



Ortho-surgical procedure involving mandible, maxilla, mento and associations: a systematic review

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DOI: <https://doi.org/10.54448/mdnt22S207>

Received: 09-11-2021; Revised: 11-27-2021; Accepted: 12-17-2021; Published: 03-27-2022; MedNEXT-id: e22S207

Abstract

Introduction: Orthognathic surgery (OS) consists of the surgical procedure that aims to correct deformities of the bones of the maxilla and mandible. The records of the first surgeries for the correction of dentofacial deformities date from the mid-nineteenth century and were initially limited to mandibular surgeries. The malocclusion has as one of the primary etiological factors the facial growth pattern. Angle's statement already said that the only possibility of correcting true dentofacial deformities was the combination of orthodontics with surgery, and the importance of the combined effort of these two distinct areas in the approach to dentofacial disharmony in patients with problems was recognized skeletal. **Objective:** This study aimed to review the literature on OS involving mandible, maxilla, mento and associations. **Methods:** Clinical studies with qualitative and/or quantitative analysis were included, following the rules of the systematic review-PRISMA. **Results:** A total of 107 articles were found involving "orthognathic surgery". A total of 47 articles were evaluated in full, and 33 were included and discussed in this study. Individuals with class III dentofacial deformities are those that normally present greater aesthetic and functional impact, and for this reason, are the ones that more frequently seek treatment. However, some studies have shown a tendency for complications to occur in older patients submitted to orthognathic surgeries. Mandibular surgical procedures with maxillary segmentation and combining three types of osteotomies should be carefully planned and trained to reduce the occurrence of complications. The surgeon, orthodontist, and all staff involved should be focused on avoiding complications during all phases of treatment.

Conclusion: It was concluded that there was an increase in the cases of OS in the last years, and with homogeneous samples between the masculine and feminine genres, and the advances in maxillary surgery corresponded to the greater number of surgical treatments.

Keywords: Bucomaxillofacial surgery. Mandible surgery. Orthognathic surgery. Malocclusion. Dentofacial deformities.

Introduction

Orthognathic surgery (OS) consists of the surgical procedure that aims to correct deformities of the bones of the maxilla and mandible [1,2]. The technique has undergone great evolution in the last two decades and has been steadily increasing. The records of the first surgeries for the correction of dentofacial deformities date from the mid-nineteenth century and were initially limited to mandibular surgeries [3,4].

The first procedure performed is credited to Simon P. Hüllihen in 1849 in the United States [5]. The initial development of North American orthognathic surgery was carried out by the plastic surgeon Vilray Blair and the orthodontist Edward Angle. However, the most significant development in this period occurred in Europe, especially in Switzerland, Austria, and Germany, with Obwegeser, Trauner, and Wassmund respectively as the main names [6].

In 1901, Frenchman René Le Fort disclosed his research on maxillary fractures. He described in a comprehensive way the experimental research in which he simulated facial traumas in cadavers. Its main purpose was to assess whether traumas in the middle third of the face radiated to the base of the skull. In addition to answering his questioning, he was able to

show clear patterns of the brittle jaw, the result of repeated fracture lines. Thus, the fracture classification system of the middle third of the face [7-11]. This classification ended up becoming widely used to name the types of maxillary osteotomies and the middle third of the face in OS [12].

Besides, the malocclusion has as one of the primary etiological factors the facial growth pattern, defined as a set of rules that act on the growth and development of the face, preserving specific characteristics, genetically determined, suffering little or no influence of the environment [13]. Angle's statement [6] already said that the only possibility of correcting true dentofacial deformities was the combination of orthodontics with surgery, and the importance of the combined effort of these two distinct areas in the approach to dentofacial disharmony in patients with problems was recognized skeletal.

Furthermore, facial deformity, with destructive psychological and social potential, has a negative impact, which may influence not only patient self-confidence but also external relationships, resulting in social and psychological disadvantages. The objectives of the patient with dentofacial deformity, related to the repair, are also psychosocial and this can express the expectation of solving their personal and social difficulties with the physical change, that is, with the improvement of their appearance by the surgical correction [14,15].

Also, OS intervenes in patients with moderate and severe dentofacial deformities of the face, with the main objective being to centralize the achievement of functional balance and harmony in facial aesthetics [16]. Obstructive sleep apnea is the arrest of the airway through the upper airway, in the presence of respiratory effort, lasting more than 10 seconds. The hypopnoea, constitutes a reduction in the passage of air, in said area, in this same period of time. These respiratory events occur innumerable times and exclusively during sleep, determining symptoms and signs that characterize Sleep Obstructive Hypopnea Apnea Syndrome [17].

Patients with anatomical abnormalities that contribute to the narrowing or obstruction of the pharyngeal air space during sleep are benefited from OS to normalize the soft and hard tissues of the face [18]. Therefore, the present work had as objective to make a review of the literature on OS involving the mandible, maxilla, mento, and associations.

Methods

Study Design

The present study was followed by a systematic

literature review model, according to the PRISMA rules. Access available at: <http://www.prisma-statement.org/>

Data sources and research strategy

Clinical studies were included as case reports, retrospective, prospective and randomized trials with qualitative and/or quantitative analysis. Also, some review studies were included. Initially, the keywords were determined by searching the DeCS tool (Descriptors in Health Sciences, BIREME base) and later verified and validated by the MeSH system (Medical Subject Headings, the US National Library of Medicine) to achieve consistent search.

Mesh Terms

The main MeSH Terms were *Bucomaxillofacial surgery. Mandible surgery. Orthognathic surgery. Malocclusion. Dentofacial deformities*. The literature search was conducted through online databases PubMed, Periodicos.com, Google Scholar, Ovid, Scopus, Web of Science and Cochrane Library.

Study quality and risk of bias

The quality of the studies was based on the GRADE instrument, with randomized controlled clinical studies, prospective controlled clinical studies, and studies of systematic review and meta-analysis listed as the studies with the greatest scientific evidence. The risk of bias was analyzed according to the Cochrane instrument.

Results

Literature Review and Discussion

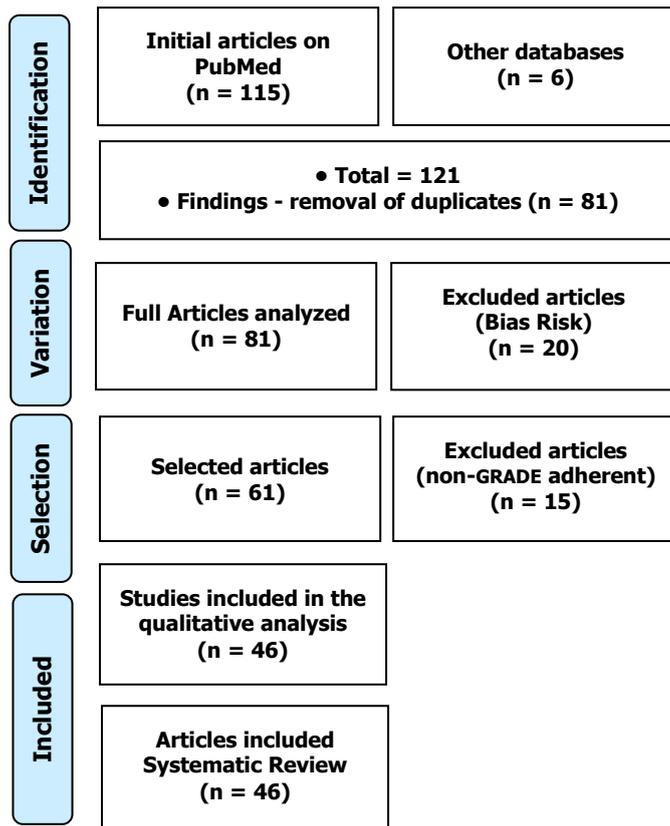
A total of 121 articles were found involving orthognathic surgery and malocclusion. Initially, was held the exclusion of existing title and duplications following the interest described in this work. After this process, the summaries were evaluated and a new exclusion was held. A total of 61 articles were evaluated in full, and 46 were included and discussed in this study (Figure 1).

The treatment of dentofacial deformities is currently one of the most discussed fields in the area of Buccomaxillofacial and Craniomaxillofacial Surgery. His study has encompassed biological, pathophysiological, surgical, and anesthetic techniques, preoperative and postoperative management, as well as craniofacial growth and development, and harmony and facial aesthetics [1,2].

This procedure aims to establish harmonious facial esthetics, optimal functional occlusion, and

improvement of airway conditions, which are the most important goals of orthodontic-surgical treatment [3]. The correct diagnosis of a malocclusion associated with skeletal deformity is essential for indication of treatment, leading to multidisciplinary planning, which leads to an aesthetic and functional correction of the case, providing the patient with functional occlusion and facial harmony [4,5].

Figure 1. The selection process of scientific articles.



Maxillo-mandibular advancement surgery promotes anteroposterior, vertical, and lateral-lateral movement, due to the displacement of the bone bases to a new position, generating tensions in the soft tissues of the region and may present significant changes in facial appearance and pharyngeal space [19].

The high prevalence of maxillary and mandibular joint deformities and a large number of combined maxillary and mandibular surgeries seem to demonstrate the severity of operated dentofacial deformities [20-23]. As the most frequent maxillary deformities were anteroposterior deficiency and an anteroposterior excess in the mandible, it is possible that there were a large number of patients with skeletal class III seeking treatment. Individuals with class III dentofacial deformities are those that normally present greater aesthetic and functional impact, and for this reason, are the ones that more frequently seek treatment [24-27].

Also, more extensive surgical procedures are usually at a higher risk of complications, and, moreover, the greater the potential for healing and recovery tends to be slower. In addition, no correlation was found between the occurrence of complications and age and sex. However, some studies have shown a tendency for complications to occur in older patients submitted to orthognathic surgeries [28].

The need for the development of centers for the correction of dentofacial deformities in our country is notable for the increase in demand for these services as shown in this study during the period studied from 2002 to 2016. These data demonstrate the need for constant scientific and technical improvement, as well as understanding the profile of these treatments for the increasingly objective treatment of these deformities [29].

In continuation, OStreats dentofacial deformities and its importance is found not only in the correction of occlusion but also in facial aesthetics. This means that the psychosocial aspects are directly related to this type of treatment since the facial appearance influences the formation of the body image, identity, and self-esteem [30-32], with greater demand for women. However, the gender homogeneity of the present study can be explained because these OSpatients treat not only aesthetic-functional deformities [33].

Thus, this surgery has an effect on the maxillo-mandibular function, the stability of the hard tissues, and the facial esthetics of the patient. The effects on the facial profile and the relationship between soft and soft tissue changes have been reported in both the short and long term. The different surgical techniques, the natural aging process, the initial growth direction, and the remodeling process should be considered when evaluating the positional stability of these tissues [34-36].

A similar study to the present study presented similar findings. An important finding in this study was that 56.0% of the patients had operated exclusively on the maxilla and 20.5% of the patients had the maxilla and mandible operated, representing 76.5% of the analyzed sample6. It can be observed that many of the patients with malocclusions have maxillary problems in association with mandibular problems, which calls us to a precise and detailed diagnosis of the malocclusion and face, considering all the structures involved, both separately and together, so that the treatment plan is successful, not only due to the occlusal aspect, but also aesthetic and functional, guaranteeing stability to the skeletal, dental, muscular structures and respiratory function aiming at the treatment of retropalatal and retrolingual collapse in patients with Obstructive Apnea Syndrome and Obstructive Hypopnea Syndrome Sleep

[10].

Also, an overview of orthognathic surgeries performed and reveals some risk factors for the occurrence of complications [37,38]. Thus, the causes of the most frequent problems can be investigated, so that the treatments can become safer [39-41]. It is suggested to pay attention to fragility points, to encourage the compulsory and detailed recording of the occurrence of complications, as well as the elaboration of a protocol to monitor its evolution [42-44].

Jung and Park [45] report the restoration of facial harmony and ideal occlusion in individuals with severe skeletal occlusion. Much is discussed in the scientific environment regarding the effect of OS on the maxillofacial complex because there are biomechanical, occlusal, and sensorial relationships between the structures of this complex. Thus, there was a restoration of masticatory and speech functions, as well as improvement of facial aesthetics.

There is still a need for attention to the management of male patients submitted to orthognathic surgery. Mandibular surgical procedures with maxillary segmentation and combining three types of osteotomies should be carefully planned and trained to reduce the occurrence of complications. The surgeon, orthodontist, and all staff involved should be focused on avoiding complications during all phases of treatment. The permanent improvement of surgical technique, materials used, methods of orthodontic treatment, and experience are necessary to achieve this goal [46].

Conclusion

It was concluded that there was an increase in the cases of OS in the last years, and with homogeneous samples between the masculine and feminine genres, and the advances in maxillary surgery corresponded to the greater number of surgical treatments.

Acknowledgement

Not applicable.

Funding

Not applicable.

Data sharing statement

No additional data are available.

Conflict of interest

The authors declare no conflict of interest.

Similarity check

It was applied by Ithenticate@.

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