ORIGINAL ARTICLE

https://doi.org/10.1590/1806-9282.20230622

Do myofascial trigger points in masseter muscles affect the symptoms of disc displacement with reduction? A cross-sectional study

Merve Damla Korkmaz[1*], Basak Cigdem Karacay[2]

SUMMARY

OBJECTIVE: The aim of this study was to demonstrate the effect of myofascial pain with referral from the trigger points in the masseter muscles on the clinical symptoms and functional limitations of the temporomandibular joint in participants with disc displacement with reduction.

METHODS: This prospective, cross-sectional study recruited participants aged 18–45 years with disc displacement with reduction with/without myofascial pain with referral in the masseter muscles based on the inclusion criteria. Maximum mouth opening and the presence of probable awake bruxism were assessed. The "Graded Chronic Pain Scale version 2.0" and "Jaw Function Limitation Scale-8" were used to evaluate Diagnostic Criteria for Temporomandibular Disorders Axis II. Pain levels were measured using the Visual Analog Scale.

RESULTS: A comparison between the disc displacement with reduction and disc displacement with reduction+myofascial pain with referral groups revealed statistically significant differences in Visual Analog Scale ($p<0.001$), the presence of awake bruxism ($p=0.038$), and Graded Chronic Pain Scale version 2.0 ($p=0.010$). However, no statistically significant difference was observed between the two groups concerning maximum mouth opening and Jaw Function Limitation Scale-8.

CONCLUSION: Participants with both disc displacement with reduction and myofascial pain with referral in the masseter muscle exhibited higher pain intensity, a higher prevalence of awake bruxism, and increased pain-related disability compared to those with disc displacement with reduction alone.

Clinical Trial Registration Number: NCT05187325.

KEYWORDS: Bruxism. Masseter muscle. Temporomandibular joint. Pain. Trigger points.

INTRODUCTION

The temporomandibular joint (TMJ) is a synovial joint containing an articular disc[1]. The functions of the articular disc are to absorb the shocks between the articular surfaces and to separate the articular cavity in the lower and upper divisions[1,2]. Temporomandibular disorder (TMD) is described as a musculoskeletal disease affecting the temporomandibular joints, masticatory muscles, and other surrounding structures[1,3]. Among TMD conditions, disc displacement with reduction (DDwR) denotes an abnormal relationship between the disc and condyle. In cases of DDwR, the disc shifts forward relative to the condyle during mouth closure, reverting to its original position upon mouth opening[4]. Anterior disc displacement gives rise to clicking, popping, or snapping sounds, pain, and TMJ deformities[4-6].

Beyond TMJ problems, muscle and soft tissue-related disorders, including myalgia, local myalgia, myofascial pain, and myofascial pain with a referral (MPwR), also cause pain[5-7]. Referred myofascial pain, a subtype of TMD, is characterized by local or radiating pain in the temporal or masticatory muscles, elicited by palpation or excessive stretching during the examination. Diagnosis is confirmed when pain from the trigger point spreads beyond its boundaries[8].

The Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) are widely accepted as reliable and valid for diagnosing TMD, and in clinical practice, it is recommended for researchers to use them for categorizing TMD sub-diagnoses[9]. It includes a two-axis model. Axis I includes diagnostic criteria for TMD, and Axis II includes the assessment of behavioral and psychosocial factors related to TMD[6,9].

The DC/TMD criteria propose utilizing history-taking, physical examination, and imaging techniques as standard approaches for diagnosing disc displacement disorders. Also, they are classified into four subtypes according to DC/TMD criteria: DDwR, DDwR with intermittent locking, DD without reduction without limited mouth opening, and disc displacement without reduction with limited mouth opening[9]. Pain-related TMD, classified by DC/TMD as myalgia, local myalgia,

[1]University of Health Sciences, Kanuni Sultan Suleyman Training and Research Hospital, Department of Physical Medicine and Rehabilitation – Istanbul, Turkey.
[2]Ahi Evran University, Faculty of Medicine, Department of Physical Medicine and Rehabilitation – Kırşehir, Turkey.
*Corresponding author: mervedml@gmail.com
Conflicts of interest: the authors declare there is no conflicts of interest. Funding: none.
Received on August 12, 2023. Accepted on August 26, 2023.

myofascial pain, MPwR, arthralgia, and headache attributed to TMD, may exist in isolation or in combination[6,10]. Notably, the literature lacks investigation into how coexisting TMD sub-diagnoses on symptoms, functions, and clinical findings could substantially inform treatment management strategies.

The aim of this study was to elucidate how the presence of MPwR from masticatory muscles influenced clinical symptoms, pain-related disability, and TMJ function limitation in participants with DDwR. The hypothesis of this study posits that concurrent MPwR with DDwR leads to increased pain levels and restricted jaw functions in patients.

METHODS

This prospective, cross-sectional study was conducted between November 2021 and February 2022. Participants aged 18–45 years with DDwR with or without MPwR in the masseter muscles were recruited from the outpatient clinic based on inclusion criteria. Inclusion criteria encompassed age between 18 and 45 years, diagnosis of DDwR with or without MPwR in the masseter muscles by a specialist using the parameters and criteria of DC/TMD Axis I, and the absence of intermittent locking of the jaw.

The diagnosis of DDwR and MPwR was established through physical examinations in accordance with DC/TMD diagnostic criteria[6]. Participants visiting the outpatient clinic were assessed for clicking, popping, or snapping sounds. Those exhibiting such sounds without intermittent locking were diagnosed with DDwR, obviating the need for imaging. Assessment of TMJ sound was performed by palpation of the TMJ using the index and middle fingers and hearing the sound during mouth opening and closing. In accordance with the literature, the examiner's ear was within 5 cm of the participant's TMJ[11]. Evaluation of MPwR involved palpation of masseter muscles, diagnosing the presence of pain during opening the jaw or pain within 2 s upon palpating the masseter muscle. Participants exhibiting MPwR were included in the DDwR+MPwR group. All evaluations were conducted by the same investigator with a minimum of 7 years experience in TMD assessment.

Exclusion criteria comprised any other TMJ conditions (including rheumatological and neurological diseases, fibromyalgia, serious psychiatric disorders, temporomandibular agenesis, hyperplasia, hypoplasia, dental prosthesis, condylar malignant neoplasm, and continuous medication use like benzodiazepines, antidepressants, and antipsychotics), intermittent locking of the TMJ, ongoing TMD treatment, prior TMJ surgical intervention, occlusal splint usage within the last year, and extensive ongoing dental treatment.

A pre-study power analysis determined the sample size, and recruitment was over once there were 60 participants in each group. Consequently, data from two groups, namely, the DDwR group (n=60) and the DDwR+MPwR group (n=60), were subjected to analysis.

Outcome measures

All participants were evaluated based on the DC/TMD Axis I and II criteria. Within Axis I, the participants were asked about pain, TMJ sounds, and locking of the TMJ during mouth opening and closing. Furthermore, clinical examinations were conducted to ascertain pain location and characteristics, incisal relationships, and mandibular movements. A visual analog scale (VAS) was used to measure the pain levels of the participants. This scale consists of a 10-point Likert scale[12].

Bruxism was diagnosed according to the classification of possible bruxism, probable bruxism, and definite bruxism, as outlined by Lobezzo et al.[13] This study specifically explored probable awake bruxism by assessing participants' symptoms and physical examination findings. The awake bruxism symptoms questionnaire consisted of two questions from the DC/TMD Oral Behavioral Checklist: "Q3-Grind teeth together during waking hours" and "Q4-Clamp your teeth together during waking hours"[14]. In cases where participants answered positively to either question, a physical examination was performed to investigate signs of awake bruxism. This examination encompassed assessing tooth marks on the tongue and cheeks, tooth wear, and masseter hypertrophy. A diagnosis of probable awake bruxism was established for participants who exhibited both positive responses to either of the two symptom questionnaire questions and displayed one of the four physical examination signs[15,16].

For the measurement of anterior maximum mouth opening (MMO), the participants were asked to open their mouths as wide as possible with the distance between the incisors recorded.

Within the Axis II assessment, the "Graded Chronic Pain Scale version 2.0 (GCPS v2.0)" and "Jaw Function Limitation Scale-8 (JFLS-8)" were used. GCPS v2.0 is a valid and reliable instrument that evaluates pain levels and pain-related disability. It consists of three items for pain levels, four items for temporomandibular function, and one item for the number of days of pain. A 1-month version of the scale was used in the present study. According to the results, five grades were determined: Grade 0 (no pain and disability), Grade I (low-intensity pain and without disability), Grade II (high-intensity pain and without disability), Grade III (moderately limiting), and Grade IV (severely limiting)[17].

JFLS-8 assesses global limitations in chewing, verbal and emotional expression, and jaw mobility. Each item consists of a 10-point scale that is evaluated between "no restriction" and "severe restriction"[18].

Data analysis

The Statistical Package for the Social Sciences statistical program (IBM Corp., Armonk, NY, USA) version 21 was used for data analysis. The distribution of the variables was analyzed by the histogram and the Shapiro-Wilk test. Descriptive statistics were presented as the mean (standard deviation) for continuous variables, the median (minimum-maximum) for ordinal variables, and the frequency with percentage for categorical variables. For inter-group analysis, the chi-square test for ordinal variables, the Mann-Whitney U test for nonparametric variables, and the independent t-test for parametric variables were used.

Sample size calculation

The G*Power program (G*Power version 3.1.9, Germany) was used for the calculation of the sample size based on the change in pain intensity. To achieve $\alpha<0.05$ and $\beta=80\%$ based on the VAS scores, as described by Poluha et al.[5] it was determined that at least 47 participants would be required for each group. Assuming a 20% dropout rate, the study required a total of 120 participants to be included.

Ethical approval

The study protocol was approved by the Local Ethical Board (under number KAEK/2021.11.309) in accordance with the Declaration of Helsinki. Verbal and oral consent was obtained from all participants. The Clinicaltrials.gov ID number of the present trial is NCT05187325.

RESULTS

A total of 120 participants diagnosed with DDwR with or without MPwR who applied to the outpatient clinic were recruited in the study according to the inclusion criteria.

The mean age of the population was 30.9±11.4 years. There was no significant difference between the two groups in terms of age, gender, or other demographic characteristics (Table 1).

The mean VAS of the participants was 3.1 (2.5) in the DDwR+MPwR group and 1.6 (2.0) in the DDwR group. GCPS v2.0 was categorized into five grades. In the DDwR+MPwR group, 21.7% of the participants had no pain, 25% of them had low-intensity pain, 30% had high-intensity pain, and 23.3% had moderately limiting pain. In the DDwR group, 36.7% of the participants had no pain, 38.3% of them had low-intensity pain, 18.3% had high-intensity pain, and 6.7% had moderately limiting pain. No participants had severely limiting pain in either group. While 46.7% of the participants had awake bruxism in the DDwR+MPwR group, this rate was 28.3%

Table 1. Demographic characteristics of the participants.

	DDwR+MPwR group (n=60)	DDwR group (n=60)	p-value
Age (years) [mean (SD)]	31.4 (10.8)	30.4 (11.9)	0.385
Gender			
Female/male	46/14	45/15	0.673
Marital status [n (%)]			
Married	21 (35%)	26 (43.3%)	0.705
Unmarried	39 (65%)	34 (56.7%)	
Education [n (%)]			
Primary school	27 (45%)	22 (36.7%)	0.278
High school	20 (33.3%)	22 (36.7%)	
University	13 (21.7%)	16 (26.6%)	
Stress levels of the working environment [n (%)]			
Not working	17 (28.3%)	22 (36.7%)	
Less stressful	22 (36.7%)	21 (35%)	0.265
Moderate stressful	16 (26.7%)	15 (25%)	
Very stressful	5 (8.3%)	2 (3.3%)	

MPwR: myofascial pain with referral; DDwR: disc displacement with reduction; SD: standard deviation.

in the DDwR group. Upon comparison of the DDwR and DDwR+MPwR groups, there were significant differences in terms of VAS (p<0.001), awake bruxism (p=0.038), and GCPS v2.0 (p=0.010) between the two groups (Table 2).

The mean score of JFLS-8 was 4.5 (1.6) in the DDwR+MPwR group and 4.9 (1.8) in the DDwR group. According to the measurement of MMO, it was found to be 38.9 (9.6) mm in the DDwR+MPwR group and 40.3 (6.6) mm in the DDwR group. There was no statistical difference between both groups in terms of MMO and JFLS-8 (Table 2).

DISCUSSION

The present study investigated pain intensity, pain-related disability, and functional limitation in individuals with DDwR with and without MPwR in the masseter muscles. The results indicated that participants with both DDwR and MPWR in the masseter muscle exhibited higher pain intensity, a higher prevalence of awake bruxism, and increased pain-related disability compared to those with DDwR alone.

Pain-related TMDs have been established as a significant cause of hospital admissions[5,19]. The most common cause of chronic musculoskeletal orofacial pain is TMD[20,21]. In this study, both DDwR and MPwR were sources of pain, with DDwR accompanied by MPwR showing an elevation in pain intensity. Similarly, Poluha et al., reported that a patient with DDwR had an increased chance of presenting MPwR as well[5].

The relationship between chronic painful conditions, mental disorders, and temporomandibular disorders has been discussed in the current literature[10,22,23]. A cross-sectional study evaluating the association between TMDs and participants' disability levels, using the GCPS v2.0, did not find a clinical correlation between them[24]. Similarly, DDwR has been linked to amplified jaw disability[25]. In the current study, disability due to chronic pain was found to be higher in participants with DDwR and MPwR than DDwR alone. This could be attributed to the additive effect of pain from trigger points (TrPs), exacerbating the pain caused by DDwR.

Individuals with disc displacement can be either asymptomatic or experience pain, limited jaw movement, and/or joint sounds while opening and/or closing the mouth[26]. Nowak et al., suggested that mandibular movements might be constrained in cases of myofascial pain in masticatory muscles[27]. However, this study found no correlation between the presence or absence of MPwR and limitations of movement or functional restrictions in the TMJ. This might be related to limitations in mandibular movement due to joint disorders. In addition, functional limitations of the TMJ could be linked to the chronic, long-term outcomes of TMDs[28].

It has been reported in the literature that myofascial pain in the masseter muscles is associated with parafunctional activities like bruxism[27]. A study investigating the impact of bruxism on TMD based on DC/TMD criteria reported that awake bruxism is associated with muscle disorders and disc displacement with the reduction subtypes of TMD[16]. According to the

Table 2. Comparison of both groups in terms of clinical symptoms, pain, and limitation of temporomandibular joint function.

	DDwR+MPwR group (n=60)	DDwR group (n=60)	p-value	95%CI of the difference	
				Lower	Upper
VAS (cm) [mean (SD)]	3.1 (2.5)	1.6 (2.0)	<0.001*	0.649	3.348
GCPS v2.0 [n (%)]					
Grade 0: no pain	13 (21.7%)	22 (36.7%)			
Grade I: low-intensity pain	15 (25%)	23 (38.3%)			
Grade II: high-intensity pain	18 (30%)	11 (18.3%)	0.010*	–	–
Grade III: moderately limiting	14 (23.3%)	4 (6.7%)			
Grade IV: severely limiting	–	–			
JFLS-8 [mean (SD)]	4.5 (1.6)	4.9 (1.8)	0.241	-1.024	0.224
Bruxism [n (%)]					
Yes	28 (46.7%)	17 (28.3%)	0.038*	–	–
No	32 (53.3%)	43 (71.7%)			
MMO (mm) [mean (SD)]	38.9 (9.6)	40.3 (6.6)	0.512	-6.179	1.164

MPwR: myofascial pain with referral; DDwR: disc displacement with reduction; SD: standard deviation; VAS: visual analog scale; JFLS-8: Jaw Functional Limitation Scale-8; GCPS v2.0: Graded Chronic Pain Scale version 2.0, Mann-Whitney U test, and chi-square test were used to assess the difference between groups. *p<0.05 is considered statistically significant.

current study results, awake bruxism was found to be more common in the DDwR+MPwR group. This occurrence could be attributed to increased activation of the masseter muscles caused by awake bruxism.

Although MMO can vary by ethnicity, it ranges between 45 and 53 mm in healthy individuals[5]. According to previous studies, restricted mouth opening was defined as less than 40 mm[29,30]. In this study, the mean value of the MMO was 39.6±8.2 mm, and there was no significant difference between the two groups,. which aligned with previous study results. Notably, the study did not distinguish between active and latent TrPs within the masseter muscles. However, according to Xu et al., central sensitization can be induced by stimulation of latent TrPs[31]. Also, Li et al., reported the presence of both nociceptive and non-nociceptive pain sensitivity at latent TrPs[32]. Considering the results of the aforementioned studies, active or latent TrPs might have influenced MMO and other pathological findings, excluding pain.

The strength of the study was to use the DC/TMD criteria that are considered the gold standard for the evaluation of TMD[8]. Furthermore, to the best of the our knowledge, this study uniquely evaluated the additional contribution of MPwR to DDwR. As such, it contributes valuable insights to the literature. Additionally, the study benefited from examinations conducted by a single experienced TMD specialist, mitigating subjective differences during participant evaluations.

Nonetheless, the study's limitations include the diagnosis of DDwR solely through physical examination, omitting the use of imaging methods. Additionally, only possible awake bruxism was evaluated, excluding sleep bruxism. While quantitative tests like polysomnography or electromyography are recommended for a definitive diagnosis of bruxism[13,33,34]. In this study, polysomnographic evaluation was not performed. Possible awake bruxism was investigated based on symptoms and a physical examination. Nevertheless, Lobezzo et al., reported that it would be sufficient to evaluate possible bruxism in studies with large samples[13]. However, in this study, only TrPs in the masseter muscle were examined without addressing referred pain from other muscles in this region. Additionally, pain assessment did not encompass algometric pressure on the muscle, representing a limitation of the study.

CONCLUSION

This study demonstrated that the participants with both DDwR and MPwR in the masseter muscle experienced higher pain intensity, a higher prevalence of awake bruxism, and increased pain-related disability in comparison to those with DDwR alone. On the other hand, the presence or absence of MPwR did not exhibit any association with limitations in mandibular movement or functional restrictions. Well-designed, prospective studies evaluating TMJ with imaging modalities in addition to the physical examination will provide a better understanding of the clinical features of TMD patients.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The study protocol was approved by the Kanuni Sultan Suleyman Training and Research Hospital Clinical Research Ethical Board (under number KAEK/2021.11.309) in conformity with the Declaration of Helsinki. All participants were informed about the study verbally and in writing.

AUTHORS' CONTRIBUTIONS

MDK: Conceptualization, Data curation, Formal Analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. **BCK**: Data curation, Funding acquisition, Investigation, Methodology, Resources, Software, Validation, Writing – review & editing.

REFERENCES

1. Trindade D, Cordeiro R, José HC, Ângelo DF, Alves N, Moura C. Biological treatments for temporomandibular joint disc disorders: strategies in tissue engineering. Biomolecules. 2021;11(7):933. https://doi.org/10.3390/biom11070933
2. Tanaka E, Yamano E, Dalla-Bona DA, Watanabe M, Inubushi T, Shirakura M, et al. Dynamic compressive properties of the mandibular condylar cartilage. J Dent Res. 2006;85(6):571-5. https://doi.org/10.1177/154405910608500618
3. Kitsoulis P, Marini A, Iliou K, Galani V, Zimpis A, Kanavaros P, et al. Signs and symptoms of temporomandibular joint disorders related to the degree of mouth opening and hearing loss. BMC Ear Nose Throat Disord. 2011;11:5. https://doi.org/10.1186/1472-6815-11-5
4. Ma Z, Xie Q, Yang C, Zhang S, Shen Y, Abdelrehem A. Can anterior repositioning splint effectively treat temporomandibular joint disc displacement? Sci Rep. 2019;9(1):534. https://doi.org/10.1038/s41598-018-36988-8
5. Poluha RL, Grossmann E, Iwaki LCV, Uchimura TT, Santana RG, Iwaki Filho L. Myofascial trigger points in patients with temporomandibular joint disc displacement with reduction: a cross-sectional study. J Appl Oral Sci. 2018;26:e20170578. https://doi.org/10.1590/1678-7757-2017-0578
6. Schiffman E, Ohrbach R, Truelove E, Look J, Anderson G, Goulet JP, et al. Diagnostic criteria for temporomandibular disorders (DC/TMD) for clinical and research applications: recommendations of the international RDC/TMD consortium network* and orofacial pain special interest group†. J Oral Facial Pain Headache. 2014;28(1):6-27. https://doi.org/10.11607/jop.1151

7. Karacay BC, Korkmaz MD. Investigation of factors associated with dizziness, tinnitus, and ear fullness in patients with temporomandibular disorders. J Oral Facial Pain Headache. 2023;37(1):17-24. https://doi.org/10.11607/ofph.3286
8. Golanska P, Saczuk K, Domarecka M, Kuć J, Lukomska-Szymanska M. Temporomandibular myofascial pain syndrome-aetiology and biopsychosocial modulation. a narrative review. Int J Environ Res Public Health. 2021;18(15):7807. https://doi.org/10.3390/ijerph18157807
9. Goyal SN, Karjodkar FR, Sansare K. Validity of diagnostic criteria for temporomandibular joint disorder in the diagnosis of disc displacement disorders of temporomandibular joint. Contemp Clin Dent. 2020;11(4):332-5. https://doi.org/10.4103/ccd.ccd_237_18
10. Sahbaz T, Karacay BC. Investigation of temporomandibular disorders in patients with fibromyalgia syndrome: a case-control study. J Stomatol Oral Maxillofac Surg. 2023;124(1S):101296. https://doi.org/10.1016/j.jormas.2022.09.017
11. Goho C, Jones HL. Association between primary dentition wear and clinical temporomandibular dysfunction signs. Pediatr Dent. 1991;13(5):263-6. PMID: 1815197
12. Price DD, McGrath PA, Rafii A, Buckingham B. The validation of visual analogue scales as ratio scale measures for chronic and experimental pain. Pain. 1983;17(1):45-56. https://doi.org/10.1016/0304-3959(83)90126-4
13. Lobbezoo F, Ahlberg J, Raphael KG, Wetselaar P, Glaros AG, Kato T, et al. International consensus on the assessment of bruxism: report of a work in progress. J Oral Rehabil. 2018;45(11):837-44. https://doi.org/10.1111/joor.12663
14. INfORM. 2023. [cited on 2023 Aug 08]. Available from: https://ubwp.buffalo.edu/rdc-tmdinternational/other-instruments-2/
15. Ohlmann B, Waldecker M, Leckel M, Bömicke W, Behnisch R, Rammelsberg P, et al. Correlations between sleep bruxism and temporomandibular disorders. J Clin Med. 2020;9(2):611. https://doi.org/10.3390/jcm9020611
16. Cigdem Karacay B, Sahbaz T. Investigation of the relationship between probable sleep bruxism, awake bruxism and temporomandibular disorders using the diagnostic criteria for temporomandibular disorders (DC/TMD). Dent Med Probl. 2023. https://doi.org/10.17219/dmp/158926
17. Korff M. Assessment of chronic pain in epidemiological and health services research: empirical bases and new directions. In: Turk DC, Melzack R, editors. Handbook of pain assessment. New York, NY: The Guilford Press; 2011. p. 455–73.
18. Ohrbach R, Larsson P, List T. The jaw functional limitation scale: development, reliability, and validity of 8-item and 20-item versions. J Orofac Pain. 2008;22(3):219-30. PMID: 18780535
19. Eweka OM, Ogundana OM, Agbelusi GA. Temporomandibular pain dysfunction syndrome in patients attending Lagos University teaching hospital, Lagos, Nigeria. J West Afr Coll Surg. 2016;6(1):70-87. PMID: 28344938
20. Kalladka M, Young A, Khan J. Myofascial pain in temporomandibular disorders: updates on etiopathogenesis and management. J Bodyw Mov Ther. 2021;28:104-13. https://doi.org/10.1016/j.jbmt.2021.07.015
21. Slade GD, Ohrbach R, Greenspan JD, Fillingim RB, Bair E, Sanders AE, et al. Painful temporomandibular disorder: decade of discovery from OPPERA studies. J Dent Res. 2016;95(10):1084-92. https://doi.org/10.1177/0022034516653743
22. Florjański W, Orzeszek S. Role of mental state in temporomandibular disorders: a review of the literature. Dent Med Probl. 2021;58(1):127-33. https://doi.org/10.17219/dmp/132978
23. Wieckiewicz M, Jenca A, Seweryn P, Orzeszek S, Petrasova A, Grychowska N, et al. Determination of pain intensity, pain-related disability, anxiety, depression, and perceived stress in Polish adults with temporomandibular disorders: a prospective cohort study. Front Integr Neurosci. 2022;16:1026781. https://doi.org/10.3389/fnint.2022.1026781
24. Chantaracherd P, John MT, Hodges JS, Schiffman EL. Temporomandibular joint disorders' impact on pain, function, and disability. J Dent Res. 2015;94(3 Suppl):79S-86S. https://doi.org/10.1177/0022034514565793
25. Campos López A, Miguel EE, Malo-Urriés M, Acedo TC. Mouth opening, jaw disability, neck disability, pressure pain thresholds, and myofascial trigger points in patients with disc displacement with reduction: a descriptive and comparative study. Cranio. 2021;1-7. https://doi.org/10.1080/08869634.2021.1956214
26. Ahmad M, Schiffman EL. Temporomandibular joint disorders and orofacial pain. Dent Clin North Am. 2016;60(1):105-24. https://doi.org/10.1016/j.cden.2015.08.004
27. Nowak Z, Chęciński M, Nitecka-Buchta A, Bulanda S, Iłczuk-Rypuła D, Postek-Stefańska L, et al. Intramuscular injections and dry needling within masticatory muscles in management of myofascial pain. systematic review of clinical trials. Int J Environ Res Public Health. 2021;18(18):9552. https://doi.org/10.3390/ijerph18189552
28. Ohrbach R, Bair E, Fillingim RB, Gonzalez Y, Gordon SM, Lim PF, et al. Clinical orofacial characteristics associated with risk of first-onset TMD: the OPPERA prospective cohort study. J Pain. 2013;14(12 Suppl):T33-50. https://doi.org/10.1016/j.jpain.2013.07.018
29. Feteih RM. Signs and symptoms of temporomandibular disorders and oral parafunctions in urban Saudi Arabian adolescents: a research report. Head Face Med. 2006;2:25. https://doi.org/10.1186/1746-160X-2-25
30. Okeson JP. Orofacial pain guidelines for assessment, diagnosis and management. Management of temporomandibular disorders. 1996. p. 1465.
31. Xu YM, Ge HY, Arendt-Nielsen L. Sustained nociceptive mechanical stimulation of latent myofascial trigger point induces central sensitization in healthy subjects. J Pain. 2010;11(12):1348-55. https://doi.org/10.1016/j.jpain.2010.03.010
32. Li LT, Ge HY, Yue SW, Arendt-Nielsen L. Nociceptive and non-nociceptive hypersensitivity at latent myofascial trigger points. Clin J Pain. 2009;25(2):132-7. https://doi.org/10.1097/AJP.0b013e3181878f87
33. Smardz J, Martynowicz H, Michalek-Zrabkowska M, Wojakowska A, Mazur G, Winocur E, et al. Sleep Bruxism and occurrence of temporomandibular disorders-related pain: a polysomnographic study. Front Neurol. 2019;10:168. https://doi.org/10.3389/fneur.2019.00168
34. Sinclair A, Wieckiewicz M, Ettlin D, Junior R, Guimarães AS, Gomes M, et al. Temporomandibular disorders in patients with polysomnographic diagnosis of sleep bruxism: a case-control study. Sleep Breath. 2022;26(2):941-8. https://doi.org/10.1007/s11325-021-02449-2

https://doi.org/10.1590/1806-9282.20230622ERRATUM

In the manuscript "Do myofascial trigger points in masseter muscles affect the symptoms of disc displacement with reduction? A cross-sectional study", https://doi.org/10.1590/1806-9282.20230622, published in the Rev Assoc Med Bras. 2023;69(12):e20230622, on page 3:

Where it reads:

The study protocol was approved by the XXX Ethical Board (under number KAEK/2021.11.309) in accordance with the Declaration of Helsinki.

It should read:

The study protocol was approved by the Local Ethical Board (under number KAEK/2021.11.309) in accordance with the Declaration of Helsinki.