Current and Emerging Concepts in Muscle Tension Dysphonia: A 30-Month Review

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Summary: The modern theory of hoarseness is that there are multifactorial etiologies contributing to the voice problem. The hypothesis of this study is that muscle tension dysphonia is multifactorial with various contributing etiologies. Methods: This project is a retrospective chart review of all patients seen in the Voice Speech and Language Service and Swallowing Center at our institution with a diagnosis of muscle tension (functional hypertensive) dysphonia over a 30-month period. A literature search and review is also performed regarding current and emerging concepts of muscle tension dysphonia. Results: One hundred fifty subjects were identified (60% female, 40% male, with a mean age of 42.3 years). Significant factors in patient history believed to contribute to abnormal voice production were gastroesophageal reflux in 49%, high stress levels in 18%, excessive amounts of voice use in 63%, and excessive loudness demands on voice use in 23%. Otolaryngologic evaluation was performed in 82% of patients, in whom lesions, significant vocal fold edema, or paralysis/paresis was identified in 52.3%. Speech pathology assessment revealed poor breath support, inappropriately low pitch, and visible cervical neck tension in the majority of patients. Inappropriate intensity was observed in 23.3% of patients. This set of multiple contributing factors is discussed in the context of current and emerging understanding of muscle tension dysphonia. Conclusions: Results confirm multifactorial etiologies contributing to hoarseness in the patients identified with muscle tension dysphonia. An interdisciplinary approach to treating all contributing factors portends the best prognosis.

Key Words: Dysphonia—Muscle tension dysphonia—Functional hypertensive dysphonia—Voice—Aerodigestive tract.

Accepted for publication March 30, 2004.

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0892-1997/$30.00
© 2005 The Voice Foundation
doi:10.1016/j.jvoice.2004.03.007

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INTRODUCTION

Voice literature has long recognized functional dysphonia as an umbrella diagnosis for impairment of voice production in the absence of structural change or neurogenic disease of the larynx. Muscle tension dysphonia (MTD) semantically lies within the bounds of functional dysphonia, although it has only occasionally been investigated as a distinct entity in the spectrum of functional voice disorders, despite its widely accepted clinical presence. Early mention is made of voice disorders stemming from apparent increased laryngeal tension and poor habits of phonation, and terms such as “myasthenia laryngis” and “psychophonasthenia” have been suggested. Several authors have more recently proposed categorization schemes for the range of underlying behaviors in functional dysphonia, which include an MTD classification.

Delineation of MTD from functional dysphonia has been suggested based on history, laryngoscopic, perceptual-acoustic, musculoskeletal, and psychological features. These data suggested that key features of MTD include posterior glottal chink, mucosal vocal cord changes, larynx rise, suprahyoid muscle tension, breathiness, glottal fry, glottal attack, and stridency. Along with classification schemes, authors have suggested myriad titles for MTD in the literature (Table 1), suggesting various underlying etiologies and characteristics. This is curiously analogous to the modern theory of hoarseness, where there are multifactorial etiologies contributing to the voice problem. The hypothesis of this study is that muscle tension dysphonia is multifactorial with various contributing etiologies. Results of this retrospective chart review are put into the context of the present understanding of MTD with a thorough review of the literature.

METHODS

This project was approved by the Northwestern University Institutional Review Board Human Subjects Committee and preceded the need for Health Insurance Portability and Accountability Act (HIPAA) compliance. A retrospective chart review was performed of all patients seen in the Voice Speech and Language Service and Swallowing Center at Northwestern Memorial Hospital with a diagnosis of muscle tension (functional hypertensive) dysphonia over a 30-month period from January 1, 2000 through June 30, 2002. The Center for Voice at Northwestern maintained integrated otolaryngologic and speech pathology care of patients, which facilitated retrieval of pertinent medical information. Data were collected on demographics, voice complaints, voice use demands, as well as pertinent medical history, lifestyle/social history, otolaryngologic assessment and laryngoscopic findings, dysphonia characteristics, and initial prognosis for improvement on therapy. Tobacco use history was categorized as mild (<10 pack/year history), moderate (11–30 pack/year) and extreme (>30 pack/year). Alcohol use was categorized as mild (1–6 per week presently), moderate (1–2 per day), and extreme (>2 per day). Caffeine use was categorized as mild (1–2 per day), moderate (2–4 per day), and extreme (>4 per day). As this information was not standardized in the medical record at the time of initial documentation, some judgments were made to fit this categorization scheme at the time of formal chart review. Formal statistical analysis of the data was not performed as the data were deemed to be dealing with observation (judgments) rather than true measured quantities. The reliability of these judgments was considered to be very good based on the experience, qualifications, and consistency of those performing otolaryngologic (K.W.A.) and speech pathology (C.L.) evaluations.

RESULTS

One hundred fifty subjects were identified, 94 female (63%) and 56 male (37%). The median age was 42.3 years, with a female median age of 41.7
and a male median age of 44.7. Pertinent voice complaints on initial presentation are summarized in Table 2. The most common complaints were hoarseness 83%, vocal fatigue 26%, vocal strain 23%, and pain related to phonation 17%. Pertinent medical history of these subjects is summarized in Table 3. Notably, a prior history of gastroesophageal (or laryngopharyngeal) reflux was present in 49% and a history of seasonal/perennial allergy symptoms in 37%. Lifestyle/social issues are listed in Table 4, including the distribution of tobacco, alcohol, and caffeine use. Twenty-seven subjects (19%) reported significant stress in their daily life. Ninety-four subjects (63%) reported excessive amounts of voice use in their professions, and 34 subjects (23%) reported that their voice use demands required excessive loudness to successfully perform their professions.

Otolaryngologic evaluation with laryngoscopic findings were available in 123 subjects and summarized in Table 5. Gastroesophageal (laryngopharyngeal) reflux and/or chronic laryngitis was observed in 52 subjects (35%). Thirty-four subjects had a vocal fold polyp (23%), with a sex distribution of 21 female to 13 male. Twenty subjects had nodules (13%), with a sex distribution of 16 female to 4 male. Twelve subjects had vocal fold cysts (8%), with a sex distribution of 7 female to 5 male. “Other” pertinent findings include bowing (n = 2), scar (n = 2), hemorrhage (n = 1), granuloma (n = 1), leukoplakia (n = 1), and papilloma and unspecified lesion (n = 2). Vocal fold paralysis was observed in 5 subjects (3%).

Speech pathology evaluation and assessment is listed in Table 6, with predominant findings of poor breath support in 98% of subjects, inappropriate pitch in 82%, and obvious cervical neck tension visible in 70%. Inappropriate intensity, fast rate of speech, glottal fry, jaw tension, and hard glottal attacks were also observed. Initial prognosis for improvement on speech therapy was excellent in 13 subjects (9%), good in 114 (76%), fair in 7 (5%), and poor in 5 (3%). Speech therapy was not recommended or the patient declined therapy in 6 cases (4%).

**DISCUSSION**

It is clear that muscle tension dysphonia in these patients was multifactorial in nature with respect to underlying etiology and contributing factors. Common clinical features of MTD in our series was consistent with well-known qualities of this disorder, including poor control of the breath stream, an abnormally low-pitched speaking voice, and increased frequency of hard glottal attacks, and possible increased prevalence in female patients. Multifactorial contributions leading to functional dysphonia and MTD have long been recognized and indicate that clinical evaluation of the voice should be comprehensive for accurate diagnosis.

Otolaryngologic evaluation of the larynx in our study and others similarly reveals multiple etiologies in patients with muscle tension voice disorders. Videostroboscopic evaluation of patients with MTD regularly shows abnormal findings such as uneven mucous layer, vessel dilation, abnormal glottal closure, and bilateral vibratory asymmetry. Additionally, laryngopharyngeal reflux, identifiable by laryngeal edema and/or erythema, was confirmed by pH probe testing in 70% of patients found to have vocal abuse/misuse/overuse syndromes, and in 78% of an MTD subgroup. Laryngoscopy findings alone, however, may not distinguish patients with functional dysphonia from normal subjects and are only part of a diagnostic evaluation.

Our study confirms this high prevalence of gastroesophageal/laryngopharyngeal reflux in the MTD population. As shown in Tables 3 and 5, a history or laryngoscopic findings suggestive of reflux was present in 49% and 46% of our patients, respectively. Including the overlap, 86 subjects (57%) had past or present reflux, having the potential to significantly affect optimal laryngeal function and voice production.
TABLE 3. Pertinent Medical History

<table>
<thead>
<tr>
<th>Condition</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gastroesophageal reflux</td>
<td>74</td>
<td>49</td>
</tr>
<tr>
<td>Allergy</td>
<td>56</td>
<td>37</td>
</tr>
<tr>
<td>Depression/anxiety med.</td>
<td>10</td>
<td>7</td>
</tr>
<tr>
<td>Asthma</td>
<td>12</td>
<td>8</td>
</tr>
<tr>
<td>Dysphagia</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>Hypertension</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Sinusitis</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>H/o tracheostomy</td>
<td>1</td>
<td>0.6</td>
</tr>
</tbody>
</table>

In this review, approximately one fifth of the patients (19%) reported high levels of stress in their lives. Also, 86% of the patients in our study reported that they require excessive voice use or the use of a loud voice in daily activity. Mood disorders, anxiety, and tension have been recognized to contribute to functional dysphonia and have been identified in as many as one third of a total group of function dysphonia patients reported by House and Andrews.11 Roughly half of another functionally dysphonic group had experienced a difficulty with speaking out, as compared with 16% of a control group.20 It has been suggested, however, that other types of functional dysphonia, such as that associated with ventricular phonation, bowed vocal cords, or conversion aphonia have a much stronger psychiatric relationship as compared with MTD.8 Aaronson21 classifies musculoskeletal tension disorders under the category of psychogenic voice disorders, stating that “the extrinsic and intrinsic laryngeal muscles are exquisitely sensitive to emotional stress, and their hyperconstriction is the common denominator behind the dysphonia and aphony in virtually all psychogenic voice disorders.” Personality investigation classified individuals with functional dysphonia versus vocal nodules as introverts and extroverts, respectively, and suggested that personality variables and their behavioral consequences may contribute to these vocal conditions.22,23

It is widely accepted that prolonged phonation under increased laryngeal muscle tension levels in MTD may lead to mucosal changes, including vocal nodules, polypoidal degeneration, or chronic laryngitis.21,24 Studies of mechanical stress in phonation suggest excessive collision, and acceleration forces may be responsible for the greatest vocal fold tissue damage.25 Indeed, computer modeling of the vibratory dynamics of vocal folds indicates the presence of high mechanical stress within the vocal fold epithelium at their midpoint, when vibrating in a mode other than normal phonation.26

Abnormal muscle tension patterns have been documented as a compensatory gesture in individuals with glottal insufficiency as in presbylaryngis or vocal fold paresis.27 Our study reinforces the concept of muscle tension dysphonia serving as a compensatory adaptation to glottal insufficiency. As shown in Table 5, a total of 88 subjects (59%) had the presence of vocal polyps, nodules, cysts, lesions, bowing, or paralysis that contributed to glottal insufficiency on intended phonation. In addition, this figure is expected to be an underestimate because of an emerging understanding of the presence of subtle vocal fold paresis.27 Although it is well known that inappropriate voice use behavior may in fact lead to the development of vocal lesions (ie, nodules), the presence of such a lesion is not amenable to vocal conservation efforts with continued voice use demands. An attempt to compensate for glottal insufficiency because of the mass effect of the lesion would be expected to heighten the shearing forces at the site of a lesion, enhancing its maturity26 and subsequently requiring increased vocal compensation for worsening glottal insufficiency. We recognize, however, that the underlying development of
TABLE 5. Otolaryngologic Assessment

<table>
<thead>
<tr>
<th>Lesion</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gastroesophageal reflux/chronic laryngitis</td>
<td>52</td>
<td>35</td>
</tr>
<tr>
<td>Polyps</td>
<td>34</td>
<td>23</td>
</tr>
<tr>
<td>Nodules</td>
<td>20</td>
<td>13</td>
</tr>
<tr>
<td>Cyst</td>
<td>12</td>
<td>8</td>
</tr>
<tr>
<td>Other</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>TVC edema</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>Paralysis/paresis</td>
<td>5</td>
<td>3</td>
</tr>
</tbody>
</table>

The lesion may have contributions from psychological, physiological, and behavioral components.

Significant vocal demand may correlate with MTD. Teaching has been identified as a highly vocally demanding profession with increased risk for vocal disability, in females more than males. Other research investigates internal central monitoring and feedback systems in relation to vocal activity. An unexpected change in the perception of one’s own voice output results in a compensatory vocal response and modified vocal output. The relation between inappropriate use of auditory feedback and specific types of voice disorders is yet to be determined. Additionally, it has been suggested that acquired plastic change to central brainstem nuclei may lead to certain types of vocal hyperfunction.

The complaint of vocal fatigue was reported in 39 (26%) of the patients in our study. Various acoustic measures have been documented in relation to MTD and vocal fatigue, a common complaint of patients with MTD. Vocal fatigue frequently results in a significant increase in speaking fundamental frequency and the presence of an anterior glottal chink as well as reduced maximum phonation time and abnormally high airflow rate. However, no difference in phonatory air flow has been shown in an MTD population versus normal phonators. An increase in EMG in the perioral and supralaryngeal muscles before and during phonation was found in most of a patient sample with MTD. Furthermore, a relationship between MTD and palpable thyrohyoid muscle tension has been shown. In addition, computer-aided phonetograms may provide classificatory information for the types of functional dysphonia.

As determined during the voice diagnostic evaluation, prognosis for improvement in voice quality was judged to be excellent or good in 85% of the patients reviewed. Various protocols have been investigated in the treatment of functional voice disorders and MTD. Successful treatment outcomes were reported using EMG biofeedback training and relaxation training, behavioral treatment using the Accent Method of voice therapy, Manual Laryngeal Musculoskeletal Tension Reduction Technique, and topical lidocaine. Vocal hygiene training and voice amplification have both been shown to improve acoustic measures in teachers with voice disorders, with voice amplification yielding greater subjective improvement per subjects. However, we believe it is important to respect multifactorial contributions to MTD, which requires taking a good history of possible contributing etiologies as well as formal laryngoscopic and otolaryngologic evaluations.

Personality factors and physiology predominate current theory on the etiology of muscle tension dysphonia. However, it appears from this study that a significant portion of subjects are also compensating for increased vocal limitations because of suboptimal voice production and/or inability to meet voice use demands. The emerging concept of compensation for chronic laryngeal irritation or glottal insufficiency in the MTD population is also reinforced by our data.

**CONCLUSIONS**

There are many contributing factors leading to MTD, with multifactorial etiologies in many patients.
Our results and review of the literature indicate that MTD is not a solitary disease or dysfunction and that it is interrelated with comorbid conditions, such as medical/neoplastic/movement issues affecting the larynx, voice use demands, and personality/behavior issues. A significant portion of MTD appears to be an unconscious attempt to compensate for conditions that result in suboptimal laryngeal function.

REFERENCES