

Orthodontics as a therapeutic option for temporomandibular disorders: A systematic review

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Objective: Orthodontics as an option for treatment and prevention of Temporomandibular Disorders (TMD) is a topic that has generated discussion over time. While an occlusion current defends Orthodontics as an alternative to treatment, another current defends more conservative and reversible treatments. The objective of this study, through a systematic literature review, was to analyze the relationship between Orthodontics and TMD, checking the effects of orthodontic therapy in treatment and prevention of TMD.

Methods: Survey in research bases: MEDLINE, Cochrane, EMBASE, Pubmed, Lilacs and BBO, between the years of 1966 and May 2009, with focus in randomized clinical trials, non-randomized prospective longitudinal studies, systematic reviews and meta-analysis was performed.

Results: After application of the inclusion criteria 11 articles were selected, 9 which were non-randomized prospective longitudinal studies, 1 randomized clinical trial and 1 systematic review.

Conclusions: According to the literature, there is a lack of specific studies that evaluated Orthodontics as an option for treatment and prevention of TMD. Thus the data conclude that there is no significant scientific evidences that orthodontic treatment treats or prevents TMD.

Keywords: Temporomandibular joint dysfunction syndrome. Temporomandibular joint disorders. Craniomandibular disorders. Temporomandibular joint. Orthodontics. Dental occlusion.

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INTRODUCTION

The relationship between orthodontic treatment and Temporomandibular Disorders (TMD) consists of a subject that raises doubts about the real role of Orthodontics in treatment and prevention of TMD. In the recent past, dental occlusion was considered the main causal factor of TMD, and orthodontic treatment consisted a primary therapeutic measure for a physiologic restoration of the stomatognathic system. Over time, the etiology of TMD has been considered as multifactorial, being associated with other contributing factors such as the presence of parafunctional habits, anatomical and neuromuscular factors, systemic changes, psychological conditions and postural alterations.^{3,21}

With the accomplishment of studies with adequate designs and precise and rigorous methodological criteria, the interface Orthodontics–TMD can be analysed critically. Thus, the general aim of this study, through a systematic literature review, was to analyse in a context of a scientific evidence based Dentistry, the inter-relation of TMD and Orthodontics, and specifically assess the effects of orthodontic therapy in the treatment and prevention of TMD.

MATERIAL AND METHODS

We performed a computerized search in MEDLINE, Cochrane, EMBASE, PubMed, Lilacs and BBO in the period from 1966 to May 2009. The research descriptors used were “orthodontics”, “orthodontic treatment”, “temporomandibular disorder,” “temporomandibular joint”, “cranio-mandibular disorder”, “TMD,” “TMJ,” “malocclusion” and “dental occlusion”, which were crossed in search engines. The initial list of studies was subjected to review by two reviewers, who applied inclusion criteria to determine the final sample of articles, which were assessed by their title and abstract. If there was any disagreement between the results of the reviewers, a third appraiser would participate by reading the full version of the article.

Inclusion criteria for selecting articles were:

- » Studies which evaluated the effectiveness of orthodontic treatment in the treatment and prevention of Temporomandibular Disorders (TMD), and in which Orthodontics was compared to no treatment, placebo, oral appliances,

pharmacological treatment and physical and relaxation therapies.

- » Studies in which orthodontic treatment is already completed in the samples.
- » Randomized clinical trials (RCTs), non-randomized prospective longitudinal studies, systematic reviews and meta-analysis.
- » Studies written in English and published between 1966 and May 2009.

Thus, we excluded case reports, case series, cross-sectional studies, simple reviews and authors opinions, as well as studies in which the orthodontic treatment has not been completed.

RESULTS

After applying the inclusion criteria 11 studies were obtained and the Kappa index of agreement between reviewers was 1.00. Of these, nine were non-randomized prospective longitudinal studies, one was a randomized clinical trial and one was a systematic review (Fig 1).

The sample of selected articles are presented in Tables 1 and 2.

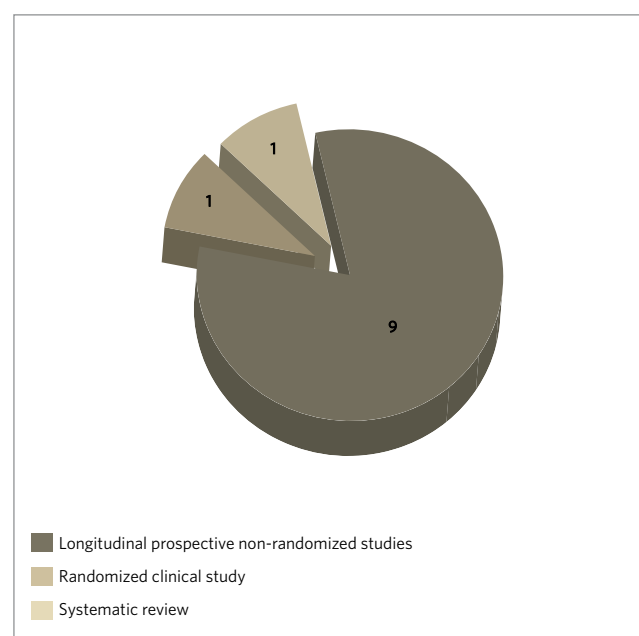


Figure 1 - Design of included studies.

Table 1 - Included studies design.

Authors	Year of publication	Study design	Sample size (N)	Control	Orthodontic appliance type
Egermark and Thilander ⁶	1992	P, L	402 mixed	Yes	FA, F
Rendell et al ²²	1992	L	- 451 without TMD - 11 with TMD	No	F
Egermark and Ronnerman ⁵	1995	L	50 tt - 135 no tt	Yes	FA, F
Keeling et al ¹⁵	1995	RCT	60 tt Bionator - 71 tt AEB - 60 no tt	Yes	FA
Olsson and Lindqvist ²⁰	1995	P, L	210 tt	No	F
Mcnamara and Turp ¹⁷	1997	SR	21 studies	-	FA, F
Henrikson et al ¹³	1999	P, L	65 tt	No	F
Henrikson and Nilner ¹¹	2000	P, L	65 tt - 58 no tt (Class II) - 60 no tt (normal)	Yes	F
Henrikson et al ¹⁴	2000	P, L	65 tt - 58 No tt (Class II) - 60 no tt (normal)	Yes	F
Henrikson and Nilner ¹²	2003	P, L	65 tt - 58 no tt (Class II) - 60 no tt	Yes	F
Mohlin et al ¹⁸	2004	P, CC	72 without TMD - 62 with TMD	Yes	FA, F

P: prospective, L: longitudinal, RCT: randomized clinical trial; SR: systematic review; CC: case-control; tt: treatment, F: fixed appliances; FA: functional appliances; H: headgear; NS: Not specified.

Table 2 - Included studies Results

Authors	Time of assessment	Diagnostic criteria for TMD	Main objective of the study	Relationship between Orthodontics and TMD
Egermark and Thilander ⁶	10 years	Questionnaire, Helkimo index	TMD prevalence in patients orthodontically treated and untreated	Treated patients: Lower prevalence of TMD
Rendell et al ²²	During tt	Helkimo index	Orthodontics as a risk factor for TMD?	Improvement in patients with TMD
Egermark and Ronnerman ⁵	Before, during, after tt	Questionnaire, Helkimo index	TMD prevalence in patients orthodontically treated and untreated	Improvement of the signs and symptoms of TMD and headaches
Keeling et al ¹⁵	Follow-up of 2 years	TMJ sound and pain, muscle pain	Orthodontics as a risk factor for TMD?	Bionator: improvements in capsular pain in some children
Olsson and Lindqvist ²⁰	After tt	Questionnaire, Helkimo index	Influence of orthodontic treatment on mandibular function	Improvement in patients with TMD
Mcnamara and Turp ¹⁷	-	-	The role of Orthodontics in the development, prevention and treatment of TMD	Lack of reliable scientific evidence
Henrikson et al ¹³	Before, during, after tt and 1 year after 1st evaluation	Signs and symptoms	Prevalence of signs and symptoms of TMD before, during and after tt	Decrease in symptoms and muscle sensitivity to palpation
Henrikson and Nilner ¹¹	2 years after 1st evaluation	Symptoms (headaches, pain, TMJ sound)	Prevalence of TMD symptoms in patients orthodontically treated and not treated	Improvement of symptoms of TMD
Henrikson et al ¹⁴	2 years after 1st evaluation	Signs (mandibular movements, pain, TMJ sound)	Prevalence of TMD signs in patients orthodontically treated and not treated	Improvement of signs of muscle TMD
Henrikson and Nilner ¹²	Beginning, after 1 and 2 years of tt and 1 year after the end of tt	Signs and symptoms	Prevalence of TMD signs and symptoms in patients orthodontically treated and not treated	Improvement of signs and symptoms of muscle TMD
Mohlin et al ¹⁸	Performed at 19 and 30 years old	Questionnaire, clinical assessment, psychological status	The role of Orthodontics in the development, prevention and treatment of TMD	Without evidence that Orthodontics is a preventive therapy for TMD

tt: treatment; MM: mandibular movements; NS: not specified.

DISCUSSION

The knowledge about the methodological criteria that qualify the scientific research becomes increasingly necessary in the current context of a scientific evidence based Dentistry. Thus, appropriate study designs, associated with methodological criteria such as randomization, calibration, sample size calculation, blinding, control factors, pairings for sex and age, among others, qualify the evidence generated and provide more precise scientific information.²³ This knowledge is important, since most publications in national journals are studies of low potential for direct clinical application.¹⁹

Likewise, the design of clinical trials allows a qualification of scientific evidence generated. Cross-sectional studies allow the study of associations that identify risk indicators and generate hypotheses. Subsequently, these hypotheses need to be tested in longitudinal studies to identify true risk factors²⁴. Due to this fact, the methodology of this systematic review included only longitudinal studies, systematic reviews and meta-analysis.

The results of this systematic review demonstrate a very limited number of specific studies about the role of orthodontic treatment in patients with signs and symptoms of TMD. Much of the selected studies aimed to evaluate first Orthodontics as a causal factor for the development of TMD, and secondarily to verify its role in the prevention and treatment of TMD. With this lack of clinical studies and significant evidences, such as RCTs, systematic reviews and meta-analysis, it becomes difficult to obtain accurate conclusions and extrapolate the results to the general population.

Some studies were suggestive of improvement in cases of TMD due to orthodontic treatment.^{5,6,11-15,20,22} However, the results of these publications are subjective, since the main objective of most of these studies was to assess the prevalence of TMD in patients treated or not treated orthodontically^{5,6,11-14} or evaluate Orthodontics as possible risk factor for development of TMD.^{15,22} Thus, these publications had limitations, due to its main objective and the sample size of patients with pretreatment TMD. Still, other studies have proposed to specifically assess Orthodontics as a therapeutic option for muscular TMD, but as there was no reevaluation at the end of treatment, they were not included in this systematic review.^{1,2}

The studies that suggest a lower prevalence of TMD in orthodontically treated patients when compared to untreated individuals, showed greater benefit in muscle TMD,^{12,13,14} while only one study related improvements in joint pain¹⁵ In relation to the preventive role of orthodontic treatment in the development of TMD, some studies correlate this association in a positive⁶ and others in a negative way.^{17,18} But the systematic analysis of the literature demonstrates a lack of specific scientific evidence about the performance of orthodontic treatment in the treatment and prevention of TMD.^{17,18}

Still, there is need for further controlled randomized clinical trials with rigorous methodological criteria and with the specific objective of assessing orthodontic therapy as a treatment option in patients with TMD. However, the difficulty of conducting RCTs involving Orthodontics and TMD is known, due to ethical and practical reasons¹⁶. Moreover, it is important to adopt universal and standardized diagnostic criteria for TMD, which would contribute to reducing the heterogeneity of the results obtained in various studies, since there are different diagnostic criteria: Craniomandibular Index,^{7,8} Helkimo Index,^{9,10} variations and adaptations of these and more recently the RDC/TMD.⁴

Therapies that change the occlusal pattern in a definitive manner, such as orthodontic treatment and occlusal adjustment, are not indicated and supported by significant scientific evidences as initial protocols of treatment for TMD. In patients with Temporomandibular Disorders conservative and reversible treatments as the initial protocol should be adopted, and then after their control and management, check the necessity of providing orthodontic procedures and prosthetic rehabilitation.

CONCLUSIONS

- » There is no specific evidence based on randomized clinical trials, systematic reviews and meta-analysis, that orthodontic therapy is a therapeutic option for treatment, control and prevention of TMD.
- » Some studies have demonstrated improvement in signs and symptoms of TMD in patients undergoing orthodontic treatment when compared to individuals who did not

receive Orthodontics. However, these results are only suggestive, since it had limitations in relation to sample size and the main objective of the study.

- » There is a need to assess Orthodontics as treatment and as prevention option for TMD

based on studies with appropriate designs and rigorous methodological criteria. Thus, the relationship between Orthodontics and TMD should be based on controlled randomized clinical trials, systematic reviews and meta-analysis for more precise conclusions.

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