Partial Arytenoidectomy for Treatment of Failed Laryngoplasty or Arytenoid Chondritis in Racehorses (21-Nov-2003)

E. J. Parente, E. Tulleners and L. L. Southwood
New Bolton Center, University of Pennsylvania, Kennett Square, PA, USA.

Abstract
Horses with failed laryngoplasty or arytenoid chondritis can return to racing and have a successful outcome after arytenoidectomy. Serious complications associated with arytenoidectomy did not occur in the horses in this study.

1. Introduction
Partial arytenoidectomy can be performed to treat horses with either arytenoid chondritis or laryngeal hemiplegia after failure of laryngoplasty. Partial arytenoidectomy has traditionally been associated with a poor prognosis for return to racing and a high post-operative complication rate [1-3]. The authors, however, have had a different experience and thought that the prognosis may be better than previous reports indicate.

The objectives of the proposed study were (1) to determine the ability of racehorses to return to successful racing after having a partial arytenoidectomy for either failed laryngoplasty or arytenoid chondritis, and (2) to determine the post-operative complications of partial arytenoidectomy. Our hypotheses were that (1) horses would return to racing and have a successful outcome after partial arytenoidectomy, and (2) there would be no post-operative complications after partial arytenoidectomy.

2. Materials and Methods
Horses - Medical records of horses who underwent operations at New Bolton Center by the authors between 1992 and 2002 were evaluated. Horses that were intended to race that underwent a partial arytenoidectomy for either failed laryngoplasty or arytenoid chondritis were used. Chondroitic arytenoid was defined as having an abnormally shaped corniculate, with limited motion, and areas of mucosal disruption (Fig. 1). Information obtained from the medical record included the signalment (age, breed, gender), history (making a noise versus no noise), lesion type (laryngeal hemiplegia versus arytenoid chondritis), lesion location (left, right, or bilateral arytenoid cartilage), post-operative complications (dysphagia or no dysphagia), and post-operative management (duration of endotracheal intubation postoperatively, days to re-evaluation, requirement for a second surgery for removal of granulation tissue).

Figure 1. Left arytenoid chondrosis with axial mucosal lesion and inability to achieve full abduction. "Kissing" lesion of granulation tissue on the axial surface of the right arytenoid. - To view this image in full size go to the IVIS website at www.ivis.org . -

Surgical Technique - All horses received penicillin (22,000 IU/kg, IM) pre-operatively and phenylbutazone (4.4 mg/kg, IV) and dexamethasone (0.5 mg/kg, IV) intra-operatively. All horses underwent a tracheotomy and unilateral partial arytenoidectomy through a laryngotomy. Care was taken to free a dorsally or caudally based mucosal flap from the body of the arytenoid before removing the arytenoid. The abaxial border of the arytenoid was freed of its muscular attachments with a combination of sharp and blunt dissection. The muscular process was sharply transected to remove the arytenoid. Mucosal closure over the defect was performed with 3-0 polyglactin 910 in multiple lines of simple continuous patterns. The ventral
border of the mucosal flap was left open to drain, and the sacculae and vocal cords were resected. Any granulating "kissing" lesions on the opposing arytenoids were resected (Fig. 2). The laryngotomy incisions were not closed. The horses recovered from anesthesia having a small tracheotomy tube in place that was often maintained until the following morning, when it was either removed or changed if needed.

*Figure 2. One day post-operative endoscopy after left partial arytenoidectomy and removal of granulation tissue from right arytenoid. - To view this image in full size go to the IVIS website at www.ivis.org. -*

**Post-Operative Recommendations** - Horses were maintained on oral phenylbutazone (0.2 mg/kg, q 12 h) and oral trimethoprim sulphamethoxazole (33 mg/kg, q 12 h) for 1 wk. The laryngotomy and tracheotomy incisions were cleaned daily. The horses were maintained in a stall for 1 month before re-evaluation and then turned-out for a second month before resuming exercise.

**Outcome Measurements** - Outcome was obtained from race records [a]. Outcome measurements were categorical and continuous: (1) returning to racing (returned versus did not return), (2) having five or more starts after surgery (less than five versus five or more), (3) total number of starts post-operatively, (4) total earnings post-operatively, and (5) months to first start.

**Statistical Analysis** - A censored analysis of data was performed using a Fisher's exact test for categorical data and an analysis of variance for continuous data [b]. The level of significance was \( P < 0.05 \).

### 3. Results

**Horses** - There were 69 horses that met the selection criteria. The median age of horses affected was 4 yr (range = 2 - 8 yr). There were 27 geldings, 21 females, and 21 intact males. All the horses were Thoroughbreds except for one Standardbred. All the horses made an abnormal respiratory noise before surgery except for four horses, whose history of noise was unknown. There were 22 horses having a partial arytenoidectomy after failure of laryngoplasty for laryngeal hemiplegia and 47 horses with arytenoid chondritis. Fifty-one horses had a left-sided lesion, 15 horses had a right-sided lesion, and 3 horses were bilaterally affected.

There were no horses showing signs of gross dysphagia after surgery. Although some horses did cough while eating the morning after surgery, there were no significant amounts of food material at the nares prompting further hospitalization. The median duration of tracheal intubation post-operatively was 1 day. There were five horses that had tracheal intubation for longer than 1 day post-operatively, and this ranged from 2 to 6 days. Forty horses (40/69; 58%) were re-evaluated by the authors after discharge from the hospital. The median duration of time to re-evaluation was 35 days (range = 15 - 127 days). Eleven horses (11/69; 16%) required a second surgery for laser excision of intralaryngeal granulation tissue from the arytenoidectomy site.

Three horses were euthanized for colic (n = 2) or laminitis (n = 1) after surgery and were excluded from the analysis. An additional three horses developed signs of abdominal pain after surgery, but responded to medical management and were included in the analysis. Therefore, 66 horses were used in the final statistical analysis.

**Outcome** - Fifty-three horses (80%) raced after surgery, and forty-four horses (67%) raced five or more times after surgery. Geldings were more likely to return to racing and race five or more times (96% and 96%, respectively) compared with females (67% and 43%, respectively) and intact males (76% and 57%, respectively). There was no association between lesion type (failed laryngoplasty versus arytenoid chondritis) and any outcome measurement. Horses with bilateral lesions (33%) were less likely to return to racing compared with horses with left (85%) or right (73%) lesions; however, this did not reach statistical significance (\( P = 0.08 \)). There was no association between lesion location and other outcome measurements. Only 40% of the horses (2 of 5 horses) requiring endotracheal intubation for longer than 1 day returned to racing, whereas 84% of the horses (51 of 61 horses) that had endotracheal intubation for just 1 day returned to racing. There was no association between duration of endotracheal intubation and other outcome measurements. There was no association between the need for a second surgery for granulation tissue removal and any outcome measurement.

The median time from surgery to the first start was 6 mo (range = 2 - 20 mo). Horses that required endotracheal intubation for
longer than 1 day had a significantly longer time from surgery to first start. There was a trend for younger horses to have a longer time between surgery and first start; however, this did not reach statistical significance (P = 0.06). There was no correlation between the time from surgery to the first start and location of lesion, type of lesion, gender, or requirement of a second surgery. The median number of starts after surgery was seven (range = 0 - 68). Females had significantly fewer starts after surgery compared with geldings. There was no association between the median number of starts after surgery and age, location of lesion, type of lesion, duration of endotracheal intubation, or requirement of a second surgery. The median earning after surgery was $10,925 (range = $0 - $152,660). There was no correlation between earnings after surgery and age, gender, location of lesion, type of lesion, duration of endotracheal intubation, or requirement of a second surgery.

4. Discussion
Very limited success has been previously reported after arytenoidectomy [1-3]. Reports range from an almost 50% euthanasia rate to 64% return to exercise [1,3], and no better than 45% return to racing [2]. Post-operative swelling and granulation tissue has been a significant factor limiting the success of surgery in these reports. Furthermore, subtotal arytenoidectomies as well as partial arytenoidectomies were often combined in earlier studies. Although subtotal arytenoidectomy was once considered a good surgical option for horses with arytenoid chondritis to prevent aspiration and restore respiratory mechanics, experimental evidence suggests very limited improvement after a subtotal arytenoidectomy in respiratory mechanics in comparison with a horse with grade IV left laryngeal hemiplegia [4]. This is secondary to the excessive residual mucosa that can dynamically obstruct the airway during exercise. An extralaryngeal partial arytenoidectomy approach has also been described, but it seems to have limited clinical application because of excessive residual mucosa as well [5]. Lumsden et al., [6] showed that a partial arytenoidectomy, in which all of the arytenoid is removed except for the muscular process, can nearly restore respiratory mechanics to normal in a treadmill exercised horse. Furthermore, a primary mucosal closure, similar to what was performed in this study, has been shown to enhance healing [7].
Several factors could have contributed to a higher success rate in this report compared with previous reports. Many of these horses had unilateral disease with only granulating "kissing" lesions on the contralateral arytenoid. Bilateral arytenoidectomy was not considered, even when both arytenoids were affected. More careful dissection to remove as much extraneous mucosa as possible limited the amount of upper respiratory obstruction post-operatively (Fig. 3). Careful dissection to remove the entire cartilage and minimize trauma to adjacent muscle may have reduced the risk of aspiration. Also, endoscopic laser resection of the 11 horses with post-operative intralaryngeal granulation tissue allowed these horses to return to successful training, whereas previous reports may not have addressed this complication of the surgery. This report demonstrates that careful resection of a chondroitic arytenoid can result in a successful racehorse post-operatively.

Figure 3. Endoscopic examination several months after left partial arytenoidectomy. - To view this image in full size go to the IVIS website at www.ivis.org . -

Footnotes
[a] Bloodstock Research Information Services, Lexington, KY, 40544.

References


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