Recurrent Laryngeal Neuropathy (RLN): Pathogenesis and management

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• **Laryngeal collapses:**
  
  – Recurrent Laryngeal Neuropathy:
    
    • **Naturally-occurring disease** is a bilateral mononeuropathy of the recurrent laryngeal nerves. (Collins et al., 2009)
    
    • **Acquired/preventable**: Trauma, iatrogenic damage, hepatic disease, lead poisoning.

  – Non-RLN Laryngeal collapses:
    
    • Unilateral/bilateral non-RLN laryngeal collapse
    • Unilateral or Bilateral Ventral Midline Arytenoid Deviation
    • Congenital structural malformation: Fourth branchial arch defect (4-BAD)
    • Acquired structural malformation: Arytenoid chondritis
• Naturally-occurring disease:
  – Prevalence 3% (TB) – 43% (Draft) - Lane et al., 2003, Brakenhoff et al., 2005.
  – Can be genetic (see presentation of Professor Vince Gerber “Genetic risk factors for equine respiratory disease”)
Recognition and awareness

- Not all horses with laryngeal collapse have naturally-occurring recurrent laryngeal neuropathy.
- The prognosis, treatment and/or management varies depending on the various causes of laryngeal collapse.
- AND the co-morbid disease: AE fold collapses, DDSP
- So identify acquired/trauma RLN and other causes of laryngeal collapse.
RLN does not always mean naturally-occurring disease

• Need to assess:
  – Look for physical evidence of iatrogenic or trauma to recurrent laryngeal n. (i.e., Horner syndrome)
  – Focus on appearance of laryngeal collapse.
  – Neuromuscular status of laryngeal musculature.
  – Status of laryngeal cartilages.
Current understanding in treatment of RLN

• Static treatment- non-physiological:
  • Ventriculo-cordectomy (i.e. Hobday)
  • Laryngoplasty (i.e. tieback)
  • Arytenoidectomy

• Dynamic treatment (physiological):
  • Laryngeal reinnervation
  • Laryngeal pacemaker (muscle and nerve? Rehabilitation?)
Sound Analysis
Experimental Data - Cordectomy and Ventriculocordectomy (VC)

• Bilateral VC significantly improved abnormal inspiratory noise by end of 90 days (Brown et al., 2003).

• Unilateral laser VC significantly improved sounds but not as effectively as bilateral VC (Robinson et al., 2006).

• Unilateral laser vocal cordectomy only gave mild improvement in abnormal inspiratory noise (Brown et al, 2005).
Naturally-occurring disease

- Elimination of abnormal sounds in 66% n=92 (Taylor et al., EVJ 2006).
- Elimination of abnormal sounds in 82%, n=22 (Henderson et al., JAVMA 2007).
- Reduction of abnormal sounds in draught horses better after VEC (n=19) than VE (n=11) (Cramp et al., 2009).
## Laryngoplasty

<table>
<thead>
<tr>
<th></th>
<th>80% HR MAX</th>
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<th>100% HR MAX</th>
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<td></td>
<td>control</td>
<td>LPVC</td>
<td>control</td>
<td>LPVC</td>
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<td>( V_T ) (liters/breath)</td>
<td>13</td>
<td>12</td>
<td>14.5</td>
<td>12.5</td>
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<tr>
<td>( V_E ) (liters/min)</td>
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<td>1293</td>
<td>1128*</td>
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<td>( P_{ui} ) (mm Hg)</td>
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<td>-17</td>
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<td>PIF (L/sec)</td>
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<td>-49</td>
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<tr>
<td>( Z_1 ) (mmHg/l/sec)</td>
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<td>( P_{aO_2} )</td>
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<td>84</td>
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<tr>
<td>( P_{aCO_2} )</td>
<td>37</td>
<td>39</td>
<td>43</td>
<td>50*</td>
</tr>
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* Different from control, Adjusted Means Results (n=6)

Radcliffe et al., 2006
Prosthetic Laryngoplasty in Racehorses (Performance)

- Sakai 2016
- Rafettio 2015
- Mason 2013
- Acento 2012
- Wiliamson 2012
- Witte 2008
- Radcliffe 2004
- Kid 2002
- Davenport 2001
- Strand 2000
- Hawkins 1997
- Russel 1994
- Speirs 1983
- Goulden 1982
Tracheal aspirations post surgery

- 95 horses with persistent DDSP and/or dysphagia cases.
- 57 treated with laryngeal tie-forward.
- 23 treated with injection bulking.
- 15 other treatments.
Dynamic treatments
After nerve-pedicle laryngeal reinnervation (n=63)

- Time to first start range from 7.5-8.6 months.
- 95% return to racing.
- 58% earned more money per start after surgery.

Nerve-pedicle being replaced by nerve implantation laryngeal reinnervation

Fulton 2003
Rossignol et al., 2016


