

# THE OCCURRENCE OF TEMPOROMANDIBULAR DISORDERS IN SUBJECTS PRESENTED WITH DENTOFACIAL DEFORMITIES

## *Ocorrência de disfunção temporomandibular em indivíduos com deformidade dentofacial*

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### ABSTRACT

**Purpose:** to investigate the occurrence of temporomandibular dysfunction in subjects with dentofacial deformity. **Methods:** 60 subjects of both sexes and aged between 18 and 40 years (mean = 27 years) and formed two groups, one composed of 30 subjects with dentofacial deformity undergoing presurgical orthodontic treatment were evaluated and a control group consisted of 30 individuals with dentofacial balance, paired to dentofacial group, according to gender and age. Anamnestic questionnaire of temporomandibular dysfunction and Axis 1 of Research Diagnostic Criteria for Temporomandibular Disorders were applied, respectively, so as to verify and rate the degree and type of temporomandibular disorders. **Results:** the results of the questionnaire demonstrated that dentofacial group presented a greater dysfunction degree and score than control group ( $p < 0.01$ ). From the Research Diagnostic Criteria for Temporomandibular Disorders, a greater occurrence of diagnoses involving disc displacement ( $p = 0.02$ ) and arthritis, arthrosis and arthralgia ( $p < 0.01$ ) for dentofacial group, in relation to control group, was verified. **Conclusion:** individuals with dentofacial deformity had increased incidence of temporomandibular dysfunction, compared with individuals with dentofacial equilibrium, in the sample studied.

**KEYWORDS:** Temporomandibular Joint Disorders; Maxillofacial Development; Malocclusion

### ■ INTRODUCTION

Dentofacial deformity (DFD) is the result of alterations in the growth and development of facial bones, leading to changes in the position of the teeth and the occlusion, as well as in facial aesthetics, oral functions and function of other structures such as articulations, muscles, teeth and periodontal ligament <sup>1</sup>. The pre-surgical orthodontic

treatment promotes alignment and leveling of the teeth within their bone bases, correcting all possible dental compensation, aiming at the future balance between the mandible and maxilla<sup>2,3</sup>, as well as facial and dental harmony, with functional occlusion and stability of the orofacial structures, following the orthognathic surgery<sup>4</sup>.

Cases of temporomandibular dysfunction (TMD) can be found, associated with the presence of dental occlusal imbalance<sup>5-7</sup>, corresponding to the generic term of a clinical set of signs and symptoms involving the masticatory muscles, the temporomandibular joint (TMJ) and associated structures<sup>8-10</sup>. The etiology of this dysfunction is multifactorial, however, the literature has stated that the presence or absence of occlusal changes, necessarily, does not cause signs and symptoms of TMD<sup>11-14</sup>.

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The presence of TMD has been largely discussed in all stages of DFD treatment, and the literature shows that subjects present a high rate of TMD signs and symptoms in the pre-surgical orthodontic treatment phase as compared to post-surgical one<sup>15-22</sup>. Nevertheless, although some authors have verified a reduction in the occurrence of TMD in individuals, following the orthognathic surgery, they report no relationship between dentofacial deformities and TMD<sup>23,24</sup>.

Studies relating TMD and DFD abound in the literature, however, most compare their findings between preoperative and postoperative periods, some being contradictory, therefore, impairing the understanding of professionals regarding the treatment of TMD in subjects with or without occlusal changes. Thus, this study aimed at verifying the occurrence of temporomandibular dysfunction in individuals presented with dentofacial deformity.

## METHODS

This observational cross-sectional study was approved by the research ethics committee of the Bauru School of Dentistry, University of São Paulo (process 049/2009) and all participants signed the informed consent.

Sixty subjects in the age range 18-40 years (mean = 27 years), participated in the study, taking into account the following exclusion criteria: intellectual deficits, neurological, psychiatric disorders and / or syndromes, arthritis, history of facial trauma and prior orthognathic surgery. The participants were divided into two groups:

The group with DFD (GDFD), which consisted of 30 subjects, 19 females and 11 males, in their final stage of the preparatory orthodontic treatment for the orthognathic surgery, 19 female and 11 male. Out of these individuals, 18 presented facial pattern III (12 females and six males) and 12, facial pattern II (seven females and five males). The inclusion criteria were: being in pre-surgical orthodontic treatment and present DFD, as diagnosed by clinical and radiographic exams.

The group with no deformity, control group (CG), comprised 30 individuals paired according to gender and age with the DFDG. They underwent interviews and orofacial myofunctional assessment through the MBGR – orofacial myofunctional examination<sup>25</sup>, so as to see if they met the following inclusion criteria: to present good general health, absence of rheumatic diseases, no DFD, good relationship between dental arches, with vertical and horizontal overlap between 1 and 3 mm, natural teeth at least up the second molar, middle facial type, nasal breathing. An anamnesis questionnaire containing

10 questions asked by a single researcher, in order to rate TMD in terms of presence and degree, was applied. Three answers are offered to the questions: “yes”, “no” or “sometimes”, and a value is assigned. The sum of the values (scores) allows sample classification by TMD (TMD index). Values from 0 to 3 indicate the absence of TMD (0); values from 4 to 8, the presence of mild TMD; 9 to 14, moderate TMD; and severe TMD, when the sum of the values of the responses was between 15 and 23<sup>26</sup>. For the results of this questionnaire, the subjects in both groups were classified according to TMD index (no TMD, mild, moderate or severe TMD) and individual scores, i.e., the values obtained from the sum of the responses.

The subjects underwent clinical exam as well – Axis 1 of the *Research Diagnostic Criteria for Temporomandibular Disorders* (RDC/TMD), for classification based on the signs and symptoms of TMD, this examination being performed by a single researcher. Based on the specifications of the RDC / TMD, the clinical evaluation assessed the following aspects: opening pattern, extent of mandibular movement (opening, laterality, protrusion), overbite, noise and pain in the TMJs during mandibular extension movements, muscular and articular palpation. From the data collected, the individuals were diagnosed and classified according to the examination criteria, into: GI – muscular diagnoses, GII – disc displacement and GIII – arthralgia, arthritis, arthrosis. The data were tabulated in a database and analyzed, statistically, using Mann-Whitney and Chi-square. The Mann-Whitney test was used for comparison, between the two groups (DFDG and CG), of the procedure with ordinal qualitative variable (anamnesis questionnaire), using the TMD index rating (no TMD, mild, moderate or severe TMD) and the individual scores.

On the other hand, the Chi-square test was used for comparison, between the two groups (DFDG and CG), of items with nominal variable (RDC / TMD), using the classification, according to the diagnosis according to the examination criteria: GI – muscular diagnosis, GII – disc displacement, and GIII – arthralgia, arthritis, arthrosis. Data analysis was performed by using the Statistica V.5.3 software, Statsoft Inc., Tulsa, USA, with a significance level of 5% ( $p < 0.05$ ).

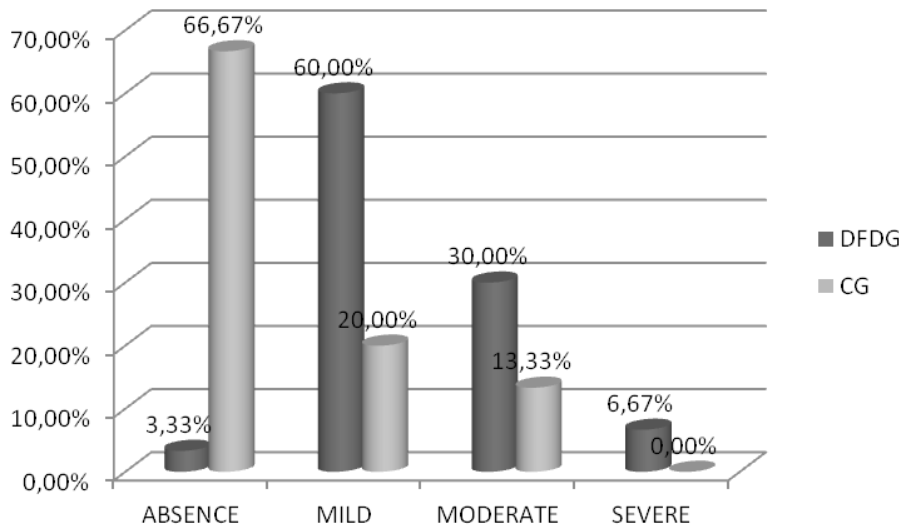
## RESULTS

Figure 1 shows the results of using the anamnesis questionnaire, in which the predominance of the absence of TMD (66,67%) and the mild degree (20,00%) of this dysfunction when present for the CG, is observed. Mild (57.00%), moderate

(30.00%) and severe (6.67%) degrees were seen in the DFDG.

Table 1 shows the average and median values of the results obtained with an anamnesis questionnaire, when comparing DFDG and CG. A statistically

significant difference ( $p = 0.00$ ) was observed between the groups, based on the results, showing that the DFD group presented a higher degree and score of TMD than the CG.



**Figure 1 – Percentage of individuals, according to the presence and severity of temporomandibular dysfunction, for the groups with dentofacial deformity and control group**

**Table 1 – Comparison between group of dentofacial deformity (DFDG) and control group (CG), in relation to the degree and scores of TM, obtained the application of anamnestic questionnaire**

	Group	Mean	Median	Value of “p”
<b>Degree of TMD</b>	<b>CG</b>	0.47	0.00	0.00*
	<b>DFDG</b>	1.47	1.00	
<b>Scores</b>	<b>CG</b>	3.17	2.50	0.00*
	<b>DFDG</b>	8.50	7.50	

Subtitles: CG – control group; DFDG – group of dentofacial deformity; TMD – temporomandibular dysfunction. \*Statistically significant difference. *Mann-Whitney Test*.

Table 2 shows the results obtained by applying the clinical examination of the RDC / TMD. It was found that A higher occurrence of different TMD diagnoses was found for the DFD group in relation to

the controls, with a statistically significant difference between the groups only for articular diagnoses GII ( $p = 0.02$ ) and GIII ( $p = 0.00$ ).

**Table 2 – Comparison between group of dentofacial deformity (DFDG) and control group (CG), in relation to the diagnosis of TMD, considering the classification of the clinical exam of *Research Diagnostic Criteria for Temporomandibular Disorders***

Group	RDC/TMD		Value of “p”
	GI		
	YES	NO	
CG	09 (30.00%)	21 (70.00%)	0.11
DFDG	15 (50.00%)	15 (50.00%)	
	GII		
	YES	NO	
CG	11 (36.67%)	19 (63.33%)	0.02*
DFDG	20 (66.67%)	10 (33.33%)	
	GIII		
	YES	NO	
CG	12 (40.00%)	18 (60.00%)	0.00*
DFDG	24 (80.00%)	06 (20.00%)	

Subtitles: control group; DFDG – group of dentofacial deformity; RDC/TMD – *Research Diagnostic Criteria for Temporomandibular Disorders*; GI: Muscular diagnoses; GII: Disc displacement; GIII: Arthralgia, arthritis, arthrosis. \*Statistically significant difference. Chi-square test

## ■ DISCUSSION

The importance of occlusion and its relationship between the cause or maintenance of TMD cases, compared with other factors, specifically in individuals presented with DFD, has been widely discussed in the literature<sup>15, 27-29</sup>. The present study found that 97% of subjects with DFD showed some degree of TMD, while in the CG, the percentage of this disorder was 33%, which may be linked to the fact that TMD symptoms such as pain, are often the main complaint of patients presented with malocclusion<sup>30</sup>.

According to the literature, individuals who have certain occlusal problems, mainly the most severe ones, as that studied here, have an expressively higher prevalence of TMD signs and symptoms than subjects with normal occlusion normal<sup>29</sup>, owing to an interdependence between the conditions of the teeth and bones, since a normally functioning TMJ relies on good occlusion<sup>31</sup>.

Furthermore, a statistically significant result has been observed, when comparing the severity of the dysfunction between DFDG and CG, for the degree of TMD and scores obtained by applying the anamnesis questionnaire, showing a greater occurrence of TMD, to some degree, in the DFDG, as compared to the CG. Thus, the findings of this study are consistent with the data in the literature, since different authors have observed a prevalence of TMD signs and symptoms in subjects presented with DFD, in the pre-surgical orthodontic period, as

compared to controls<sup>18,19,20,29</sup>. It is worth noting the methodological differences between the studies, as in the literature, other instruments have been used, different from the anamnesis questionnaire applied in this research, nevertheless, they used the clinical exam of TMJs, analogue visual scale, Helkimo's anamnesis and dysfunction index or applied the RDC / TMD protocol. As for the diagnosis of TMD, held from the application of the clinical examination (axis I) of the RDC / TMD protocol, a higher occurrence of articular diagnoses GII (disc displacement) was revealed and GIII (arthritis, arthralgia and arthrosis), for the DFD group, as compared to the control group. Corroborating the results of this study, Farella et al., Farella et al.<sup>18</sup>, using RDC/TMD only in individuals with DFD, found that 50% of the subjects presented articular diagnosis (GII). However, according to Abrahamsson et al.<sup>29</sup>, a different result was seen, using the same test protocol, with a prevalence of muscular TMD diagnosis (GI) in individuals presented with DFD, as compared to the control group with normal occlusion, with statistical significance among the three types of diagnoses (GI, GII and GIII), when the groups were compared. The differences in relation to the present study may be justified by the fact that, in the study by Abrahamsson et al.<sup>29</sup>, despite the larger sample, the control group was not matched by gender and age. The prevalence of articular diagnoses (GII and GIII) in subjects with DFD, in this study, can be attributed to the skeletal and dental imbalance in these individuals, which is not present in the controls, since internal changes in the TMJs of

individuals presented with DFD are reported in the literature<sup>15,16,32</sup>.

Thus, the disharmony caused by DFD can influence the correct position and function of the TMJ, in the period prior to the orthognathic surgery, since occlusal interferences or severe malocclusion may be involved in the multifactorial etiology of TMD<sup>33</sup>.

However, special attention should be taken into account in the assessment of the results, for this research is part of a cross-sectional study, thus, a cause and effect relationship between the variables (dentofacial deformity and temporomandibular dysfunction) studied cannot be assumed.

It is known that many of the TMD events, including the articular ones (present in a good portion of the sample) can lead to secondary occlusal changes because they cause postural changes of the mandible, with a significant impact on dental occlusion.

Thus, interdisciplinary assistance, in all phases of the orthodontic-surgical treatment is necessary, since the etiology of TMD has multi-factorial origins and needs continuous monitoring of all causal factors for a better prognosis, aiming at the best approach to treat these patients.

## ■ CONCLUSION

This study showed that individuals presented with dentofacial deformity had an increased incidence of temporomandibular dysfunction in relation to the degree and classification of the dysfunction, as compared to patients with dentofacial balance, in the sample.

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## RESUMO

**Objetivo:** verificar a ocorrência de disfunção temporomandibular em indivíduos com deformidade dentofacial. **Métodos:** foram avaliados 60 indivíduos de ambos os gêneros e idade entre 18 e 40 anos (média=27 anos), sendo formados dois grupos, um composto por 30 sujeitos com deformidade dentofacial, em tratamento ortodôntico pré-cirúrgico e um grupo controle constituído por 30 indivíduos com equilíbrio dentofacial, pareados segundo o gênero e a idade com o grupo deformidade. Para avaliação da articulação temporomandibular, foram aplicados o questionário anamnésico de disfunção temporomandibular e o Eixo 1 do *Research Diagnostic Criteria for Temporomandibular Disorders* para verificar e classificar o grau e o tipo da disfunção temporomandibular, respectivamente. **Resultados:** os resultados da aplicação do questionário demonstraram que o grupo com deformidade apresentou maior grau e escore da disfunção que o grupo controle ( $p<0,01$ ). A partir do *Research Diagnostic Criteria for Temporomandibular Disorders* verificou-se maior ocorrência de diagnósticos de deslocamento de disco ( $p=0,02$ ) e de artrite, artralgia e artrose ( $p<0,01$ ) no grupo com deformidade em relação ao grupo controle. **Conclusão:** indivíduos com deformidade dentofacial apresentaram maior ocorrência de disfunção temporomandibular, quando comparados aos indivíduos com equilíbrio dentofacial, na amostra estudada.

**DESCRITORES:** Transtornos da Articulação Temporomandibular; Desenvolvimento Maxilofacial; Má Oclusão

## ■ REFERENCES

1. Gonçalves ES. Cirurgia ortognática: guia de orientação para portadores de deformidades faciais esqueléticas. São Paulo: Editora Santos; 2010.
2. Manganello LCS, Silveira ME, Cappellette M, Garducci M, Lino AP. Cirurgia ortognática e ortodontia. São Paulo: Santos; 1998.
3. Hall B, Jamsa T, Soukka T, Peltomaki T. Duration of surgical-orthodontic treatment. Acta Odontol Scand. 2008;66(5):274-7.
4. Okasaki LK. Quando indicar uma cirurgia ortognática. In: Araújo A, organizador. Cirurgia Ortognática. São Paulo: Santos; 1999. P.7-18.
5. Wigdorowicz-Makowerowa N, Grodzki C, Panek H, Ma'slanka T, Plonka K, Palacha A. Epidemiologic



- studies on prevalence and etiology of functional disturbances of the masticatory system. *J Prosthet Dent.* 1979;41(1):76-82.
6. Gesch D, Bernhardt O, Mack F, John U, Kocher T, Alte D. Association of malocclusion and functional occlusion with subjective symptoms of TMD in adults: results of the Study of Health in Pomerania (SHIP). *Angle Orthod.* 2005;75(2):183-90.
  7. Conti ACCF, Freitas MR, Conti PCR. Avaliação da posição condilar e disfunção temporomandibular em pacientes com má oclusão de classe III submetidos à protrusão mandibular ortopédica. *R Dental Press Ortodon Ortop Facial.* 2008;13(2):49-60.
  8. Thilander B, Rubio G, Pena L, de Mayorga C. Prevalence of temporomandibular dysfunction and its association with malocclusion in children and adolescents: an epidemiologic study related to specified stages of dental development. *Angle Orthod.* 2002;72(2):146-54.
  9. Oliveira AS, Dias EM, Contato RG, Berzin F. Prevalence study signs and symptoms of temporomandibular disorder in Brazilian college students. *Braz Oral Res.* 2006;20 (1):3-7.
  10. Okeson JP. Management of temporomandibular disorders and occlusion. 6th ed. St.Louis: Elsevier; 2008.
  11. Valle-Corotti KM, Pinzan A, Conti PCR, Janson G. A oclusão e a sua relação com as disfunções temporomandibulares (DTM) em jovens com e sem tratamento ortodôntico: um estudo comparativo. *Revista Dental Press Ortodon.* 2003;8(6):79-87.
  12. Al-Ani MZ, Davies SJ, Gray RJ, Sloan P, Glenn AM. Stabilisation splint therapy for temporomandibular pain dysfunction syndrome. *Cochrane Database Syst Rev.* 2004;(1):CD002778. Review.
  13. Koh H, Robinson PG. Occlusal adjustment for treating and preventing temporomandibular joint disorders. *J Oral Rehabil.* 2004;31(4):287-92. Review.
  14. Mohlin B, Axelsson S, Paulin G, Terttu P, Bondemark L, Brattstrom V, et al. TMD in relation to malocclusion and orthodontic treatment. *Angle Orthodontist.* 2007;77(3):542-8.
  15. Wolford LM, Karras S, Mehra P. Concomitant temporomandibular joint and orthognathic surgery: a preliminary report. *J Oral Maxillofac Surg.* 2002;60(4):356-62.
  16. Wolford LM, Reiche-Fischel O, Mehra P. Changes in temporomandibular joint dysfunction after orthognathic surgery. *J Oral Maxillofac Surg.* 2003;61(6):655-60.
  17. Aoyama S, Kino K, Kobayashi J, Yoshimasu H, Amagasa T. Clinical evaluation of the temporomandibular joint following orthognathic surgery – multiple logistic regression analysis. *J Med Dent Sci.* 2005;52:109-14.
  18. Farella M, Michelotti A, Bocchino T, Cimino R, Laino A, Steenks MH. Effects of orthognathic surgery for class III malocclusion on signs and symptoms of temporomandibular disorders and on pressure pain thresholds of the jaw muscles. *Int J Oral Maxillofac Surg.* 2007;36(7):583-7.
  19. Pahkala RH, Kellokoski JK. Surgical-orthodontic treatment and patients' functional and psychosocial well-being. *Am J Orthod Dentofacial Orthop.* 2007;132(2):158-64.
  20. Oland J, Jensen J, Melsen B. Factors of importance for the functional outcome in orthognathic surgery patients: a prospective study of 118 patients. *J Oral Maxillofac Surg.* 2010;68(9):2221-31.
  21. Ramieri G, Piancino MG, Frongia G, Gerbino G, Fontana PA, Debernardi C, et al. Clinical and instrumental evaluation of temporomandibular joint before and after surgical correction of asymptomatic skeletal class III patients. *J Craniofac Surg.* 2011;22(2):527-31.
  22. Silva MMA, Ferreira AT, Migliorucci RR, Nary Filho H, Berretin-Felix G. Influência do tratamento ortodôntico-cirúrgico nos sinais e sintomas de disfunção temporomandibular em indivíduos com deformidades dentofaciais. *Rev Soc Bras Fonoaudiol.* 2011;16(1):80-4.
  23. Panula K, Somppi M, Finne K, Oikarinen K. Effects of orthognathic surgery on temporomandibular joint dysfunction. A controlled prospective 4-year follow-up study. *Int J Oral Maxillofac Surg.* 2000;29(3):183-7.
  24. Dervis E, Tuncer E. Long-term evaluations of temporomandibular disorders in patients undergoing orthognathic surgery compared with a control group. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2002;94(5):554-60.
  25. Genaro KF, Berretin-Felix G, Rehder MIBC, Marchesan IQ. Avaliação miofuncional orofacial – protocolo MBGR. *Rev CEFAC.* 2009;11(2):237-55.
  26. Conti PC, Ferreira PM, Pegoraro LF, Conti JV, Salvador MC. A cross-sectional study of prevalence and etiology of signs and symptoms of temporomandibular disorders in high school and university students. *J Orofac Pain.* 1996;10(3):254-62.
  27. Egermark I, Blomqvist JE, Cromvik U, Isaksson S. Temporomandibular dysfunction in patients treated with orthodontics in combination with orthognathic surgery. *Eur J Orthod.* 2000;22(5):537-44.
  28. Felício CM de, Braga APG. Sinais e sintomas de desordem temporomandibular em pacientes orto-cirúrgicos. *J Bras Ortodon Ortop Facial.* 2005;10(56):187-94.
  29. Abrahamsson C, Ekberg E, Henrikson T, Nilmer M, Sunzel B, Bondemark L. TMD in consecutive patients referred for orthognathic surgery. *Angle Orthod.* 2009;79(4):621-7.

30. Mazzone N, Matteini C, Incisivo V, Belli E. Temporomandibular joint disorders and maxillomandibular malformations: role of condylar “repositionin” plat. *J Craniofc Surg.* 2009;20(3):909-15.
31. Madeira MC. Anatomia da Face – Bases Anátomo-Funcionais para a Prática Odontológica. São Paulo: Sarvier; 1998.
32. Toll DE, Popovic N, Drinkuth N. The use of MRI dignostics in orthognathic surgery: prevalence of TMJ pathologies in Angle Class I, II, III patients. *J Orofac Orthop.* 2010;71(1):68-80.
33. Bourzgui F, Sebbar M, Nadour A, Hamza M. Prevalence of temporomandibular dysfunction in orthodontic treatment. *Int Orthod.* 2010;8(4):386-98.

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