



# Successful orthodontic and surgical treatment of a patient with Class III malocclusion: a clinical case report

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## Abstract

**Introduction:** Class III malocclusion affects between 5% and 15% of the entire Brazilian population.

**Objective:** The present study aimed to present a clinical case report of the ortho-surgical treatment of a patient with class III malocclusion, showing the follow-up of the good evolution of the treatment and the improvement of the patient's quality of life.

**Case Report:** The patient EOMO, male and 53 years old, presented class III and on 02/03/2003 the patient submitted the orthodontic documentation. The first phase was the surgical expansion of the maxilla, orthodontic treatment of alignment, and maxillomandibular leveling. The second phase was maxillary advancement and mandible reduction surgery. On 07/31/2003, EOMO decided to undergo orthodontics and the indicated surgeries. Today, after years of treatment and surgeries, EOMO lives well and his appearance has improved 100%, and today he lives with a good quality of life.

**Final considerations:** According to the clinical case presented, the treatment of Class III must be fundamentally based on the diagnosis so that the treatment is installed to correct the compromised structures instead of being compensated in places not affected by this malocclusion, that is, it must. The degree of involvement of the maxilla and mandible must be evaluated so that the treatment is directed to that bone base and achieves its objectives and impacts of facial improvement. Redirection of growth in Class III cases is indicated as soon as the anomaly is diagnosed, as the displacement processes that occur in the midface can only be affected with treatment as long as the growth zones can respond to the biomechanical stimulus. Therefore, the younger the Class III patient is treated,

the better the facial correction effects will be.

**Keywords:** Malocclusion. Class III malocclusion. Orthodontic treatment. Surgery.

## Introduction

In the scenario of orthognathic surgeries, malocclusion has a prevalence of 6% in the ages of 7 and 15 years in Brazil [1]. The highest number of traumatic injuries to deciduous teeth occur between one and a half and three years of age and to permanent teeth between 7 and 10 years of age, with boys being more subject to dental trauma than girls. Class III malocclusion affects between 5% and 15% of the entire Brazilian population [1].

In this sense, orthodontics enables aesthetic treatment and a good prognosis. It is suggested that most cases of Class III malocclusion have retrusion or maxillary hypoplasia, which may or may not be associated with mandibular prognathism [1-5]. Treatment of Class III malocclusion before late mixed dentition appears to induce more favorable craniofacial changes, with a significant increase in maxillary sagittal growth. However, a mandibular restriction effect can be achieved in a later treatment [5]. Some studies report that the disarticulation of the circumaxillary sutures accentuates the orthopedic effects, but the use of a face mask at a young age, even without palatal expansion, is effective for the correction of skeletal Class III [6,7].

Moreover, expansion should be indicated based on the clinical characteristics of the case. The harmonious functional aspect of the patient is important for the stability of the results. The dental and skeletal

modifications of the Class III correction produce an improvement in the relationship between the teeth, the bony bases, and the soft tissues [8].

Thus, several treatment modalities are proposed for the correction of Class III malocclusion [9]. Approaches include the use of a protraction face mask with rapid maxillary expansion, a face mask without maxillary expansion, a face mask with alternating expansion with maxillary constriction, a face mask associated with miniimplants in the zygomatic pillar, use of mini-implants orthodontics in the lower arch as anchorage for maxillary traction using a removable upper appliance, use of mini-implants in the retromolar region, use of mini-implants on the buccal side of the lower arch, posterior region, use of chin cup, reverse chin cup, functional Fränkel regulator appliance use of an acrylic grid and frame, use of a removable mandibular retractor, use of a reverse "twin block", and use of a "tandem traction bow appliance" [10-14].

In this scenario, it is of paramount importance that the diagnosis is made as early as possible since skeletal discrepancies are quite difficult to correct due to the complexity of the treatment and the lack of predictability in the patients' growth pattern [15,16]. It is well documented in the literature that, in patients with Class III malocclusions that still have growth potential, the most commonly used treatment protocol is the protraction facial mask associated with rapid maxillary expansion. Several studies that seek to show other types of treatment use this therapeutic modality as a control group [17-19].

Therefore, the present study aimed to present a clinical case report of the orthosurgical treatment of a patient with class III malocclusion, showing the follow-up of the good evolution of the treatment and the improvement of the patient's quality of life.

## Methods

### Study Design

The present study was elaborated according to the rules of the CARE case report (<https://www.care-statement.org/>). A descriptive literature review was also carried out to provide sufficient scientific data for the theoretical basis of this study. The descriptors used were *Malocclusion. Class III malocclusion. Orthodontic treatment. Surgery*. The most relevant works to the proposed theme were selected, excluding those that did not contemplate the objective of this study. The research was carried out from July to November 2022 and developed based on Google Scholar, Scopus, PubMed, Scielo, and Cochrane Library.

### Ethical Approval

This study respected the human rights rules of the 1964 declaration of Helsinki and obtained the Informed Consent Form according to CNS/CONEP Resolution 466/12 from Brazil. Data from the child under study were obtained through the collection and analysis of information contained in the patient's medical record, duly authorized by those responsible using signing the Informed Consent Form.

### Case report

#### Patient Information and Clinical Findings, Timeline, Diagnostic Assessment, Therapeutic Intervention, and Follow-up

The patient EOMO, male and 53 years old, presented class III (**Figure 1**) and on 02/03/2003 the patient submitted the orthodontic documentation. On 02/21/2003 the patient was evaluated by the orthognathic surgeon, in Bauru state of São Paulo. Where the treatment and its phases were indicated. The first phase was the surgical expansion of the maxilla, orthodontic treatment of alignment, and maxillomandibular leveling (Note: through the expansion of the maxilla see the possibility of creating space for element 13, although the age is not very likely). The second phase was maxillary advancement and mandible reduction surgery. On 07/31/2003, EOMO decided to undergo orthodontics and the indicated surgeries. It was explained again that it would be in two stages (1st - maxillary expansion and 2nd - maxillary advancement and mandible reduction).

On 03/30/2004, EOMO took the impression of the HAAS orthodontic appliance. On 05/04/2004 cementation of the HAAS, buccal arch segment 18x25 passive on teeth 14-18; 24-25. On 04/07/2004, EOMO underwent maxillary expansion surgery and after 4 days HAAS activation began, 1/4 turn in the morning and 1/4 turn at night, for 4 days and then moving on to 2/4 turns in the morning and 2/4 rounds in the evening. Wait 90 days and ask for tooth #13 to be extracted. On 05/01/2004, EOMO removed the stitches and a single mouthwash with chlorhexidine. And continue with HAAS activations until you encounter no more resistance when activating it. On 05/29/2004, the HAAS controlled and replaced the arch segment plus spring closed sections 24-26. And the patient has no post-surgical symptoms. On 06/27/2004, EOMO performed the removal of the HAAS appliance and upper molding for full-use removable containment. On 09/24/2004, EOMO installed fixed braces on his teeth.

From March 2005 to February 2006, orthodontic treatment was carried out. On 04/04/2006, EOMO carried out a new evaluation of the surgeon, where he

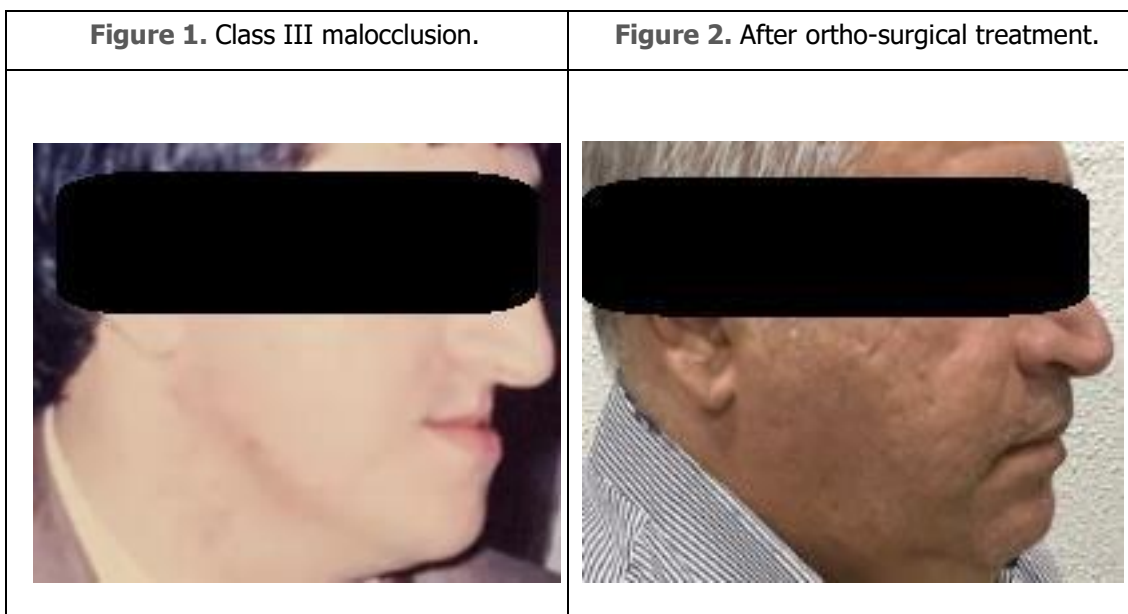
asked to place the passive 19x25 arches and coordinate them. Move the models and forward them to the orthognathic surgeries of the mandible and maxilla after the 19x25 arches. And after surgeries close diastemas. On 11/10/2006, EOMO removed the metallic arches for the patient to make an upper and lower molding and wax occlusion. On 12/18/2006, EOMO went to the preoperative consultation and placed hooks in the upper and lower 19x25 arches. On 12/19/2006, orthognathic surgery was performed with forward maxillary advancement (only in the maxilla), where this decision was taken by the dental surgeon during surgery after moving the maxilla and placing it occluding with the mandible.

On 12/20/2006, the patient was discharged. Feeding is still only in the cup. On 01/12/2007, aesthetics are good, dental and facial aspects as well. Made occlusion adjustments. Removal of stitches located at the bottom of the vestibule from posterior to posterior superior. On 02/23/2007, EOMO went back to the surgeon and he released him to continue with the orthodontic treatment and also to eat normally. A panoramic x-ray was taken and the surgeon told the orthodontist that there is a need to use Class II elastics,

guide the patient to masticate the front and sides, and also perform speech therapy. Then he forwarded the same to the speech therapist (for evaluation and conduct on lingual posture, chewing, diction, and other factors, if any). He placed arch 020 superior and arch 018 inferior towards superior and inferior. Elastic 5116, class III, night and 1/2 day use, daily changes. He also made the necessary occlusal adjustments.

On 04/18/2008, EOMO started doing speech therapy. On 7/1/2008, a proposal was requested to remove the appliances and evaluate them. Removal of the upper corrective appliance. Upper containment: Howley plate: full use, being removed for feeding and cleaning. Guidance on hygiene techniques. Guidance on hygiene techniques: plaque and teeth. On 10/15/2010, the lower (fixed) corrective appliance was removed. And made occlusal adjustments. On 08/06/2011, the patient was discharged and is monitored annually for control purposes only.

Today, after years of treatment and surgeries, EOMO lives well and his appearance has improved 100%, and today he lives with a good quality of life (**Figure 2**).



## Discussion

Based on the case report above, the two most common dilemmas surrounding Class III treatment are the timing of treatment and the type of appliance [20,21]. Various appliances have been used to correct a Class III skeletal discrepancy, but little evidence is available about their long-term effectiveness. Likewise, early treatment of Class III malocclusion has been pursued with increasing interest. However, there is no solid evidence of long-term benefits [21,22].

In this context, a meta-analysis study evaluated

the effectiveness of orthodontic/orthopedic methods used in the early treatment of Class III malocclusion in the short and long term. Fifteen studies, 9 RCTs, and 6 CCTs were included in this review. In the RCT group, only 3 of the 9 studies were assessed at low risk of bias, and the others were either at high or unclear risk of bias. All 6 CCT studies were classified as high risk of bias. Three randomized clinical trials involving 141 participants analyzed the comparison between protraction masks and untreated control. The results for reverse overjet (mean difference, 2.5 mm; 95% CI,

1.21-3.79;  $P = 0.0001$ ) and ANB angle (mean difference,  $3.90^\circ$ ; 95% CI, 3.54-4.25;  $p < 0.0001$ ) were statistically significantly favoring the face mask group. All CCTs demonstrated a statistically significant benefit in favor of using each device. However, the studies showed a high risk of bias. Therefore, there is a moderate amount of evidence to show that early treatment with a face mask results in an improvement in short-term skeletal and dental effects. However, there was a lack of evidence on long-term benefits [23].

Also, Mandall et al. [20] tested the Class III treatment with a face mask associated with rapid maxillary expansion and concluded that it was effective both skeletally and dentally. The only difference in the respective studies was the follow-up time after achieving a Class I molar relationship, which ranged from 15 months to 36 months.

Furthermore, maxillary expansion before treatment with a face mask is used in most cases because it has the benefits of correcting the posterior crossbite when present, increasing the arch length, causing the bite to open, generating a release/activation of the circumaxillary sutures, and generating an initiation of movement of the maxillary complex downwards and forwards [24-28]. However, Vaughn et al. [29], in a randomized clinical trial, testing maxillary protraction in a group with expansion and another without prior maxillary expansion concluded that the changes produced to the dentofacial complex were equivalent to an improvement in malocclusion. Class III and there was no change in total treatment time. Maxillary expansion is only necessary in cases of posterior crossbite or space deficiency [30-41]. These data also according to the systematic review conducted by Kim et al. [42]. In contrast to the use or not of maxillary expansion before maxillary protraction treatment, Liu et al. [39] tested the expansion plus constriction protocol and observed that there were some statistically significant differences, such as better anterior movement of the maxilla and rotation of the mandibular and palatal plane in the expansion/constriction group, but these changes did not demonstrate any clinical relevance, since they were less than 1 mm and  $10^\circ$ , respectively.

Chin cups have been used to control mandibular protrusion in growing patients for nearly a century [43]. However, a deeper investigation of the literature revealed controversies and contradictions regarding the methodology of use, such as the appropriate age for starting treatment and the magnitude of force used. Clinical effectiveness is much debated by authors who use different protocols, obtaining different results [44-47].

Abdelnaby and Nassar [33] carried out a study in patients aged between nine and ten years with chin cups with occipital pull using two magnitudes of force. The authors obtained as a result a significant decrease in the SNB angle both by clockwise rotation of the mandible and by the increase in anterior facial height in the two treated groups when compared to the untreated one, these data are also following the systematic review carried out by Chatzoudi et al. [48]. The results achieved with the use of this apparatus significantly improved the maxillomandibular relationship, however, with few skeletal effects, the difference in force magnitude generated the same effects.

Faced with so many devices already used and tested for the treatment of Class III malocclusion, because they are not very aesthetic, several authors seek to develop new devices that can facilitate use and, consequently, acceptance by patients. Showkatbakhsh et al. [32] developed a new device called a reverse chin cup, to make a maxillary protraction. In this randomized clinical trial, the age range of patients ranged from seven to ten years, and aimed to compare its effectiveness with the face mask. In both treatments, an anterior movement of the maxilla was achieved, as well as a proclination of the upper anterior teeth and a lingualization of the lower incisors. The authors mention that, because the facial mask is bulky, children feel discouraged from using it, especially at school, due to shame and the discomfort it generates. Thus, they suggest that the use of the reverse chin cup, as it is a more aesthetically acceptable method, maybe a better option for maxillary protraction.

The use of the lingual grid or removable upper acrylic stop generates pressure from the tongue on the bulkhead, causing this force to be transmitted to the maxilla, causing its movement to the anterior [49,50]. When comparing its effects with that of the face mask, the results are similar in moving the maxilla forward. One advantage is that the lingual crib does not cause some unfavorable effects on the mandible (backward and downwards rotation) for patients with vertical growth patterns [50,51].

Also, orthopedic treatments with skeletal anchorage are becoming a new paradigm for the early treatment of Class III malocclusion [52-54]. Several studies cite the use of extraoral appliances associated with this type of anchorage [55,56]. The use of miniimplants installed bilaterally in the zygomatic pillar associated with a facial mask or installed between the roots of the lower canines and first premolars on the buccal side, associated with a removable upper appliance with Class III hooks and elastics, can be used to pull the maxilla forward. Such treatment

modalities, when compared with the use of a face mask, present similar results in the correction of the maxillary deficiency. The fact of using devices of smaller size causes a smaller aesthetic imbalance and can generate a better acceptance of the patient, allowing the treatment to be started earlier [57].

### Final considerations

According to the clinical case presented, the treatment of Class III must be fundamentally based on the diagnosis so that the treatment is installed to correct the compromised structures instead of being compensated in places not affected by this malocclusion, that is, it must be. The degree of involvement of the maxilla and mandible must be evaluated so that the treatment is directed to that bone base and achieves its objectives and impacts of facial improvement. Redirection of growth in Class III cases is indicated as soon as the anomaly is diagnosed, as the displacement processes that occur in the midface can only be affected with treatment as long as the growth zones can respond to the biomechanical stimulus. Therefore, the younger the Class III patient is treated, the better the facial correction effects will be.

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### Funding

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### Informed consent

The term was applied.

### 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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