Skeletal Class III Dentofacial Deformity with an Open Bite Treated by Orthodontics and Orthognathic Surgery – a Case Report

Abstract

The class III skeletal deformity with open bite may be due to a horizontal excess of the mandible, an antero-posterior deficiency of the maxilla, or both. In most cases, there is a posterior vertical maxillary excess that creates the anterior open bite. Treatment of open bite deformities is known to be difficult and results are not always predictable. Growth modification and orthodontic camouflage not only can compromise the aesthetics but also can jeopardize the stability of the results. In such cases the combined surgical – orthodontic correction is considered the best treatment modality. Simultaneous mobilization of the maxilla and mandible is often needed to correct severe class III dentofacial deformities with accompanying open bite. In the treatment of these malformations it has been shown that the composed approach is very important to achieve high-quality functional and aesthetic results. The authors present a case of 18-year-old female patient with a class III dentofacial deformity with an open bite interdisciplinary treated using orthodontics and orthognathic surgery. They demonstrate the stages of planning and discuss surgical techniques and results obtained.

Key words: skeletal Class III malocclusion, open bite, orthognathic surgery, interdisciplinary treatment.

Skeletal Class III anomalies involve mandibular prognathism, maxillary retrusion, or combination of both [1, 2]. The Class III dentofacial deformity with an accompanying open bite is a complex musculoskeletal deformity that exhibits skeletal abnormalities in all three planes. Vertically there is inferior rotation of the posterior maxilla that creates the anterior open bite by a clockwise rotation of the mandible. The vertical discrepancy also affects antero-posterior jaw relationship [3, 4]. The growth of the mandible rotates down and back and masks the true magnitude of the ex-
cessive mandibular length. In addition, excessive face height is noted (long face), and a transverse maxillary constriction with a posterior crossbite, is variably present. Bailey et al. wrote that primary distinguishing characteristic of the long-face is a large total facial height that is manifested almost entirely in elongation of the lower third [3]. Prognathic mandible and retrognathic maxilla with accompanying anterior open bite result in a typical concave profile, flatness of the paranasal areas and cheeks, Angle Class III malocclusion and increased lower face height.

The Class III open bite deformities may create both aesthetic concerns and functional problems including masticatory insufficiency, periodontal disease, speech problems and temporomandibular joints dysfunctions [5, 6]. The psychosocial impact of a dentofacial deformity on an individual is well known. Such a deformity can profoundly affect the quality of life and often leads to discrimination in social interactions [7, 8].

Etiology of Class III skeletal deformities include hereditary environmental factors. The relative contribution of genetic factor to Class III malocclusions has been the subject of a number of previous studies [7, 9–11]. Among environmental factors which have been suggested as contributory to the development of Class III open bite deformities are enlarged adenoids, nasal blockage, hormonal disturbances, posture and trauma [7].

Generally, skeletal Class III open bite deformities are difficult to correct and maintain. Its treatment outcome is less stable than surgical cases without skeletal open bites [2, 4, 12].

In patients with a severe Class III open bite skeletal deformities, growth modifications and orthodontic camouflage do not lead to a satisfactory functional and aesthetic results. The tendency of anterior teeth to relapse towards their pretreatment vertical and horizontal relationship following treatment is well recognized [3, 12]. In such cases the combined surgical-orthodontic correction is the best treatment modality.

A primary goal of presurgical orthodontic treatment is to eliminate all existing dental compensation. The teeth are aligned in their optimal positions in arch so that an acceptable occlusion can be produced at surgery [1, 13].

After preoperative orthodontic preparation surgery is performed to re-align the jaw bases. In the past, most patients were treated by mandibular procedures but experience had shown that the correction of skeletal open bite by lower jaw surgery as an isolated procedure is considered to induce considerable relapse due to clockwise rotation of the mandibular body with lengthening of the su- prahyoid muscles and stretching the ptreygomas-

seteric sling. Currently, the best surgical results are achieved through bimaxillary procedures. The bilateral sagittal ramus osteotomy (BSSO) and Le Fort I osteotomy are the most frequently used methods for surgical correction of skeletal Class III open bite discrepancies. Maxillary intrusion is used to close an open bite and to obtained the correct face height, and mandibular osteotomies are used to adjust the horizontal position of the lower jaw [2, 4].

Following surgical alignment of the jaws, the finishing treatment are applied to the teeth through postoperative orthodontics. This may involve simple alignments or more extensive compensation for minor relapse or overcorrections. This process usually requires from six to twelve months [13].

In this report we present a case of 18-year-old female patient with a class III dentofacial deformity with an open bite interdisciplinary treated using orthodontics and orthognathic surgery. We demonstrate the stages of planning and discuss surgical techniques and results obtained.

Case Report

A female patient aged 17 years and 8 months presented to the Maxillofacial Clinic of Wroclaw Medical University with a chief complaint of “too prominent lower jaw, flat appearance of her midface and chewing problems”. The patient was referred by her orthodontist asked for surgical correction of Class III open bite dentofacial deformity. The abnormal forward growth of the lower jaw was first noted at the age of 8 years and had become gradually worse. The patient’s mother and grandfather had similar prognathous deformity. Her medical history was noncontributory.

Clinical Examination

Clinical examination revealed the following:

1) extraoral – frontal view: increased chin prominence, decreased exposure of upper lip vermilion, deficient paranasal areas, increased lower facial height (Fig. 1A),

2) extraoral – profile view: increased chin prominence with obtuse labio-mental fold, concave profile, stretched lower lip to compensate increased lower facial height (Fig. 1C),

3) intraoral – molar and canine class III malocclusion on both sides, anterior open bite, retroclined lower incisors and proclined upper incisors, crowding with blocked out the left upper canine with gingival recession, narrow maxillary dental arch, deviation of mandibular dental midline to the left 1 mm in relation to the maxillary dental mid-
The aims of treatment were: to reduce excessive anterior facial height, to correct the sagittal skeletal discrepancy between the maxilla and the mandible, to correct profile concavity, to closure of an open bite, to leveling and alignment of the dental arches.

**Treatment Plan**

To correct a skeletal class III open bite deformity the following treatment plan was proposed:

1. Removal of all wisdom teeth.
2. Presurgical orthodontics to level and align the dental arches with elimination of dental compensations.
3. Simultaneous bimaxillary osteotomies: Le Fort I maxillary osteotomy to advance and superiorly repositioned the maxilla (to allow the mandible to autorotate and close an open bite) and bilateral sagittal split ramus osteotomy to set back the mandible.
4. Postsurgical orthodontic treatment to refine the occlusion and retention after debanding.
Treatment Progress

All wisdom teeth were removed and fixed appliances were placed to start preoperative orthodontics. The maxillary and mandibular arches were leveled with continuous archwires, starting with .016-in nickel-titanium (Ni-Ti) and working up to .017x.025-in Ni-Ti. After proper buccolingual inclination in the posterior teeth had been achieved and all anterior dental compensations had been eliminated by proclination of mandibular incisors and retroclination of maxillary incisors, .017x.025-in stainless steel (SS) archwires were applied before the surgery. Both dental arches were leveled and aligned and compatibility of the arches was established (Fig. 2D–H, Fig. 5B).

At the age of 19 years 8 months corrective bimaxillary surgery was performed. The maxilla was osteotomized and advanced 5 mm by the conventional Le Fort I procedure [14]. At the same time the maxilla was superiorly repositioned 2 mm anteriorly (to establish ideal tooth-upper lip relationship) and 5 mm posteriorly (to allow the mandible to autorotate and close an open bite) (Fig. 6A–C). The occlusal splint constructed during mock surgery on the articulator was applied to determine the position of the maxilla. The maxilla was fixed in new position with four titanium miniplates and sixteen monocortical screws. 7 mm of mandibular set back was performed using a bilateral sagittal ramus osteotomy [15] and osteotomized fragments were fixed with one titanium miniplate and 4 monocortical titanium screws on each side. Maxillomandibular fixation was maintained for 14 days after surgery and then was changed to elastics.

Six weeks after surgery, the surgical stabilizing arch wire was replaced by .017x.025-in active arch wire and vertical elastics were applied to settle the occlusion. After 6 months post surgery, the patient was debonded. The retention appliances used were a maxillary removable retainer and a mandibular canine-to-canine bonded retainer.

Results Achieved

The posttreatment extraoral photographs, taken 6 months (Fig. 3A–C) and 2 years and 8 months post surgery (Fig. 4A–C) reveal a favorable and stable improvement in the frontal and profile facial views. The lip competency, tooth-to-lip at rest, and at smile was significantly improved. The soft facial profile improved with reduced chin and lower lip prominence and increased paranasal fullness. The excessive vertical facial dysplasia was reduced, and most of the cephalometric values were brought into the normal range (Tab. 1). The intraoral posttreatment photographs reveal stable class I canine and molar relationships on both sides and normal overjet and overbite (Fig. 3D–H, Fig. 4D–H). All the functional movements of the mandible were without symptoms. The patient was very satisfied with the results of treatment.

Conclusions

With the advances of the orthognathic surgery techniques, patients with skeletal class III dentofacial deformities can be benefited from a combined orthodontic and surgical treatment.

With proper preoperative assessment and postoperative care, the discomfort and potential complications from the surgery can be reduced to a minimum.

When evaluating patients with dentofacial deformities, attention should be directed toward the skeletal and soft tissue aesthetic examination. It is important to keep in mind that the patient’s overall satisfaction will be highly dependent on the aesthetic result, not on the achievement of a cephalometrically normal database.

Patients with Class III open bite discrepancies are best treated by a combined maxillary advancement with intrusion and mandibular set back procedure.

Table 1. Selected cephalometric measurements according to Segner and Hasund analysis [16] before and after surgery

<table>
<thead>
<tr>
<th>Measurements (Pomierze)</th>
<th>Presurgery (Przedoperacyjne)</th>
<th>Norm (Norma)</th>
<th>Postsurgery (Pooperacyjne)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNA</td>
<td>76.2°</td>
<td>82.0° ± 3.0</td>
<td>79.0°</td>
</tr>
<tr>
<td>SNB</td>
<td>82.9°</td>
<td>80.0° ± 3.0</td>
<td>80.5°</td>
</tr>
<tr>
<td>ANB</td>
<td>–4.5°</td>
<td>2.0° ± 2.0</td>
<td>–1.5°</td>
</tr>
<tr>
<td>Gn-gn</td>
<td>134.0°</td>
<td>122.0° ± 7.0</td>
<td>128.4°</td>
</tr>
<tr>
<td>NL-NL</td>
<td>3.9°</td>
<td>8.0° ± 4.0</td>
<td>10.2°</td>
</tr>
<tr>
<td>ML-NL</td>
<td>36.3°</td>
<td>28.0° ± 5.0</td>
<td>34.1°</td>
</tr>
<tr>
<td>ML-NL</td>
<td>32.4°</td>
<td>20.0° ± 7.0</td>
<td>23.8°</td>
</tr>
<tr>
<td>H</td>
<td>–2.7°</td>
<td>9.0° ± 3.0</td>
<td>5.4°</td>
</tr>
<tr>
<td>Wits</td>
<td>–12.3 mm</td>
<td>0.0 mm ± 2.0</td>
<td>–4.0 mm</td>
</tr>
<tr>
<td>Index</td>
<td>64.8%</td>
<td>80.0% ± 7.0</td>
<td>70.0%</td>
</tr>
</tbody>
</table>
Fig. 2. Immediate preoperative facial (A–C) and occlusal (D–H) photograph after orthodontic decompensation

Ryc. 2. Przedoperacyjne fotografie twarzy (A–C) i zgryzu (D–H) po ortodontycznej dekompensacji wady

Fig. 3. Posttreatment (6 month post surgery) facial (A–C) and occlusal (D–H) photographs

Ryc. 3. Fotografie twarzy (A–C) i zgryzu (D–H) po zakończeniu leczenia (6 miesięcy po operacji)
Fig. 4. Posttreatment (2 years, 8 months post surgery recall) facial (A–C) and occlusal (D–H) photographs

Ryc. 4. Fotografie twarzy (A–C) i zgryzu (D–H) w odległym badaniu kontrolnym (2 lata, 8 miesięcy po operacji)

Fig. 5. Pretreatment (A), immediate presurgery (B) and postsurgery (C) lateral cephalometric X-rays

Ryc. 5. Radiogramy profilowe głowy: (A) przed leczeniem, (B) bezpośrednio przed zabiegiem operacyjnym i (C) po zabiegu operacyjnym
Described case illustrates the importance of proper diagnosis and treatment planning. This patient who presented with a severe skeletal class III open bite malocclusion was successfully treated with combined multidisciplinary approach and satisfactory improvement was achieved regarding aesthetics, function and occlusion.

References

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