



Revista CEFAC

ISSN: 1516-1846

ISSN: 1982-0216

ABRAMO Associação Brasileira de Motricidade Orofacial

Herpich, Carolina Marciela; Politti, Fabiano; Gomes, Cid Andre Fidelis de Paula; Gloria, Igor Phillip dos Santos; Amaral, Ana Paula; Amaral, Maitê de Freitas Rocha de Souza; Herpich, Graciela; Kalil, Sandra Bussadori; Gonzalez, Tabajara de Oliveira; Biasotto-Gonzalez, Daniela Aparecida

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Revista CEFAC, vol. 20, no. 2, 2018, March-April, pp. 175-181

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DOI: <https://doi.org/10.1590/1982-021620182028616>

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Evaluation of pain threshold upon palpation of the masticatory muscles in women with temporomandibular disorder according to the Research Diagnostic Criteria of Temporomandibular Disorders

Carolina Marciela Herpich⁽¹⁾
Cid Andre Fidelis de Paula Gomes⁽¹⁾
Igor Phillip dos Santos Gloria⁽¹⁾
Ana Paula Amaral⁽¹⁾
Maitê de Freitas Rocha de Souza Amaral⁽¹⁾
Graciela Herpich⁽¹⁾
Sandra Bussadori Kalil⁽¹⁾
Tabajara de Oliveira Gonzalez⁽¹⁾
Fabiano Politti⁽¹⁾
Daniela Aparecida Biasotto-Gonzalez⁽¹⁾

⁽¹⁾ Centro de apoio à pesquisa de análise de movimento, Universidade Nove de Julho - UNINOVE, São Paulo, São Paulo, Brasil.

Conflict of interests: Nonexistent



ABSTRACT

Purpose: to evaluate the pain threshold upon palpation of the masticatory muscles in women with temporomandibular disorder (TMD) according to the Research Diagnostic Criteria of Temporomandibular Disorders (RDC/TMD).

Methods: a cross-sectional study was conducted involving the evaluation of pain threshold upon palpation of the extraoral muscles (temporal, masseter, posterior mandibular region, submandibular region) and intraoral muscles (lateral pterygoid area and temporal tendon) in women using the RDC/TMD clinical examination.

Results: 60 women were evaluated. Statistically significant differences were found among the muscles evaluated regarding the pain threshold. The lateral pterygoid area, bilaterally, had the lowest pain threshold, followed by the masseter and temporal muscles.

Conclusion: this study suggests that the lateral pterygoid muscle, bilaterally, has the lowest pain threshold upon palpation among the masticatory muscles, followed by masseter and temporal muscles, in women with TMD, according to the RDC/TMD evaluation.

Keywords: Temporomandibular Joint Disorders; Physical Therapy Modalities; Myofascial Pain Syndromes

Received on: August 1, 2016
Accepted on: January 25, 2018

Mailing address:

Carolina Marciela Herpich
Rua Prof. José Maria Barone Fernandes,
300, Vila Maria
CEP: 02117-020 - São Paulo, São Paulo,
Brasil
E-mail: carolinaherpich12@hotmail.com

INTRODUCTION

Temporomandibular disorder (TMD) is characterized as a set of disorders that mainly affect the masticatory muscles and temporomandibular joints¹. The main symptom is referred pain, especially upon palpation^{2,3}, accompanied by a reduction in range of motion. The multifactor etiology^{4,5} includes functional, anatomic and psychosocial elements⁶⁻⁹, illustrating a complex interaction among these mechanisms that can reduce the quality of life of affected individuals¹⁰.

For the diagnosis of TMD, studies and clinicians have used indexes and questionnaires that assist in the classification of the disorder, the evaluation of the severity and the determination of the effectiveness of the most diverse interventions^{11,12}. The Research Diagnostic Criteria of Temporomandibular Disorders (RDC/TMD) is among the most widely used for this purpose and is characterized as a complete assessment tool for the diagnosis of TMD with muscle and/or joint involvement as well as the determination of both physical and psychological aspects related to the disorder^{13,14}. The RDC/TMD also enables a discerning evaluation of pain symptoms in the masticatory muscles and temporomandibular joints through palpation. Characterized as a widely employed evaluation in clinical practice, palpation offers the examiner the ability to investigate the harmony among the actions of the masticatory muscles and the functioning of the temporomandibular joint¹⁵.

Besides the evaluation of affected structures, several authors report different clinical responses to pain between genders¹⁶. The higher prevalence rates of pain states in the female gender has been attributed to a possible link to changes in the hormonal system¹⁷, which may explain proportions that range from two to six women for each man diagnosed with TMD¹⁸.

Understanding these characteristics and that TMD is a complex clinical entity, studies are needed to compare symptoms using specific methods and recruiting the population that is truly more affected. Such studies can provide knowledge for the choice of the best therapeutic approach as well as improve the chances of the resolution of the signs and symptoms and, consequently, the rehabilitation of affected individuals.

The aim of the present study was to evaluate the pain threshold upon palpation of the masticatory muscles in women with TMD according to the RDC/TMD. The hypothesis is that differences in the pain threshold are found among the different masticatory muscles involved in TMD when submitted to palpation,

with the lowest threshold expected for the lateral pterygoid muscle.

METHODS

This study received approval from the Human Research Ethics Committee of Nove de Julho University (certificate number: 18032013.4.0000.5511). All volunteers signed a statement of informed consent, which was drafted in compliance with Resolution 466/12 from 2012 of the Brazilian National Board of Health.

A cross-sectional study was conducted at a physical therapy clinic in the city of São Paulo, Brazil. One physiotherapist was in charge of recruiting the patients and determining the fulfillment of the eligibility criteria. A second physiotherapist administered the RDC/TMD and determined the diagnosis. A third physiotherapist performed the data processing and analysis. All physiotherapists had an average of 10-year experience involving patients with TMD and received three months of training with the tools employed in the study.

Volunteers were recruited through verbal invitations and flyers placed in dental and physical therapy clinics in the city of São Paulo between February and November 2014. Female volunteers (due to the high prevalence of TMD in this gender¹⁹) with a diagnosis of TMD using the RDC/TMD were included. The exclusion criteria were age under 18 and above 40 years, currently undergoing orthodontic, physiotherapeutic or medicinal (analgesic, anti-inflammatory or muscle relaxant) therapy, missing teeth and/or the use of partial or complete dentures, bite plate usage, a history of trauma to the face or temporomandibular joint and a diagnosis of osteoarthritis (IIIb) or osteoarthrosis (IIIc), using the RDC/TMD.

Ninety-eight women were evaluated, 38 of whom were excluded, resulting in 60 volunteers eligible for the study. The evaluation consisted of a detailed history on the disorder and the administration of the RDC/TMD¹¹, which furnishes the following diagnoses: myofascial pain (Ia), myofascial pain with limited mouth opening (Ib), disc displacement with reduction (IIa), disc displacement without reduction (IIb), disc displacement without reduction and limited mouth opening (IIc). Volunteers with pain and/or fatigue in the masticatory muscles during functional activities for more than six months⁹ were included (Table 1). It should be mentioned that it was possible for a volunteer to have more than one diagnosis, as reported in previous studies^{19,20}.

Table 1. Distribution of diagnoses of temporomandibular disorders according to Research Diagnostic Criteria of Temporomandibular Disorders (RDC/TMD)

| Diagnosis | n | % |
|-----------------------------------|----|------|
| Only group I (muscle) | 24 | 40 |
| Only group II (disc displacement) | 4 | 6.6 |
| Only group III (arthralgia) | 2 | 3.3 |
| Groups I and II | 16 | 26.6 |
| Groups I and III | 5 | 8.3 |
| Groups II and III | 2 | 3.3 |
| Groups I, II and III | 7 | 11.6 |
| Total | 60 | 100 |

Outcomes

Pain threshold upon palpation

Items 8 and 10 of the RDC/TMD clinical exam were selected for the evaluation of the pain threshold upon palpation. These items rate pain intensity upon palpation of the masticatory muscles bilaterally, as follows: no pain = 0, mild pain = 1, moderate pain = 2, and severe pain = 3. The muscles were evaluated always from right to left in accordance with the experience of the examiner. The following muscles were evaluated:

- Extraoral muscle palpation

- A – Posterior temporal – behind the temple (behind and immediately above the ears).
- B – Mid temporal – mid region of temple (4 to 5 cm to the side of the lateral margin of the eyebrows).
- C – Anterior temporal – anterior part of temple (superior to the infratemporal fossa and immediately above the zygomatic process).
- D – Superior masseter – cheek below zygoma (1 cm in front of the temporomandibular joint and immediately below the zygomatic arch).
- E – Mid masseter – cheek, side of face (anterior margin descending to the angle of the mandible).
- F – Inferior masseter – cheek, line of mandible (1 cm above and anterior to the angle of the mandible).
- G – Posterior mandibular region (stylohyoid) – posterior region of digastric muscle (mandible, throat region – area between the insertion of the sternocleidomastoid muscle and posterior edge of the mandible).
- H – Submandibular region – mid pterygoid/supra-hyoid/anterior region of digastric (below the

mandible, 2 cm in front of the angle of the mandible).

The examiner performed single manual palpation of the muscles with 1 Kg of pressure for muscles A to F and 0.5 Kg of pressure for muscles G and H.

- Joint palpation

- A – Lateral pole (anterior to tragus and on temporomandibular joint)
- B – Posterior ligament (inside ear)

- Intraoral muscle palpation

- A – Lateral pterygoid area – anterior portion of maxillary molars.
- B – Temporal tendon – anterior edge of coronoid process.

Single manual palpation of these muscles was performed with 0.5 Kg of pressure.

For the definition of the pain threshold upon palpation of the temporal and masseter muscles, the mean corresponding to the score of each of the portions of these muscles was calculated.

Data analysis

The Shapiro-Wilk test was used to determine the normality of the data. As the data exhibited asymmetrical distribution, the Kruskal-Wallis test with Dunn's post hoc test for multiple comparisons was used to measure differences in the pain threshold upon palpation. The SPSS 16.0 program (SPSS Inc., Chicago, USA) was used for the statistical analyses, with a p-value < 0.05 considered indicative of statistical significance.

RESULTS

Table 1 displays the distribution of the diagnoses of TMD of the 60 volunteers according to the RDC/TMD. Table 2 displays the pain thresholds of the regions palpated indicated on the RDC/TMD, demonstrating

significant differences among the structures investigated. Table 3 displays the results of Dunn's post hoc test, demonstrating significant differences in the pain threshold among the structures investigated.

Table 2. Median and interquartile range (25-75%) of pain threshold in palpated structures indicated by Research Diagnostic Criteria of Temporomandibular Disorders (RDC/TMD) (0 = no pain, 1 = mild pain, 2 = moderate pain, and 3 = severe pain)

| | Right side | Left side |
|-----------------------------|------------------|------------------|
| | Median (25-75%) | Median (25-75%) |
| Lateral pterygoid muscle | 1.59 (1.27-1.90) | 1.67 (1.40-1.93) |
| Temporal muscle | 0.65 (0.48-0.81) | 0.60 (0.44-0.76) |
| Masseter muscle | 1.03 (0.83-1.23) | 1.07 (0.86-1.29) |
| Posterior mandibular region | 0.45 (0.23-0.68) | 0.51(0.29-0.73) |
| Submandibular region | 0.13 (0.02-0.24) | 0.18 (0.06-0.29) |
| Lateral pole | 0.88 (0.61-1.15) | 0.81(0.57-1.06) |
| Posterior ligament | 0.37 (0.16-0.58) | 0.40 (0.21-0.60) |
| Temporal tendon | 0.65 (0.38-0.92) | 0.68 (0.40-0.97) |
| Comparisons among variables | $p < 0.005^*$ | $p < 0.005^*$ |

* Denotes significant differences among structures (Kruskall-Wallis ANOVA).

Table 3. Comparison of pain upon palpation among structures described on Research Diagnostic Criteria of Temporomandibular Disorders (RDC/TMD) (Dunn's post hoc text)

| | MT | | MM | | PMR | | SR | | LP | | PL | | TT | |
|-----|-------|--------|----|----|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| | R | L | R | L | R | L | R | L | R | L | R | L | R | L |
| LPA | <0.05 | <0.001 | ns | ns | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| MT | | | ns | ns | ns | ns | <0.001 | <0.001 | ns | ns | <0.05 | ns | ns | ns |
| MM | | | | | <0.001 | <0.001 | <0.001 | <0.001 | ns | ns | <0.001 | ns | <0.01 | <0.01 |
| PMR | | | | | | | ns | ns | ns | ns | ns | ns | ns | ns |
| SR | | | | | | | | | <0.001 | <0.001 | <0.001 | ns | <0.001 | ns |
| LP | | | | | | | | | | | <0.001 | ns | <0.001 | <0.001 |
| PL | | | | | | | | | | | | | ns | ns |

R: right; L: left; LPA: lateral pterygoid area; MT: mid temporal; MS: mid masseter; PMR: posterior mandibular region; SR: submandibular region; TT: temporal tendon; LP: lateral pole; PL: posterior ligament

DISCUSSION

The aim of the present study was to evaluate the pain threshold upon palpation of the masticatory muscles in women with TMD according to the RDC/TMD. The main finding was the lower pain threshold found in the area of the lateral pterygoid muscle (LPM) bilaterally, followed by the masseter and temporal muscles. Besides the high degree of representativeness of the population with TMD in clinical practice, which is characterized by the female gender¹⁶, this study differs from previous

investigations by using a musculoskeletal pain threshold assessment method that is widely employed in clinical practice and considered one of the foundations for the diagnosis of TMD using the RDC/TMD²¹.

Despite the wide use in the clinical setting, divergent opinions are found regarding the use of palpation for the evaluation and diagnosis of individuals with TMD. Gomes et al. (2008)²² report acceptable specificity values (higher than 0.90), whereas Chaves et al. (2010)²³ consider this type of evaluation to be limited, declaring that the pressure pain threshold determined

with the aid of an algometer has greater reliability than manual palpation. However, unlike the present study, Chaves et al. (2010)²³ had a sample of only children, the majority of whom was male, which are characteristics that do not represent the main population affected by TMD. Thus, the practice of palpation is justified in the clinical setting due to the fact that it enables the determination of other clinical factors beyond pain alone, such as tissue quality and the state of muscle fibers, which are essential factors for the evaluation and diagnosis of musculoskeletal disorders²³.

The present findings demonstrate the importance of investigating the lateral pterygoid, masseter and temporal muscles bilaterally. These muscles have considerable representativeness with regard to the characteristic pain in individuals with a diagnosis of TMD⁹. Santos et al. (2005)²⁴ report that the masseter muscle is the most sensitive site in cases of TMD, which may involve functional overload of the joint, occlusal factors and consequent overactivity of the LPM, although the evidence is limited^{25,26}. Differently from the study conducted by Santos et al. (2005)²⁴, however, the present findings show the greater representativeness of the LPM regarding pain upon palpation in cases of TMD, demonstrating that this muscle may have fundamental importance in the evaluation of patients with a diagnosis of this disorder. Bonjardim et al. (2005)²⁷ also point out the importance of the LPM, although the sample of individuals with a diagnosis of TMD was in a different age range (12 to 18 years). Moreover, the authors found greater pain sensitivity in this muscle in the female gender.

The LPM is directly involved in lateral functional movements in unilateral action and protrusion of the mandible in bilateral action, playing an important modulating role in the joint movements^{28,29}. Thus, changes in the LPM could facilitate joint derangement, exerting a negative impact on the biomechanical harmony of the temporomandibular joint, which justifies the use of resources directed at this muscle^{30,31}. The present findings underscore the clinical importance of a detailed evaluation and the application of therapies directed at the LPM. Lopes (2015)³² found that individuals with simultaneous diagnoses of TMD and migraine tend to exhibit hypertrophy of the LPM and have greater pain symptoms during palpation of this muscle. The authors also found strong associations between myofascial pain and both disc displacement and arthralgia in the diagnosis using the RDC/TMD. In agreement with these findings, 26.6% of the

volunteers in the present study exhibited myofascial pain associated with disc displacement and 8.3% had myofascial pain associated with arthralgia.

Further demonstrating the clinical importance of the LPM, Stelzenmueller et al. (2016)³³ state that manual palpation is essential to the clinical evaluation of this muscle. The basic requirement for successfully palpating the LPM is precise knowledge of the muscle topography and the proper route for intraoral palpation. These requirements were met by the physiotherapist in charge of the evaluations in the present study, who had 10 years of experience in the evaluation and treatment of patients with TMD.

The present study has limitations that should be addressed. There was no group without TMD to serve as a baseline in the follow up of the volunteers. Moreover, there was no establishment of different groups based on the type of TMD and there were no imaging exams to complement the diagnosis and enable a better analysis of the LPM area. Thus, further studies are needed to overcome these limitations.

CONCLUSION

The present findings suggest that the lateral pterygoid muscle, bilaterally, has the lowest pain threshold upon palpation among the masticatory muscles, followed by masseter and temporal muscles in women with TMD, according to the RDC/TMD evaluation.

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