Bimaxillary Orthognathic Surgery in Skeletal Class III Malocclusion

Stephanus Christianto1, Yiu Yan Leung2
1 Faculty of Dentistry, Maranatha Christian University – Indonesia
2 Department of Oral and Maxillofacial Surgery, Faculty of Dentistry, The University of Hong Kong – Hong Kong

‘Corresponding Author: Christianto Stephanus, Faculty of Dentistry, Maranatha Christian University – Indonesia

Email: chris11889@ymail.com

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ABSTRACT

Background: Skeletal Class III malocclusions can vary in severity, with different levels of treatment available to reflect this variance. In cases of moderate to severe skeletal discrepancy, orthodontic treatment in conjunction with orthognathic surgery is a common treatment option. This case report outlines an orthosurgical treatment approach for a patient with severe skeletal Class III malocclusion. Case Report: A 23-year-old female presented with skeletal Class III malocclusion. Pre-surgical orthodontic treatment was done after 1.5 years. The lateral profile view showed a concave profile, incompetent lip closure, deficiency in paranasal area, acute nasolabial angle, and obtuse labiomental fold. Intraorally, she had a negative 5.5 mm overjet and 2 mm overbite. The surgical procedures performed included high-level Le Fort I osteotomy, bilateral intraoral vertical ramus osteotomies (IVRO), and genioplasty. Conclusion: The treatment of skeletal Class III dentofacial deformity should be planned according to the malocclusion and facial profile to achieve a functional and esthetic outcome. A systematic treatment plan that takes into consideration the patient’s expectations and concerns must be created and implemented for a satisfactory outcome.

Keywords: skeletal class III, bimaxillary, orthognathic surgery, malocclusion
Background

A combination of orthodontic treatment and orthognathic surgery is often performed in patients with moderate to severe skeletal Class III malocclusion. Spalj et al. reported that the most common differential skeletal type in Class III patients was mandibular prognathism with normal maxilla (43%), followed by maxillary retrognathism with normal mandibular position (19.6%), and a combination of both (< 5%). In complex cases, such as a combination of maxilla retrognathism and mandible prognathism, bimaxillary orthognathic surgery in conjunction with orthodontic treatment is often required to achieve a harmonious, balanced facial profile, with proper occlusion, and to avoid major surgical movement (because such cases may present a higher risk of relapse). Moreover, the proper treatment plan together with patient expectation before and after orthognathic surgery are also required to determine the success of treatment. In this case report, we present an outline of the treatment plan for a skeletal Class III patient that includes orthodontics and bimaxillary surgery.

Case Report

A 23-years-old Asian female reported the chief complaints of a protruding lower jaw and an inability to bite food with her front teeth. On extra-oral examination, a lateral view of the face showed skeletal Class III malocclusion with a concave profile, incompetent lip closure, depressed paranasal area, and slightly acute nasolabial angle. The frontal view showed a slight chin deviation to the left by 2 mm (Fig. 1A). At rest, around 4 mm of the incisor showed, and when smiling, the full length of the incisor crowns were seen, with excessive gingival exposure of around 2 – 3 mm.

Intra-oral examination revealed an ovoid-shaped maxilla and mandibular arches, with mild to moderate anterior and posterior crowding in both arches. The interarch relationship showed a reverse overjet of 2 mm and overbite of 1 mm. In maximum intercuspation, the canines and molars were in a class-III relationship on both sides. The mandibular and maxillary dental midlines did not coincide with each other, with the lower dental midline deviating by 2 mm to the left and the upper dental midline deviating by 2 mm to the right of the facial midline (Fig. 1B). A diagnosis of skeletal Class III, with Angle Class III, malocclusion was made.

A combination of orthodontic and surgical approaches was proposed to manage the skeletal Class III malocclusion. The pre-surgical phase of orthodontic treatment was comprised of extraction therapy for the maxillary first premolars, which was essential to align the
maxillary arch and remove any dental compensation. Meanwhile, no extraction of the mandibular premolars was required to align and decompensate the mandibular arch.

One and a half years after the pre-surgical orthodontic phase, the surgical phase of the treatment began (Fig. 2). The surgical phase included high-level Le Fort I osteotomy to address the 2 mm anterior maxillary impaction, followed by the 5 mm posterior maxillary impaction, and finally the 2 mm maxillary setback. In addition, intraoral vertical ramus osteotomies (IVRO) and genioplasty were planned to address the 12 mm mandibular setback and 4 mm chin advancement, consecutively. Postoperative intermaxillary fixation (IMF) was applied to fixate the proximal and distal segment of the ramus osteotomy. At six weeks postoperatively, the IMF was removed, and the post-surgical orthodontic phase continued to refine the occlusion and ensure a balance of tooth interdigitation (Fig. 3).

One year following the post-surgical orthodontic phase, the brackets were debonded, and palatal and lingual retainers were put in place. The overjet and overbite were restored to normal, and Class I molar, Class I canine, and matching dental midlines were obtained (Fig. 4). The facial profile showed a marked improvement, with fullness in malar area and an excellent esthetic balance between hard and soft tissue (Fig. 5). Patient in this case report has signed the informed consent documents from the Faculty of Dentistry, Hong Kong University Dental Hospital which allow the authors to publish their case.

Figure 2. A. Pre-surgery posteroanterior cephalogram, lateral cephalogram, and extraoral photographs. B. Pre-surgery intraoral views

Figure 3. Six weeks post-surgery posteroanterior cephalogram, lateral cephalogram, and extraoral photographs
Skeletal Class III malocclusion is prevalent among the East Asian population. Many studies on the lower face of the East Asian population have shown that a slightly retruded mandibular profile is more common than average and that skeletal Class II profiles are more common than are skeletal Class III profiles. As such, many patients with a skeletal Class III profile will seek orthodontic treatment to improve their facial appearance. However, in adult patients—mainly those with moderate to severe skeletal Class III profiles—the involvement of orthodontic treatment alone (i.e., camouflage therapy) is not possible. Accordingly, a combination of orthodontic and surgical approaches becomes inevitable to accomplish satisfactory treatment outcomes.

The clinical success of orthognathic surgery is not only defined by good facial outcomes but also by a combination of factors such as the fulfillment of patient expectations, proper functional occlusion, patient comfort, and the stability of the results. For this reason, proper diagnosis and treatment planning are crucial.

In the case presented in this study, the presurgical orthodontic treatment was performed for the alignment of dentition and incisor decompensation. The purposes of
Presurgical orthodontic treatment for this patient were to enable maximal surgical correction of the deformity and to enable the production of an ideal occlusion. After one and half years of presurgical orthodontic treatment, high-level Le Fort I osteotomy, IVRO, and genioplasty were planned.

High-level Le Fort I osteotomy is a modified version of Le Fort I osteotomy. This technique is slightly different from the conventional Le Fort I osteotomy in that, in this technique, the osteotomy of the lateral wall maxilla starts from the pyriform rim and goes up to below the infraorbital foramen and down along the zygomatic buttress (Fig. 6). The main purpose of this osteotomy is to result in greater improvement of the paranasal area during rotation or advancement movements than can be gained from conventional Le-Fort I osteotomy. In this case, the patient had deficiency of the paranasal area as well as an acute nasolabial angle. The high-level Le-Fort I osteotomy, with clockwise rotation movement (3 mm anterior impaction and 5 mm posterior impaction), was chosen to improve the paranasal area. Meanwhile, 2 mm of maxillary setback was required to increase the nasolabial angle, especially after anterior maxillary impaction, leading to a reduction in the nasolabial angle.

The most common surgical procedures to correct the mandibular prognathism are bilateral sagittal split ramus osteotomy (BSSO) and IVRO. The advantages of BSSO includes great flexibility in repositioning the distal segment of the mandible and the elimination the need for IMF. However, the neurosensory disturbance (NSD) of the inferior alveolar nerve (IAN) remains a major complication of the BSSO procedure. The incidence of postoperative NSD after BSSO ranges from 5% to more than 90%. This complication has a severe effect on quality of life and often leads to patient complaints after the treatment. Compared with BSSO, IVRO has been reported to have several advantages in that it may prevent NSD and require a shorter surgery time. Nevertheless, postoperative IMF is still the main drawback of IVRO. In this case report, IVRO was chosen to treat mandibular setback instead of BSSO; the main reason for this was related to the patient’s concern about postoperative NSD. Because of the large setback and clockwise rotation movement of the mandible, the retrognathic appearance would be shown from downward and backward rotation movement of the chin. Accordingly, in this case report, advancement genioplasty was performed with the purpose of improving the facial profile, especially after large mandibular setback.

**Conclusion**

The treatment of skeletal Class III dentofacial deformity should be planned according to the malocclusion and facial profile to achieve a functional and esthetic outcome. A systematic treatment plan must be created and implemented in conjunction with the patient’s expectations and concerns to achieve a satisfactory outcome.
Conflict of Interest

The authors report no conflict of interest related to this study.

References
