

# EPA Consensus Project Paper: The Relationship Between Prosthodontic Rehabilitations and Temporomandibular Disorders

## Keywords

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## ABSTRACT

*Aim: The aim of this systematic review is to evaluate the relationship between prosthodontic treatment and temporomandibular disorders (TMD). Materials and Methods: Two clinical questions have been raised. Can prosthodontic treatment be used as a strategy to manage temporomandibular disorders? Is there any causal relationship between prosthodontic rehabilitation and the onset of TMD? A systematic search was performed in four medical databases to identify Clinical Trials (CT) and Randomized Clinical Trials (RCT) that could answer the two clinical questions. Results: Any articles fulfilling the inclusion criteria were found. Therefore, the best available evidence on TMD management and aetiology is discussed in a scoping review with focus on the relationship with prosthodontic treatment. Conclusions: Based on current scientific evidence, prosthetic rehabilitation cannot be proposed as a treatment option for TMD patients, based on the effectiveness of other more conservative options as well as the absence of association between features of dental occlusion and TMD. Thanks to the high neuro plastic adaptation skills of the stomatognathic system, prosthodontic rehabilitation cannot be identified as a direct cause of TMD, but clinicians should pay caution when performing relevant occlusal modifications.*

## INTRODUCTION

Temporomandibular disorders are a collective term embracing a heterogeneous group of conditions affecting the temporomandibular joint (TMJ) and associated muscles and structures.<sup>1</sup> They are considered a subclassification of musculoskeletal disorders.<sup>2</sup> The main clinical findings in TMD patients are pain at palpation in the preauricular area, at the level of the TMJ and of the masticatory muscles; limitation in range of motion and various TMJ sounds (click, crepitus); disc displacement with/without reduction.<sup>3</sup> A common patient complaint is headache,<sup>4</sup> but sometimes other symptoms may be present, such as tinnitus.<sup>5</sup> The etiological paradigm of TMD has shifted from a mechanistic model to a multifactorial and biopsychosocial one,<sup>6</sup> characterized by an interaction of systemic (psychological, neurological, genetic) and anatomical factors.

Despite the absence of high-quality evidence, occlusal correction has been considered for years as one of the main therapeutic options for TMD patients, based on the belief that malocclusion has a strong role in TMD etiology.<sup>7</sup> This approach was based on the idea that occlusal interferences can be the etiology of TMD and that the TMJs could benefit from their adjustment.

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Considering that teeth are kept apart most of the day, no biological rationale justifies this approach. Moreover, prospective case-control studies have shown the higher impact of psychosocial determinants (anxiety, stress, somatic awareness, sleep quality, neuroticism) than anatomic aspects in the etiology of TMD symptoms.<sup>8</sup>

In prosthodontics, despite a general lack of high-quality evidence for many prosthodontic procedures, prosthodontists manage fully and partially edentulous patients with a high degree of success. Nevertheless, it seems that many procedures are more based on experience and personal opinions than scientific evidence. It is generally agreed that Randomized Clinical Trials (RCT) represent the best level of scientific evidence, whilst in the prosthodontic field, due to the difficulties of performing studies with such a design, the number and quality of RCT performed remains low.<sup>9,11</sup>

Within this framework, the aim of this article is to review the literature on the possible relationship between prosthodontic rehabilitations and temporomandibular disorders (TMD). The available literature was reviewed to report on (1) The role of prosthetic treatment as a possible treatment option for TMD, and (2) The potential causal effect of prosthodontic treatment on the onset of temporomandibular disorders.

## MATERIALS AND METHODS

For this review, two clinical questions were considered:

1. Can prosthodontic rehabilitation be used as a treatment for TMD?
2. Can prosthodontic rehabilitation cause of TMD?

On March 13th, 2022, a systematic review was performed in the most relevant medical databases: MEDLINE (PubMed), EMBASE, CENTRAL (Cochrane Central Register of Controlled Trials), Scopus, to find all the relevant articles that may help answering the above questions. Only clinical trials with at least 5 participants and a follow-up of at least 12 months were considered. Expert opinions, case reports, letters to editors, and reviews, were excluded from consideration. Only English papers were taken into account.

The MeSH (Medical Subjects Heading) terms “Temporomandibular Disorder” AND “Prosthodontics” were used to start the search query. At first, the search was limited to clinical trials, selecting review articles that investigated the role of prosthodontics as a treatment or as a cause for temporomandibular disorders. The authors looked at: (1) randomized clinical trials (RCTs) comparing the effectiveness of prosthodontic treatment with other treatment options in TMD patients; (2) clinical trials reporting TMD’s onset in patients that received prosthodontic treatment and never experienced TMD before. For the purpose of this review, other types of studies such as systematic reviews, and meta-analysis, case reports, and letters to editors were not considered. As a second step, the search was extended to the full citation list provided by the above search

query and to articles included in the reference list of papers retrieved in full text.

Articles were screened by looking at the title and the abstracts. Authors independently performed the search for articles and successfully discussed the results, reaching a definitive consensus.

The review protocol was registered in PROSPERO (CRD42021287587).

## RESULTS

From the input search “prosthodontics” and “temporomandibular joint disorders”, only 13 articles were found (*Figure 1*). However, none of them fulfilled the inclusion criteria. Therefore, a second search was performed, including a full citation list identified by the above search queries, providing 661 results. After careful examination of the titles and abstracts, all papers were excluded since no none had an adequate design to answer the clinical questions raised above. Due to the general lack of evidence, the authors organized a scoping narrative review to answer the two questions in the discussion section.

## DISCUSSION

### 1) CAN PROSTHODONTIC REHABILITATION BE CONSIDERED A TREATMENT OPTION FOR TMD?

For a long time, dentists shared the common belief that occlusal disturbances have a central role in the onset of TMD. From a historical point of view, otolaryngologist James Costen made this association for the first time at the beginning of the last century. He suggested that a lack of posterior support might be the cause of symptoms around the TMJ and ear area. According to modern principles of evidence-based dentistry, his study design based only on series of cases, would not satisfy today’s scientific requirements. Since then, various types of occlusal therapies, ranging from adjustment of purported interferences to extensive orthodontic and prosthodontic rehabilitations, were proposed by various clinicians as the main treatment strategy for TMD patients.

These precepts of the so-called “gnathologists” were based on the concept that with the elimination of occlusal interferences and the realisation of a purportedly ideal occlusion, patients would automatically get rid of signs and symptoms of TMD.<sup>12,13</sup> Moreover, the fact that some patients got some relief from some occlusal changes reinforced the idea of the positive correlation between occlusal disturbances and TMD among practitioners. The missing point in this sort of inductive thinking is that no study could show a true causal relationship between occlusion and TMD onset, nor efficacy of occlusal treatments, viz., superiority over other treatment modalities. Anecdotes, unsubstantiated claims, and case reports of improvement in TMJ symptoms with some occlusal therapy are not enough to prove any causal relationship. Similarly, improvement with oral

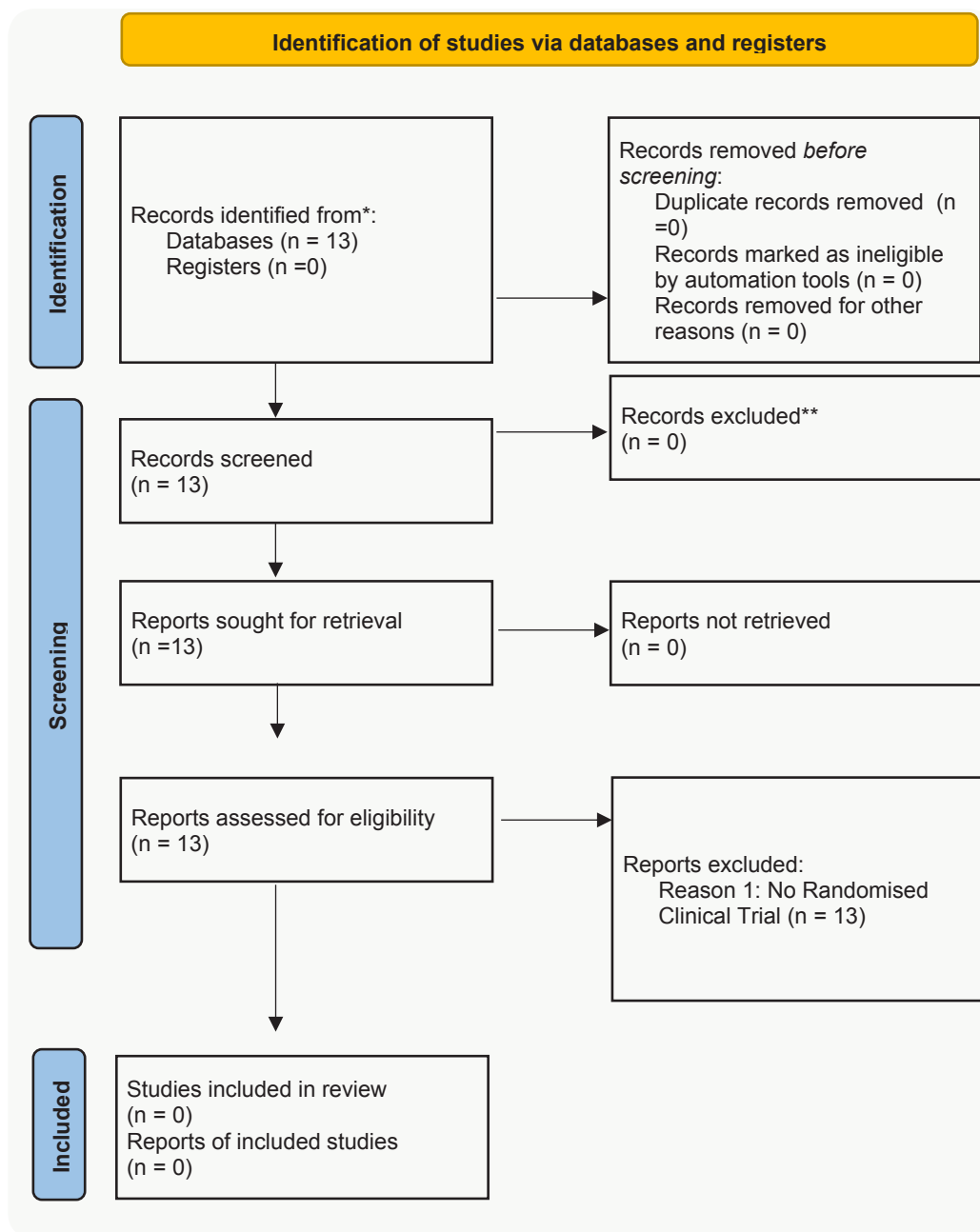


Figure 1: Literature Search outflow.

appliances is not related to any specific design that may suggest an occlusion-mediated effect.<sup>21</sup> The most plausible hypothesis is that they represent a crutch that helps recruiting recruit muscle fibers from different regions than usual, allowing relief for fatigued muscles and loaded joint surfaces.<sup>19</sup> Thus, they are proposed only as a temporary solution, and not as a so-called “Phase I” device that must be used to plan occlusal changes.<sup>20</sup>

In contrast, current evidence suggests that simpler therapies without any influence on occlusion have equal effectiveness, with less potential side effects, and financial, biological, and social costs for the patient.<sup>14,22</sup> However, the literature suggests that the association between the components of dental occlusion and TMD is very weak. Thus, correction of dental occlusion should not be considered as the primary treatment goal for a TMD patient.<sup>7,15-16</sup>

The standard of care for TMD is currently represented by counseling, cognitive-behavioural therapies, psychological support, occlusal appliances, physiotherapy, pharmacotherapy, with an escalation to surgery in some selected cases.<sup>18,20</sup> As such, prosthodontic treatment is not recommended.

Therefore, as a summary recommendation for prosthodontists, clinicians must keep in mind that prosthodontic rehabilitation cannot be considered a treatment strategy for TMD. In addition to that, symptoms should be treated before any occlusal rehabilitation. This is because TMD patients have a lower threshold to pain, and their stomatognathic system can be more sensitive to occlusal changes.<sup>23</sup> They might have more difficulty adapting to a new occlusal equilibrium, which might influence the outcome of the prosthodontic treatment. Therefore, prosthodontic treatment in TMD patients should always be prudent and, if possible, performed in collaboration with colleagues trained in orofacial pain.<sup>31-32</sup>

## 2) CAN PROSTHODONTIC TREATMENT CAUSE TMD?

The lack of scientific literature investigating the possible etiological role of prosthodontic treatment in TMD onset does not imply that the clinician should ignore the temporomandibular joint status when making the treatment plan. Prosthodontic practitioners should follow the principle of being conservative, and reserve the re-organization of occlusal relationships to selected cases with prosthodontic indications.

Generations of dentists have been educated according to the paradigm that an ideal inter arch relationship should be pursued during any prosthodontic treatment to avoid iatrogenic damage to the TMJ. Several dogmas around the concepts of centric relation, anterior guidance, condylar position as well as several treatment planning philosophies based on electronic devices have been proposed.<sup>24</sup> In reality, none of the proposed concepts is based on current scientific evidence, nor have a consensus in biological meaning. This contributed to the creation of a lack of uniformity among general practitioners and different dental schools.<sup>25</sup> The common belief was that if the proper centric relation recording is not achieved to plan and build an extensive restoration, there is risk of causing TMJ problems. The simple fact that proponents of a specific centric relation concept have often opposite views on how to define and record it (e.g., retruded condylar position with hinge axis vs advanced and relaxed neuromuscular position) demonstrates that clinical success with such procedures is not related to the specificity of the procedure itself.<sup>24</sup> Considering that there is no such a thing as an "ideal condylar position" there is no rationale for pursuing a specific, preconceived, instrumentally-guided interrelationship between the jaws.<sup>26-27</sup> Thus, there is no condylar position that is more physiologic than others, and neuroplasticity phenomena is likely to explain the adaptation of the stomatognathic system to a new mandible position.<sup>30</sup>

The clinical implications are related with some situations in which there is the need to establish a new mandibular position for prosthetic reasons (e.g., lack of prosthetic space, patients with severe generalised tooth wear).<sup>29</sup> The concept of restoring vertical dimension of occlusion (VDO) is also related to this issue.<sup>28</sup> As with many concepts surrounding occlusion, the establishment of an ideal VDO as a protective factor against the onset of TMD was believed to be part of a prosthetic treatment planning. Actually, research that demonstrated that a specific VDO was more protective than others against the onset of TMD, showed that the change was minimal in relation to the habitual intercuspal position.<sup>33-34</sup>

In conclusion, considering that no specific occlusal concept has been proven to be superior to the others, the general recommendation for prosthodontists when planning complex prosthodontic treatment is to not put much emphasis on the adaptation capabilities of the stomatognathic system.<sup>16</sup> If important changes are necessary for prosthetic reasons, they should be kept to a minimum and introduced into the patient's mouth gradually and over an extended period of time,

in order to evaluate their accommodation capability. The neuroplasticity of the system will allow adaptation.

## CONCLUSIONS

This systematic review proved the lack of high-quality evidence study, Clinical Trials (CT) and Randomised Clinical Trials (RCT), on the topics of the possible role of prosthetic rehabilitation as a treatment option for TMD and the causal relationship between prosthodontics and temporomandibular disorders. Despite this, the following conclusions can be drawn:

1. No scientific evidence supports the need to perform any prosthodontic rehabilitation/occlusal adjustments to manage TMD patients. Any studies proved the superiority of the prosthodontic approach over the conventional and conservative management strategies coming from the orofacial pain field in temporomandibular disorder patients. In addition, based on current evidence of best TMD practice, it is highly unlikely that any ethical committee would authorise such studies because of the very unfavourable cost-to-benefit reasons. Thus, this evidence has to be considered definitive, and the derived ethical implications should be taken into serious considerations when evaluating any opposite claims.
2. Although prosthetic rehabilitation does not seem to have a direct effect on the temporomandibular joint, particular caution should be adopted by practitioners when performing any consistent occlusal change, not to exceed the accommodation capabilities of the stomatognathic system. Patients with history of TMDs and certain psychological traits must be considered the less accommodating individuals. In addition to that, it must be remarked that any specific clinical or instrumental procedures should be considered the gold standard for prosthodontic planning.

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