PACING OF THE CRICOARYTENOIDEUS DORSALIS MUSCLE BY NEUROPROSTHESIS
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Recurrent laryngeal neuropathy (RLN, “roaring”) is a major cause of poor athletic function in performance horses, with a prevalence of 8% in Thoroughbreds. RLN leads to dynamic airway collapse with upper airway obstruction at exercise and alveolar hypoventilation with hypoxemia.

RLN is a chronic peripheral motor neuropathy that usually occurs on the left side, a finding that has been attributed to the greater length of the left recurrent laryngeal nerve. Histologically, RLN is most severe distally (close to the muscle) where the disease is characterized by axonal loss and demyelination. RLN results in progressive atrophy of the intrinsic laryngeal muscles— the main laryngeal abductor, the cricoarytenoid lateralis (CAL) muscle and the sole arytenoid abductor, the cricoarytenoid dorsalis (CAD) muscle. Atrophy of the left CAD muscle results in loss of arytenoid cartilage abduction and is associated with dynamic airway collapse. Horses as young as 6 months old can be affected RLN and appears to be a good candidate for therapy using functional electrical stimulation (FES). In this study, the feasibility of FES for equine vocal fold paralysis was explored by testing arytenoid abduction evoked by electrical stimulation of the PCA muscle. Rheobase and chronaxie were determined for innervated PCA muscle. We then tested the hypothesis that direct muscle stimulation can maintain airway patency during strenuous exercise in horses with induced transient conduction block of the laryngeal motor nerve. Six adult horses were instrumented with a single bipolar intra-muscular electrode in the left PCA muscle. Rheobase and chronaxie were within the normal range for innervated muscle at 0.55± 0.38v and 0.38± 0.19ms respectively. Intramuscular stimulation of the PCA muscle significantly improved arytenoid abduction at all levels of exercise intensity and there was no significant difference between the level of abduction achieved with stimulation and control values under moderate loads. Additional results from 12 horse treated with FES following transection of the recurrent laryngeal nerve will also be presented.