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ORIGINAL ARTICLE



Partial arytenoidectomy in 21 standing draught horses with recurrent laryngeal neuropathy

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Summary

Objective: To report the use of standing partial arytenoidectomy (PA) in draught horses affected by left-sided recurrent laryngeal neuropathy (RLN). Study design: Retrospective descriptive study. Animals: Twenty-one draught horses diagnosed with left-sided recurrent laryngeal neuropathy (RLN). Methods: Medical records of 21 draught horses subjected to standing PA to treat left-

sided RLN were reviewed. Data recorded included history, signalment, presenting complaint, athletic or intended use, pre- and postoperative resting upper respiratory tract endoscopic findings, perioperative medication, surgical details, postoperative exercise recommendations and follow-up.

Results: Twenty-one horses (100%) had a history of abnormal respiratory noise and 15 horses (71%) had exercise intolerance. Of the 19 horses with follow-up, surgery resolved or significantly reduced the abnormal respiratory noise in 17 horses (90%) and resolved exercise intolerance in all 13 horses with a history of exercise intolerance and follow-up. None of the horses had signs or evidence of coughing at the time of follow-up.

Conclusion: Standing left-sided PA can resolve the clinical signs associated with left-sided RLN in draught horses.

KEYWORDS

horse, draught horse, partial arytenoidectomy, recurrent laryngeal neuropathy, standing surgery

INTRODUCTION

Recurrent laryngeal neuropathy (RLN) is a common respiratory disease in horses that causes progressive atrophy of the cricoarytenoideus dorsalis muscle and arytenoid cartilage collapse (Brakenhoff et al., 2006). Draught breeds have been reported to have a higher prevalence of RLN than other horse breeds (Brakenhoff et al., 2006; Dixon et al., 2001; Sweeney et al., 1991). Recurrent laryngeal neuropathy may cause abnormal respiratory noise and occasionally exercise intolerance in draught horses used for athletic activities (Kraus et al., 2003). Showing draught horses with abnormal

respiratory noise can lead to penalisation or even elimination during competition.

Unilateral or bilateral ventriculocordectomy can be performed to eliminate abnormal respiratory noise and respiratory tract obstruction in draught horses with RLN (Cramp et al., 2009). However, prosthetic laryngoplasty (PL) and unilateral ventriculocordectomy is the treatment of choice for draught horses with RLN presented for increased inspiratory noise and exercise intolerance as this combination has been shown to achieve a highlevel of client satisfaction following surgery (Kraus et al., 2003; Rossignol et al., 2015). Performing a PL standing is a safe and

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attractive option for draught horses diagnosed with left-sided RLN (Rossignol et al., 2015). This treatment option avoids the known potential complications associated with general anaesthesia in draught horses, but this approach does not avoid the complications associated with the PL procedure itself, such as surgical failure, implant infection, or aspiration following the procedure (Kraus et al., 2003).

Partial arytenoidectomy (PA) is the treatment of choice for horses with advanced arytenoid chondritis (Ducharme & Rossignol, 2019), but it can also be effective to treat horses with RLN (Barnes et al., 2004; Ducharme & Rossignol, 2019; Parente et al., 2008). Partial arytenoidectomy performed with the horses standing has been shown to be a safe and effective procedure in horses of various breeds (Gray et al., 2019). This treatment option results in an increased cross-sectional area of the rima glottidis, therefore decreasing the resistance to airflow and abnormal respiratory noise. Besides, PA is technically easier to perform than the PL procedure in our experience and since there is no implant or general anaesthesia required, has less potential for anaesthesia or PL complications (Gray et al., 2019). For this reason, this procedure is most commonly performed as the primary surgical option in draught horses diagnosed with RLN at our practice. The aim of this study was to report the outcome of draught horses with left-sided RLN treated with a PA performed with standing sedation and local anaesthesia. We hypothesised that PA would be an effective treatment option for draught horses affected by left-sided RLN with a history of abnormal respiratory noise and exercise intolerance.

MATERIALS AND METHODS

Study design

In this retrospective descriptive study, the medical records of draught horses presented for standing PA to the University of Illinois Veterinary Teaching Hospital between November 2015 and January 2024 with a presenting complaint of abnormal respiratory noise with or without exercise intolerance were reviewed. Horses were included in the study if they underwent standing PA and had no prior surgical procedures performed; five of these horses were included in a previous report where the emphasis was the description of the technique (Gray et al., 2019). Information obtained from the medical records included surgery date, signalment, presenting complaint, athletic or intended use, previous treatments, resting upper respiratory tract endoscopic findings, postoperative findings and recommendations and short-term complications. Short and long-term outcomes were obtained by reviewing the endoscopic re-evaluations and by communicating by telephone with owners.

Preoperative evaluation and surgical management

All horses had a preoperative upper respiratory tract videoendoscopic examination performed at rest by the attending surgeon.

Symmetry and synchrony of the arytenoid cartilage movement was assessed while horses were quietly breathing and immediately after swallowing. Resting laryngeal function was graded according with the Havemeyer system (Ducharme & Rossignol, 2019) in each case. Preoperatively, horses had a 14-gauge catheter aseptically placed in the left jugular vein and received gentamicin 6.6 mg/kg bwt i.v., procaine penicillin G 22,000 units/kg bwt i.m., phenylbutazone 4.4 mg/kg bwt i.v. and dexamethasone 0.05 mg/kg bwt i.v. Horses were placed in the stocks, sedated with xylazine 0.05 mg/kg bwt i.v. and the head and neck was positioned on a head stand in moderate extension. The throat latch strap of the halter was removed and placed across the dorsal part of the halter so it would not interfere with the surgical site. Horses were also sedated with detomidine 0.015 mg/kg bwt i.v. and butorphanol tartrate 0.02 mg/kg bwt i.v. immediately before surgery. However, throughout the procedure horses also received alternating doses of detomidine 0.005 mg/ kg bwt i.v. and xylazine 0.25 mg/kg bwt i.v. when horses started to react to the surgical procedure.

All horses underwent PA following the standing technique. Briefly, an area extending from the cranial third of the ventral cervical region to the middle third of the mandible was clipped and aseptically prepared and the areas to be incised were desensitised using 2% mepivacaine HCL. A temporary tracheotomy was performed as previously described and stainless steel tube tracheotomy (Kruuse, Jørgen Kruuse A/S) was placed and maintained throughout surgery. Each surgery was monitored with a 1m videoendoscope (Olympus, Olympus Corporation of the Americas) that was passed through the left nasal passage to allow visualisation of the surgical procedure.

An 8–10cm laryngotomy was performed using a #10 scalpel blade to incise the skin and subcutaneous tissues. Using Metzenbaum scissors, the sternohyoid muscles were separated to expose the cricothyroid membrane, which was incised using a #10 scalpel blade. The lumen of the larynx was desensitised by instilling 40mL of 2% lidocaine HLC through the biopsy channel of the endoscope. A left-sided ventriculocordectomy was performed in each horse before the PA using a sacculectomy burr (Sontec Instruments Inc) passed through the laryngotomy followed by transection and removal of the vocal cord using Metzenbaum scissors and a curved sponge forceps.

Using a #10 scalpel on a long blade handle, a 'U' shaped incision was made along the most axial portion of the corniculate process, ventral and caudal aspects of the body of the arytenoid cartilage. The mucosa was separated from underlying cartilage using a periosteal elevator, the body of the arytenoid cartilage was then grasped using a sponge forceps and dissection along the lateral aspect was performed to separate the cartilage from the musculature using long curved Metzenbaum or Mayo scissors depending on the case. Once dissection was complete, the arytenoid cartilage was grasped with sponge forceps and advanced in a rostral direction. Curved scissors were used to transect the muscular process off the arytenoid body and remove the main body of the cartilage. Finally, double action bone Ruskin Rongeurs were used to remove any additional cartilage and the redundant mucosa was trimmed using Metzenbaum scissors. The tracheotomy tube was removed immediately after surgery and all surgical sites were left open to heal by second intention.

Postoperative management and follow-up

All horses received systemic non-steroidal anti-inflammatory and antimicrobial drugs for 7 days and throat spray consisting of 250 mL of glycerin, 250 mL of dimethyl sulfoxide 90%, 500 mL of nitrofurazone and 1g of dexamethasone sodium phosphate [20mL twice daily via the laryngotomy incision using a 60 mL catheter tip syringe × 10d] for 10 days post-operatively. Some horses were discharged the day of the procedure with instructions to keep the horse on stall rest with twice daily hand-walking for 4 weeks and to return to the hospital for a follow-up upper airway endoscopic examination 4-6 weeks after surgery. At the follow-up examination, information about incisional complications, respiratory complications (coughing, etc.) and dysphagia following surgery was gathered via conversation with the owner without the use of a standardised questionnaire. Further information about the respiratory noise while working and performance following surgery was gathered by the same investigator via telephone conversation with the owner or trainer after the horse had returned to full work.

RESULTS

Twenty-one draught horses (5 mares, 2 stallions and 14 geldings) with a median weight of 818kg (range: 650–994kg) and median age of 5 years (range: 2–15 years) were included in the study. There were 18 Belgians, 3 Percherons and 1 Oberlander; 18 were used for competitive and 3 for noncompetitive hitch or pulling before the surgery. Fifteen horses (71%) had an endoscopic diagnosis of a Havemeyer grade IV left-sided RLN and 6 horses (29%) had an endoscopic diagnosis of a Havemeyer grade III c left-sided RLN. One of the horses had a small ulcer on the axial surface of the right arytenoid cartilage just above the dorsal attachment of the vocal cord thought to be due to chronic intermittent contact between the left and right arytenoid cartilages (Kelly et al., 2003). The rest of the horses included in the study had no additional airway abnormalities at rest. Twenty-one horses (100%) had a history of abnormal respiratory noise and 15 horses (71%) also had exercise intolerance.

All horses underwent a standing left-sided PA under endoscopic guidance without intraoperative complications except for one horse (7 years old) in which mild difficulty in abducting the left arytenoid cartilage during dissection was encountered, presumably due ankylosis of cricoarytenoid joint. Nine horses (43%) were discharged the same day of the surgery and the rest of the horses (57%) were discharged the day after the surgery.

Postoperative endoscopic evaluation of the upper respiratory tract, including the proximal portion of the trachea for evidence of aspiration, was performed on 18 out of the 21 horses (86%). The median time between surgery and postoperative evaluation was



FIGURE 1 Postoperative image of a horse obtained 4 weeks after surgery. There is a small amount of corniculate process loose mucosa which was preserved at the uppermost rostral aspect of the surgery site to avoid rostra displacement of the palatopharyngeal arch.

4 weeks (range: 4–6 weeks). No coughing, aspiration and/or dysphagia were reported for any of the 18 horses at the time of recheck endoscopy. Upon recheck endoscopic examination, 17 horses had adequate healing of the surgery site (Figure 1). One horse had a small granuloma dorsally and tissue that appeared to web from the surgical site to the distal aspect of the left vocal fold which was thought to be a vocal cord remanent (Figure 2); no additional treatment was recommended at that time.

Follow-up information was available for 19 out of 21 horses; no follow up could be obtained for two horses with a history of abnormal respiratory noise and exercise intolerance. The median available follow-up was 37 months (range: 5–99 months). Of the horses with follow-up, in 17 (90%) PA resolved, or greatly decreased, abnormal respiratory noise and in 13 horses (100%) with a history of exercise intolerance in addition to the respiratory noise returned to full work without any issues. Seven horses experienced transient abnormal respiratory noise re-occurrence shortly after returning to exercise, but these horses continued to exercise despite the noise and the respiratory noise resolved within 6 weeks.

Two horses had persistent abnormally increased respiratory noise during exercise. One of these horses developed a rightsided RLN and underwent a right-sided transendoscopic diode laser-assisted ventriculocordectomy as described by Henderson et al. (2007). Briefly, the right vocal fold was stabilised by applying slight tension with a 50-cm-long trans-nasal grasping forceps (Sontec Instruments Inc) and a diode laser (DiodeVet, BWTEK Inc) was used to transect the dorsal and ventral attachments of the vocal fold. Then, a trans-nasal sacculectomy burr (Sontec Instruments Inc) was inserted through a short segment of nasogastric tubing and passed under videoendoscopic guidance into the right laryngeal saccule and rotated in a clockwise direction to engage and evert the mucosa prior to tissue dissection with the diode laser. The vocal cord was also excised. The abnormally increased respiratory noise during exercise persisted in this horse. The other horse (Figure 2)



FIGURE 2 Twelve weeks (a) and 16 weeks (b) postoperative images of a horse that still had increased airway noise when returned to work. On the left image there is a small granuloma dorsally and vocal cord remanent. The web was removed via transendoscopic, diode laser-assisted resection and the granuloma was left intact. Note the healed cordectomy appearance detected in all successful cases.

with persistent airway noise also had exercise intolerance when returned to work. In this horse the left vocal cord remanent was removed with the diode laser trans-endoscopically and the abnormal respiratory noise and exercise intolerance subsequently resolved. In both horses, trans-endoscopic surgery was chosen to avoid having to repeat a laryngotomy.

DISCUSSION

This is the first report of exclusively draught horses affected by left-sided RLN managed with a PA performed with the horses standing and sedated. While PA has been primarily advocated for horses with arytenoid chondritis or a failed PL, our results demonstrate that this surgical option may be successful in draught horses diagnosed with left-sided RLN intended for competitive hitch or pulling. A majority of horses were able to show and compete without penalisation during competition which makes this treatment option effective. It has been demonstrated that the differences in airway mechanics between PL and PA in racehorses are minimal at submaximal exercise (Lumsden et al., 1994; Radcliffe et al., 2006). Moreover, PA avoids the major potential complications associated with the PL procedure itself such as chronic coughing or prosthesis infection that may require prosthesis removal or a repeat PL (Kraus et al., 2003).

Intermittent coughing and/or dysphagia are reported as common complications after PA (Barnes et al., 2004; Lumsden et al., 1994). It has been speculated the surgical technique has a major impact on postoperative coughing and/or dysphagia, particularly atraumatic dissection of the arytenoid cartilage from the adjacent soft tissues (Ahern & Parente, 2009) and preservation of the corniculate process mucosa (Rossignol & Ducharme, 2021). The mucosa overlying the corniculate process maintains the normal anatomy of the piriform recess and may reduce coughing and/or dysphagia (Rossignol & Ducharme, 2021). We believe performing PA with the horses sedated and standing with the endoscope allows adequate visualisation of the surgery site facilitating accurate dissection and preservation of the corniculate process mucosa. Excessive removal of the corniculate process mucosa in the rostral part of the rima glottidis can cause food contamination of the trachea (Ahern & Parente, 2009). In our study, none of the horses developed intermittent coughing and/or dysphagia postoperatively. This represents a major advantage over PL and surgeons should consider performing a PA rather than PL in this particular breed.

Interestingly, during follow-ups with owners or trainers, we learned that seven horses were reported to experience transient abnormal respiratory noise re-occurrence after their recheck endoscopy and shortly after returning to exercise. Horses continued to exercise despite the noise, and by 6 weeks, once the horses had regained conditioning/fitness, the abnormal respiratory noise had resolved. It is possible these horses experienced dynamic collapse of the unsupported upper respiratory tract structures (corniculate mucosa or left aryepiglottic fold) or other abnormalities such as medial deviation of the right vocal fold or intermittent displacement of the soft palate, all of which have been reported in horses subjected to overground endoscopic evaluation following left-sided PA (Davidson & Parente, 2011; Hackett & Leise, 2019).

It is also possible that these horses had weakness of the supporting muscles of the respiratory tract and secondary exerciseinduced dynamic collapse of the pharynx that improved or resolved as the horse's fitness improved (Fitzharris et al., 2023). Improved fitness has been shown to result in increased strength of the upper airway muscles and improved upper airway function during exercise (Fitzharris et al., 2023). Additionally, the same group found that horses had lower grades of dynamic respiratory tract collapse with increased upper respiratory tract muscle strength (Fitzharris et al., 2021). Overground endoscopic evaluation under driven conditions would have been useful to determine the short-lived abnormal respiratory noise in these draught horses (Hackett & Leise, 2019). However, not every overground endoscopic system available can be fitted to large draught horses such as the ones included in our study.

Persistent abnormal respiratory noise is a potential complication following PA in draught horses used athletically. In these situations, resting recheck endoscopic evaluation of the upper respiratory tract is vital to rule out additional airway pathology such as right-sided RLN or complications associated with the surgery site such as intraluminal granulomas or remanent of the left vocal cord (Ahern & Parente, 2009). This diagnostic information is critical for appropriate management of these complications which can lead to a successful outcome following a PA procedure. In this report, two horses had persistent respiratory noise and had changes in resting endoscopic evaluation which were addressed with transendoscopic procedures using the diode laser. One of these two horses went on to have a full recovery while the other had persistent respiratory noise.

Economic considerations are an important determinant in the decision-making process to select a surgical approach in young draught horses affected by RLN. Some of the horses operated had to recover rapidly, return to exercise to get conditioned and be sold at the summer sales. The low cost, low complication rate, and short convalesce time following PA make this option very attractive to manage draught horses with left-sided RLN in our area. One potential drawback of our technique is the healing time (2–3 weeks) and wound care necessary for the tracheostomy and laryngotomy incisions.

Readers should keep in mind that the small number of cases included in the study and relying on medical records data and owner feedback for certain outcome measures such as postoperative complications, exercise intolerance, noise reduction and the lack of a standardised questionnaire to consistently inquire about some of this information were important study limitations. Additional limitations included the relative short follow-up timeframe for some of the horses included given that their athletic use or careers are much longer that the median follow-up reported and the lack of objective assessment of aspiration of dust or food particles of the horse operated. Nonetheless, our results suggest that this surgical approach represents a viable option for competitive hitch draught horses diagnosed with RLN with presenting complaints of poor performance and abnormal respiratory noise.

CLINICAL RELEVANCE

- Partial arytenoidectomy is an effective treatment option for competitive draught horses with recurrent laryngeal neuropathy presented for abnormal inspiratory noise +/- exercise intolerance.
- Partial arytenoidectomy performed standing with endoscopic guidance helps with visualisation of the surgery site and facilitates accurate dissection of the arytenoid cartilage.
- Partial arytenoidectomy is technically easier to perform than laryngoplasty and avoid the potential complications of general anaesthesia or laryngoplasty surgery.

AUTHOR CONTRIBUTIONS

S. M. Gray: Conceptualization; writing – original draft; writing – review and editing; investigation; formal analysis. **S. D. Gutierrez-Nibeyro:** Conceptualization; investigation; writing – original draft; writing – review and editing; formal analysis.

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CONFLICT OF INTEREST STATEMENT

The authors declare no potential conflicts of interest with respect to the research, authorship, publication of the article and/or financial relationships that could inappropriately influence this work.

ETHICS STATEMENT

Verbal informed client consent was given for use in retrospective studies.

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REFERENCES

- Ahern, B.J. & Parente, E.J. (2009) Surgical complications of the equine upper respiratory tract. Veterinary Clinics of North America: Equine Practice, 24, 465–484.
- Barnes, A.J., Slone, D.E. & Lynch, T.M. (2004) Performance after partial arytenoidectomy without mucosal closure in 27 thoroughbred racehorses. *Veterinary Surgery*, 33, 398–403.
- Brakenhoff, J.E., Holcombe, S.J., Hauptman, J.G., Smith, H.K., Nickels, F.A. & Caron, J.P. (2006) The prevalence of laryngeal disease in a large population of competition draft horses. *Veterinary Surgery*, 35, 579–583.
- Cramp, P., Derksen, F.J., Stick, J.A., Nickels, F.A., Brown, K.E., Robinson, P. et al. (2009) Effect of ventriculectomy versus ventriculocordectomy on upper airway noise in draught horses with recurrent laryngeal neuropathy. *Equine Veterinary Journal*, 41, 729–734.
- Davidson, E.J. & Parente, E.J. (2011) Exercising videoendoscopic evaluation of 7 horses with abnormal respiratory noise and poor performance following partial arytenoidectomy. *Equine Veterinary Education*, 23, 626–629.
- Dixon, P.M., McGorum, B.C., Railton, D.I., Hawe, C., Tremaine, W.H., Pickles, K. et al. (2001) Laryngeal paralysis: a study of 375 cases in a mixed-breed population of horses. *Equine Veterinary Journal*, 33, 452–458.
- Ducharme, N.G. & Rossignol, F. (2019) Larynx. In: Auer, J.A., Stick, J.A., Kümmerle, J.M. & Prange, T. (Eds.) Equine Surgery, 5th edition. St. Louis, MO: Elsevier, pp. 734–769.
- Fitzharris, L.E., Franklin, S.H., McConnell, A.K., Hezzell, M.J. & Allen, K.J. (2021) Inspiratory muscle training for the treatment of dynamic upper airway collapse in racehorses: a preliminary investigation. *Veterinary Journal*, 275, e105708.
- Fitzharris, L.E., Hezzell, M.J., McConnell, A.K. & Allen, K.J. (2023) Training the equine respiratory muscles: inspiratory muscle strength. *Equine Veterinary Journal*, 55, 306–314.
- Gray, S.M., Gutierrez-Nibeyro, S.D. & Secor, E.J. (2019) Partial arytenoidectomy in 14 standing horses (2013-2017). Veterinary Surgery, 48, 473–480.
- Hackett, E.S. & Leise, B.S. (2019) Exercising upper respiratory videoendoscopic findings of 50 competition draught horses with abnormal

respiratory noise and/or poor performance. Equine Veterinary Journal, 51, 370–374.

- Henderson, C.E., Sullins, K.E. & Brown, J.A. (2007) Transendoscopic, laser-assisted ventriculocordectomy for treatment of left laryngeal hemiplegia in horses: 22 cases (1999-2005). *Journal of the American Veterinary Medical Association*, 231, 1868–1872.
- Kelly, G., Lumsden, J.M., Dunkerly, G., Williams, T. & Hutchins, D.R. (2003) Idiopathic mucosal lesions of the arytenoid cartilages of 21 thoroughbred yearlings: 1997-2001. Equine Veterinary Journal, 35, 276-281.
- Kraus, B.M., Parente, E.J. & Tulleners, E.P. (2003) Laryngoplasty with ventriculectomy or ventriculocordectomy in 104 draft horses (1992–2000). Veterinary Surgery, 32, 530–538.
- Lumsden, J.M., Derksen, F.J., Stick, J.A., Robinson, N.E. & Nickels, F.A. (1994) Evaluation of partial arytenoidectomy as a treatment for equine laryngeal hemiplegia. *Equine Veterinary Journal*, 26, 125–129.
- Parente, E.J., Tulleners, E.P. & Southwood, L.L. (2008) Long-term study of partial arytenoidectomy with primary mucosal closure in 76 thoroughbred racehorses (1992–2006). *Equine Veterinary Journal*, 40, 214–218.
- Radcliffe, C.H., Woodie, J.B., Hackett, R.P., Ainsworth, D.M., Erb, H.N., Mitchell, L.M. et al. (2006) A comparison of laryngoplasty and

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- Rossignol, F. & Ducharme, N.G. (2021) Complications in larynx surgery. In: Rubio-Martinez, L.M. & Hendrickson, D.A. (Eds.) Complications in equine surgery. Hoboken NJ: Wiley Blackwell, pp. 438–467.
- Rossignol, F., Vitte, A., Boening, J., Maher, M., Lechartier, A., Brandenberger, O. et al. (2015) Laryngoplasty in standing horses. *Veterinary Surgery*, 44, 341–347.
- Sweeney, C.R., Maxson, A.D. & Soma, L.R. (1991) Endoscopic findings in the upper respiratory tract of 678 thoroughbred racehorses. *Journal* of the American Veterinary Medical Association, 198, 1037–1038.

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