The Value of Laryngeal Electromyography in the Evaluation of Laryngeal Motion Abnormalities

*Yolanda D. Heman-Ackah and †Arlene Barr

Philadelphia, Pennsylvania and †Chicago, Illinois

Summary: Laryngeal electromyography (EMG) functions routinely as a prognostic tool in the evaluation of vocal fold paralysis, as a guide for therapeutic injections into the laryngeal muscles, and more recently as an assessment tool in the evaluation of vocal fold paresis. This study investigates the clinical utility of laryngeal EMG as a diagnostic aid in the evaluation of movement disorders of the larynx in patients complaining of dysphonia. A retrospective chart review of all laryngeal EMGs performed at a tertiary laryngology referral center over a 13-month period was performed. All laryngeal EMGs were performed to evaluate laryngeal motion abnormalities in dysphonic patients. Thirty-seven laryngeal EMGs were completed during this study period. Analysis of the data revealed that the medical treatment plan changed as a result of findings on laryngeal EMG in 10/37 patients (27.0%); laryngeal EMG guided and/or confirmed the course of treatment in 12/37 patients (32.4%) and did not change the treatment plan in 15/37 patients (40.5%). Laryngeal EMG is a useful diagnostic tool that, in this study, contributed significantly to and helped guide the evaluation and management of motion disorders in the larynx of dysphonic patients.

Key Words: Dysphonia—Dystonia—electromyography (EMG)—Laryngeal electromyography—Larynx—Movement disorder—Muscle tension dysphonia—Myoclonus—Paralysis—Paresis—Tremor.

INTRODUCTION

Laryngeal electromyography (EMG) has been used traditionally by physicians as a diagnostic aid in the evaluation of vocal fold paralysis and as a guide for therapeutic injections into the intrinsic muscles of the larynx.[1–3] In the evaluation of vocal fold paralysis, laryngeal EMG is particularly helpful in differentiating paralysis from other causes of vocal fold immobility and in evaluating the presence of ongoing degeneration or reinnervation,

Accepted for publication April 13, 2005.

Presented as a poster at the American Laryngological Association Meeting at COSM April 30–May 1, 2004 and at the 33rd Annual Symposium of the Voice Foundation: Care of the Professional Voice, June 2–6, 2004.

Approved by the Institutional Review Board at Graduate Hospital, Philadelphia, Pennsylvania.

From the *Department of Otolaryngology-Head and Neck Surgery, American Institute for Voice and Ear Research, Thomas Jefferson University and Graduate Hospital, Philadelphia, Pennsylvania, and the †Department of Neurology, University of Illinois at Chicago, Chicago, Illinois.

Address correspondence and reprint requests to Yolanda D. Heman-Ackah, MD, American Institute for Voice and Ear Research, 1721 Pine Street, Philadelphia, PA 19103. E-mail: phillyvoicemd@aol.com

Journal of Voice, Vol. 20, No. 3, pp. 452–460
0892-1997/$32.00

doi:10.1016/j.jvoice.2005.04.009

thus guiding the therapeutic plan.[1,2,4] Although the electrical patterns of various neurologic conditions in the larynx have been described, the widespread use of laryngeal EMG by physicians as a diagnostic aid in the evaluation of movement disorders of the larynx has not yet become routine in most voice centers. The purpose of this article is to describe our experience with laryngeal EMG as a diagnostic tool in the evaluation of movement disorders of the larynx that manifest as dysphonia.

METHODS

A retrospective chart review of all patients who presented to a university-based tertiary laryngology referral center for evaluation of dysphonia over the course of the 13-month period from March 2002 to April 2003 was performed. All patients had given consent to have their medical records used by physicians for research purposes at the time of their initial evaluation according to Health Insurance Portability and Accountability Act of 1996 (HIPAA) regulations, and this study was approved by the Institutional Review Board at Graduate Hospital, Philadelphia, PA. All patients who underwent laryngeal EMG for the evaluation of a motion abnormality observed on examination were included in this study. A motion abnormality was defined as any increase or decrease in vocal fold adductory mobility, abductory mobility, or longitudinal stretch of the vocal folds; asymmetry in vocal fold adduction, abduction, or longitudinal stretch of the vocal folds; spontaneous laryngeal activity; involuntary laryngeal activity; laryngeal dysdiadokinesis; laryngeal bradykinesia; laryngeal rigidity; or laryngeal dysmetria. Patients who were found on clinical examination to have functional dysphonia or muscle tension dysphonia alone did not routinely undergo laryngeal EMG.

Our technique for assessing for motion abnormalities in the larynx involved both flexible laryngoscopic and rigid strobovideolaryngoscopic evaluation of each patient.[5] Each patient was anesthetized initially with 4% topical lidocaine and 0.05% oxymetazoline hydrochloride intranasally, followed by a pharyngeal and hypopharyngeal topical application of Cetacaine (14% benzocaine, 2% butyl aminobenzoate, 2% tetracaine hydrochloride; Cetylite Industries, Pennsauken, NJ). After allowing sufficient time for decongestion and anesthesia, the examination was begun with flexible laryngoscopy. The flexible laryngoscopic examination consists of two major components: observation of the larynx at rest and while performing phonatory maneuvers. Observation of the larynx at rest allows one to assess the normal resting tone and position of the vocal folds. Under normal circumstances, the vocal folds should sit in a predominantly abducted position at rest, adducting slightly with expiration and abducting during inspiration. A median position of one or both vocal folds usually implies vocal fold fixation either from paralysis, scar, or joint immobility. A paramedian position is usually associated with vocal fold paresis, scarring, or cricoarytenoid joint dysfunction. Paradoxical vocal fold movement, which is characterized by adduction during inspiration and abduction during expiration, is usually associated with reflux-induced or asthma-induced laryngospasm and/or anxiety.

Spontaneous activity at rest is usually caused by tremor or myoclonic activity. Tremor in the larynx is characteristically observed as involuntary, rhythmic, periodic spasms of the laryngeal, supraglottic, or pharyngeal muscles. The reliable periodicity of the spasms, similar to the ticking of a clock, is the key feature of tremor. Tremors can occur at rest or with intention, which in the larynx is observed during sustained phonation. Myoclonus is differentiated from tremor in that the spasms observed during myoclonic activity are jerky and arrhythmic.[6]

Endoscopic evaluation of the larynx during running speech and during singing allows one to assess the use of accessory muscles of phonation by the patient and to assess the presence of dystonic activity during phonation. The ideal position of the supraglottic and pharyngeal muscles during phonation is in a relaxed position, with all adductory and tensor actions being observed in the vocal folds only. Muscle tension dysphonia (also commonly referred to as supraglottic hyperfunction) occurs when the glottic, supraglottic, pharyngeal, and strap muscles are overly recruited during phonation. On examination, it has the appearance of an anterior-to-posterior or lateral-to-medial squeezing of the