

## **PRE OP CONSIDERATIONS**

- high risk of general anesthesia in horses, and especially in Draft horses which are affected by this condition. A team at Cornell now performs the procedure standing (other techniques)
- Essential requirements and considerations for a successful tie back procedure include:
  - Careful dissection, meticulous haemostasis and preservation of function of thyropharyngeus m. through minimal dissection.
  - Avoid cutting needles for placement of prosthesis.
  - Position arytenoid within 'normal' range of abduction.
  - Carefully management of any dead space during closure.
  - Rotation requires less intervention than lateralization.

## **INTRA OP CONSIDERATIONS/COMPLICATIONS**

- When a horse is in lateral recumbency, the endotracheal tube, which is used to ventilate horses with oxygen and anesthetic gases, compresses the larynx from side to side interfering with its positioning and/or assessment during surgery.
- Hemorrhage: although the lateral approach to the larynx should not encounter any major vascular structures, bleeding may occur from a number of sites during the procedure, the most important being the transected cricoarytenoid muscle, the arytenoid cartilage, the inter-arytenoid site. The procedure should be undertaken therefore with meticulous haemostasis throughout since haematoma developing around the tie-back can lead to rapid avulsion of the prosthesis; the development of a haematoma in the inter-arytenoid space of the vocal fold can cause acute airway obstruction. Management of these complications may necessitate airway by-pass and rapid re-exploration of the surgical site.
- • Arytenoid fragmentation: over-manipulation of the arytenoid cartilage during the procedure and the use of cutting needles for placement of the prosthesis can lead to disintegration of the cartilage. Although in some cases it is possible to salvage enough of the cartilage to permit satisfactory conclusion of the procedure, a contralateral intervention is usually the safer option.
- • Inadequate glottic opening: failure to achieve adequate enlargement of the glottic opening is normally apparent on postoperative inspection. Possible causes include incomplete arytenoid separation / misplacement of the prosthesis during lateralization and intensioning during the rotation procedure. Immediate revision may be feasible in some cases, failing which a contralateral procedure is indicated.

## POST OP CONSIDERATIONS/COMPLICATIONS

- 50% success rate
  - many horses develop complications following surgery, including chronic airway disease (because their swallowing is affected) or the surgery fails and needs to be repeated
  - this can end the career of a racehorse
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- surgeons may over or under compensate and tie the arytenoid back too far or not far enough. This can predispose the horse to aspirate food when eating and develop pneumonia when tied too far or to underperform if not tied far enough.
  - Over-abduction of the glottic opening: enlargement of the glottic opening beyond the point of maximum natural arytenoid abduction is a common problem for inexperienced surgeons. Depending on the degree of over-abduction, some patients may cope with the complication whereas others will experience dysphagia and aspiration. This complication is normally apparent within 24hrs and in severely symptomatic cases, revision to reduce the degree of abduction or complete arytenoid release with contralateral intervention may be feasible.
  - Hemorrhage is the most common complication encountered during surgery. Complications can arise if the surgical site is not cared for properly.
  - Hematoma / edema development: poor haemostasis or dead space management can lead to the development of perilaryngeal hematoma or edema. This will necessitate upper airway bypass since revision is only rarely helpful in these cases.
  - Aspiration: perhaps the most controversial and misunderstood of all tie-back problems is aspiration. Merely positioning the arytenoid and vocal fold within the normal range of abduction should not of itself cause or promote aspiration. Despite the preoperative concern of glottic constrictive function surprisingly few patients experience aspiration. The common assumption that the absence of constriction postoperatively leads to aspiration is simplistic and ignores the contribution of the primary glottic protective mechanisms.

simplified and ignores the contribution of the primary glottic protective mechanism, the epiglottic shield reflex. Aspiration almost always therefore is associated with postoperative dysphagia in which there is failure of epiglottic function too. The two common causes of this are excessive arytenoid abduction and absence of thyroepiglottic muscle function. This incidence of this complication can be reduced by avoiding excessive abduction and minimal dissection of the thyropharyngeus muscle. Where contralateral procedures become necessary, an interval between procedures is wise to permit recovery of swallowing function.

- Arytenoid pull-through: chronic pull-through of the prosthesis is sometimes encountered weeks or even months after surgery. The underlying cause of this is not always clear but not necessarily the result of surgical failure. A contralateral procedure may encourage a similar long term outcome.
- Contralateral arytenoid collapse: in some patients that have experienced severe airway obstruction prior to surgery there is a tendency for the non-abducted arytenoid / epiglottis to collapse towards the rima over the weeks immediately following tie-back. This can sometimes be predicted by the postoperative appearance of the larynx; management is staged contralateral abduction.
- Potential complications include seroma formation, surgery site infection, coughing, aspiration, loss of abduction, and complete failure of the prosthetic suture. Arytenoid chondritis can develop in the arytenoid cartilage that was "tied back". It is typical that horses will lose abduction of the arytenoid cartilage over time. A repeat laryngoplasty performed in horses that experience dynamic collapse of the arytenoid following laryngoplasty. Repeat procedures are much more difficult due to the scar tissue that

forms following the first surgery. Horses that chronically aspirate and cough are candidates for removal of the prosthetic suture(s). Most of the time the problem resolves following removal of the prosthesis.

- The most common complication found in a study by Hawkins et al (2008) was coughing in 50% of horses.
- in some cases, horses have had an increase in inflammatory airway disease (IAD) or exercise-induced pulmonary hemorrhage (EIPH) following tie-back procedures. A study conducted in Hong Kong was designed to investigate the incidence of these problems in horses that had left-sided prosthetic laryngoplasty and ventriculocordectomy (PLV).
- A study group was composed of 24 horses that had undergone this surgical treatment for roaring. Each horse in the study group was matched with two horses that were not. These control horses were matched to study group horses by trainer, year of importation to Hong Kong, and international handicap rating. Horses in the control group were all Thoroughbred racehorse geldings with an average age of three years.
- Prior to surgery, horses in both groups had similar levels of EIPH. After surgery, all horses showed some degree of EIPH. Epistaxis, a severe degree of EIPH in which blood drips from the nostrils after exercise, was seen in 38% of surgical horses compared

drips from the nostrils after exercise, was seen in 38% of surgical horses compared to 7% of control horses. All surgical group horses also showed excess tracheal mucous discharge after surgery, a condition that was seen in only 32% of control horses.

- After treatment, surgical horses had fewer race starts than horses in the control group, though the number of starts for which stakes money was earned was not significantly different. Among horses that had surgery, 70% were retired from racing within two years. Retirement was primarily because of epistaxis. Of the control horses, only 37% were retired in the same time period.

#### Common complications -

- Coughing—Immediate post-operative coughing is reported in roughly 43% of patients, but chronic coughing is reported in about 14% of horses;
- Arytenoid abduction loss—This type of surgical failure (when the sutures fail or pull through the arytenoid cartilage) is observed in 2 to 15% of affected horses in the immediate post-operative period. "The more insidious loss of abduction reported over the weeks and months following surgery, which that occurs in the majority of cases is problematic and difficult to prevent," Cramp said;
- Wound infection—The reported incidence of wounds at the incision site is between 1% and 6%, he said;
- Continued respiratory noise and/or poor performance—"Three recent studies reporting on the 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 (48-59%) of dynamic laryngeal or pharyngeal collapse that is not arytenoid cartilage instability or collapse," he said. Thus, it's important to examine the horse for another problem that could be causing the collapse, concluding that the surgical procedure has failed; and
- Arytenoid chondritis—This condition, which refers to inflammation of the arytenoid cartilage, is reported in 1% of cases. However, Cramp added that "more recent studies with longer term follow-up of cases suggest that the prevalence ... may in fact be higher at 8%."

#### POST OP CARE

- Post-operative care consists of stall rest for four weeks with hand walking only, then 2-3 weeks of small paddock turnout or light walking exercise
  - After six weeks, training can be resumed
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## PROGNOSIS

### Study by Hawkins et al 2008:

- Postoperative racing performance for 167 horses was subjectively evaluated by respondents as being improved in 69% of the horses. Overall owner satisfaction outcome after surgery was 81%. Of 230 horses, 178 raced at least one time after surgery. Overall, 117 horses raced three or more times before and after surgery, and 65 of these horses had improved performance index scores. None of the variables of surgical procedure affected performance index scores.
- Conclusions and Clinical Relevance—Laryngoplasty with or without ventriculectomy allowed 77% of the horses to race at least one time after surgery, improved racing performance in 56% of the horses that completed three races before and after surgery, and improved subjectively evaluated racing performance in 69% of the horses.
- One study showed that laryngoplasty was effective in reducing upper airway noise 30 days post-surgery, however the procedure was not as effective at minimizing noise as ventriculocordectomy. Cramp also noted the horse's intended use is important when measuring a procedure's success rate.
- "Nonperformance horses that have submaximal exercising oxygen requirements are generally reported to enjoy high success rates of 70-92% after laryngoplasty," he said. "In comparison, laryngoplasty performed in racehorses is reported to have a lower racing success (38-59%)."