

# Imaging from temporomandibular joint during orthodontic treatment: a systematic review

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## Abstract

**Introduction:** The evolution of imaging in dentistry has provided several advantages for the diagnosis and development of treatment plans in various dental specialties. Examinations as nuclear magnetic resonance, computed tomography and cone beam volumetric tomography, as well as 3D reconstruction methods, have enabled a precise analysis of orofacial structures. Allied to this fact, the effects of orthodontic treatment on temporomandibular joint (TMJ) could be evaluated with the accomplishment of clinical studies with appropriate designs and methodologies. **Objective:** This study, a systematic literature review, had the objective of analyzing the interrelation between orthodontic treatment and TMJ, verifying if orthodontic treatment causes changes in the internal structures of TMJ. **Methods:** Survey in research bases MEDLINE, Cochrane, EMBASE, Pubmed, Lilacs and BBO, between the years of 1966 and 2009, with focus in randomized clinical trials, longitudinal prospective nonrandomized studies, systematic reviews and meta-analysis. **Results:** After application of the inclusion criteria 14 articles were selected, 2 were randomized clinical trials and 12 longitudinal nonrandomized studies. **Conclusions:** According to the literature analysis, the data concludes that orthodontic treatment does not occur at the expense of unphysiological disc-condyle position. Some orthodontic mechanics may cause remodeling of articular bone components.

**Keywords:** Temporomandibular joint. Temporomandibular joint dysfunction syndrome. Temporomandibular joint disorders. Orthodontics. Magnetic resonance imaging. Tomography.

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### Editor's summary

The effects of orthodontic treatment on temporomandibular joint (TMJ) is the subject of doubts and discussions until the current days. Many of those doubts persist because of the use of conventional radiographs which have limitations. With the advent of imaging examinations with specificity, sensitivity and greater accuracy in the reproduction of joint anatomical structures, such as nuclear magnetic resonance (NMR), computed tomography (CT) and cone beam volumetric tomography (CBVT) as well as methods of 3D reconstruction, this interrelationship can be assessed with greater accuracy.

The authors' proposal for this article was to analyze within a context of an evidence-based dentistry, which implications orthodontics have on the TMJ and specifically to check changes in condylar and articular disc position, as well as joint morphological changes, that occur due to orthodontic treatment.

Thus the search was performed in MEDLINE, Cochrane, EMBASE, PubMed, Lilacs and BBO in the period from 1966 to February 2009. Inclusion criteria for selecting articles were: studies based on images from NMR, CT

and/or CBVT that evaluated the effects of orthodontic treatment in TMJ; randomized clinical trials (RCTs), non-randomized prospective longitudinal studies, systematic reviews and meta-analysis; studies in which orthodontic treatment was already concluded in the samples; studies written in English and Spanish.

After applying the inclusion criteria 14 studies were obtained, 2 randomized clinical trials and 12 longitudinal studies without randomization criteria. Among the selected studies, 11 were based on magnetic resonance imaging and 3 in computed tomography imaging.

The authors conclude, with this systematic review, that orthodontics when correctly performed does not cause adverse effects to the TMJ. Yet, the application of forces during certain orthodontic mechanics, especially orthopedic situations, can cause alterations in condylar growth and in bone structures of the TMJ.

The authors end the paper noting that further randomized clinical trials are necessary, with longitudinal and interventional nature, for the determination of more precise causal associations, within a context of a scientific evidence-based dentistry.

## Questions to the authors

**1) The fact that most papers have used orthopedic appliances makes us think that this kind of treatment has been performed in growing patients. Therefore I ask: in adult patients the results would be the same?**

Studies involving adult patients in whom follow-up with imaging examinations were performed also found that the correct occlusal relationship after orthodontic treatment was not obtained at the expense of changes in the condyle-articular disc complex. The findings of clinical studies should be added to these results, based on imaging examinations, which have also provided evidences that orthodontics is not a form of development, prevention and treatment for temporomandibular disorders (TMD).

**2) In the discussion you mention that in some cases of TMD, an improvement can be obtained as a result of orthodontic treatment. What is the reason of this improvement?**

It is important to be noted that the findings of these studies are only suggestive, since the primary objective of the studies was not to evaluate orthodontics as possible therapy for TMD.

Still, it is necessary to emphasize that the scientific evidences indicate that orthodontic treatment does not consist in a form of prevention or treatment for signs and symptoms of TMD. In TMD patients, the treatment option is based on conservative, minimally invasive and reversible therapeutics.

**3) What are the major difficulties in conducting a randomized controlled clinical trial evaluating the interrelationship between TMD and orthodontic treatment?**

It is a consensus that treatment protocols for temporomandibular disorders should be guided by conservative, minimally invasive and reversible therapeutics. Thus, the accomplishment of randomized clinical trials shows ethical and practical limitations, since some participants would not receive a beneficial treatment, as well as some situations would not be investigated with this methodology. Thus, therapies that change irreversibly the occlusal pattern, such as orthodontics, would provide the patient a treatment that has no scientific basis to support it and change occlusion irreversibly, considering that available conservative treatments are effective for the control and treatment of TMD.

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