MUSCULOSKELETAL STRESS SYNDROME, EXTRINSIC LARYNGEAL MUSCLES AND BODY POSTURE: THEORETICAL CONSIDERATIONS

Síndrome de tensão musculoesquelética, musculatura laríngea extrínseca e postura corporal: considerações teóricas

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ABSTRACT

The theme of this study is the musculoskeletal stress syndrome, extrinsic laryngeal muscles and body posture. The purpose is to describe, from the literature review, the characteristics of the extrinsic muscles of the larynx; posture; vocal implications of musculoskeletal stress syndrome; evaluation and physical therapy and voice therapy. We performed a literature review of the last 13 years which included articles aimed and/or body textwere in line with the objectives of this study. The research was conducted in the databases of *Literatura Latino-Americana e do Caribe em Ciências da Saúde*, *Biblioteca Regional de Medicina*, Public Medline, Medical Literature Analysis and Retrieval System on Line, Scientific Electronic Library Online and Google Schoolar. Were established important relationships within the physical therapy and voice therapy, among which stand out the relationships muscular, postural and functional synergy in the vocal apparatus. In physical therapy to reduce muscle tension, the literature indicates use of transcutaneous electrical stimulation, low level laser, laser acupuncture, cryotherapy, manual therapy and traction, massage, cervical manipulations and mobilizations, associated or not to exercise, stretching, isometric relaxation , assisted soft tissue mobilization, therapeutic exercises aimed at correcting balance and muscle, diaphragm and respiratory rehabilitation therapy craniocervical flexion. In speech therapy, studies found only through digital manipulation of the larynx and semi-ocluded vocal tract exercises.

KEYWORDS: Larynx; Dysphonia; Posture; Laryngeal Muscles; Musculoskeletal System; Therapeutics

INTRODUCTION

The laryngeal muscles can be divided, according to its localization in the extrinsic and intrinsic. The extrinsic musculature has one of the inserts in the laryngeal cartilages and the other in adjacent structures, while the intrinsic has two inserts structures of the larynx itself[1].

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The increased tension of the extrinsic muscles leads to elevation of the larynx in the neck, with the constant participation of the extrinsic muscles on phonation[1-3]. In some cases, this tension is so intense that the set of manifestations is renamed Musculoskeletal Tension Syndrome (MSTS) or muscle tension dysphonia[1-3] and includes several vocal impairments. The MSTS may be classified as primary, when there are no lesions in the laryngeal structure, and secondary, when it presents tissue reactions[1-3].

Evolution may be accompanied by some laryngeal and vocal signs and symptoms, as median compression of the vocal folds, causing decrease in opening-angle.; constriction global, median (approximation of the vocal folds) or antero-posterior of vestibule; presence of triangular slits; laryngeal elevation and predominance of abrupt vocal attack[1-3].

Furthermore, signals may be observed as the elevation of thoracic cage and shoulders; increase of muscular mass of the neck and nape; mandibular locking; venous distension; tension of supra-hyoid muscle; hyperextended head; short and compressed breathing; restricted and tense facial expression; resulting in excessive global effort and not efficient[1-3].

In general, the prejudice in vocal production is related to inadequate respiratory function, incorrect use of resonators, hypertension of lingual, glottal and cervical muscles[1-3].

The participation of the extrinsic laryngeal muscle on the voice has been the focus of scientific studies and research in recent years, once the dysphonia, especially hyperfunctional, may be related to muscle imbalances craniocervical[2-7].

Through of careful assessment, it is possible to determine if the vocal dysfunction alters the behavior of the cervical muscles and to verify the possible influence on body posture and contrariwise. It is importance to study the relation between body posture, laryngeal musculature and vocal production, because the action (multiprofessional and interdisciplinary) of speech therapy and physical therapy may optimize the treatment and provide greater benefits for patients[3].

Studies[8-11] suggest that rehabilitation of vocal production, focusing on the extrinsic muscles of the larynx and other cervical muscle groups associated with respiratory reeducation and correction of postural deviations, may decrease the time of therapy.

Considering the above, this paper intends to describe, from the literature review, the extrinsic muscles of the larynx; posture; MSTS and its vocals implications; assessment and treatment of Physical Therapy and Speech Therapy.

METHODS

Have been performed theoretical and exploratory research with the technique of non-systematic review of the literature. The search was performed in data banks of databases *Literatura Latino-Americana e do Caribe em Ciências da Saúde* (Lilacs), *Biblioteca Regional de Medicina* (Bireme), Medical Literature Analysis and Retrieval System online (MedLine), PublicMedline (PubMed), Scientific Electronic Library Online (Scielo) e Google Schoolar (Academic Google), selecting the studies published in the period from 2000 to 2012. The Health Sciences Descriptors (DeCS, 2013) used for the location of the articles were: voice; dysphonia; larynx; laryngealmuscles; posture; musculoskeletal system; therapeutic. The search was performed by isolated descriptors and subsequently by the association between them.

Have been included books, original research articles and bibliographic review about MSTS, extrinsic muscles of the larynx, body posture and treatment of Speech Therapy and Physical Therapy, correlated or not, of classical sources and current to the national and international scientific literature. The exclusion criteria adopted were: non-indexed periodicals in the databases mentioned above; studies which dealt with other types of musculoskeletal syndromes; studies with publishing time upper than 13 years.

It was applied the criteria of inclusion and exclusion in the researchers found, leaving 40 studies for review. These materials have been organized according to the authors, title, year of publication and type of study. It was necessary to reduce the number of references, adopting as a criterion to maintain 80% of the studies of the last five years, giving priority to the original research articles, within a total of 40 maximum references, excluding studies that did not brought individual contributions to this review.

From this categorization, the references were grouped according to the themes that gave rise to the subtitles of the body of this work: extrinsic muscles of the larynx and body posture; musculoskeletal tension; MSTS and its vocal implications; assessment and treatment of Physical Therapy, and Speech Therapy to MSTS.

LITERATURE REVIEW

Extrinsic muscles of the larynx and body posture

The larynx is constituted of a composite structure by articular cartilage, connected by ligaments and membranes, activated by intrinsic laryngeal muscles. The extrinsic muscles have connection with external structures of the larynx and is responsible for maintaining the position of the larynx in relation to other structures of the neck (laryngeal support) and their depression, elevation and traction anteroposterior to speech and swallowing movements, with possible an influence on phonation[1,3].

The extrinsic muscles are subdivided into supra-hyoid and infra-hyoid muscles, its innervations are performed from the cervical plexus and the blood irrigation derives from the superior laryngeal artery, anteroposterior and branch of the superior thyroid artery[12].

The supra-hyoid muscle encompasses four muscles: digastric, mylohyoid, genius-hyoid and hyoid-style, located in the region of anterior neck, above the hyoid bone and inserted[1,3,8,13,14]. In general, these muscles are involved in elevation, anteriorization, and posteriorization and or fixation of the larynx in the neck, stretching the vocal folds, increased subglottic pressure and alteration of resonant cavities during the production of treble sounds and strong loudness[15].

The digastric muscle is thick and deep, divides into anterior and posterior beam, with inserts on the inner edge of the mandible and the mastoid of the temporal bone, respectively[13]. The anterior belly of the digastric is activated during the production of front vowels and consonants which require high position of the tongue. Helps to lift and anteriorization of hyoid bone and larynx, mandibular depression, cough and swallow. The posterior belly posterioriza and lift the hyoid bone and larynx[15].

The mylohyoid muscle is located on the floor of the mouth, originates in the hyoid, mylohyoid line of the mandible, from the mentalis symphysis, to the region of the third molar, has insertion in the body of the hyoid bone[13]. Its function in phonation is related to speech articulation; production of treble sounds, because participates of the elevation, stabilization and traction anterior of the hyoid bone and larynx, and swallowing[15].

The genie-hyoid has an insert in the inferior portion of the mentalis muscle and another in the hyoid bone[13] over which exerts force directly and indirectly on the thyroid cartilage, because it elevates both structures and exerts anterior traction, stretching the vocal folds and influencing the increase of the fundamental frequency of the voice to produce treble sounds[5,14,15].

The style-hyoid muscle originates at the styloid process and its insertion occurs in the body of the hyoid bone[13], raising and making posterior this bone and larynx, also contributing to the production of treble sounds[15].

In summary, the anterior digastric muscles, genius-hyoid and milo-hyoid raise and make anterior the hyoid bone, favoring the treble sound; also act in mandibular depression and production of front vowels or consonants which require high position of the tongue[5,13-15]. The posterior digastric muscle and hyoid-style raise and make posterior the hyoid bone and larynx. The combined action of all these supra-hyoid muscles lifts and fixed the larynx without anteroposterior traction, favoring vocal fold adduction[15].

The group infra-hyoid musculature is composed of muscles attached to the hyoid bone inferiorly: sterno-hyoid, omo-hyoid, thyrohyoid sternothyreoid[8,13,15]. These muscles participate in depression, fronting, posteriorly or fixation of the larynx in the neck[15], with the exception of thyrohyoid that depresses the hyoid and raises the larynx. He exerts traction a thyroid cartilage upward, stretching the vocal folds and favoring the treble, because its activity is similar to the intrinsic cricothyroid muscle, which may also help in medialization of the vestibular folds[8,15].

The sterno-hyoid muscle inserts on the posterior surface of the manubrium of sternum, in the medial extremity of the clavicle, in the ligamentous tissue adjacent, whose fibers make a vertical route, and at the lower edge of the body of the hyoid bone[13]. When contracted during phonation, exerts traction down the larynx and vocal folds are stretched, influencing the glottal adduction and control of air flow, may increase the duration of the emission, subglottic pressure and loudness[15].

The omo-hyoid has inferior and posterior bellies. The lower is inserted on the upper surface of the scapula and intermediate tendon, the higher fits into the intermediate tendon, in the greater cornu and along the lower face of the greater cornu of the hyoid bone[13]. Its function is to depress and make posterior the larynx and maintain the cervical fascia tense, impeding the collapse of the neck region during deep inspiration and the veins and arteries of the neck and the apex of the lungs to be compressed during inspiration[15].

The sternothyreoid originates on the posterior surface of the manubrium of sternum and the first costal cartilage[13]. When acting in conjunction with the intrinsic cricothyroid muscle, participates in the production of treble sounds, because it helps tilting

and fixing larynx. In isolation, its activation exerts traction the larynx, tongue and hyoid caudally, helping to produce bass sounds. Furthermore, influences to open of the glottis and larynx during inspiration and yawn[15].

Besides the extrinsic laryngeal muscles supra and infra-hyoid, other not laryngeal muscles are related to the cervical spine, the region where there are larynx and vocal folds[3,7,12]. The sternocleidomastoid muscle, whose insertion occurs along the mastoid, superior nuchal line, manubrium of the sternum and anterior border of the medial third of the clavicle[3], when contracted unilaterally, tilts and rotates the head at the same-side and bilateral contraction, participates in the cervical flexion[14].

Originating the last five cervical vertebrae and inserting on the first and second rib, there are the scalene muscles, which contracted unilaterally, have for primary action is the ipsilateral tilt of the neck and when contracted bilaterally, participate in the elevation of the ribs in inspiration. Meanwhile, the trapezius muscle is originan a superior nuchal line, nuchal ligament and spinous process of the seventh cervical vertebra and 12th thoracic vertebra, inserting in the posterior border of the clavicle, acromion and spine of the scapula, with function tilt and rotate the head to the same-side, when contracted unilaterally, and participate in cervical extension when contracted bilaterally[3].

During cervical extension, the anterior muscles of the neck stretches and suboccipital muscles (trapezius and the elevators of the scapula) are shortened. When the position cervical extensionis position is established, muscle weakness emerges the anterior neck with adaptive shortening of the suboccipital group. Course may change in shape of the larynx, especially to tighten, which increases the adduction of the vocal folds and vocal resonance alters. Thus, there is the influence of paralaringea musculature that participates to the cervical posture over the larynx and vocal production[7].

In cervical flexion, occurs the suboccipital musculature stretching and the shortening of anterior neck musculature (muscles supra and infra-hyoid). The depresses larynx with cervical flexion, favoring the abduction glottal and vocal resonance changes. Current studies[5-7] emphasize the correlation between body posture and extrinsic muscles of the larynx.

The relationship between hypertrophy of extrinsic laryngeal muscle, postural deviations and voice handicap, through the application of the Voice Handicap Index (VHI) and the Dysphonia Severity Index (DSI) was investigated in 25 female professors. It was observed a positive correlation between tension index, DSI and VHI, especially for hypertension of sternocleidomastoid and genius-hyoid muscles. The combination of hypertension genius-hyoid muscle, elevated position of the hyoid bone and forward head were the most important predictors of low scores on the DSI. The results showed worsening of dysphonia index as decreased the quality of life in relation to the voice and increased the incidence of hypertension, underscoring the importance of the evaluation of muscle tension and body posture in the voice disorders diagnosis[5].

Search with 27 healthy subjects aimed to determine if the vocal tension is a side effect of effort and improper posture during communication, evaluating them on three different levels of vocal effort. It was observed that with increase of magnitude and duration of body movement, the vocal effort was also greater, with a significant correlation[6]. These data confirm the close relationship and coordination between body posture and voice on communicative behavior. Another study sought to correlate body posture and tension during phonation using stabilometry, verified a positive correlation between the center displacement of gravity of the body and increase the electrical signal of postural muscles during vocal effort[16].

The identification of the influence of different body postures in vocal production was investigated by analyzing 25 samples of sustained vowel /a/ in three different postures: orthostatic (A), with forward head posture associated with cervical spine extension (B) and increased thoracic kyphosis associated with forward head (C). The comparison was performed by means of photogrammetry and perceptual voice analysis and acoustics. The results showed significant variation of jitter between the positions A and B and significant modifications auditory perceptual between the positions A-B and A-C as resonance, pitch and vocal quality, saying that the erect posture is more appropriate for vocal production[7].

A pilot study investigated the relationship between cephalometric, magnetic resonance images and muscle function of the stomatognathic system during voice production. Verified the presence of correlations between structures phonation, the craniofacial bones and cervical spine, with increased the size of the airways associated with larger distances between the base of the skull, hyoid bone, larynx, the epiglottis, uvula and C3 from the chin[17].

The literature shows the importance of correct posture for efficient vocal production. The maintenance of torso erect, turn down head slightly, shoulders relaxed, seeking the free movement of the larynx, without locks for production and projection of sound in the vocal tract seems to be the ideal[6,7,17,18].

Musculoskeletal tension

Physiologically, during muscle contraction, occurs chemical processes that provide energy to the execution of movements. After contraction (during muscle relaxation), energy reserves are again reconstructed. According to the level of demand, there is a reduction of energy reserves (sugar and phosphorus bonds) and increase of waste (including, lactic acid and carbonic acid), occurring acidification of muscle tissue, which can cause decreased its function[19].

When a muscle loses the flexibility, with decreased length-tension relationship, incapacitating to produce adequate peak tension, which causes weakness and retraction[20]. Increased muscle tension represents a way for the body to demonstrate the alteration of a given body segment. This leads to compensation and overloads that generate damage in the body functionality. This reasoning may be made to the stomatognathic system, larynx and cervical posture because they have muscles and nerve connections in common[20].

The bilateral contraction of the neck muscles, causing flexion of the cervical spine on the thoracic and forward head, makes possible the increased inspiratory effort, contributing an apical ventilatory pattern and, in turn, increased recruitment of accessory muscles of inspiration[21]. Hypertension neck muscles also damages body balance, because it affects positioning of the vestibular apparatus and musculature responsible for the regulation of ocular movements, also causing decreased cervical range of movement and forward head, increasing muscle tension and tractioning a hyoid mandible posteriorly[21].

In a study about muscles involved in posture external and internal of the larynx at rest and during phonation, it was found that the increased tension of the supra-hyoid muscles resulted in excessive elevation of the larynx. The contraction of the thyrohyoid muscles exerts traction the hyoid bone and thyroid cartilage together and, in severe cases, closes the space thyrohyoid, producing anteroposterior supraglottic constriction[8].

In research with professors, were evaluated postural aspects during the professional voice use and in situations outside employment. It was observed the majority had significant hypertension of sternocleidomastoid muscle and genius-hyoid; body weight was altered in position in relation to the frontal plane, being concentrated in the posterior region; were also observed hyoid bone in the high position, muscular hypertension and anteriorization of the thyroid cartilage. Through questionnaires, participants referred pain at the end of the day, a result of musculoskeletal tension, no difference was observed in results in the two situations evaluated. Professors with higher workload and service time showed greater alterations[14].

Research with dysphonic women and control group with voice adapted analyzed the posture and function of the craniocervical region by means of photogrammetry and evaluation of the Craniocervical Dysfunction Index (CDI). The results of the photogrammetric evaluation showed no difference between the mean values of the angle of head protrusion between the groups, this suggests that the position of the head in the sagittal plane not differ between the groups studied. However, the majority of women in the dysphonic group had moderate and sereve craniocervical dysfunction in CDI. Dysphonic subjects did not present postural alteration of craniocervical region, but the dysphonic women were classified as having a greater degree of craniocervical dysfunction than clinically normal. The study suggests that the dysphonia is more related to functional alterations of the cervical region than the posture of the same region[22].

Observed in research that women are more susceptible to cervical tensions, since the main responsible for muscle pains was the increase of thoracic kyphosis caused by environmental factors, bad posture habits, muscle retractions, physical and emotional stress[1].

Musculoskeletal Tension Syndrome and its vocal implications

In MSTS primary, there is tension generalized increased in the whole intrinsic and extrinsic laryngeal muscles simultaneously, associating with altered laryngeal posture[2,3,14,22,23]. In presence of tissue reaction laryngeal lesions, MSTS is classified as secondary[1-3,24].

The MSTS is also classified as type “I” and type “II”, the latter being subdivided into “a” and “b”[1,3]. In type “I”, to the otorhinolaryngological exam, the larynx presents structurally normal, but with posterior chink during phonation and stiffness of supra-hyoid muscle upon palpation. The MSTS type “II” resembles the first category, but with organofunctional lesion established. In MSTS type “II b”, the larynx is located higher in the neck, with the presence of posterior chink, besides alterations in location outside the larynx, such as the jaw, among others. There may be diffuse changes in entire length of the vocal folds and episodes of chronic laryngitis[1-3].

The installation of MSTS occurs slowly and progressively, the degree of alteration is generally compatible with the clinical history and data from speech evaluation performed. Although MSTS fit as a subclassification of psychogenic dysphonia, there

is no suppression of symptoms with symptomatic manipulation[1,2]. The MSTS is influenced by external factors such as work stress, family problems, professional concerns, as well as intrinsic factors related to the subject's personality that can lead to increased of tension, such as perfectionism and anxiety[1,2].

The patients present muscular hypertension during speech, without direct association with laryngeal affections. The incoordination or excessive contraction of muscles associated with the voice production may manifest itself hoarse vocal quality, compressed or strained-strangled hyperadduct of vocal folds and the ventricular bands, sphincter constriction of the larynx, with a predominance of vocal sudden, laryngopharyngeal resonance and increasing the number of voice breaks. Are also observed deviations of pitch and loudness for both extremes, addition to symptoms such as pain in the neck region and/or fatigue or, even, aphonia[1,3,24].

In cases of fatigue the laryngeal muscle, there is consistent increase in effort in voice production and mechanical stress resulting from the collision between the vocal folds during phonation excessive, causing the death of epithelial cells and the separation of the fibers of collagen and elastin, of the basement membrane. Subsequently, due to the increase of vibration may be increased intravascular pressure and consequent extravasation of erythrocytes and the variation fluid dynamics of in the structure of the vocal fold. These processes alter the biomechanical properties of the tissue as viscosity and, therefore, have the capacity of bring modifications in the vibration characteristics. This displace phonation threshold pressure and would cause phonation instability with breaks voice. This process results in symptoms of discomfort, pain or scratching voice[1,3,24-26].

Another sign commonly found in the MSTS is the tongue in the lowered position and hypertensive, and firmly supported against the dental arches, with the tongue edge marked and grooved by the teeth. The tongue is connected to the larynx by means of the hyoid bone and moves constantly during speech. Thus its position hyperfunctional posteriorized causes posterior horizontal resonance. Symptoms of vocal MSTS tend to soften during periods of higher rest and lower stress[1,27].

The diagnosis of MSTS is difficult, since there is the possibility of the vocal folds present normal aspects on otorhinolaryngological exam, but symptom profile of unexplained and persistent dysphonia. Sometimes, even, an error occurs in the diagnosis according to the similarity of symptoms with other types of dysphonia, as the adductor spasmodic dysphonia[1,2,27].

Although there is no direct relationship between MSTS and presence of laryngeal affections, it is possible that functional alterations resulting of the syndrome favoring the formation of organofunctional lesions due to the inadequate vocals adjustments, which confirms the difficulties to preparing the correct diagnosis[1]. It was proposed a tool for clinical evaluation of extrinsic laryngeal muscle tension (ELMT) by palpation and the investigation of the relationship between the tension and the different types vocal alterations, mainly MSTS, and the presence or absence of gastroesophageal reflux disease (GERD). Establish a palpation technique and a classification system of tension for four separate muscle groups (supra-hyoid, thyrohyoid, cricothyroid and pharyngolaryngeal). Participated 465 patients, 65% female and 35% male, and the results of ELMT were analyzed in relation to the diagnosis of GERD. Found a strong relationship between thyrohyoid muscle tension and MSTS and RGE. Thyrohyoid muscle tension was the only group that showed a significant relationship with MSTS. There was no significant difference of ELMT for the presence or absence of GERD, and also found a possible causal relationship between GERD and ELMT[8].

Other studies have also considered relevant the tension from other muscle groups such as the sternocleidomastoid, cervical paraspinal, upper fibers of the trapezius and scalene[9,10]. Surface electromyography makes it possible to evaluate objectively the muscles in various situations as to determine the possible influence of cervical limit and postural alteration in muscle activation pattern[9].

The increase in electromyographic activity of the superficial cervical muscles is associated with cervical spine disorders such as pain, whiplash (concussion lesion or whip after trauma to the cervical spine), cervicogenic headaches, among others[9,10,28]. Thus, it is assumed that hypertension of superficial cervical flexor muscles may being a compensatory strategy for the deep flexor muscle dysfunction[9].

Still, with a possible relationship with MSTS, among the various types of pain, those of muscular origin usually occurs by cranial or cervical muscle tension[9,10,28].

Treatment of Physical Therapy and Speech Therapy for MSTS

The literature suggests that evaluation to identify the MSTS is comprised of interview, followed by the evaluation of vocal function, palpation of the tension of the extrinsic muscles of the larynx, standard otorhinolaryngology exam and videolaryngostroboscopy[8], being interesting the referral to physiotherapy assessment, given the nature of this generalized muscular hypertension syndrome.

Studies suggest a physical therapist therapy including electrotherapy and transcutaneous electrical nerve stimulation (TENS), light amplification by stimulated emission of radiation (laser) of low intensity, laser acupuncture, cryotherapy, among others[10,29]. A proven effective modality for normotensive cervical muscles is manual therapy with traction, massage, cervical manipulation and mobilization, associated or not to exercise, as well as passive stretching and/or resistive, isometric relaxation, assisted soft tissue mobilization (important in the treatment of muscle fascia), therapeutic exercises aiming to correct and balance muscle, diaphragm respiratory reeducation and therapy with craniocervical flexion[9,10,29].

Research[30] that investigated the effect of the Global Posture Reeducation (GPR) body alignment and the clinical condition of patients with temporomandibular joint dysfunction and postural deviation, with hypertension of the sternocleidomastoid muscles, trapezius (upper fibers), masseter and temporalis, noted that after the RPG there was improvement of the horizontal alignment of the head. This shows that postural deviations generate tension in muscle chains, and result in the masticator and neck muscles[28,30], being able to influence the function of the larynx.

Speech therapy treatment for MSTS includes the use of physical techniques, laryngeal and shoulder girdle massage, postural modifications of the head, as well as smoothing techniques of vocal emission[1,2]. In extreme cases, may be employed the botulinum toxin injection for relief of symptoms and as a help in the development of rehabilitation for vocal behavior therapy[1].

Techniques of digital manipulation of the larynx may also be employed in the treatment of MSTS, resulting in changes in vocal quality, issuing more relaxed and gravest fundamental frequency. However, their performance may cause extreme discomfort to patients[1,2].

The main goal of manual therapy of the larynx is to relax the hypertensive muscles that inhibits normal phonation function[2] and has been used in several studies of subjects with MSTS[31,32]. One of them verified, by improving the acoustic analysis results, that manual therapy of the larynx is effective in the treatment of vocal disorders arising from MSTS[33]. Other[34], with 93 patients with functional dysphonia, evaluated the effects of circumlaryngeal massage performed in a single session and observed acoustics improve, but unrelated to the improvement of perceptual voice.

The literature suggests that the reduction of musculoskeletal tension, obtained by voice techniques such as yawning and sigh, laryngeal manipulation and prolonged /b/, leads to a better quality of voice production[12].

The relationship of postural alterations with dysphonia was investigated in 40 women before and after speech therapy, associated with postural modifications. The results showed, through laryngostroboscopy improves of the dysfunction in all participants. This suggests relationship with increased accuracy of postural performance, probably due to the fact that the rehabilitation provided greater proprioceptive awareness of body structures. The authors believe that improved control over the voice and breathing promotes postural reeducation, and the opposite is also true. It is suggested, therefore, that the rehabilitation should not be focused exclusively on the larynx, but also involve postural rehabilitation[11].

A study of 11 theater students (aged 18 to 23 years), diagnosed with MSTS type I (four men and seven women) used spectrographic narrowband, questionnaires on quality of life and nasofibrolaryngoscopy to evaluate the effect of a therapeutic program exercises with semi-occluded vocal tract (SOVTE). The therapy consisted of six sessions (once a week), each lasting 30 minutes, which was conducted in a sequence of three exercises, sorted according to the degree of impedance applied to the vocal tract, from the most artificial to the most natural: phonation plastic tube (inner diameter 0.19in and 11.8in length); phonation plastic tube (inner diameter of 0.19 in and 3.93 in length), and sound fricative /ß:/. Each exercise was applied with three variations: sustained emission in pitch and loudness usual; glissan the ascending intervals of fifth and eighth; glissan of descendants with the same intervals fifth and eighth [3].

Participants were instructed to perform the exercises twice a day. After therapy, the results showed significant improvement in spectroscopy and in nasofibrolaryngoscopy, six subjects showed decreased muscular tension patterns laryngeal three remained the same tension and two triggered contraction of the ventricular bands to phonation, it is possible to suggest that the speech therapy should extend for a longer time. There was a positive correlation between improvement in nasofibrolaryngoscopy and improvement in spectrograph indicating that subjects who improve the standards also improve laryngeal spectrographic. Thus, it is possible that the use of resonance tubes having one favored easier and relaxed phonation[3].

Study carried with 23 women without vocal complaints and ages between 23 and 40 years, who performed twice the exercises FingerKazoo and phonation with straw, showed reduction of the fundamental frequency after both exercises,

according to the authors, may be related to tension reduction to phonation[35].

It is highlighted that the literature is scarce when it comes to MSTS, possibly due to the difficulty of diagnosis of the patients. For this reason, are suggest studies with that population to promote greater support to speech therapy treatment. Inclusive, it was not found in literature studies on simultaneous treatment between Speech Therapy and Physical Therapy, which seems to be more effective, in view of the researched literature[10,29].

However, although few researches on vocal speech therapy in MSTS, many authors [2,3,35-37] indicate different vocal techniques for the reduction of phonatory hyperfunction, stress and fatigue, among which are the SOVTE (vibration of the lips and tongue, fricatives sounds, /b/ prolonged, humming, firmness glottic, FingerKazoo, lip constriction, Lessac Y-Buzz and phonation into tubes), yawn-sigh, rotation speaking in the vestibule, overarticulation techniques and psalmody voice. The exercise of basal tone or vocal fry can also be indicated in some cases of muscle tension dysphonia (laryngeal isometrics, vocal fatigue, uncomfortable speech, mid-posterior triangular chink)[1,38,39].

The psalmody voice is a vocal technique that promotes muscle adjustment more efficiently and at lower muscle tension intrinsic and extrinsic of the larynx, as well as greater respiratory support, making the individual use greater airway pressure over the strong adduction between the vocal folds. Since this technique also works the resonant level, the individual begins to divide the forces in the three levels of vocal production[40]. In a study conducted with four professors with a history of vocal fatigue that compared therapy with psalmody voice with placebo therapy (each of the two modes of therapy consisted of six sessions of one hour each), it was observed that the technique decreased fatigue muscle justly by improving motor adjustments during speech and reduce hypertension[40]. Although the authors do not bring the indication for patients with MSTS, based on the benefits shown by psalmody voice technique, it is possible to think that it may be used in speech therapy for patients with MSTS.

The same way, it is possible to make an analogy with other techniques, such as SOVTE. The literature suggests that such exercises increase the impedance of the vocal tract, generating a phonation with less effort because the retroflex resonance, causes increase the air pressure in the sub region and supraglottic and, consequently, at the glottic level. This tends to increase the amplitude of mucosa vibration, but with reduced impact on the medial contact between the vocal folds. In other words, we can say that these exercises produce a more economical and effortless phonation[3,35-37].

After the execution of SOVTE, expected some effects as: reduction of phonatory pressure and glottal airflow, increased harmonic energy, modification in shape of the glottal pulse air and oscillatory characteristics of the vocal folds, increasing the sound pressure, and increased perception of vibrations in various regions of the vocal tract. So that, as the psalmody voice, the SOVTE also divide the effort between the three levels of vocal production, reducing hypertension[3,35]. Thus, it is also possible to consider that patients with MSTS would benefit from the use of SOVTE.

CONCLUSION

The literature shows that MSTS may be considered as a series compensations that postural deviations can generate body adaptations and, therefore, cause modifications in the morphophysiological larynx and throughout the body musculature, highlighting the extrinsic laryngeal and cervical.

It was possible to better understand the interface of Physical Therapy and Speech Therapy treatments, among which we highlight the relationship between the body muscles, especially the respiratory and cervical, the posture and functional aspects on the vocal apparatus synergy that should be reflected in the evaluation and therapy of MSTS. Thus, the effectiveness of therapy will occur more quickly and with less chance of relapse.

In Physical Therapy to reduce muscle tension, the literature suggests the use of TENS, low intensity laser, laser acupuncture, cryotherapy, as well as manual therapy with traction, massage, cervical manipulation and mobilization, associated or not to exercise, stretching, isometric relaxation, assisted soft tissue mobilization, therapeutic exercises aiming to correct and balance muscle, diaphragm respiratory reeducation and craniocervical flexion therapy.

In Speech Therapy, studies found only through digital manipulation of the larynx and SOVTE directed to MSTS, however, many authors suggest different vocal techniques for the reduction of vocal hyperfunction, effort and fatigue: nasals, yawn-sigh, /b/ prolonged technique, vocal fry, rotation speaking in the vestibule, overarticulation techniques and psalmody voice.

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RESUMO

O tema deste estudo é a Síndrome de tensão musculoesquelética, musculatura laríngea extrínseca e postura corporal.Tem como objetivo descrever, a partir de revisão de literatura,as características da musculatura extrínseca da laringe; postura corporal; Síndrome de tensão musculoesquelética e suas implicações vocais; avaliação e tratamento fisioterapêutico e fonoaudiológico.Foi realizado levantamento bibliográfico dos últimos 13 anos em que foram incluídos artigos cujo objetivo e/ou corpo do texto estivessem em consonância com os objetivos do estudo. A pesquisa foi realizada nos bancos de dados das bases Literatura Latino-Americana e do Caribe em Ciências da Saúde, Biblioteca Regional de Medicina, *PublicMedline*, *Medical Literature Analysis and Retrieval System on Line*, *Scientific Electronic Library Online* e *Google Schoolar*. Estabeleceram-se relações importantes do âmbito fisioterapêutico e fonoaudiológico, dentre as quais se destacam as relações musculares, posturais e funcionais na sinergia do aparato vocal. Na fisioterapia para redução da tensão muscular, a literatura aponta uso de eletroterapia transcutânea, *laser* de baixa intensidade, *laser* acupuntura, crioterapia, bem como terapia manual com tração, massagens, manipulações e mobilizações cervicais, associadas ou não a exercícios, alongamentos, relaxamento isométrico, mobilização assistida dos tecidos moles, exercícios terapêuticos visando à correção e equilíbrio muscular, reeducação respiratória diafragmática e terapia com flexão craniocervical. Na fonoaudiologia, foram encontrados apenas estudos com a manipulação digital da laringe e exercícios de trato vocal semiocluído.

DESCRITORES: Laringe; Disfonia; Postura; Músculos Laríngeos; Sistema Musculoesquelético; Terapêutica

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