Complications with laryngoplasty

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Safia Barakzai discusses some of the issues that can arise after this procedure, from the aspiration of food to wound infection and arytenoid chondritis.

LARYNGOPLASTY, or “tieback” surgery, is one of the most commonly utilised treatments for recurrent laryngeal neuropathy in horses (“roaring”, idiopathic laryngeal hemiplegia and laryngeal paralysis).

It is usually performed concurrently with a unilateral (left-sided) ventriculocordectomy. However, laryngoplasty can have a high complication rate, and some complications can be associated with significant patient morbidity. Ahern and Parente (2008) have published a detailed account of complications and their management.

Coughing

Coughing, both immediately postoperatively and chronically, is a common complication of laryngoplasty, with the prevalence of acute postoperative coughing reported as being as high as 43 per cent and that of chronic coughing being 14 per cent (Dixon et al, 2003).

Coughing results from aspiration of food material into the trachea due to the newly fixed arytenoid's inability to adduct and protect the lower airway during swallowing, or perhaps due to surgically induced changes in pharyngeal or upper oesophageal function (Greet, 1979; Barakzai, unpublished observations). True aspiration pneumonia (as opposed to tracheitis) is thankfully relatively rare after laryngoplasty. The degree of arytenoid abduction is thought to be significantly associated with the severity of postoperative coughing and aspiration of food material (Russell and
However, wide abduction is certainly not the only factor that causes dysphagia, because the complication is occasionally seen in horses with moderate or minimal arytenoid abduction.

Aspiration of food (Figure 1) and coughing usually reduces over the first two to three weeks after surgery – if this does not occur or if the degree of aspiration and/or cough is very severe, the laryngoplasty suture must be removed.

**Loss of arytenoid abduction**

Some loss of abduction is almost inevitable in almost every case (to some degree) in the long term (Dixon et al, 2003; Barnett et al, 2011).

Acute loss of abduction in the immediate postoperative period (Figure 2) is often due to suture pull-through at the muscular process of the arytenoid or the cricoid cartilage, or avulsion/fracture of the muscular process. This type of surgical “failure” necessitates repeat laryngoplasty or arytenoidectomy, and has been reported to occur in two to 15 per cent of cases (Marks et al, 1970; Hawkins et al, 1997; Dixon et al, 2003; Kraus et al, 2003). Methods to prevent construct failure – such as the use of cables and washers (Schumacher et al, 2000), various different trochars, needles and suture materials – have been suggested by different authors.

The more insidious loss of abduction reported over the weeks to months following surgery that occurs in the majority of cases (Dixon et al, 2003; Barakzai et al, 2009; Davidson et al, 2010) is problematic and difficult to prevent. Proposed causes of this gradual loss of abduction include the suture “cutting in” to cartilage or embedding into the underlying soft tissues, suture loosening and stretch, and continued atrophy and volume reduction of the cricoarytenoideus muscle. Many of these causes of abductory loss are likely to be associated with long-term cyclical loading of the suture-cartilage construct, which occurs more than 1,000 times/day – particularly during swallowing and coughing (Witte et al, 2010). Several methods to reduce loss of abduction have been proposed, such as promoting ankylosis of the cricoarytenoid joint by using surgical curettage (Parente et al, 2011) or injection of polymethyl methacrylate (Cheetham et al, 2009).

However, there is no longterm information regarding the efficacy of these procedures in large numbers of clinical cases.

Several experimental and clinical studies have suggested that a moderately abducted arytenoid that is fixed in position (in effect, no longer becomes adducted during inspiration at exercise) provides a sufficient airway for non-performance horses. Moderate (grade three) abduction has also been shown to have no significantly adverse effect on the racing performance of National Hunt racehorses, compared to horses with good (grades one or two) abduction (Barakzai et al, 2009). A cross-sectional dynamic endoscopic study of horses postlaryngoplasty has reported that the grade
of arytenoid abduction is not correlated with arytenoid stability (Barnett et al, 2011). However, in a population of horses that is returned with recurrent symptoms of respiratory noise and/or poor performance, this is not the case, with Davidson et al (2010) reporting that arytenoid instability was more common in horses with no residual surgical abduction, compared to those with poor-to-moderate abduction.

**Wound infection**

As with any surgical site with a permanent implant, the prosthesis and the wound can become infected (Figure 3). Some surgeons believe that if a laryngotomy is performed at the same time as laryngoplasty (to perform the vocal cordectomy), there may be an increased risk of infection of the laryngoplasty site, compared to when the vocal cordectomy is performed using a transendoscopic laser.

Given the proximity of the two surgical incisions and the contaminated nature of the laryngotomy site (Figure 2), this may be true in some instances. Currently, the reported incidence of laryngoplasty wound infection is between 0.5 and six per cent (Hawkins et al, 1997; Strand et al, 2000; Davenport et al, 2001; Kidd and Slone, 2002; Dixon et al, 2003; Kraus et al, 2003). Wound infection treatment consists of wound lavage and broad-spectrum antibiotics. In occasional cases where the infection is refractive to conservative management, the prosthesis will need to be removed.

**Continued respiratory noise and/or poor performance**

The aetiology of continued noise and poor performance after laryngoplasty is complex. In one study, experimental horses with higher levels of arytenoid abduction were found to have increased levels of noise compared to those with more moderate abduction (Brown et al, 2004). Three studies reporting results of exercising endoscopy in horses that have undergone laryngoplasty have all reported that although arytenoid instability does occur in some cases, there is an alarmingly high incidence (48 to 59 per cent) of dynamic laryngeal or pharyngeal collapse that is not arytenoid cartilage collapse (Davidson et al, 2010; Compostella et al, 2010; Barnett et al, 2011). These include right vocal fold collapse, dorsal displacement of the soft palate, aryepiglottic fold collapse, collapse of the axial portion of the corniculate cartilage and so on. Clearly, more research must be done in this field, but the take-home message is that horses presented for investigation of laryngoplasty “failure” should always undergo dynamic endoscopy before laryngoplasty is repeated because instability of the arytenoid cartilage is often not the cause of ongoing clinical signs.

**Arytenoid chondritis**
Arytenoid chondritis has been reported in one per cent of horses following laryngoplasty (Dixon et al, 2003), but more recent studies with longer-term (months to years) follow-up of cases suggest that the prevalence of this serious complication may in fact be higher – at eight to nine per cent (Davidson et al, 2010; Barnett et al, 2011).

Infection may enter the arytenoid cartilage via the suture placed at the muscular process, or more likely, through the vocal process if the dorsal vocal cordectomy incision damages the cartilage.

References