ORIGINAL ARTICLE

The Use of Fibrolaryngoscopy in Muscle Tension Dysphonia in Telemarketers

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KEYWORDS
Dysphonia; Tension; Muscle; Telemarketers; Fibrolaryngoscopy

Abstract
Introduction: Muscle tension dysphonia (MTD) is a voice disorder in the absence of current organic laryngeal pathology, without obvious psychogenic or neurological aetiology. The laryngeal features of MTD include a posterior glottal gap and supraglottic hyperfunctional activities; however, it remains unclear if these features are specific to MTD. This report aims to compare the laryngeal features in telemarketer patients with MTD versus non-dysphonic control subjects.

Methods: We reported on an observational, analytic, and transversal study. Fiberoptic nasal endoscopy was performed on 57 patients (28 telemarketers with MTD and 29 control subjects). These random-sequence videotapes were independently rated by an expert laryngologist according to the modified Morrison and Rammage classification. In addition, a questionnaire about vocal symptoms and other details was completed.

Results: The posterior glottal gap was the most common feature in telemarketers with MTD, while incomplete glottal gap was observed more frequently in non-dysphonic patients. More than 70% of the videotapes were rated as pathologic. There was no statistical difference in the prevalence of normal features or bowing glottal gap between patients and control subjects. Anterior–posterior supraglottic contraction was more frequent in the control group. The major symptoms found were: voice gets tired quickly, increased vocal effort and neck tension.

Conclusions: The heterogeneity in the laryngeal features in telemarketers with MTD seen under fibroscopy and their presence among the non-dysphonic population suggest that they cannot determine by themselves the diagnosis of MTD.

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Utilidad de la fibrolaringoscopía en la disfonía por tensión muscular en teleoperadores

Resumen

Introducción: La disfonía por tensión muscular (DTM) es una alteración de la voz en ausencia de patología laríngea orgánica, y sin alteraciones neurológicas o psicológicas evidentes. El hiato posterior y la actividad supraglótica hipertónica son considerados como las manifestaciones fibrolaringoscópicas típicas de DTM, a pesar de que este síndrome parece menos frecuente en mujeres en comparación con sus homólogos. En el estudio de Titze et al. se evidenció que la disfonía por tensión muscular afecta de manera mayor a los hombres que a las mujeres. El objetivo principal de este estudio fue comparar los hallazgos fibrolaringoscópicos entre pacientes teleoperadores con DTM versus individuos sin síntomas vocales. Como objetivo secundario se persiguió describir las características personales, laborales y clínicas del grupo de teleoperadores.

Métodos: Estudio observacional, analítico y transversal. Se reclutaron 57 pacientes (28 de DTM y 29 del grupo control) a los cuales se les realizó una fibrolaringoscopia, catalogados a ciegas por un laringólogo experto en función de la clasificación de Morrison y Rammage modificada. Además se llevó a cabo un cuestionario a ambos grupos acerca de antecedentes personales y laborales.

Resultados: El hiato posterior fue más prevalente en teleoperadores con DTM, mientras que en el grupo control lo fue el hiato longitudinal. Más del 70% de las fibroscopias del grupo control fueron informadas como patológicas. La contracción supraglótica antero-posterior fue más frecuente en pacientes sanos. Los síntomas más presentes fueron fonastenia, tensión en musculatura del cuello y esfuerzo vocal aumentado.

Conclusión: La heterogeneidad en los patrones fibroscópicos laríngeos en teleoperadores con DTM, así como su presencia en personas sanas, sugiere que los mismos en forma aislada no pueden establecer el diagnóstico de DTM.

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Introduction

Muscle tension dysphonia (MTD) is a voice alteration in the absence of organic laryngeal pathology and with no evident neurological or psychological alterations. It is characterised by a generalised tension increase in laryngeal and paralaryngeal areas, which triggers an hyperfunctioning vibrational pattern of the vocal cords and ventricular bands. When these muscles lose coordination and contract inappropriately, they cause hoarseness, cervical muscle pain, vocal fatigue, etc. Prolonged phonation in the presence of increased laryngeal muscle tension can lead to changes in the mucosa, such as lymph nodes, polyloid degeneration, and chronic laryngitis.

This syndrome is more common in middle-aged patients with a significant use of voice under stress situations. Other causative agents include personal factors such as smoking, alcohol, drugs, etc., as well as occupational factors (length of working day, background noise, prior vocal training). Although recent research shows an association between voice problems and people working in vocally demanding activities, such as teachers, singers, and gym instructors, there is scarce information about the prevalence, clinical characteristics, and fibrolaryngoscopic patterns of this disease in telemarketing staff.

Titze et al. report that telemarketing staff represent 2.3% of consultations in voice clinics, despite representing only 0.78% of the working age population in the U.S.A. in 1994. This demonstrates that telemarketing staff are 3 times more likely to consult voice specialists than patients from the general population.

The diagnosis of this entity is based on clinical and videofibrolaryngoscopic examination. Posterior hiatus and hypertonic supraglottic activity (antero-posterior and lateral laryngeal contraction) are considered the typical fibrolaryngoscopic manifestations of MTD. However, it is still unclear whether these patterns are specific to this pathology. Some authors argue that these findings are also observed in people without any laryngeal symptoms. In his study, Linville found that young women presented a high incidence of posterior hiatus, while older women presented a higher incidence of anterior hiatus and spindle-shape hiatus. At present, there are no studies which have systematically compared the prevalence of these images in the population of telemarketing staff suffering MTD and individuals without dysphonia.

The main objective of this study was to compare the videofibrolaryngoscopic findings among telemarketer patients diagnosed with MTD versus individuals without vocal symptoms (control group). A secondary objective was to describe the personal, occupational, and clinical characteristics of these telemarketers.

Material and Methods

We conducted an observational, analytical, and cross-sectional study on patients with MTD who worked in call centres in the city of Cordoba and who attended consultation at the Otolaryngology department of our institution during the period between April and October 2010.

We recruited patients aged over 18 years who had worked as telemarketers for a period exceeding 1 year. The
diagnosis of MTD was based on clinical signs and a laryngoscopic examination. The criteria used to select patients were: suffering dysphonia for 3 months or more, associated to videofibrolaryngoscopy compatible with signs of laryngeal hypertonus (supraglottic contraction and inadequate posterior laryngeal closure) and with absence of structural pathology (carcinomas, polyps, papilloma, lymph nodes, Reinke oedema, laryngitis or recurrent paralysis). We excluded those patients who smoked more than 5 cigarettes per day, those with chemical laryngitis due to severe gastroesophageal reflux according to the Reflex Finding Score, individuals with a history of psychological problems preceding dysphonia or signs of psychological alterations at the time of the study, as well as patients with acute respiratory infection and a history of laryngeal surgery.

The control group included volunteer patients, without current or past laryngeal pathology, to whom we applied the same exclusion criteria as patients with MTD. All patients signed an informed consent form to participate in the study, which had the prior approval of the Ethics Committee of our institution.

Clinical and Sociodemographic Characteristics

Both groups completed a questionnaire about personal history (smoking, nasal allergies, alcohol consumption, symptoms of gastroesophageal reflux and use of medication associated with the production of laryngeal symptoms, including contraceptives, inhaled corticosteroids, vasopressors, antidepressants, etc.). In addition, telemarketing staff were questioned about their work history (time in the position, weekly hours, and working conditions), history of laryngeal pathology (current symptoms, duration, and treatment received), and impact of vocal problems on their quality of life.

Fibrolaryngoscopic Evaluation

The videofibrolaryngoscopy was conducted by the same operator in both groups of patients, after instillation of lidocaine at 5% in the right nostril, using a flexible 3.5 mm fiberscope (Karl Storz PPT 2) with a halogen light source of 150 watts (Escleris) and digitised using an Engodigi imaging system (Escleris). The procedures were performed in a comfortable sitting position to prevent cervical and laryngeal muscle contraction. During the study, patients were asked to perform preestablished exercises (pronouncing the vowels “i” and “e” steadily, counting from 1 to 10 and reciting the days of the week).

The recordings of patients with MTD and those in the control group were randomly ordered within a new file, in which each patient was only identified by a number. These recordings were blindly evaluated by an expert laryngologist and catalogued according to the modified Morrison and Ramage classification.

We considered as complete glottic closure that in which the free edges of the vocal cords came into contact throughout their entire length during phonation, without leaving any gaps. Posterior hiatus was defined as a triangular gap in the posterior glottis between the 2 arytenoid cartilages and the posterior third of the vocal cords (this did not include cases where there was a gap between the arytenoids but in which the vocal cords made proper contact). We defined longitudinal hiatus as a cleft between both cords extending from the anterior laryngeal commissure to the posterior. Finally, spindle-shaped or fusiform hiatus or bowling was defined as an incomplete glottic closure in which the vocal cords did not come into contact completely, leaving a cleft in the shape of a spindle in the middle third. In addition, supraglottic activity was divided into anteroposterior contraction (shortening of the anteroposterior laryngeal diameter) and lateral contraction (hyperadduction of the ventricular bands).

Statistical Analysis

Data were analysed using the Medcalc program (demo version). Comparison of proportions between groups was done using the chi-square test. Finally, we considered statistically significant a value of P<.05 and a 95% confidence interval.

Results

Clinical and Sociodemographic Characteristics

We recruited a total of 58 patients, 29 with MTD and 29 in the control group. The mean age was 28.1 years (range 20–42 years) for the MTD group and 27.68 years (range 20–43 years) for the control group. Both groups were similar with respect to gender, smoking, alcohol consumption, symptoms of gastroesophageal reflux, nasal allergy, and use of medication (Table 1).

In the MTD group, the mean experience as a telemarketer was 34.7 months (range 19–84 months). Up to 75.8% of patients worked between 32 and 38 h per week. The vast majority (86.2%) reported working in a noisy environment, with excessive heat or air conditioning and expressed the need to raise their voice during their workday. Only 44.8% reported having received training on the adequate use of their voice before or after starting work. Up to 69% of the population reported having missed work due to voice symptoms at some point.

The mean duration of symptoms was 8.8 months, ranging from 3 to 24 months. The symptoms reported by telemarketing staff with MTD are listed in Fig. 1, which shows that the most common were phonasthenia (89.7%), cervical muscle tension (85.2%), and increased vocal effort (82.8%). The vast

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Sociodemographic and Clinical Characteristics of Both Groups.</th>
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<tbody>
<tr>
<td></td>
<td>MTD</td>
</tr>
<tr>
<td>Age</td>
<td>28.1 years</td>
</tr>
<tr>
<td>Female gender</td>
<td>79.30%</td>
</tr>
<tr>
<td>Male gender</td>
<td>20.70%</td>
</tr>
<tr>
<td>Smoking (less than 5 cig/day)</td>
<td>24.10%</td>
</tr>
<tr>
<td>Alcohol</td>
<td>10.30%</td>
</tr>
<tr>
<td>Nasal allergy</td>
<td>13.80%</td>
</tr>
<tr>
<td>Gastroesophageal reflux</td>
<td>37.90%</td>
</tr>
<tr>
<td>Use of medication</td>
<td>20.20%</td>
</tr>
</tbody>
</table>

MTD: muscle tension dysphonia.
majority of patients (75.8%) considered their voice quality to be poor or regular (44.8% and 31%, respectively).

**Fibrolaryngoscopic Evaluation**

 Videofibrolaryngoscopy was performed on 29 patients with MTD and on 29 patients in the control group. One patient in the first group was excluded from the study due to technical difficulties during the recording of fibroscopy, so the final figure was 28.

*Table 2* lists the findings from the fibrolaryngoscopic evaluation conducted by an experienced laryngologist.

In regard to glottic closure, pathological images were observed in a large number of patients in both groups (75% and 72% for the MTD and control group, respectively), as evidenced in Fig. 2. Of the patients with MTD, 57.1% (n=16) presented posterior hiatus, while 12 patients in the control group (41.1%) presented longitudinal hiatus. Both patterns showed a statistically significant difference. Over 70% of fibroscopies in the control group were reported as pathological (only 8 were normal). However, no significant differences were found between groups in relation to normal fibroscopies, nor with respect to fusiform hiatus.

With regard to supraglottic activity, 51.7% of patients in the control group were reported as positive for anteroposterior contraction, as opposed to 21.4% of MTD patients ($P<.04$). Few patients in either group presented lateral supraglottic contraction, specifically 3 telemarketers and 9 patients in the control group (the difference was not statistically significant) (Fig. 3).

**Discussion**

MTD is considered as a manifestation of excessive rigidity of the intrinsic and extrinsic laryngeal musculature. Fibrolaryngoscopy is one of the most commonly used methods for the visualisation of the vocal cords and surrounding structures. Technological advances have significantly improved image quality through these flexible endoscopes, thus establishing this method as a fundamental tool for the diagnosis of MTD. In general terms, posterior hiatus and supraglottic laryngeal activity are considered to be the classical findings in this entity.

This study was designed to establish the prevalence of fibrolaryngoscopic patterns in telemarketer patients with MTD compared with control patients without dysphonia. It showed that only posterior hiatus was more prevalent in the group of telemarketer patients. However, a high prevalence of longitudinal hiatus was also found among control patients. These findings were consistent with those expressed in the work of Sama et al.,

**Table 2** Fibrolaryngoscopic Findings in Telemarketer Patients With Muscle Tension Dysphonia.

<table>
<thead>
<tr>
<th></th>
<th>MTD, %</th>
<th>Control, %</th>
<th>$P$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>25</td>
<td>27.6</td>
<td>.94</td>
</tr>
<tr>
<td>Longitudinal hiatus</td>
<td>14.3</td>
<td>41.4</td>
<td>&lt;.05</td>
</tr>
<tr>
<td>Posterior hiatus</td>
<td>57.1</td>
<td>20.7</td>
<td>&lt;.02</td>
</tr>
<tr>
<td>Fusiform hiatus</td>
<td>3.6</td>
<td>10.3</td>
<td>.64</td>
</tr>
<tr>
<td>Anteroposterior contraction</td>
<td>21.4</td>
<td>51.7</td>
<td>&lt;.04</td>
</tr>
<tr>
<td>Lateral contraction</td>
<td>10.7</td>
<td>31</td>
<td>.12</td>
</tr>
</tbody>
</table>

MTD: muscle tension dysphonia.

**Figure 1** Vocal symptoms in telemarketing staff with muscle tension dysphonia.

**Figure 2** Fibrolaryngoscopic images of glottic closure: telemarketers with muscle tension dysphonia versus patients in the control group. MTD: muscle tension dysphonia.
prevalence of typical MTD patterns was higher in patients, it was also high in the population without dysphonia (60% of control patients presented 1 or more pathological images).

The same study reported that the only specific findings of MTD were lateral contraction and glottic closure of the bowing or fusiform type. In contrast, in our work these were the only patterns which did not present a statistically significant difference between both groups. Moreover, contrary to expectations, anteroposterior supraglottic contraction was found more frequently in the group of healthy subjects than in MTD patients. This evidenced its scarce usefulness to establish, by itself, an accurate diagnosis of this pathology.

In a study conducted on 47 Vietnamese teachers with MTD, Duong et al. noted that the most significant findings at the glottic level were longitudinal and posterior hiatus (44.7% and 29.8%, respectively). In addition, 35 patients presented anteroposterior contraction and 11 presented lateral contraction. Nevertheless, this work did not compare the data with a control group, thus not showing whether such patterns were specific to patients with MTD.

The results shown by our research revealed that there was a significant prevalence of pathological fibroscopic patterns among healthy subjects (72.4%). It is probable that, due to a similar exposure to contributing factors for dysphonia being present in both groups of patients, the population of healthy subjects used as controls could not be considered completely normal despite not presenting laryngeal symptoms. An alternative explanation could be that some images are pathological for certain individuals but not for others. In other words, an abnormal phonatory habit may trigger dysphonia in some patients but not in others. Another justification would be that fibrolaryngoscopy may not be the procedure of choice for the evaluation of functional pathology, as it ignores lesions or patterns which would reveal laryngeal pathology if evaluated using another method (e.g. videostroboscopy).

The secondary objective of this study was to describe the personal, pathological, and working characteristics of our study population. In this regard, we found that the prevalence of female gender, age, and exposure to other risk factors (tobacco, reflux, allergy, noisy environment, excessive heat, etc.) coincided with previous reports. The importance of these findings is that, once the multifactorial origin of this disease has been established, treatment should not focus only on rehabilitation and reduction of hours of use of the vocal apparatus, but also on modifying related health issues, such as environmental, biological, and personality factors.

There is great diversity with respect to the prevalent symptoms in MTD. This study found that the symptoms reported most frequently by patients with MTD were phonasthenia, cervical muscle tension, and increased vocal effort. However, while in the work of Jones et al. the symptoms reported were odynophagia, need to clear the voice, and increased pharyngeal secretions, Duong et al. reported hoarseness, phonasthenia, and need to clear the voice as the most frequent. The results obtained in this respect suggest that MTD is a complex, multifactorial disease which most often affects voice workers, such as telemarketing staff, impairing not only their productivity, but also their social life.

**Conclusion**

In our work, the fibrolaryngoscopic patterns related to increased laryngeal tension were prevalent among both telemarketing staff diagnosed with MTD and patients with no laryngeal symptoms. There were a high number of patients with pathological images at the glottic level in both groups (over 70% of fibroscopies in the control group were reported as pathological). Posterior hiatus was most prevalent among telemarketers with MTD, whereas in the control group it was longitudinal hiatus. There were no significant differences between groups in relation to normal fibroscopies or fusiform hiatus. Anteroposterior supraglottic contraction was more frequent among healthy patients. Few patients in either group presented lateral supraglottic contraction, with no significant difference.

Heterogeneity among laryngeal fibroscopic patterns in telemarketers with MTD along with their presence in healthy individuals suggest that, by themselves, they cannot constitute a diagnosis of MTD.

**Conflict of Interests**

The authors have no conflicts of interest to declare.

**References**