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Electromyographic rest of the masticatory muscles of patients with temporomandibular disorders before and after speech therapy with and without elastic bandage

Repouso eletromiográfico dos músculos mastigatórios de pacientes com disfunção temporomandibular antes e após intervenção fonoaudiológica com e sem bandagem elástica

Resto electromiográfico de los músculos masticatorios de pacientes con trastornos temporomandibulares antes y después de logopedia con y sin venda elástica

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Abstract

Purpose: Objective: The research aims to verify the electromyographic rest thresholds of the masseter and temporal muscles in patients with temporomandibular disorders (TMD) before and after speech therapy intervention with and without the use of therapeutic elastic bandage. **Methods:** The collection included 14 female participants, aged between 18 and 40 years, who had a diagnosis of muscular or mixed TMD. The patients were divided into two groups: with traditional therapy (CB) bandage and traditional therapy (SB) only group. The patients underwent initial evaluation, as well as surface electromyography in situations of maximum voluntary contraction and rest and at the end of the four weeks of intervention, a new evaluation was performed with the same instruments. Data analysis occurred quantitatively and qualitatively. **Results:** In the SB group, the right masseter muscle showed a significant increase in resting values. It was observed that the same occurred for all muscles in this group, influencing the balance of the ipsilateral and contralateral muscles, although without statistical evidence. The CB group did not show statistically significant values, but qualitatively the muscle rest values decreased and balanced in a contralateral way. **Conclusion:** No statistically significant changes were observed in the resting electromyographic thresholds of the masseter and temporalis muscles in both groups. Qualitatively, there was an increase in electromyographic values after traditional manual therapy in all muscles in the SB group. Regarding the CB group, there was a decrease in electromyographic resting values after therapy, although without statistical evidence.

Keywords: Temporomandibular joint; Temporomandibular Joint Dysfunction Syndrome; Electromyography; Elastic Therapeutic Bandage; Musculoskeletal Manipulations.

Resumo

Objetivo: A pesquisa tem por objetivo verificar os limiares de repouso eletromiográfico dos músculos masseter e temporal em pacientes com disfunção temporomandibular (DTM) antes e após intervenção fonoaudiológica com e sem a utilização de bandagem elástica terapêutica. **Métodos:** A coleta contou com 14 participantes do sexo feminino, com idade entre 18 e 40 anos, com diagnóstico de DTM muscular ou mista. As pacientes foram divididas entre dois grupos classificados em: pacientes com bandagem associada à terapia tradicional (CB) e grupo de terapia tradicional (SB). As pacientes inicialmente foram avaliadas pelo exame de eletromiografia de superfície nas situações de contração voluntária máxima e repouso, e após quatro semanas de intervenção, foi realizada nova avaliação com os mesmos instrumentos. A análise dos dados ocorreu de forma quantitativa e qualitativa. **Resultados:** No grupo SB o músculo masseter direito apresentou aumento dos valores de repouso com significância, foi observado que o mesmo ocorreu para todos os músculos deste grupo, influenciando no equilíbrio da musculatura ipsilateral e contralateral, no entanto sem evidência estatística. O grupo CB não demonstrou valores estatísticos significativos, porém qualitativamente os valores de repouso muscular diminuíram e equilibraram-se de forma contralateral. **Conclusão:** Não foram observadas mudanças estatisticamente significantes nos limiares eletromiográficos durante repouso dos músculos masseter e temporal em ambos os grupos. Qualitativamente houve aumento dos valores eletromiográficos após terapia manual tradicional em todos os músculos do grupo SB. Com relação ao grupo CB, houve diminuição dos valores do repouso eletromiográfico após terapia, embora sem evidências estatísticas.

Palavras-chave: Articulação Temporomandibular; Síndrome da Disfunção da Articulação Temporomandibular; Eletromiografia; Bandagem Terapêutica Elástica; Manipulações Musculoesqueléticas.

Resumen

Objetivo: La investigación tiene como objetivo verificar los umbrales electromiográficos de reposo de los músculos masetero y temporal en pacientes con trastornos temporomandibulares (TMD) antes y después de la terapia del habla con y sin el uso de venda elástica terapéutica. **Métodos:** La colección incluyó a 14 participantes mujeres, con edades entre 18 y 40 años, diagnosticadas con TTM muscular o mixta. Los pacientes fueron divididos en dos grupos clasificados en: pacientes con vendaje asociado a

terapia tradicional (CB) y grupo de terapia tradicional (SB). Los pacientes fueron inicialmente evaluados mediante electromiografía de superficie en situaciones de máxima contracción voluntaria y reposo, luego de cuatro semanas de intervención se realizó una nueva evaluación con los mismos instrumentos. El análisis de datos se llevó a cabo cuantitativa y cualitativamente. **Resultados:** En el grupo SB, el músculo masetero derecho presentó un aumento significativo en los valores de reposo, se observó que lo mismo ocurrió para todos los músculos de este grupo, influyendo en el equilibrio de los músculos ipsilaterales y contralaterales, sin embargo, sin evidencia estadística. El grupo CB no mostró valores estadísticamente significativos, pero cualitativamente los valores de descanso muscular disminuyeron y se equilibraron contralateralmente. **Conclusión:** No se observaron cambios estadísticamente significativos en los umbrales electromiográficos en reposo de los músculos masetero y temporal en ambos grupos. Cualitativamente, hubo un aumento de los valores electromiográficos después de la terapia manual tradicional en todos los músculos del grupo SB. En cuanto al grupo CB, hubo una disminución de los valores electromiográficos de reposo después de la terapia, aunque sin evidencia estadística.

Palabras claves: Articulación temporomandibular; síndrome de disfunción de la articulación temporomandibular; electromiografía; Vendaje Terapéutico Elástico; Manipulaciones musculoesqueléticas.

Introduction

Temporomandibular Dysfunction (TMD) is characterized by changes involving the masticatory muscles, temporomandibular joint (TMJ), and nearby components, as well as the stomatognathic system, causing limitations and preventing its correct functioning[1]. It presents multifactorial causes, such as environmental and psychological elements, systemic diseases, postural changes, anxiety, stress, and harmful oral habits[2,3]. TMD has affected a large portion of the world population, with greater involvement in females[1,4]. In the literature, three divisions are reported for TMD, namely the dysfunctions: muscular, joint, and mixed, the latter with characteristics of associated muscular and joint factors[5]. Joint TMD is related to cases of joint disc displacement, such as disc displacement with or without reduction[6]. Muscle changes are due to excessive activity exerted by the chewing muscles, and as a result of this factor, there are inflammatory episodes, muscle fatigue, and pain [7].

An essential resource for investigating TMD and the efficiency of its treatment is surface electromyography (EMGs). This examination allows us to capture the action potential of the musculature, as well as the bioelectrical recording of the muscle at rest and muscle contraction. The recorded data are paramount for studying the muscle's physiological and pathological state. The EMG is understood as a painless, no nuisance, fast, and non-invasive examination [8,9].

The surface electromyography exam allows us to assess the motor unit, a functional unit that generates muscle action. The motor unit is formed by a nerve cell (body and its extensions) and all muscle fibers innervated by it. Muscle fibers contract due to nerve stimuli and impulses, and the amount of motor units in a muscle influences the force it can exert. The electrical signal from this examination provides data on the activation of electrical currents of muscle fibers through microvolts (μV) that are captured by the electromyograph and translated graphically[10].

Electromyographic rest is captured when the patient is without voluntary motor activity. Studies show that the normality of the minimum electrical activity at rest occurs around 5μV, which, although it is an extremely low value, can still be captured by amplifications of electromyograph signals[11,2].

The mandible performs movements through the action of the masticatory muscles, especially the masseter and temporal muscles, essential to the masticatory function. It is agreed that the masseter is the muscle responsible for masticatory strength. In contrast, the temporal muscle has greater activity during mandibular movement[10,12] and is also responsible for the posture of mandibular rest. The mandibular rest provides the rest of the muscles and dental support structures. Therefore, rest is maintained by the minimal contraction activity exerted by the muscles, which allows the possibility of maintaining a static posture[13].

The speech therapist, in the treatment of TMD, performs activities that seek to regulate tone, mo-

bility, and sensitivity of stomatognathic structures and functions, posture at rest of the mandible and mouth, decreased pain, and harmful habits, thus promoting a decrease in stress and anxiety and an increase in quality of life and social interaction. To cover the needs of patients with TMD, the therapy follows an order of guidelines taken from harmful habits, muscle and cervical massages, and relaxations. It may include orofacial and TMJ-specific myofunctional exercises [14,6].

One practice that can be associated with traditional speech therapy for TMD is the therapeutic elastic bandage. The bandage is applied on the integumentary tissue, allowing an exchange of information from the environment with the body, which can promote rebalancing of motor activity, improvement of blood and lymphatic circulation, and enlargement of proprioception due to interaction with cutaneous mechanoreceptors[15].

Considering the insufficient information in the specialized literature on the subject, the changes caused by TMD, the characteristics of rest EMGs, and the different therapeutic means of speech therapy, this study aims to verify the electromyographic rest thresholds of the masseter and temporal muscles in patients with temporomandibular dysfunction before and after speech therapy intervention, with and without the use of a therapeutic elastic bandage. The initial hypothesis is that patients receiving the therapeutic elastic bandage will have better overall results on surface electromyography, expressed by the reduction of electromyographic rest signals due to muscle relaxation. After the end of therapy, electromyography is expected to show a greater balance between the right and left sides of the studied musculature, demonstrating muscle reorganization.

Material and method

Interventional study, approved under number 2,676,182 of the Ethics and Research Committee. The collection was performed at the School of Speech Therapy Clinic, where the Laboratory of Surface Electromyography and Electrophysiology is located. To be included in the research, patients should receive from the volunteer dental surgeon of the research team a diagnosis of muscle or mixed TMD of the disc displacement type with clinically normal reduction and occlusion; age over 18 years and under 40 years; body mass values between 18.5 and 29 points. According to the cutoff points of the World Health Organization[16], cases of BMI <18.5kg/m2 are considered low weight; BMI >18.5 to 24.9kg/m2 = normal; BMI ≥25 to 29.9kg/m2 overweight; and BMI > 30.0kg/m2 obesity. High BMIs impact the capture of the electrical signal by potentially creating a fatty barrier in the facial region. Also, they should agree and sign the free and informed consent form.

We excluded individuals diagnosed with TMD of joint origin from this study, as well as those with more than three dental absences or with two absences of teeth in occluding pairs, patients using muscle relaxants, who presented neurological and cognitive impairment that made it impossible to understand the procedures, being in orthodontic treatments, and having previously performed speech therapy for TMD.

The research had 14 participants, all female, divided equally between two groups: GB group with bandage and GS group without bandage.

The patients underwent oromyofunctional and temporomandibular dysfunction assessment based on the AMIOFE[17] and Temporomandibular Dysfunction Assessment[18] protocols. These protocols were used in patient inclusion and exclusion.

After signing the Free and Informed Consent Form, each patient received instructions on the procedures for undergoing the EMGs. They were advised to remove the metal accessories used, clean makeup or other cosmetics, and previous fasting for more than two hours before the procedure was requested. The examination took place in a quiet environment, and with natural lighting, the other electronic equipment was turned off. The participant remained sitting in a high back chair without a headrest and with her feet on the floor. For skin preparation, cleaning and friction were performed with gauze moistened in 70% ethyl alcohol to reduce skin impedance. Then, the electrodes were bilaterally adhered to the skin over the masseter and temporal muscles, and the unipolar ground electrode had its adhesion to the skin over the sternum. The electrodes used were silver/silver chloride disc type, disposable, self-adhesive, bipolar, and with conductive gel. The electromyograph used for the examination was the Miotool 400 model, of the Miotec brand, with four channels to which the electrodes connect, and the converter configuration is of the A/D type of 14-bit resolution in the acquisition of EMG signals; common rejection rate

of signals > 100dB; high-pass filter of 20 Hz and low-pass filter of 500 Hz; acquisition capacity of 2000 samples/second per channel, and electrical isolation of 5000 volts. The responses obtained were in RMS automatically, according to the Miosuite 1.0 Software. The device was connected to a laptop without contact with the power grid, and the traces were saved on a hard disk.

The situations determined were maximum voluntary contraction (MVC) and rest. During MVC, it was requested that, for ten seconds, the individual performs maximum intercuspation with a gauze roller between the molar teeth bilaterally. The MVC measurement was used to normalize the electromyographic signal. Two rest recordings were collected, with the patient relaxed, instructed not to perform any movement of the mandible or body for twenty seconds, and only the central ten seconds were selected.

After ending the initial assessment, the participants were divided into two groups for the subsequent start of therapy. The interventions had a total duration of four weeks, plus one previous session for assessment and another subsequent session for reassessment, and the therapy oriented in the clinic should be performed daily, three times a day. Individual consultations took place once a week for 45 minutes. The consultations were conducted by two undergraduate students, trained, calibrated, and guided by the specialist speech therapist. The first group, called with bandage (CB), used the bandage associated with traditional manual therapy, and the second group, without bandage (SB), underwent only manual therapy, based on massages and stretches recommended by the literature[14] for muscle relaxation. Stretching was performed and consisted of vertical movements along the muscle fiber in the opposite direction to muscle contraction and massages, with circular movements, respectively, performed in the masseter and temporal muscles in a bi-digital manner, using the index and middle fingers. The stretching exercises had three sets of ten repetitions, and the massage had three sets of twenty repetitions. The participants who used the bandage remained with it fixed to the skin on the masseter muscle for three days, without removing it at any time. The application occurred bilaterally and was performed in the mandibular branch (fixed point), until the zygomatic arch (moving point) contrary to the contraction of the muscle fiber. During the sessions, the participants were trained to perform the exercises and maneuvers outside the therapeutic clinical environment. To control the performance of the exercises outside the clinic, the participants were asked to send videos of their practice daily; thus, if they were not performed, they would be excluded from the sample. However, in conducting this research, exclusion was not necessary. At the end of the sessions, a new session was held for reassessment with the same instruments used in the initial assessment. The SB group (manual therapy only) was used as a control group, as it was considered that inserting a group with TMD that did not receive intervention would be unethical, as well as inserting a group without complaint to receive treatment.

To analyze EMG data before and after the speech therapy intervention with and without the use of elastic bandage, the data were arranged in Microsoft Excel 2010 spreadsheets, in which information on muscle rest patterns was allocated, and descriptive data analysis was performed by obtaining the mean, standard deviation, median, maximum values, and minimum values of numerical variables. For exploratory analysis, the SPSS software for Windows was used through the tests: Mann Whitney and Wilcoxon. Only P-values lower than 0.05 were considered significant.

Results

The research was conducted with 14 participants, all female, aged between 18 and 40 years old.

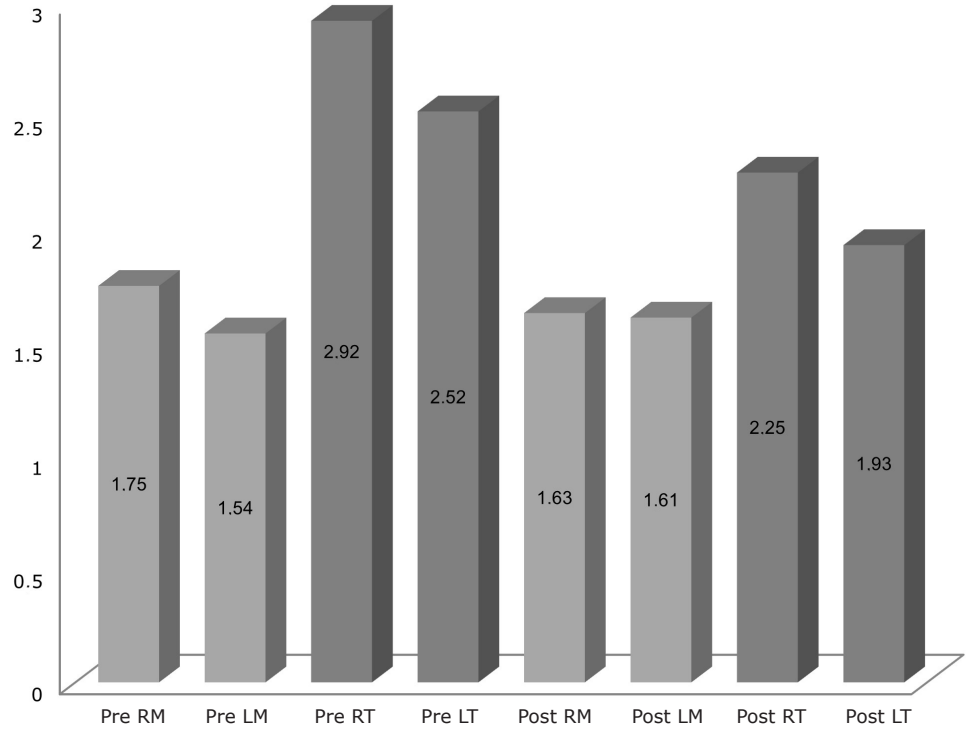
According to Table 1, the analysis of muscle rest after therapy associated with using bandage, if compared to values before therapy, resulted in decreased values at rest, except for the left masseter muscle. However, without statistical difference.

Table 1. Comparison of muscle rest values of the bandaged group before and after therapy (n=7).

Musc.	Mean µV	Pre-intervention		Post-intervention			
		Stand. Dev.	Median	Mean µV	Stand. Dev.	Median	P-value
RM	1.75	0.98	1.29	1.63	0.64	1.36	0.735
LM	1.54	0.67	1.29	1.61	0.55	1.50	0.612
RT	2.92	1.88	2.12	2.25	1.60	1.61	0.176
LT	2.52	1.29	2.06	1.93	0.82	1.62	0.176

*Abbreviations: RM (right Masseter); LM (left Masseter); RT (right Temporal); LT (left Temporal); Musc. (Muscle); Stand. Dev. (Standard Deviation).
* Significance P <0.05.

In this same group, after using the bandage, it is observed in Figure 1, qualitatively, a greater balance of the masseter and temporal muscles between the contralateral sides. In other words, the right and left sides are compared to the values before the intervention.



* Comparison of rest of contralateral muscles before and after bandage therapy. Abbreviations: PRE RM (Right Masseter Pretherapy); PRE LM (Left Masseter Pretherapy); PRE RT (Right Temporal Pretherapy); PRE LT (Left Temporal Pretherapy); POST RM (Right Masseter Posttherapy); POST LM (Left Masseter Posttherapy); POST RT (Right Temporal Posttherapy); POST LT (Left Temporal Posttherapy).

Figure 1. Comparison in rest µV of the contralateral muscles before and after bandage therapy.

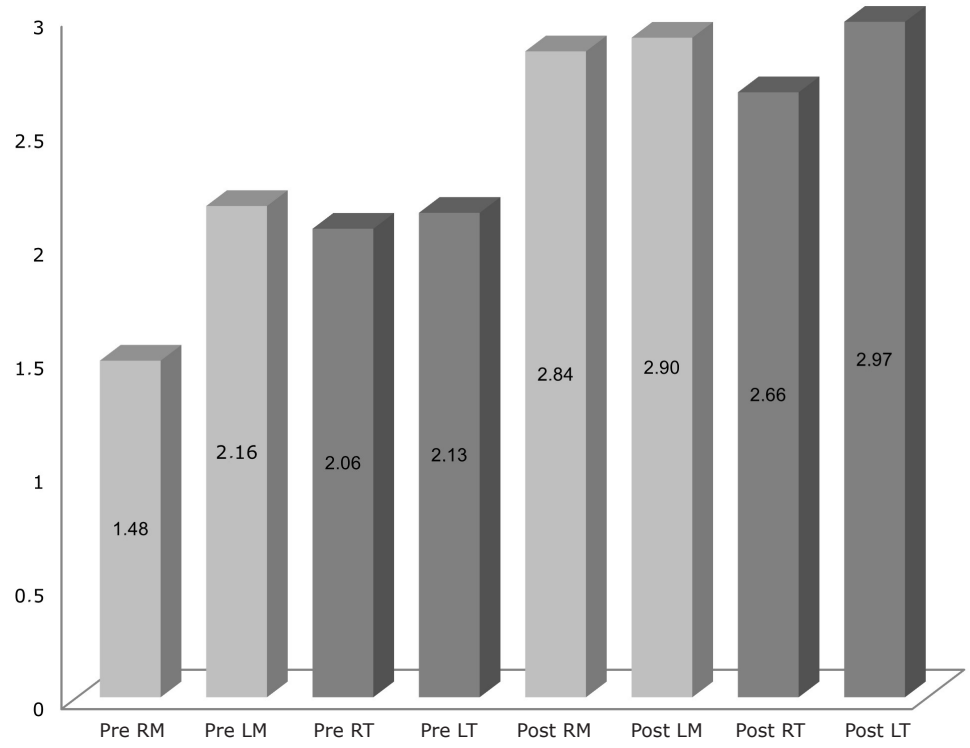
Muscle balance was considered a condition of greater proximity of electromyographic values in an ipsilateral (temporal and masseter) way or balance of the same muscle group in a contralateral way, that is, right and left side. In the SB group, the electromyographic rest values remained balanced between the muscles bilaterally before and after therapy. In this group, only the right masseter muscle showed significant statistical value (p=0.043), showing increased resting values after therapy, balancing with the other muscles. Although there was an increase in resting values after therapy in all muscles of this group, no statistical evidence was obtained, as shown in Table 2 below.

Table 2. Comparison of muscle rest values of the group without bandages before and after therapy (n=7).

Musc.	Mean µV	Pre-intervention			Post-intervention		
		Stand. Dev.	Median	Mean µV	Stand. Dev.	Median	P-value
RM	1.48	0.75	1.32	2.84	1.42	2.31	0.043
LM	2.06	0.83	1.93	2.66	1.63	1.93	0.499
RT	2.16	1.14	2.40	2.90	1.75	2.82	0.091
LT	2.13	1.12	1.76	2.97	2.09	2.36	0.499

*Abbreviations: RM (right Masseter); LM (left Masseter); RT (right Temporal); LT (left Temporal); Musc. (Muscle); Stand. Dev. (Standard Deviation).
* Significance P <0.05.

In the SB group, qualitative analysis suggests a balance of the ipsilateral musculature (right masseter and right temporal) (left masseter and left temporal), emphasizing the right side, after therapy without bandage, although without statistical evidence, as shown in Figure 2.



*Comparison of ipsilateral muscle rest before and after therapy without bandage use. Abbreviations: PRE MD (Right Masseter Pretherapy); PRE LM (Left Masseter Pretherapy); PRE RT (Right Temporal Pretherapy); PRE LT (Left Temporal Pretherapy); POST RM (Right Masseter Posttherapy); POST LM (Left Masseter Posttherapy); POST RT (Right Temporal Posttherapy); POST LT (Left Temporal Posttherapy).

Figure 2. Comparison in μV of ipsilateral muscle rest before and after therapy without bandage.

Table 3 describes the values found when comparing the two groups, with and without bandage. No statistical differences were found between the two. However, from the qualitative analysis, it is noted that the two groups presented different characteristics in the responses generated by the therapies.

Table 3. Comparison of groups with and without bandage after therapy (n=14).

Musc.	Mean μV	With Bandage		No Bandage			
		Stand. Dev.	Median	Mean μV	Stand. Dev.	Median	P-value
RM	1.63	0.64	1.36	2.84	1.42	2.31	0.110
LM	1.61	0.55	1.50	2.66	1.63	1.93	0.180
RT	2.25	1.60	1.61	2.90	1.75	2.82	0.338
LT	1.93	0.82	1.62	2.97	2.09	2.36	0.338

*Abbreviations: RM (right Masseter); LM (left Masseter); RT (right Temporal); LT (left Temporal); Musc. (Muscle); Stand. Dev. (Standard Deviation).
*Significance P <0.05.

In the sample of the two groups before and after the intervention, the minimum value of muscle rest at 0.40 μV and maximum of up to 7.75 μV with a mean of 2.21 μV was verified.

Discussion

The number of people diagnosed with TMD has increased, affecting mainly female adults, with prevalence between the second and fourth decade of life. Studies report that women are most affected due to hormonal components, such as higher estrogen levels, and biological, social, and psychoemotional factors, such as anxiety and depression. Moreover, females seek treatments more frequently than males[19,20,3].

We chose to use BMI as an inclusion and exclusion criterion because the layer and thickness of fat in the skin can affect the uptake of electromyographic signals and occlusal interference, another factor that can generate bias. Participants who were using muscle relaxants to preserve the physiological properties of the muscle were not accepted. Patients with neurological and cognitive impairment were excluded due to the consensus that such patients may not respond reliably to questionnaires and inquiries. It was considered that patients who had already undergone previous speech therapy or who were undergoing orthodontic treatment could also present bias in their initial and final assessments[8].

In this study, only traditional manual therapy was performed in one group, and this same therapy was associated with bandage in another group, with the aid of the EMGs test to capture the responses generated during muscle rest. Although other methods help diagnose TMD, surface electromyography can provide data on the effectiveness of treatment through clinical follow-up, in addition to helping establish conducts. The choice of conduct may be linked only to traditional or therapeutic support strategies, along with information from the myofunctional assessment[9]. Besides, another contributing factor to the choice of EMGs in this research is its use in scientific studies that analyze changes in muscle patterns[21].

The EMGs record the bioelectrical responses of the muscles during different moments, such as maximum contraction, rest, and exertion. To perform the examination, constant monitoring of the desired muscle is essential. The capture of the activity is done through electrodes placed on the skin. The information is viewed from the screen of a computer through software that generates graphical information[22]. The signal's amplitude, duration, and frequency are significant traces of electromyographic activity[11]. For a safe examination result, observation, analysis, and interpretation of the action and integrity of the muscle component should be made[22].

The EMG examination can show the variables of muscle action during contraction and data on its condition during rest. It provides responses about the physiological and pathological state of the musculature, such as hyperactivity, hypoactivity, and muscle spasms, fundamentals that govern muscle activity, mandibular location, and occlusal relationship[8].

The current research focuses on the muscle rest threshold obtained through EMGs. When at rest, the mandible tends to settle in an accommodation of unconscious suspension, and because of this, the chewing muscles remain in relaxation, and it is expected only minimal electromyographic activation of the musculature[5].

When analyzing the resting values of the present study of patients with TMD in the groups with and without bandages before and after therapy, we observed the minimum resting value at 0.40 μV and a maximum value of 7.75 μV. According to the literature, in TMD cases with pain, sensory and motor influences are generated, leading to muscle differences at rest, causing an increase in the values of the expected behavior patterns, normal of the musculature[2,5].

The mean muscle rest found in both groups and treatments was 2.21 μV. This finding corroborates the study by Rodrigues[11], in which it is reported that the value considered adequate for muscle rest can reach up to 5μV.

In the CB group, the resting values after therapy did not present significantly lower statistical values relative to the pretherapy moment. According to the initial hypothesis, however, there was a reduction in values in all muscles, except in the left masseter, according to quantitative and qualitative analysis.

The study by Silva et al.[21] aimed to analyze the effects of therapeutic elastic bandage on the trapezius muscle through surface electromyography in healthy adults. This study corroborated that of Silva et al.[21], as it found that the bandage does not present

effects with statistical significance demonstrated by EMGs during rest. However, a qualitative gain was observed when Silva's study verified muscle relaxation through a questionnaire. Thus, Silva proposed that the bandage could offer positive qualitative results to individuals. Although without formal registration and analysis of the patients' perception, the patients in this study reported a feeling of relaxation after using the bandage

In the CB group, a balance of the contralateral masticatory muscles was observed after the intervention, however, without statistical evidence.

A study by Hernandes[3] proposed verifying and comparing the effects of traditional speech therapy with bandages in treating muscle TMD. The research included two participants of the same age, one receiving bandage associated with traditional therapy and the other only undergoing traditional therapy. The results showed that the bandage associated with traditional therapy promoted decreased pain in a shorter time than the group that did not use bandages. However, both techniques proved to be efficient at the end of treatment. In this same study, it is mentioned that one of the objectives of elastic bandages is to provide muscle balance.

Notably, the bandage consists of an elastic tape of great adhesion to the skin that offers environmental stimuli to the body, processed by afferent pathways, and taken to the primary sensory cortex[3]. For the conduction of information, stimuli are performed with the bandage on the integument, which provides the sensation of the skin area[23]. According to the literature, after establishing the therapeutic purposes, the bandage, well instrumented, provides a range of benefits to the patient, used as an aid to therapy. The gains provided by the bandage include decreased pain and muscle overload, improvement of muscle and joint injuries, and muscle balance[15-3]. In addition to these characteristics, it offers improved blood and lymphatic circulation and increased proprioception by activating or relaxing muscles[21].

Silva et al.[21] report that in recent years the bandage has been used more in speech therapy and is being put on the agenda in congresses, clinical discussions, articles, and scientific meetings.

The SB group of this research presented significantly higher statistical value after intervention in the right masseter muscle. However, even if no significant values were found for the other muscles, qualitatively increased electrical activity was observed in all muscles in patients in the SB group, with the balance between the contralateral and ipsilateral sides after traditional therapy.

The study by Mazzetto et al.[24] concluded that the changes in the electromyographic indices of patients with TMD are more significant and that they are not directly related to pain complaints, but rather due to the existence of an imbalance in muscle activity, information that is useful for the adequacy of procedures, referrals, and therapies aimed at the musculature.

Stefani[14] and Berretta et al.[6] report that one of the purposes of speech therapy in treating TMD is the adequacy of the balance of the masticatory muscles. Thus, after qualitative analysis, the increase in the electromyographic values of muscle rest in this study can be understood as a corresponding balance of the masticatory muscles. According to the data discussed above, it was observed that the two groups presented different characteristics, with the CB group showing decreased electromyographic values during muscle rest in the post-therapeutic moment and the corresponding SB group increasing such values in the post-intervention moment. Both treatments provided patients with functional benefits.

In this study, it was possible to observe that, when performing stretches and therapeutic massages recommended for TMD that proposed muscle relaxation, the indexes of electromyographic rest changed, with values increased and decreased according to the therapeutic technique used.

For subsequent research, it is interesting to expand the sample of patients and include a self-reported questionnaire of satisfaction due to the proprioception and feeling of relaxation that the use of the bandage provided in patients.

Conclusion

It is concluded that no statistically significant changes were observed in the electromyographic resting thresholds of the masseter and temporal muscles in both groups. Only the SB group presented statistical evidence in the right masseter muscle at rest, with increased value after the intervention. Qualitatively, an increase in electromyographic values was observed after traditional manual therapy in all muscles of this group. Regarding the CB group, there were changes in values with

decreased electromyographic rest after therapy, although without statistical evidence.

With the completion of the therapies, the two groups presented different characteristics regarding the electromyographic responses generated.

No statistically significant values were obtained relative to the balance between the muscles analyzed. However, qualitatively, there was muscle balance in the SB group due to the increase in rest values in a contralateral and ipsilateral manner. Contralateral muscle balance was generated in the CB group due to the decrease in resting values.

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