT and/or MRI is required to obtain a more definitive diagnosis.

Author’s declaration of interests

No conflicts of interest have been declared.

References


