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Research of the major approaches to temporomandibular disorders and space maintainers: a concise systematic review

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Abstract

Introduction: The temporomandibular joint (TMJ), being the only mobile joint in the skull, is one of the most complex structures to study, this joint allows rotation and translation movements, this is due to its double joint with the condyle and its condylar cavity. The term Temporomandibular Disorders (TMD) is used to describe TMJ diseases that may be related to the joint, musculature, ligaments, bone, tooth, and psychological aspects. **Objective:** It was to address the main considerations and clinical findings of temporomandibular disorders and the use of space maintainers through a concise systematic review. **Methods:** The present study followed a systematic review model, following the rules of systematic review – PRISMA. The search strategy was performed in the PubMed, Cochrane Library, Web of Science and Scopus, and Google Scholar databases. The quality of the studies was based on the GRADE instrument, and the risk of bias was analyzed according to the Cochrane instrument. **Results and Conclusion:** The total of 136 articles were found. A total of 76 articles were fully evaluated and 34 were included in this study. A total of 34 studies were excluded with a high risk of bias (studies with a small sample size). Also, 42 studies were excluded because they did not meet the GRADE. The results showed that the stomatognathic system (SS) is extremely important in the physiological interconnection with its constituent elements and the central nervous system. An interference can lead the masticatory muscles to adapt their function to protect the SS, leading the mandible to a position with different dental contacts, which can cause damage to the TMJ. These damages can generate parafunction or TMD. Space maintenance is one of the most important activities in the prevention of malocclusion. A practical option to obtain this rehabilitation is through the installation of aesthetic or functional space maintainers.

Keywords: Temporomandibular joint. Temporomandibular joint disorders. Space maintainer. Treatments. Clinical trials.

Introduction

The temporomandibular joint (TMJ), being the only mobile joint in the skull, is one of the most complex structures to study, this joint allows rotation and translation movements, this is due to its double joint with the condyle and its condylar cavity [1]. For all this gear to work efficiently, occlusion, joint, musculature, ligaments, and psychological factors must be in complete harmony, in line with this, the person mustn't have harmful habits to all these mentioned structures, such as habits such as biting objects, straining the jaw, sleeping badly or exerting any tension that is not natural to the jaw [1,2].

In this context, the term Temporomandibular Joint Disorders (TMD) is used to describe TMJ diseases that may be related to the joint, musculature, ligaments, bone, tooth, and psychological aspects [2]. However, TMD can be divided into two large subgroups: those originating from joint problems, that is, those in which the signs and symptoms are related to the TMJ, and those of muscular origin, where their relationship is associated with the structures of the stomatognathic system [3].

Also, TMD can manifest in the masticatory muscle, TMJ, ear, mouth, tooth, and skull. The alteration in the

masticatory muscles caused by TMD is characterized by pain associated with the soft and hard tissues of the head, face, neck, and other intraoral structures [3,4]. The etiology is multifactorial and TMJ problems can be divided into muscle disorders, and joint disorders, with muscle disorders affecting muscles of mastication, including myofascial pain, myositis, and trismus, while joint pain encompasses problems that occur within the joint capsule, and these changes are in the shape of the articular surfaces due to remodeling of the surfaces of the articular disc causing disc displacements [4,5].

Beside, TMD have a very broad interpretation and represent a population that has been suffering from muscle and/or joint pain. When installed, it represents joint pain in the TMJ and/or muscle, because of this scenario, we see that the most affected population is the female sex, in a proportion of 4:1 [5].

Furthermore, TMD have a direct impact on the lives of people who are affected by this type of injury. This pain affects the daily lives and work activities of these people, reducing their quality of life and productivity. Other problems that can occur are ear pain (otalgia), a sensation of ear fullness, a sensation of decreased hearing acuity, tinnitus, dizziness, and vertigo. Other symptoms are limitation of mandibular movements, abnormal static and dynamic occlusion and there may also be the presence of joint noises (such as clicking and/or crackling) [5].

The click may or may not occur with pain and with the double click when opening and closing the mouth, which characterizes a displacement of the articular disc with possible reduction, and the asymptomatic silent joint with limitation of mouth opening is indicative of a possible displacement of the articular disc without reduction, and when recurrent encryption occurs, it is indicative of arthrosis [6]. For a correct and accurate diagnosis of TMD, and correct treatment, the evaluation of all symptoms aligned with teamwork is essential for successful treatment of TMD, in which each professional will work in their area of competence [6].

Therefore, the present study aimed to address the main considerations and clinical findings of temporomandibular disorders and the use of space maintainers through a concise systematic review.

Methods

Study Design

The present study followed a systematic review model, following the rules of systematic review - PRISMA (Transparent reporting of systematic review and meta-analysis, access available in: http://www.prisma-statement.org/).

Data Sources

The search strategy was performed in the PubMed, Cochrane Library, Web of Science and Scopus, and Google Scholar databases. The present study was carried out from January to April 2022.

Descriptors (MeSH Terms) And Search Strategy

The main descriptors (MeSH Terms) used were "*Temporomandibular joint. Temporomandibular joint disorders. Space maintainer. Treatments. Clinical trials*". The rules of the word PICOS (Patient; Intervention; Control; Outcomes; Study Design) were followed.

Selection, Risk of Bias and Quality of Studies

Two independent reviewers performed research and study selection. Data extraction was performed by reviewer 1 and fully reviewed by reviewer 2. A third investigator decided some conflicting points and made the final decision to choose the articles. The quality of the studies was based on the GRADE instrument and the risk of bias was analyzed according to the Cochrane instrument.

Results and Discussion

Article Series and Eligibility

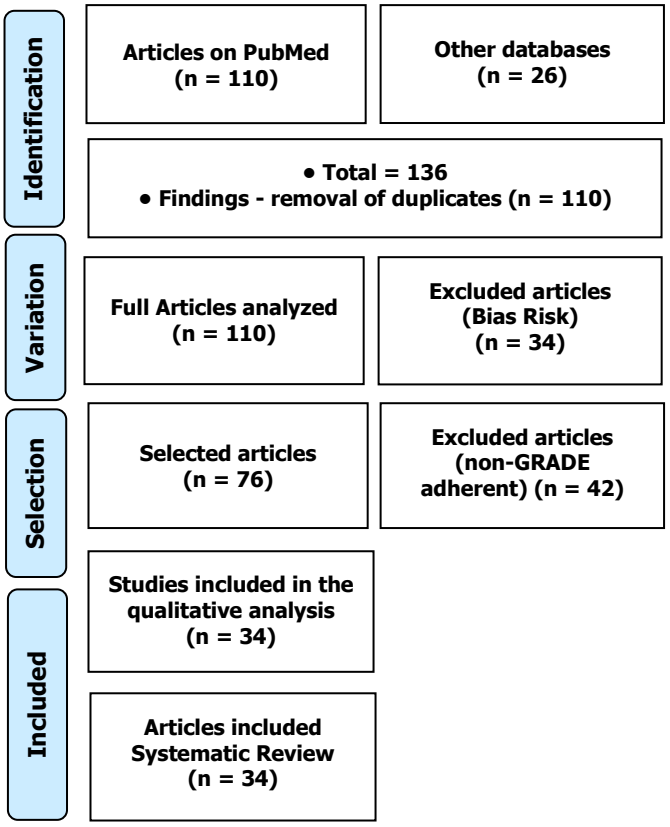
The total of 136 articles were found. Initially, the duplication of articles was excluded. After this process, the abstracts were evaluated and a new exclusion was performed. A total of 64 articles were fully evaluated and 34 were included in this study (**Figure 1**).

Considering the Cochrane tool for risk of bias, the overall assessment resulted in 34 studies that were excluded with a high risk of bias (studies with a small sample size). Also, 42 studies were excluded because they did not meet the GRADE.

The stomatognathic system (SS) is extremely important in the physiological interconnection with its constituent elements and the central nervous system (CNS), and the proprioceptors present in the soft tissues, muscles, temporomandibular joint (TMJ), and periodontal membrane [1,2]. An interference can lead the masticatory muscles to adapt their function to protect the SS, leading the mandible to a position with different dental contacts, which can cause damage to the TMJ. These damages can generate parafunction or TMD [3].

In this sense, the dysfunctions occur from the increase in muscle activity, interacting with other constituent elements of the SS, with a physiological interconnection with the CNS. TMD is a term that refers to an association of diseases that affect the masticatory muscles, TMJ, and adjacent structures, divided into two

Figure 1. Flowchart showing the article selection process.



subgroups: those of joint origin, where signs and symptoms are associated with TMJ, and those of muscular origin, in which the signs and symptoms comprise the stomatognathic musculature, TMD have a broad interpretation that portrays a general population of patients suffering from regularly painful jaw muscle and joint dysfunction [4,5]. Precisely for this reason, it can be classified as disorders related to pain and dysfunction of the masticatory muscles and disorders related to TMJ [6].

Also, a high percentage of malocclusions are caused by these early losses, he proposed, in 1907, a space maintainer that would remain unchanged, even if for a prolonged length of stay in the oral cavity [7-10]. In the literature, there are initiatives toward the use of maintainers since 1924. From 1930, the authors recommend and talk about the necessity of using such devices [11-13]. Space maintenance is one of the most important activities in the prevention of malocclusion [14,15]. The purpose of deciduous dentition is to maintain the perimeter of the bow for successors to erupt normally, hence great importance should be given to tooth loss at this stage. However, attention should be paid to the loss of young permanent teeth [16].

In this context, a study showed that of 119.00 school-aged children00 examined, a 51% malocclusion treatment index was found, and in 80% of those, a preventive orthodontic orientation would be required [8]. In Brauer's study of the incidence of malocclusions, with 41 patients examined, 42 premature extractions of primary first molars and 71 premature extractions of primary second molars were found [9].

Handling the premature loss of deciduous teeth requires care, especially when done by a clinical dentist. The consequences of inadequate procedures have serious repercussions on normal dental development [17]. The loss can compromise the eruption of permanent teeth and decrease the perimeter of the arch. The eruption of the lost space is of paramount importance to ensure the normal and development of the dentition [18-21].

The strategy for the maintenance of space in the deciduous and mixed dentition is, first, to know the problem to plan the treatment [22]. The treatment differs from the posterior to the anterior region and causes as well. Loss in the anterior region is usually due to trauma, which is common when the child is learning to walk. Rampant cavities would be the cause of loss of anterior and posterior teeth [23]. Most of the posterior ones are lost by caries, rarely by trauma [24]. To maintain the space for dental losses, the use of space-saving devices is indicated, as there is no loss of space, since the permanent tooth may take months to erupt [25-27].

In another study on the incidence of malocclusions, with 41 patients examined, 42 premature extractions of primary first molars and 71 premature extractions of primary second molars were found [28]. Aesthetic/functional rehabilitation is necessary until the eruption of permanent successor teeth occurs [29]. A practical option to obtain this rehabilitation is through the installation of aesthetic or functional space maintainers [30].

Thus, space maintainers are orthodontic devices that replace one or more deciduous teeth and are used to preserve the space destined for the permanent tooth successor, preventing it from suffering deviations during its eruption [29]. These devices, regardless of the design chosen, should be as realistic as possible. However, there are some requirements, such as maintaining the desired interproximal space, not interfering with the occlusion of the opposing teeth nor with the eruption of the permanent tooth, allowing sufficient mesiodistal space for the permanent tooth alignment to erupt, not to infer in phonetics and chewing and present a simple framework and be easily hygienized [31-33].

The facial typology seeks to redefine the relationships between deleterious habits and malocclusions, through the valuation of individual morphological characteristics, which will lead to

craniofacial growth and development to assume certain facial types, different in their structural and functional aspects. It is these particularities that will define the action of these habits on the face. These limits are aimed at the differential diagnosis, to establish, in each case, the possibilities of the individual himself, speech-language intervention, and, mainly, the need for interdisciplinary action [34].

Thus, the neuromuscular stability of the stomatognathic system may be impaired by the presence of deleterious habits [1,2]. In addition to the habits of digital sucking, prolonged use of the pacifier, tongue sucking, or lips triggering facial changes and/or functional adaptations, there are habits, mainly related to masticatory muscles, such as bruxism, dental tightening, onicofagia, cheek bite or lips [4]. These habits result in an abnormal request of the masseter, temporal and pterygoid muscles, both medial and lateral. Such muscles, in a state of hyperfunction, may present painful symptomatology and decreased coordination [5,6].

Due to the aging of the stomatognathic apparatus the orofacial functions can be modified, such as malocclusion, therefore for greater effectiveness and longevity of the final result of the orthodontic treatment, the indefinite use of fixed inferior containment should be established and accompanied by the professional [6].

Conclusion

According to the objective of the present study, it can be concluded that the stomatognathic system is extremely important in the physiological interconnection with its constituent elements and the central nervous system. An interference can lead the masticatory muscles to adapt their function to protect the SE, leading the mandible to a position with different dental contacts, which can cause damage to the TMJ. These damages can generate parafunction or TMD. Space maintenance is one of the most important activities in the prevention of malocclusion. A practical option to obtain this rehabilitation is through the installation of aesthetic or functional space maintainers.

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Conflict of interest
The authors declare no conflict of interest.

Similarity check
It was applied by Ithenticate@.

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