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Evaluation of TMD signs and symptoms in individuals undergoing orthodontic treatment

Avaliação de sinais e sintomas de DTM em Indivíduos em tratamento ortodôntico

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ABSTRACT

Objective: To verify the presence of TMD signs and symptoms in patients undergoing orthodontic treatment. **Material and methods:** 28 individuals undergoing orthodontic treatment at the university clinics were selected. To assess TMD, the Research Diagnostic Criteria for Temporomandibular Disorders (RDC-TMD) was used. Pain was assessed by Visual Analogue Scale (VAS). The amplitude, sound, and pain during jaw movements, as well as pain on palpation of intra- and extraoral muscles were assessed by craniomandibular index (CMI). The pain to pressure threshold was evaluated by algometer. Mean values and standard deviation were obtained and the analysis was expressed in percentage. **Results:** RDC-TMD demonstrated that most of the individuals did not have TMD; 3.57% presented osteoarthritis, 10.71% arthralgia, 3.57% disc displacement without reduction, 7% myofascial pain, and 14.28% myofascial pain with opening limitation. The VAS evidenced average pain of 1.37 cm (SD=1.4). CMI average was 0.26 (SD = 0.14). The pain to pressure threshold measured with algometer was 3.7 (SD = 1.7) for the anterior temporal and 3.00 (SD = 1.2) for superficial masseter. **Conclusion:** It was observed TMD signs and symptoms in 39.13% of the individuals undergoing orthodontic treatment.

KEYWORDS

Orthodontics; Temporomandibular Joint Disorders; Epidemiology.

RESUMO

Objetivo: verificar a presença de sinais e sintomas de DTM em indivíduos em tratamento ortodôntico. **Material e Métodos:** foram avaliados 28 indivíduos que estavam em tratamento ortodôntico na clínica de uma faculdade do estado de São Paulo. Para identificar a presença de DTM foi utilizado o Research Diagnostic Criteria for Temporomandibular Disorders (RDC-TMD). A dor foi avaliada pela Escala Visual Analógica (EVA). A amplitude, dor e ruído durante os movimentos mandibulares, além da dor à palpação de músculos intra e extra orais e cervicais foram aferidos pelo Índice Craniomandibular (ICM). O limiar de dor à pressão foi avaliado por meio de algômetro. Os valores médios e desvio padrão foram obtidos e a análise foi expressa em porcentagem. **Resultados:** o RDC-TMD demonstrou que a maioria dos indivíduos não apresentaram DTM, que 3,57% apresentaram osteoartrite, 10,71% artralgia, 3,57% deslocamento de disco sem redução, 7% dor miofascial e 14,28% dor miofascial com limitação de abertura; A EVA evidenciou dor média de 1,37 cm (DP=1,4). A média do ICM foi de 0,26 (DP=0,14). O limiar de dor à pressão aferido com algômetro foi de 3,7 (DP=1,7) para o m. temporal anterior e de 3,00 (DP=1,2) para o feixe superficial do m. masseter inferior. **Conclusão:** foram observados sinais e sintomas de DTM em 39,13% dos indivíduos em tratamento ortodôntico.

KEYWORDS

Ortodontia; Transtornos da Articulação Temporomandibular; Epidemiologia.

INTRODUCTION

Epidemiology studies the factors determining the frequency and distribution of diseases in human population; a specific group addresses diseases of unknown etiology or etiology not fully understood [1]. The temporomandibular disorder (TMD) has the latter etiology, and it can be defined as a group of pain or not functional conditions involving the mastication muscles and/or the temporomandibular joints (TMJ) [2], divided into muscle, articular, and mixed disorders [3].

Currently, TMDs are the most prevalent condition of orofacial chronic pain and the third most prevalent chronic pain type, only behind common pains as headache and back pain [4]. Prevalence studies report that approximately 75% of the population has at least of TMD sign such as alteration in the mandibular movement, articular sound, or pain to palpation and, approximately 33% has at least on symptom as facial or joint pain [5]. The orofacial pain generated by TMD is directly related to oral health and the individual's quality of life [6], evidencing the necessity of better understanding this disorder.

TMD etiology is multifactorial and may involve unstable occlusion, malocclusion, stress, anxiety [7], depression, psychological factors, trauma, genetic predisposition, race, social status, and psychological status [8]. Over the last years, the relationship between orthodontics and TMD is increasingly gained attention. The literature still does not reach consensus [9], but some studies verified that occlusal factors play some role in TMD development [10].

The need to investigate TMD signs and symptoms in individuals undergoing or who will undergo the orthodontic treatment is based on the increasing number of lawsuits against the responsibility of orthodontists in Brazil. In some lawsuits, the patients accused the orthodontist to cause TMD during or after the orthodontic treatment [11]. It is believed that by performing the pre-, trans-, or post-treatment evaluation, the signs and symptoms the results are the same [12]. Thus, the epidemiological screening of patients undergoing orthodontic treatment is not contraindicated, although TMD signs and symptoms fluctuate are unpredictable and can appear during orthodontic treatment [13].

Taking into consideration that the epidemiologic screening of the current situation of a given population is important to plan and execute the dental prevention and treatment [14], this study aimed to analyze the prevalence of TMD signs and symptoms in individuals undergoing orthodontic treatment.

MATERIALS AND METHODS

This study was approved by the Institutional Review Board regarding the ethical aspects under protocol no. #38570414.8.0000.5508.

4.1 Sample

Twenty-eight individuals undergoing orthodontic treatment at the university clinics were evaluated according to the inclusion and exclusion criteria.

4.1.1 Inclusion criteria

To be included in the study, the patients should:

- be at complete permanent dentition (second molars) with or without pre-molar extraction;
- age between 13 and 44 years;
- Undergo corrective orthodontic treatment.

4.1.2 Exclusion criteria

To be included in the study, the patients should not:

• undergo treatment with occlusal splint

• use continually the following drugs: analgesic, anti-inflammatory, myorelaxants antidepressants, anxiolytics

4.2 Methods

4.2.1 Application of Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD)

The Research Diagnostic Criteria for Temporomandibular Disorders (RDC/ TMD) aims to identify the presence of TMDs, classifying TMD into muscular, articular, or mixed [15]. This procedure was performed by a single examiner, previously calibrated.

RDC/ TMD (Annex 1) is composed by two axes (axis I and axis II). Axis I evaluates the clinical and functional parameters; axis II assesses the psychological aspects. In this study, we used RDC/TMD axis I, composed by three parts: questionnaire on the aspects related to pain progression, which was answered by the patient him/herself; clinical examination, in which the TMD signs and symptoms were assessed, performed by a single and calibrated examiner; and flowchart, in which the questionnaire and clinical examination data were tabulated and enabled the classification of TMD type.

4.2.2 Visual Analogue Scale (VAS)

Visual Analogue Scale (VAS) is a subjective method already very studied by the literature that estimate the pain intensity [16] reported by the individual him/herself. After RDC, the individuals classified the magnitude of their pain on a linear visual scale, measuring 10 cm in length, with two thresholds on the endings: ¨with pain¨ and ¨the worst pain already felt¨.

4.2.3 Craniomandibular index (CMI)

The craniomandibular index (CMI) was developed to be used in clinical and epidemiological TMD studies, enabling to measure the objective severity of the craniomandibular symptoms and TMD and myofascial dysfunction severity. This index assessed the visual signs, the mandibular movement symptoms, and the alterations during mandibular movements with articular noises, limitations in movements and muscular and articular pain [17]. CMI has simple, clear, and defined methods aiming at quantifying the evolution of TMD signs and symptoms.

At all following-up appointments, the examiner filled in a chart with information on aspects related to muscle sensitivity (Palpation Index) and the presence of limitation or noise during the mandible's functional movements (Dysfunction Index), generating CMI, ranging from zero to one.

4.2.4 Algometer

The algometer is an instrument with which a determined force is applied on the muscles to verify the pain sensitivity of the patient against the pressure [18]. The patient was seated on dental chair, the most vertical as possible. The algometer was placed perpendicular to the muscle to be examined (anterior Temporal and superficial Masseter), and an increasing and constant pressure of approximately 0.5 kg/cm^2 / second was exerted until the patient reported a pain sensation.

At that moment, the pressure stopped and the value corresponding to the pain threshold was recorded. While the algometer was used with one hand, the other hand held the patient's head, so that he/she did not move it, which would affect the collection of the data.

4.2.5 Data analysis

Data were presented as mean and standard deviation and the results were expressed as percentage.

RESULTS

Table 1 shows the percentage of individuals with and without TMD according to RDC-TMD.

The data of VAS, CMI, and pain to pressure threshold measured by the algometer are seen in table 2.

Table 3 displays the amplitude and presence or absence of pain during excursive mandibular movements.

Table 1 - Percentage of individuals with and without TMD according to RDC-TMD.

Diagnosis	%
Myofascial pain without limitation in opening	7.00
Myofascial pain with limitation in opening	14.28
Disc displacement without reduction	3.57
Arthralgia	10.71
Osteoarthritis	3.57
without TMD	60.87

Table 2 - Mean and standard deviation values of VAS, CMI, and pain to pressure threshold (algometer).

		Mean	SD
Algometer (kg)	rT	3,78	1,7
	lT	3,77	1,78
	rM	2,9	1,28
	lM	3,06	1,23
VAS (cm)		1,37	1,4
CMI	DI	0,25	0,11
	PI	0,23	0,17
	CMI	0,26	0,14

rD- right TEMPORAL, lE- left TEMPORAL; rD- right MASSETER; lE- left MASSETER; DI – Dysfunction Index; PI- Palpation Index

Table 3 - Amplitude of mandibular opening, lateral movements, and protrusion (cm) and pain (%).

Mandibular opening	Maximum, unassisted, without pain	Mean		40.67
		SD		7.55
	Maximum, unassisted	Mean		46.92
		SD		6.34
	Maximum, assisted	Mean		48.78
		SD		6.11
Excursive mandibular movements	Right lateral movement	Mean		12.82
		SD		4.12
		Pain	yes	21.42%
			no	78.58%
	Left lateral movement	Mean		11.75
		SD		3.42
		Pain	yes	25%
			no	75%
	Protrusion	Mean		5.53
		SD		3.57
		Pain	yes	18%
			no	82%

DISCUSSION

The literature lacks evidence on the cause-effect relationship between orthodontic treatment and TMD [19]. Although very controversial, recent studies show that neither malocclusion nor orthodontic mechanics predisposes to TMD [20] regardless of the extraction of the pre-molars [21]. Indeed, longitudinal studies10 do not reveal TMD symptoms occurring during the treatment. After 20-year following-up period [22], the only factors identified were greater TMD prevalence in females and greater prevalence of TMD signs and symptoms at adolescence.

Although no scientific evidence shows that orthodontic treatment is a risk factor for TMD development, there are evidences on the positive effect of proper orthodontic treatment during childhood on TMJ function during adult life [23]. The muscular signs improved after orthodontic treatment of Class II malocclusions [10], which can be explained by the greater occlusal stability due to the reduction of interferences and increase of occlusal contacts after treatment. This improvement in muscular discomfort can be observed during the orthodontic treatment, probably due to the decrease in the activity of the masticatory muscles caused by the increasing in tooth sensitivity associated to orthodontic mechanics [10].

This study allowed to recognize the population treated at the orthodontic clinics of the institution regarding the presence of TMD signs and symptoms. Thus, preventive measures and collective actions can be adopted aiming at TMD treatment and a better quality of life of the patients. RCD-TMD [21], as already reported, was adequate for TMD diagnosis [10]. The standardization of the diagnosis criteria is of extreme importance to make easy the assessment and comparison of the research's results. After the application of RDC-TMD, the patients were classified as follows: Group 1 (muscular disturbs) = 21.42%; Group II (disc displacement) = 3.57%; and Group III (arthralgia, osteoarthritis, osteoarthrosis) = 25%. A review study on general population [24] (n=2,491) observed the prevalence of 9.7% of group I, 11.4% of group II, and 2.6% of group III. The literature reports low TMD index [12]: 1% of group I, 3% of group II, and 1% of group III, of 200 individuals randomly selected.

In this study, the pain measured by VAS was in average 1.37 cm (SD=1.4), which was very below that of a research on tension headache and TMD (4.10 cm and 1.95 cm, TMD pre-treatment and post- treatment, respectively) [25].. Pain to pressure threshold mean value of the muscles analyzed through the algometer was 3.73kgf/cm^2 for anterior Temporal and 2.93 kgf/cm^2 for superficial Masseter. This result was different from that of other study [26], in which the authors found 1.5 kgf/cm^2 for superficial Masseter and 2.66 kgf/cm^2 for anterior Temporal. The mean CMI was 0.27, in this study, a value very smaller than that of other study [27].

It is very likely that TMD signs and symptoms begin during the orthodontic treatment due to synchronicity, but not to orthodontic treatment itself. The rationale behind this fact is that the age of patients seeking orthodontic treatment matches the age range of greater TMD prevalence [23]. TMD signs and symptoms seem to increase with age, mainly from adolescence to menopause, and therefore, TMD begins during the orthodontic treatment, unrelated to it DTM [28].

Some studies attempted to assess the possible effect of occlusal factors on TMD development [10]. Possibly, occlusal factors play little etiologic role in pain and functional alterations of the stomatognathic system, but the literature lacks consensus on the role of occlusal problems in TMD etiology [22].

Based on the literature and on the results of this study, it can be concluded that the orthodontic treatment does not increase TMD signs and symptoms, and therefore, the orthodontic treatment is not a risk factor for TMD development. Possibly, individuals having TMD signs and symptoms during the evaluation already had them prior to orthodontic therapy. Thus, it is recommended referring these patients, during or after orthodontic treatment, to undergo therapies aiming at decreasing pain and maintaining TMJ health.

CONCLUSION

TMD signs and symptoms occurred in 39.13% of the individuals undergoing orthodontic treatment, with low pain prevalence (VAS) and low CMI. The mean pain to pressure threshold was 3.7 kgf/cm^2 for anterior Temporal and 3.00 kgf/cm^2 for superficial Masseter, which are considered within the normal standards of healthy individuals.

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