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Comparison of Oral and Maxillofacial Surgeons' and Orthodontists' Treatment Plans for Inclined Class III Patients

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ABSTRACT

Background and Aim: The ability to predict the final result of the facial profile has a major role in treatment planning since the main objective of most patients for orthognathic surgeries is to improve their overall aesthetics. On the other hand, treatment planning for borderline patients is more difficult and challenging. Sometimes, we have to consider all the aspects of the dentofacial profile and choose the best treatment plan. This study aimed to evaluate and compare different treatment plans proposed by oral and maxillofacial surgeons and orthodontists for inclined Class III patients.

Materials and Methods: This review has been done by searching the English articles published between 1998 and 2019 in the PubMed and Google Scholar databases using the following keywords: Clinical Protocols, Malocclusion, Angle Class III, Surgeons, and Orthodontists.

Conclusion: The comparison of the treatment plans between orthodontists and maxillofacial surgeons for inclined Class III patients showed no significant differences. The patients reached optimal function and aesthetics with both treatment plans.

Keywords: Clinical Protocols, Malocclusion, Angle Class III, Surgeons, Orthodontists

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Introduction:

In recent years, various aspects of dentofacial aesthetics have been studied; these aspects have been extensively researched to meet the needs of orthodontic patients for cosmetic treatments. Clinical examinations and diagnostic measures in the design and evaluation of orthognathic and orthodontic treatments previously focused on the components of the dental and skeletal tissues.

However, the emergence of the soft tissue paradigm has changed this approach towards the relationship between the soft and hard tissues in facial aesthetics.⁽¹⁾

Class III dentoskeletal disorder can cause problems with aesthetics, facial asymmetry, and possibly mental and psychological discomfort.

Therefore, at present, the treatment of Class III patients should be performed to achieve proper function and acceptable aesthetics; in fact, achieving these two goals is the main criterion of proper surgery.⁽²⁾

Class III malocclusion occurs due to insufficient growth of the maxilla in the anterior and vertical dimensions, anterior mandibular overgrowth or a combination of the two.⁽²⁾ In today's view, orthodontic treatment alone has little role in improving facial aesthetics in Class III patients and is only useful in mild cases. Nowadays, combined surgical-orthodontic treatments are widely accepted in the treatment of patients with moderate to severe deformities.⁽²⁾ Orthognathic surgical treatments to improve the aesthetics of Class III patients include:

- Bilateral sagittal split ramus osteotomy (BSS-RO), which was first introduced by Trauner and Obwegeser in 1957 and modified by Dal Pont in 1961 and then Epker in 1977.
- LeFort I osteotomy, which was popular in the early 80s for maxillary advancement surgery for Class III correction.⁽³⁻⁶⁾

The treatment plan for inclined Class III patients is very complex because not all of these patients need orthognathic surgery; therefore, evaluating and choosing the right patients who need orthodontic treatment alone or combined surgical-orthodontic treatments is our primary challenge in diagnosis and treatment planning.⁽⁷⁾ Surgery with orthodontic treatment will result in acceptable aesthetic and functional results that are often faster than those achieved without surgery. The orthodontic treatment plan is an interactive process in which the patient and the therapist are involved and are often confronted with stress due to differing views and experiences. The therapist draws inspiration from the clinical and observable findings, while patients differ in their perceptions of their values and needs. Good listening and understanding the patients' needs are essential skills for therapists.⁽⁸⁾ This study aimed to evaluate the extent of agreement between maxillofacial surgeons and orthodontists in the presentation of a treatment plan for inclined Class III patients. The selection of

a specific orthognathic option depends on many factors, including the initial facial morphology and the ability of maxillofacial surgeons and orthodontists to diagnose and predict treatment outcomes.

Materials and Methods

The present study was done by searching the PubMed and Google Scholar databases in 2019 using the following keywords: Clinical Protocols, Malocclusion, Angle Class III, Surgeons, and Orthodontists. The English articles published until February 2019 were reviewed. Full-text articles that examined the extent of agreement between maxillofacial surgeons and orthodontists in the presentation of treatment plans for inclined Class III patients were reviewed.

Discussion:

Dentoskeletal Class III disorders can cause aesthetic problems as well as facial asymmetries with consequent mental distress.⁽²⁾ The choice of the orthognathic treatment plan depends on many factors, including the initial facial morphology and the ability of maxillofacial surgeons and orthodontists to diagnose and predict treatment outcomes. Surgery coupled with orthodontic treatment will produce good aesthetic and functional results faster than the results achieved by non-surgical treatments. However, we must also remember that surgery has unavoidable risks. Ultimately, achieving the right function and aesthetics is the main goal of the treatments.⁽⁹⁾

Mirhashemi and Parhiz evaluated the treatment process proposed by orthodontists and surgeons for inclined Class III patients and the satisfaction level after treatment.⁽⁵⁾ This study was performed on 31 patients, including 16 females and 15 males with the mean age of 21 years and reverse jet less than 0.5 mm, who had achieved appropriate occlusion two months after surgery. Maxillofacial surgeons and orthodontists presented their treatment plans separately, and if there were any theoretical differences, they discussed and debated the best treatment option for the patient.

The visual analog scale (VAS) was used to determine patient satisfaction. From the 31 studied patients, orthodontists and surgeons suggested bimaxillary surgery for 61% and 45% of the patients, respectively.

For 35% of the patients, the treatment plan of surgeons and orthodontists was different, but the difference was not significant. The results of the data analysis showed that there was no significant difference between the treatment plans presented by orthodontists and maxillofacial surgeons, and both groups preferred bimaxillary surgeries.⁽⁵⁾

Rabie et al performed a study to compare the morphological characteristics of inclined Class III patients with an orthodontic treatment plan and an orthognathic surgical treatment plan and compared the results of each treatment.⁽⁶⁾

For this purpose, lateral cephalometry was performed on 25 Class III patients with ANB angles greater than -5 degrees, who received orthodontic treatment in 13 cases and surgical treatment in 12 cases. Orthodontic treatment was performed by moving the retruding mandibular anterior teeth and mandibular rotation in the downward and backward directions. Surgical treatment was performed with the backward movement of the anterior dentoalveolar segment. Both therapies were found to cause significant changes in the mandibular dentoalveolar position as well as the lower incisors, which resulted in patient satisfaction.⁽⁶⁾

In the cited study, 18 patients, including 10 males and 8 females with the mean age of 24.5 years, were recruited. Profile photography and lateral cephalometry were taken from patients and digitalized. Cephalometric analysis was performed manually, and the computer predicted the results of each of the three treatment methods. The images were sent to 51 orthodontic surgeons (45.1% response rate), 78 orthodontists (71.8% response rate), and 61 members of the general population (100% response rate). All predictions, except for mandibular retrusion in three patients, improved facial aesthetics, and for the other 14 patients, there was almost a general agreement among the three groups of reviewers. The general public reported lesser degrees of aesthetic improvement.⁽⁶⁾

Stellzig-Eisenhauer and colleagues conducted a study to isolate borderline Class III patients, who

required orthodontic treatment, from other patients who required surgery.⁽⁷⁾ In this research, cephalometric images of 175 patients were examined, and 20 aesthetic, angular, and linear scales were used for evaluation. The analyses were carried out in a stepwise manner with great care to identify the dentoskeletal variables that best separated the two groups. Finally, 92% of the patients were categorized, and these variables were extracted: Witts index, anterior cranial length, maxillary/mandibular ratio (Mx/Mn), and lower gonial angle. The final equation obtained from the study reported that, among the mentioned variables, the importance of the Witts index was higher than the others.⁽⁷⁾

In 2011, Tseng et al performed a study to distinguish between skeletal Class III patients requiring surgery and those who need no surgery using cephalometric analysis.⁽⁹⁾

Lateral cephalometric images of 80 patients (40 surgical and 40 non-surgical) were analyzed using 25 cephalometric measurement scales. Of these, 14 scales showed a statistically significant difference between the two groups. The analyses were used to test the ability of these 14 cephalometric scales to differentiate between the two groups, and again, six valid and clinically relevant scales were selected for ease of access to appropriate discriminating factors. According to the results, every Class III patient who has four of the following six major indices needs surgical treatment:⁽⁹⁾

Overjet ≤ -4.73 mm, Witts appraisal ≤ -11.18 mm, L1-MP angle $\leq 80.8^\circ$, Mx/Mn ratio $\leq 65.9\%$, overbite ≤ -0.18 mm, and gonial angle $\geq 120.8^\circ$.⁽⁹⁾

Kerr and colleagues attempted to define cephalometric criteria for skeletal Class III patients. (10) Criteria for surgery included ANB angles of less than -4 degrees, Mx/Mn ratio of less than 0.84, the angle of rotation of the lower incisors relative to the mandible equal to 83 degrees, and the Holdaway angle equal to 3.5 degrees.⁽¹⁰⁾

Martinez et al compared the different cephalometric variables in adult patients with Class III malocclusion before and after treatment to identify the effective variable in determining orthognathic surgery or camouflage orthodontic

treatment.⁽¹¹⁾ In this study, 156 adult patients were studied, 77 undergoing orthodontic camouflage and 79 undergoing orthognathic surgery. The angles of SNA, SNB, and ANB, as well as the facial axis, mandibular plane, upper and lower incisor inclination, inter-incisal angle, and Witts index were evaluated before and after treatment. This study showed that previous normal values were slightly worsened after orthodontic camouflage treatments while these variables improved in orthognathic surgical cases.⁽¹¹⁾

In 2018, Eslami et al conducted a study to determine the method of orthognathic surgery or orthodontic camouflage treatments.⁽¹²⁾ In this study, the cephalometric images of 65 patients with medium skeletal Class III were evaluated.

Thirty patients were enrolled in the orthodontic camouflage treatment group and 29 patients in the orthognathic surgery group. The camouflage treatments included maxillary anterior teeth protrusion and mandibular anterior teeth retrusion. In the orthognathic surgery group, the surgical treatments included mandibular retraction, maxilla protrusion, or bimaxillary surgery.⁽¹²⁾

The study showed that cases with Holdaway angles more than 10.3 degrees and Witts index more than -5.8 mm are suitable for camouflage treatments, whereas Holdaway angles of less than 10.3 degrees and Witts index of less than -5.8 mm are suitable for orthognathic surgery, which showed that the Holdaway angle and Witts analysis are two essential parameters in the treatment of borderline Class III patients (Table 1).⁽¹²⁾

Table 1: The reviewed articles

Authors	Year	Number of subjects	Age (year)	Conditions	Results
Eslami et al (12)	2018	65 patients			Holdaway angles larger than 10.3° and Witts indices larger than -5.8 mm are suitable for camouflage treatments, whereas Holdaway angles less than 10.3° and Witts indices less than -5.8 mm are suitable for orthognathic surgical procedures, indicating that the Holdaway angle and Witts analysis are two essential parameters in the treatment of inclined Class III patients.
Martinez et al (11)	2017	156patients			Previous normal values (SNA, SNB, ANB, facial axis, mandibular plane, upper and lower incisor inclination, inter-incisal angle, and Witts) were slightly worsened after orthodontic camouflage treatments while these variables improved in orthognathic surgical cases.
Mirhashemi and Parhiz (5)	2014	31 patients (16 females and 15 males)	21	Reverse jet less than 0.5 mm	There was no difference between the treatment plans provided by orthodontists and maxillofacial surgeons.
Tseng et al (9)	2011	80patients			Every Class III patient who has four of the following six major indices needs surgical treatment: Overjet \leq -4.73 mm, Witts appraisal \leq -11.18 mm, L1-MP angle \leq 80.8°, maxillary/mandibular ratio (Mx/Mn ratio) \leq 65.9%, overbite \leq -0.18 mm, and gonial angle \geq 120.8°.
Fabré et al (3)	2010	18 patients (8 females and 10 males)	24.5		All predictions, except for mandibular retrusion in three patients, improved facial aesthetics, and for the other 14 patients, there was almost a general agreement among the three groups of reviewers. The general public reported lesser degrees of aesthetic improvement.
Rabie et al (6)	2008	25patients		Class III patients whose ANB angles exceeds -5 degrees	Both therapies produce significant changes in the mandibular dentoalveolar position as well as the lower incisors, leading to patient satisfaction.
Stellzig-Eisenhauer et al (7)	2002	175 patients			Among the mentioned variables (Witts index, anterior cranial length, Mx/Mn ratio, and lower gonial angle), the Witts index was more important than others.
Kerr et al (10)	1992				Criteria for surgery include ANB angles of less than -4 degrees, Mx/Mn ratio of less than 0.84, mandibular inclination angle of

Conclusion:

According to the reviewed articles, the treatment plan outlined for borderline Class III patients is not significantly different from the viewpoints of maxillofacial surgeons and orthodontists, and both show approximately similar results that ultimately lead to patient satisfaction, health, and aesthetics.

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