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Management of skeletal class III malocclusion by surgery-first approach: A case report

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ABSTRACT

The purpose of Dentofacial Deformity Treatment is to achieve the proper aesthetic and functional occlusion results. Conventional orthognathic surgery involves a long-term orthodontic phase before surgery for about 18 months, in which patients' facial appearance worsens and their motivation decreases. In the SFA (surgery first approach) method, the surgery is performed before orthodontics and orthodontic therapy is performed to improve dental occlusion and final settlement. Two main advantages of this method are the reduction of the therapy period and the initial improvement in the patient's facial appearance. The SFA has certain benefits, especially in Class 3 malocclusion. In this case report, a 19-year-old girl with a relatively severe Class 3 malocclusion with skeletal discrepancy due to a mandibular prognathism and maxillary retrognathism, and asymmetrical face with chin deviation to left is presented with a unilateral posterior cross bite which was effectively treated using the SFA protocol. The SFA therapy was performed by removing orthodontics before surgery, followed by maxillary advancement surgery, and posterior maxillary impaction and postoperative orthodontic sets to dental alignment and settling the occlusion. Despite the overall reduction in the orthodontic therapy period to less than 9 months, good results and functional occlusion were obtained.

Keywords: Surgery first; Orthognathic surgery; Skeletal class III; Malocclusion; Orthodontic treatment.

Introduction

Orthodontics is carried out to improve dental occlusion, functional objects, and smiling beauty. Among the malocclusions, the therapy with skeletal discrepancy is a combination of orthodontic methods coupled with surgery. Typically, during a therapeutic process involving dental align and leveling, decompensation and arch coordination are performed in the pre-surgery phase, orthognathic surgery followed by finishing in the orthodontic phase after surgery. This method has been started with high predictability and stability since 1960 and has been used as a routine method in treating skeletal disorders [1-3]. Despite all the advantages and efficiency of this method, it has some disadvantages, such as long-term therapy, the deterioration of patients during the pre-surgery period, the inadequate stimulation and cooperation of patients, and the discomfort caused by lack of occlusion stability in chewing patients [4-7]. Moreover, more rapid, efficient, stable dental movements, and similar results to conventional orthognathic methods and higher degrees of success have been reported to this method, which has

made the orthodontists and patients to choose this method more. Given the difficulties in this method, it has been proposed to maximize the effect of accurate use of surgical models to design the right therapy as well as close consultation with the surgeon [15-17]. In this study, we investigate a skeletal class 3 malocclusion case that was successfully treated in a short period with the desired results using the SFA method.

Case Report

A 19-year-old girl was referred with the chief complaint of poor appearance due to a prominent mandible. Clinical examination showed facial asymmetry with chin deviation to left. Besides, skeletal and dental class 3 malocclusion with posterior cross bite was observed in the left segment of the patients dentition. The evaluation of the patients profile showed that the mandibular prognathism, maxillary retrognathism, and the faded mentholbial salcus were evident. The patient had no medical, dental history, and oral habits.

Extra-oral Examinations:

Extra-oral examinations recorded a maximum opening of 45mm, and the condition of the TMJ and jaw muscles were assessed for any pathological conditions. The patient had no history of pain or joint issues.

Soft Tissue Assessment:

The lips in the rested position were together and the tension in the labial muscles was not obvious. The nasolabial angle was acute (80 degrees) and the soft tissue of the nose, upper, and lower lips were examined and reported in the normal range.

Facial Proportions:

From the frontal view, the patient had an asymmetrical face, especially in the mandible angle and chin area. The deviation of the chin to the left was quite clear. The patient›s 1/3 facial proportions were recorded in the normal range. In the patients profile view, the appearance of the face was straight and the chin-throat angle was 90 degrees with a straight form. Also, the angle and slope of the mandibular plan were determined as flat.

Mini Aesthetics and Smile Analysis:

In the mini-static study, the midline shift was evaluated, which was considered to be 3mm for the middle line deviation to the left and maxillary midline was normal. The smile line was considered normal in terms of height and the smile arch was flat. The buccal corridor appeared to be moderate, and the upper tooth show at a smile was 10mm, while in other conditions was 0mm. Also, the lower tooth show at a smile was 2mm, while in other conditions was 0mm.

Intra-oral Evaluation:

Periodontal examination recorded tissue health in terms of soft tissue lesions, BOP, and attached gingiva. The patients oral hygiene was well. In dental evaluations, superficial decay at the occlusal surface of some teeth (No. 5, 12, 15, 19, 21) was observed and consulted with a restorative specialist. Also, the root canal therapy and amalgam restoration were carried out on tooth No. 3, which was recorded at the desired level in terms of therapy quality. The patient lost teeth No. 14 and 30. The molar and canine relations were two sides of Class 3. The amount of overbite was 0, and the patient›s overjet was -1mm. A comparison of CO and CR illustrated the coordination between the two in the normal range, and there was no clear functional shift.

Figure 1. Pretreatment intraoral photographs.

Radiographic Examination:

Examination of the patient's panoramic confirmed the information from the intraoral assessments, including the fact that the third molar mandibular teeth on both sides were forming roots and their direction of growth was in the right direction. The patient didn't have maxillary third molar's bud. Also, due to the clear asymmetry in the mandible, an anterior-posterior cephalogram patient was prescribed, after which the information in the clinical examination was confirmed. Space and Bolton analyses were performed on dental models.

The list of patient problems based on Acroman Profit is as follows.

1- Facial asymmetry and chin deviation to left- Acute nasolabial angle-Mentholbial salcus has disappeared–flat smile arch-Prominent chin-Mandibular dental midline shift to the left.

2- Teeth rotation No. 12,13,14,28,29- retroclination of

lower incisors and proclination of upper incisors.

3-Palatal Cross bite in teeth No. 12,13,14,15.

4– Class 3 Skeletal-mandibular prognathism and maxillary retrognathism-class 3 molar and canine relationship on both sides, edge to edge incisor relationship.

5- Horizontal growth pattern.

After evaluating the patient's diagnostic evidence, the patient's diagnosis was made on the class 3 skeletal disorder with horizontal growth pattern, asymmetrical face, proclination of maxillary dental arch and retroclination of the mandibular dental arch. Also, the purpose of the therapy was determined based on the patient's diagnosis and the surgeon's consultation. Immediately after the surgery, the purposes included proper canine and molar relationships and 4mm overjet due to the patient's low IMPA. The ultimate therapeutic goals included aligning the maxillary and mandibular dental arch, improving the maxillary and mandibular incisor inclination, obtaining the ideal overjet and overbite, modifying the mandibular dental midline shift, obtaining the ideal functional occlusion, and ultimately improving the skeletal and soft tissue profiles.

Variable	*Pre-treatment*	*End of Treatment*	*Variable*	*Pre-treatment*	*End of Treatment*
SNA	*81*	*82*	*Sn-GoGn*	*25*	*28*
SNB	*86*	*84*	*FMA*	*18*	*22*
ANB	*-5*	*-2*	*Y-axis*	*52*	*53*
Max. Length	*91*	*91*	*S-Ar*	*36*	*36*
Man. Length	*127*	*118*	*Basal Angle*	*26*	*26*
Max- Man difference	*36*	*27*	*Jarabak Index*	*66%*	*66%*
A to NP	*-1*	*+1*	*U1 – NA*	*34*	*29*
Pog to NP	*+12*	*+9*	*U1 – SN*	*113*	*110*
Wits	*-10*	*-6*	*U1 – FH*	*120*	*117*
Sn to Maxillary plane	*4*	*5*	*L1 – NB*	*18*	*18*
Facial angle	*95*	*93*	*IMPA*	*85*	*86*
UAFH	*52*	*49*	*FMIA*	*77*	*80*
LAFH	*70*	*67*	*Inter incisal angle*	*133*	*141*
Saddle angle	*123*	*123*	*Holdaway Ratio*	*1.5*	*3*
Articular angle	*143*	*134*	*Lu to E Line*	*-9*	*-2*
Gonial angle	*122*	*132*	*LI to E Line*	*-3*	*-1*
Sum of Bjork	*388*	*359*			

Table 1. Pretreatment and posttreatment cephalometric measurements.

Figure 2. Pretreatment cephalometric and panoramic radiographs.

Treatment plan:

We planned the SFA treatment after the therapeutic purposes were assessed and according to patient›s information, medical history and dental records, the lack of trauma history, consultation of the maxillofacial surgeon, and informed consent from the patient. This treatment consisted of two parts: leFORT 1 surgery for maxillary advancement and posterior impaction of 2 and 3mm, respectively, and mandible asymmetrical set back using the BSSO method to eliminate mandible asymmetry and prognathism of 6 and 3mm in the right and left, respectively. The treatment plan was confirmed after re-examination and re-evaluation using manual surgery model, cephalometric and dolphin software prediction, therefore, VTO is created for therapeutic purposes and achieve planned skeletal movements and it was easier to communicate with the maxillofacial surgeon. Finally, the surgical splint was made according to model surgery and the prediction of orthodontic movements.

The surgeon uses this splint in the operating room and delivers temporary postoperative occlusion for orthodontics to the orthodontist. 022 MBT system brackets were placed in an ideal situation before surgery and 16.22 stainless steel wire was formed inactive and it was engaged in brackets. In the operating room, at first, a surgical incision was made on the soft tissue of maxilla for better access. The leFORT 1 osteotomy was carried out according to a treatment plan which included 3mm of advancement and 5mm of posterior impaction on the right side and 3mm of posterior impaction on the left side using the temporary implant. Maxilla was fixed in preform using two L shape plates with four holes and four screws, then, the temporary splint was removed. Sagittal osteotomy of mandible was carried out and it was fixed on the final splint on either side by a plate with four holes and four screws. Zygomatic osteotomy and advancement were carried out in infraorbital nerve and with a distance of 5mm from the inferior orbital rim and it was fixed using plate and screws. Finally, the patient was discharged after a day of care with an elastic reminder and he was reached out for examination and removal the splint on week after surgery.

The patient referred a week after surgery with the good general condition and a reduction in pain and edema. Because of the increased overjet to correct the incisor angle and achieve other therapeutic goals, they were considered. Four weeks after surgery, the 16.22 stabilizer orthodontic wire was released as a base wire and NITI 14 wire was used with elastics to align and level the tooth arch. Afterward, the NITI 14, NITI 16, steel 16, and 16.22 steel wires were used for five months. After this period, the brackets were debonded and the removable retainer for mandible and fixed and removable retainer for maxilla were delivered to the patient. Finally, the patients treatment results were desirable and the results were very satisfactory due to the short time of treatment and overall patient satisfaction was very high.

Figure 3. Post-treatment facial photographs.

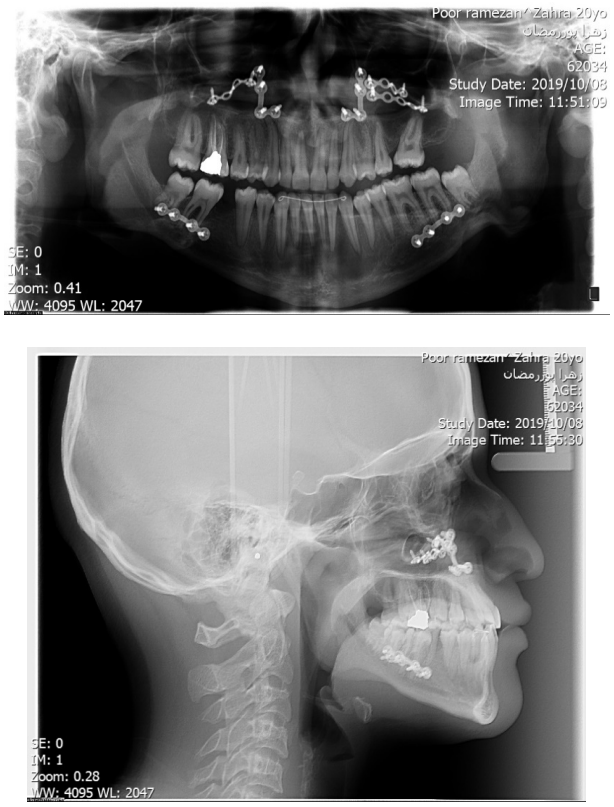

Figure 4. Post-treatment cephalometric and panoramic radiographs.

Discussion

Orthodontic therapy with surgery has been considered as a method in patients with severe skeletal disorders. This method is routinely used in patients with Class 3 skeletal disorders and is assumed as a long-term therapy. This therapy using the SFA method in some patients can be very beneficial, as it reduces the overall period of therapy and improves the overall satisfaction of patients. According to the studies, the stability and the results of this therapy method are similar to the usual orthodontic-surgical methods [2,18].

Studies that were conducted on the SFA method in SFA reported a reduction in the overall period of therapy, which can reduce complications of the long-term therapy period, including dental decay, and periodontal problems, as well as reducing the level of patients› cooperation and satisfaction. Elimination of pre-surgery orthodontic, acceleration of dental movements in post-surgery following RAP phenomenon, high cooperation of patients due to relieving the original complaint and improving their facial appearance as well as aligning the type of facial movements with improved soft tissue and mouth environment, are among the effective factors in reducing the overall period of patients therapy [59,19-25]. The reduction of the therapy period is evident in our study so that the overall period difference in our study is less than half of the period in the typical 18-month method. This can lead to a high level of satisfaction in patients seeking to reduce the therapy period. The patient had the intention of migration and limited time, so this method followed by very high satisfaction. Considering the complexity of this method, the selection of this method can provide the maximum benefit that patient selection is conducted with care. Patients with the degree of the skeletal disorder are not so severe that mild and moderate dental misalignment can be considered acceptable criteria for this approach.

Moreover, due to the lack of stable occlusion after surgery and difficulty in predicting dental movements in orthodontics and the surgery model can be extremely helpful for patients and coworkers using computers for some patients. Also, due to the lack of stable post-surgery occlusion and the difficulty in the prediction of dental movements in orthodontics, performing a prediction and surgery model using a computer in some patients can be highly effective [26-28]. Despite all the constraints of this study, considering the cooperation and high experience between the orthodontist and the surgeon, and the detailed treatment plan and predictions made in the manual treatment plan and Dolphin software, the results were satisfactory in terms of beauty and occlusion in the shortest possible period.

Conflict of Interest

There is no conflict of interest to declare.

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