

## Main Predictors of Orthognathic Surgery Involving Mandible, Maxilla, Mento and Associations: A Review

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### Abstract

**Introduction:** 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 approaching the dentofacial disharmony of patients with skeletal problems was recognized.

**Objective:** This study aimed to review the literature on Orthognathic Surgery involving mandible, maxilla, mento and associations.

**Methods:** Experimental and clinical studies were included (case reports, retrospective, prospective and randomized trials) with qualitative and/or quantitative analysis. The mesh terms were included Buco-maxillo surgery, mandible surgery, orthognathic surgery, malocclusion, dentofacial deformities.

**Conclusion:** It was concluded that there was an increase in orthognathic surgery cases 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:** Buco-Maxillo Surgery; Mandible Surgery; Orthognathic Surgery; Malocclusion; Dentofacial Deformities

### Introduction

Orthognathic surgery consists of the surgical procedure that aims to correct deformities of the bones of the maxilla and mandible and represents, today, a reality in Brazilian dentistry [1,6]. 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 [34,35].

The first procedure performed is credited to Simon P. Hullihen in 1849 in the United States [16,32]. 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 [32].

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 brittle jaw, the result of repeated fracture lines. Thus, the fracture classification system of the middle third of the face [21,23,24,33]. This classification ended up becoming widely used to name the types of maxillary osteotomies and the middle third of the face in orthognathic surgery.

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.

Angle's statement [2] 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.

The 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 pa-

tient 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 [3].

Orthognathic surgery 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 [4]. 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, constitute 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 [5].

Patients with anatomical abnormalities that contribute to the narrowing or obstruction of the pharyngeal air space during sleep are benefited with orthognathic surgery to normalize the soft and hard tissues of the face [6].

The present work had as objective to make a review of the literature on Orthognathic Surgery involving jaw, maxilla, mento and associations.

## Methods

Experimental and clinical studies were included (case reports, retrospective, prospective and randomized trials) with qualitative and/or quantitative analysis. Initially, the key words were determined by searching the DeCS tool (Descriptors in Health Sciences, BIREME base) and later verified and validated by MeSh system (Medical Subject Headings, the US National Library of Medicine) in order to achieve consistent search.

## Mesh Terms

The words were included Buco-maxillo surgery, mandible surgery, orthognathic surgery, malocclusion, dentofacial deformities. For further specification, the *cirurgia ortognática* description for refinement was added during searches. The literature search was conducted through online databases: Pubmed, Periodicos.com and Google Scholar. It was stipulated deadline, and the related search covering all available literature on virtual libraries.

## Series of Articles and Eligibility

A total of 75 articles were found involving orthognathic surgery. Initially, it was held the exclusion existing title and duplications in accordance with the interest described this work. After this process, the summaries were evaluated and a new exclusion was held. A total of 53 articles were evaluated in full, and 42 were included and discussed in this study.

## Literature Review and Discussion

The treatment of dentofacial deformities is currently one of the most discussed fields in the area of Buccomaxillofacial and Cranio-maxillofacial 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 [34-36].

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

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 [17].

The high prevalence of maxillary and mandibular joint deformities and the large number of combined maxillary and mandibular surgeries seem to demonstrate the severity of operated dentofacial deformities [31]. As the most frequent maxillary deformities were anteroposterior deficiency and the 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 [27].

In addition, 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, in the present study, 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 [15,22,26].

The need for 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.

In continuation, orthognathic surgery treats 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, the identity and the self-esteem [22], with greater demand for the women. However, the gender homogeneity of the present study can be explained because these orthognathic surgery patients treat not only aesthetic-functional deformities.

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 [19].

Jung, Jung and Park [41] 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 orthognathic surgery (OC) on the maxillofacial complex, because there are biomechanical, occlusal and sensorial relationships between the structures of this complex [21]. Thus, there was a restoration of masticatory and speech functions, as well as improvement of facial aesthetics [10,16].

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 sample. 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 retroplatal and retrolingual collapse in patients with Obstructive Apnea Syndrome and Obstructive Hypopnea Syndrome Sleep [6].

The results of the study provide an overview of orthognathic surgeries performed and reveal some risk factors for the occurrence of complications. From the analysis of the data, the causes of the most frequent problems can be investigated, so that the treatments can become more and more safe. 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.

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 [42].

## Conclusion

It was concluded that there was an increase in the cases of orthognathic surgery 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.

## Conflict of Interests

There is no conflict of interest between authors.

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