



**Case Study**

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# Presentation of a Novel Method for Equine Vocal Cordectomy in a Thoroughbred Racehorse Post Laryngoplasty



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## Summary

Considerable variation exists in the literature relating to vocal cord and/or ventricle (VC/V) surgical procedures, as an adjunct to laryngoplasty or as a sole treatment for laryngeal hemiplegia. This includes whether the procedure is necessary, which side to operate on, unilateral or bilateral procedure, which exact structure to remove, the timing as related to the laryngoplasty if an adjacent, and the complications resulting from the procedure elected, such as contributing to aspiration and dysphagia.

This paper describes a novel technique, which was to use a modified punch intranasally in the standing horse under endoscopic guidance, (similar to an epiglottic entrapment hook), to transect the left vocal cord only in a minimalistic approach. This was ultimately successful in minimizing the respiratory noise and returning the horse to competitive form 2 ½ years after a laryngoplasty, that had gradually lost abduction and settled in a grade 4 (Dixon)/Grade B (Rakestraw) position. A first unsuccessful partial transection of the leading edge was followed by a second total transection which appeared as apparently successful. This is a low-cost technique, within the realms of many practitioners, that deserves more evaluation both post laryngoplasty and as a sole treatment for laryngeal hemiplegia.

**Keywords:** Thoroughbred; Vocal Cordectomy; Laryngoplasty; Recurrent Laryngeal Neuropathy

## Introduction

Recurrent laryngeal neuropathy (RLN) is a common, widespread condition, with Laryngoplasty (LP) being currently described as the technique of choice for improving athletic performance [1,2]. However, respiratory noise may be present post-surgery, especially in cases of sub-optimal abduction which is the most common LP complication [3,4], so it is common to perform a unilateral or bilateral ventriculectomy, vocal cordectomy, or ventriculocordectomy. Usually done at the time of surgery, these vocal cord/ventricle (VC/V) procedures are said to be effective in decreasing respiratory noise during exercise, [5-8]. In populations that perform at submaximal exercise, a VC/V procedure without laryngoplasty may be the preferred treatment, to avoid the many LP complications [2,9,10]. A ventriculectomy is said to improve airway noise, whereas a ventriculocordectomy is said to improve both noise and airway function [6,7]. However, other studies suggest the improvement in noise reduction and athletic performance with VC/V surgical procedures may be debatable [11,16].

With post LP surgery complications of dysphagia and cough being described with increasing emphasis more recently [4,16-18], it has been suggested a more conservative unilateral vocal cordectomy may be the surgery of choice, conserving tissue in the vocal cord area, and decreasing the chances of food and saliva aspiration during swallowing [4,19]. Unilateral laser surgery would also help avoid the potential complication of webbing, although other strategies have been described to overcome this complication in the bilateral laser procedures [4,8].

There is also some debate regarding the optimal degree of abduction to aim for with the LP procedure. Some surgeons advocate that, with evidence suggesting there is no athletic increase in performance with increasing abduction [20], but more chances of dysphagia complications, laryngoplasty with moderate abduction in conjunction with ventriculocordectomy is recommended to improve performance and limit complications [2]. While one study surprisingly found more respiratory noise

with greater arytenoid abduction [21], others found better athletic performance and less noise with a grade A (Rakestraw) pull outs [22,23]. Hence some surgeons prefer a grade A abduction as the optimal outcome for race horses, without any need for VC/V, this being the preferred approach by the author [18]. Post LP surgery dynamic endoscopy may also be of value. The cause of any respiratory noise can be more specifically identified, and any adjunct procedure targeted accordingly, with Dorsal Displacement of the Soft Palate (DDSP) a possible common contribution to post LP respiratory noise [24,3,25].

Original techniques for VP/V procedures described a surgical approach through a laryngotomy incision, normally at the end of surgery, under General anesthesia [23]. More recent techniques describe the use of an intra-nasal laser technique, either under GA, or standing, as standing LP procedures have become more widespread, once again predominantly at the time of surgery [23]. However, URT laser surgery can be expensive, and requires a high skill factor to avoid complications [4]. No intranasal instrumentation exists for an endoscopic guided approach to perform a VP/V procedure, as exists for epiglottis entrapment [26].

The suggestion to delay the VP/V procedure until post LP

abduction grade, surgical noise and complications have been ascertained, then using a minimal tissue sparing unilateral procedure of vocal cordectomy only if warranted, (preferably post dynamic endoscopy), was made after ex vivo experimentation [19]. However, no clinical published reports exist to date describing results in clinical cases following this protocol, using non laser instrumentation to perform intranasal endoscopic guided vocal cordectomy.

### Materials and Methods

A 7-year-old racing thoroughbred underwent a routine laryngoplasty on 21/7/21. After 26 starts, it presented again 2 ½ years later with a history of recent increased respiratory noise and poor performance. Endoscopy at rest revealed a grade 4 (Dixon) or grade B (Rakestraw) post laryngoplasty score, with a slight degree of arytenoid abduction. A dynamic endoscopy was performed, which revealed that the left arytenoid cartilage abduction of grade B (Rakestraw) was maintained, as well as the axial displacement of left vocal cord into the rima glottis space (Figure 1). The decision was made to manage the noise with a tissue-sparing procedure of vocal cordectomy, involving the trimming of the left vocal cord, and to trial specialist equipment made up for the procedure.

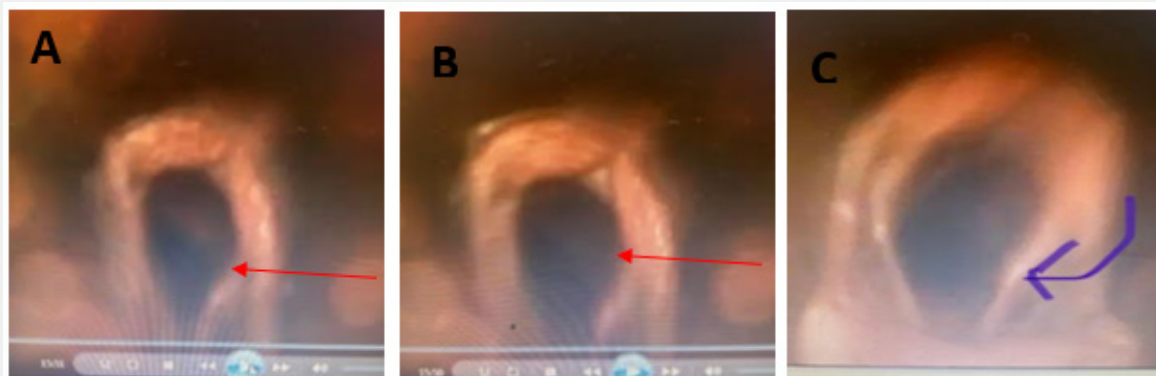


Figure 1: A, B and C showing the axial displacement of the left vocal cord, and maintenance of the left arytenoid in a grade B position.

The horse was presented to the hospital for the procedure three weeks later, on 20/12/23. It was immobilized in a crush and was sedated with detomidine (0.012mg/kg) and butorphanol (0.025mg/kg). Under endoscopic guidance, 20mls of Vetacaine (mepivacaine) local anesthetic was sprayed onto the surfaces of the larynx via a catheter through the endoscope. A custom-made prototype instrument was manufactured, from stainless steel, similar in size, shape, and length to a guarded epiglottic entrapment hook (Figure 6). Scissor handles acted to open and shut punch forceps in a horizontal plane. With the endoscope in the right nostril, the specialist equipment was passed through the horse's left nostril and extended to the left vocal cord, at which point a small section was removed via the novel punch instrument under endoscopic guidance (Figure 2). The section was taken

off the leading edge of the cord to avoid complications such as dysphagia and aspiration (Lean et al., 2022).

### Results

The next day, the horse was re-scoped to examine the early stages of the healing, and the lesion was found at the expected leading edge of the vocal cord (Figure 3).

The horse was then put on box rest and was walked for the next 7 days, and then returned to work.

The trainer reported that the respiratory noise had not improved, and the horse raced twice post-surgery (20/1/24 and 11/2/24), running poorly both times (near last both times).

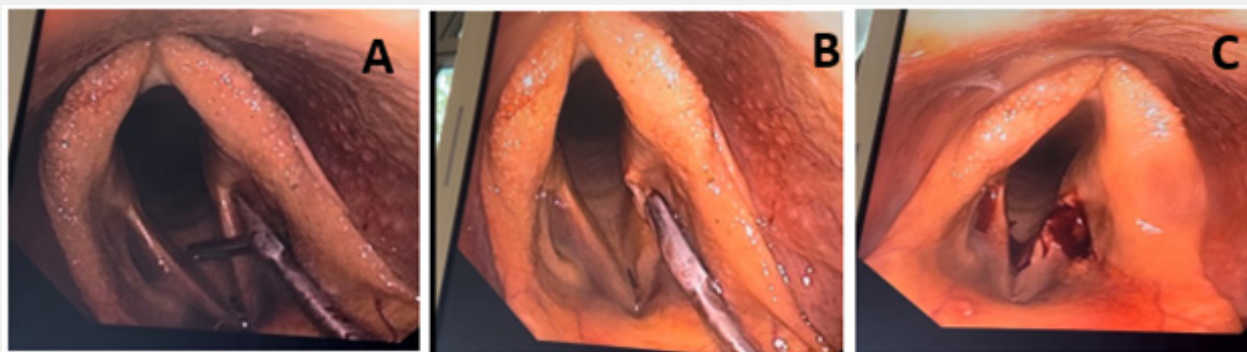


Figure 2: A, B and C showing the process of the removal of the small section from the leading edge of the left vocal cord.

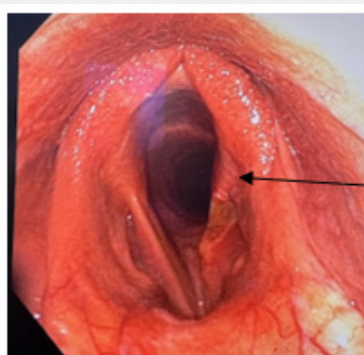


Figure 3: picture of the surgical lesion day 1 post-surgery (black arrow), examined endoscopically.

It was decided to repeat the surgery on 23/2/24, using the same technique, however this time taking multiple bites with the punch forceps, to ensure the entire vocal card was transected (see Figure 4).

The horse was returned to work after 7 days walking, and the trainer reported an immediate improvement in the respiratory noise.

The horse raced 3 ½ weeks after surgery with an improvement in form, running 5<sup>th</sup> of 11 horses. The horse subsequently raced 8 times over the course of the next 7 months, placing 3 times and winning once, an apparent improvement on pre-surgery form (see Table 1).

A follow up endoscope exam 4 months after the second surgery, during the horse's improvement in form and reduction in noise is shown in figure 5.

**Table 1:** Description of horse performance pre first VC, after partial VC and following second VC.

Procedure	Respiratory noise	Starts	Wins	Placings	Poor performance /runs (last 3)
Last 6 starts pre 1 <sup>st</sup> VC (partial)	yes	6	0	0	6
After partial VC	yes	2	0	0	2
After 2nd VC	no	8	1	3	2

### Discussion

Although the results of this novel technique are limited to one clinical case, the procedure did subjectively improve performance and decrease respiratory noise. This would support the findings of recent literature in experimental situations [19], that unilateral vocal cordectomy can be effective in grade B and C grades of post laryngoplasty abduction.

It is assumed that grade A cases, with good performance and making minimal noise, would not benefit from the procedure [18,19], hence this case would support delaying any VC/V procedure several months post-surgery, so the final abduction, amount of noise, and performance can be ascertained, and other potential causes of post laryngoplasty respiratory noise can be ruled out by dynamic endoscopy.

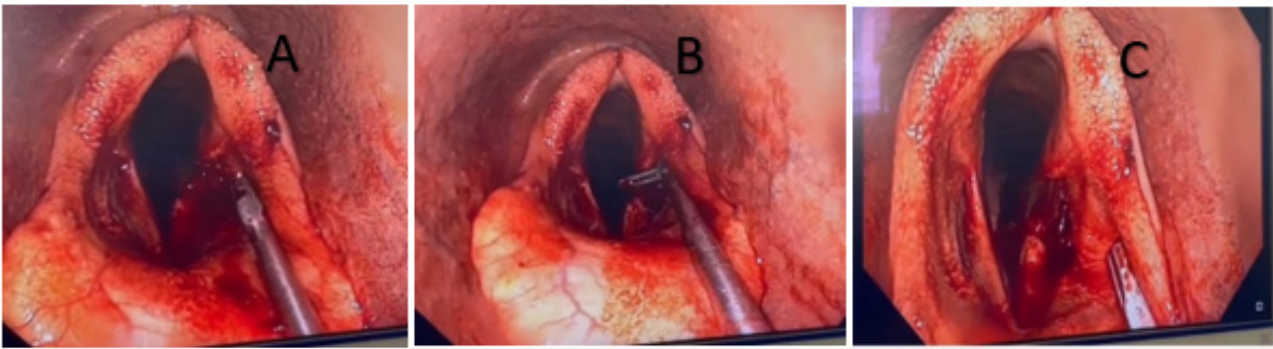


Figure 4: A, B and C showing the process of the repeat vocal cordectomy, entire transection of the vocal cord, with multiple bites of the cordectomy punch.



Figure 5: Full depth defect still observed in left vocal cord 4 months post-surgery.



Figure 6: Guarded epiglottic hook above the novel vocal cordectomy punch forceps (a).

In this case the first attempt was apparently unsuccessful, taking only the leading edge of the vocal cord. When repeated, this time ensuring the entire vocal cord was transected, immediate improvement was reported. This may explain in the literature

why vocal cordectomy have varying degrees of success reported [19,14,27], which could be due to the variation in techniques. Based on this case full transection of the vocal cord would be recommended.

Using a steel instrument (a), similar in concept and operation to the guarded epiglottic entrapment hook (Figure 6) seemed a safe and economic alternative to laser treatment, especially in the hands of the lesser skilled and experienced surgeons. Conceivably, the technique could also be done under GA, or at the time of laryngoplasty (standing or GA) if required.

While a small alteration in vocal cord function could dramatically alter respiratory noise, this case had no objective noise measurement so future evaluations of the technique would ideally include this to improve the reliability of the data. Similarly, while the horse did show apparent improvement in form (Table 1) with the 2nd procedure, there are many other contributing factors to performance, and further studies with more numbers, preferably randomized prospective cohort studies with matched controls, would be needed to ascertain if this procedure did improve airway function in grade B and C post laryngoplasty sufficiently to affect performance

### Conclusion

The novel method of vocal cordectomy using a specifically designed surgical instrument, taking care to fully transect the vocal cord rather than the leading edge, seems a promising approach for resolving issues of collapsing vocal cords in horses presenting with respiratory noise and exercise intolerance, either post-laryngoplasty in racehorses, or potentially as an alternative in sport horses with laryngeal hemiplegia.

In racehorses, this would enable the surgeon to dispense with VC/V adjunct procedures at the time of laryngoplasty surgery, sparing tissue and avoiding complications of cough and dysphagia. Horses can be followed up and a vocal cordectomy using this equipment performed at a later stage only if indicated.

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