CHRONIC LARYNGEAL STIMULATION MAINTAINS DYNAMIC CLOSURE CONTROL

C.L. Ludlow, S. Bielamowicz, M. Daniels, P. Choyke, V. Hampshire, K. Maltby, R. Testerman, R. Bierbaum, D. Erickson
NIDCD, NIH and Medtronic, Inc., USA
E-mail: cludlow@pop.nidcd.nih.gov

Abstract - Because patients with voice and swallowing disorders must have intermittent volitional control of laryngeal vocal fold closure while maintaining an open airway for respiration, we evaluated the use of chronic neuromuscular laryngeal stimulation for dynamic control of laryngeal closure.

Methods: Six dogs were implanted bilaterally with Peterson-type electrodes in the vocal and ventricular portions of the thyroarytenoid muscle. Stimulation intervals, were applied daily for 8 months using the Medtronic Xtrel system. Monthly measures were made of a) the voltage threshold for minimal detectable movement, b) vocal and ventricular fold displacement and c) peak angular velocity during closure during maximal stimulation on each side.

Results: Bilateral stimulation effected complete glottal closure in all dogs at the time of implantation. CT scans confirmed that the electrodes remained in position in the thyroarytenoid muscle throughout the study and that the 3D shape of the tract was altered during stimulation. Electrodes remained functional bilaterally in all but two dogs where one side became dysfunctional at 6 months. Threshold and kinematic data demonstrated stable movement thresholds and angular velocities with effective glottal closure throughout the study on both the stimulated and non-stimulated sides.

Conclusions: The study demonstrated the potential of such a system for providing sustained dynamic control of glottal closure in patients with laryngeal motor control disorders.