CASE REPORT

Orthodontic Camouflage Treatment of an Adult Skeletal Class III Malocclusion

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Surgical treatment is the preferred and most stable treatment for adult patients with severe skeletal Class III malocclusion.[1] Patients with borderline dentoalveolar compensation who are not willing to accept the costs, risks, and potential complications of surgery can sometimes be treated successfully with camouflage orthodontics.[2] In more extreme cases, however, conservative orthodontic treatment may lead to adverse side effects such as periodontal disease and root resorption, as well as poor long-term stability. It is not clear which mechanics are most appropriate or which patients are most likely to benefit from an orthodontic approach to severe skeletal Class III malocclusion. To help clarify these questions, we present the following report of an adult case treated non-surgically.

Diagnosis and Treatment Plan

A 30-year-old female presented with a moderate dental and skeletal Class III malocclusion (Fig. 1). The patient's profile was concave in both centric occlusion and centric relation, and the lower lip was prominent. The lower anterior face height was proportionately short, but no significant facial asymmetry was observed.

The patient had a complete set of permanent teeth except for missing upper third molars. In CO, the molar relationship was Class III on the right and Class I on the left, and the incisors were in crossbite, with an overjet of –3mm. In CR (not pictured here), the incisors were in an end-to-end relationship, resulting in zero overbite and a posterior open bite. The maxillary midline was coincident with the facial midline. In CR, the mandibular midline was also coincident with the maxillary and facial midlines, but a 1.5mm left lateral shift from CR to CO placed the mandibular midline 1.5mm to the left of the maxillary and facial midlines in CO. Despite the functional shift, no signs of TMD were detected. Both the maxillary and mandibular arches exhibited moderate arch-length deficiencies, involving diastemas in the lower incisor region. Oral hygiene was good.

Cephalometric analysis indicated features of skeletal crossbite (Table 1). The maxilla was significantly retrusive (SNA = 76°) relative to the cranial base, while the mandible was moderately protrusive (SNB = 82°) in CO, indicating a skeletal Class III (ANB = –6°). The maxillary incisors were slightly upright, but the mandibular incisors were normal (IMPA = 84.5°). The mandible showed a forward and upward

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Fig. 1 30-year-old female patient with moderate dental and skeletal Class III malocclusion before treatment.

TABLE 1
CEPHALOMETRIC DATA

	Norm	Pretreatment	Post-Treatment
SNA	82.8° ± 4.0°	76.0°	76.0°
SNB	80.1° ± 3.9°	82.0°	80.0°
ANB	2.7° ± 2.0°	–6.0°	–4.0°
FMA	31.3° ± 5.0°	19.0°	23.0°
SN-GoGn	31.1° ± 5.6°	25.0°	28.0°
ANS-Me	65.8mm ± 4.1mm	59.5mm	63.5mm
U1 to SN plane	105.7° ± 6.3°	102.0°	110.0°
IMPA	93.9° ± 6.2°	84.5°	81.0°
Interincisal angle	125.4° ± 7.9°	146.0°	135.5°
Occlusal plane-SN	12.4° ± 4.4°	10.0°	5.0°

rotation and a hypodivergent skeletal pattern (FMA = 19°, SN-GoGn = 25°, ANS-Me = 59.5mm).

Overall treatment objectives were to correct the Class III malocclusion and improve the patient's facial esthetics. More specifically, the treatment was designed to eliminate the CR-CO discrepancy, resolve the anterior crossbite, establish a Class I molar relationship, eliminate the maxillary and mandibular arch-length deficiencies, reduce the deep underbite, align the arches and midlines, and establish a functional occlusion.

Treatment Progress

The remaining third molars were extracted. Glass ionomer cement was placed on the occlusal surfaces of both lower first molars to help open the bite and facilitate placement of standard edgewise .022" maxillary and mandibular fixed appliances. Initial leveling and alignment were performed with round archwires in both arches. Subsequently, .017" × .025" upper accentuated-curve and lower reverse-curve Chinese nickel titanium archwires were placed, along with $\frac{3}{16}$" Class III elastics* from the upper second molars to the lower canines. The greatest depth of the archwire curves was in the buccal regions. The patient was instructed to wear the Class III elastics as long as possible to help distalize the lower dentition.

Eleven weeks after placement of the nickel titanium archwires, a Class I molar relationship and positive overjet had been completely established. Because of excessive molar uprighting and distal inclination of the mandibular molar crowns, the nickel titanium wires were removed after 11 months of treatment, and .018" × .025" stainless steel archwires were placed for three months to induce distal apical movement. Short Class III elastics were worn to provide anchorage during this period, followed by short up-and-down elastics for detailing and finishing.

Patient compliance was excellent throughout the 18-month active treatment period. Thermoplastic retainers were then worn full-time, except during meals and brushing, for the first 12 months and at night only for the next 12 months.

Treatment Results

All treatment objectives were fully achieved, including an ideal overjet and overbite with Class I molar and canine relationships (Fig. 2). The functional shift was eliminated. Torque control was maintained while the mandibular incisors were retracted, resulting in better incisal inclination. The concave facial profile was improved somewhat, with a labial proclination of the maxillary incisors resulting in additional upper lip prominence and a slight clockwise rotation of the mandible. Skeletally, however, the maxilla was still retrognathic, and the chin was slightly prominent.

An appropriate dentoalveolar response was essential for success in this case. Cephalometric superimposition showed that the maxillary incisors were protruded and tipped labially, while the maxillary molars were extruded. The mandibular incisors were uprighted and extruded, and the second molars were tipped distally, effecting a counterclockwise occlusal-plane rotation (Fig. 2B). The post-treatment panoramic radiograph showed little or no root resorption. Acceptable occlusion and good periodontal health were observed at the two-year follow-up, indicating long-term stability (Fig. 3).

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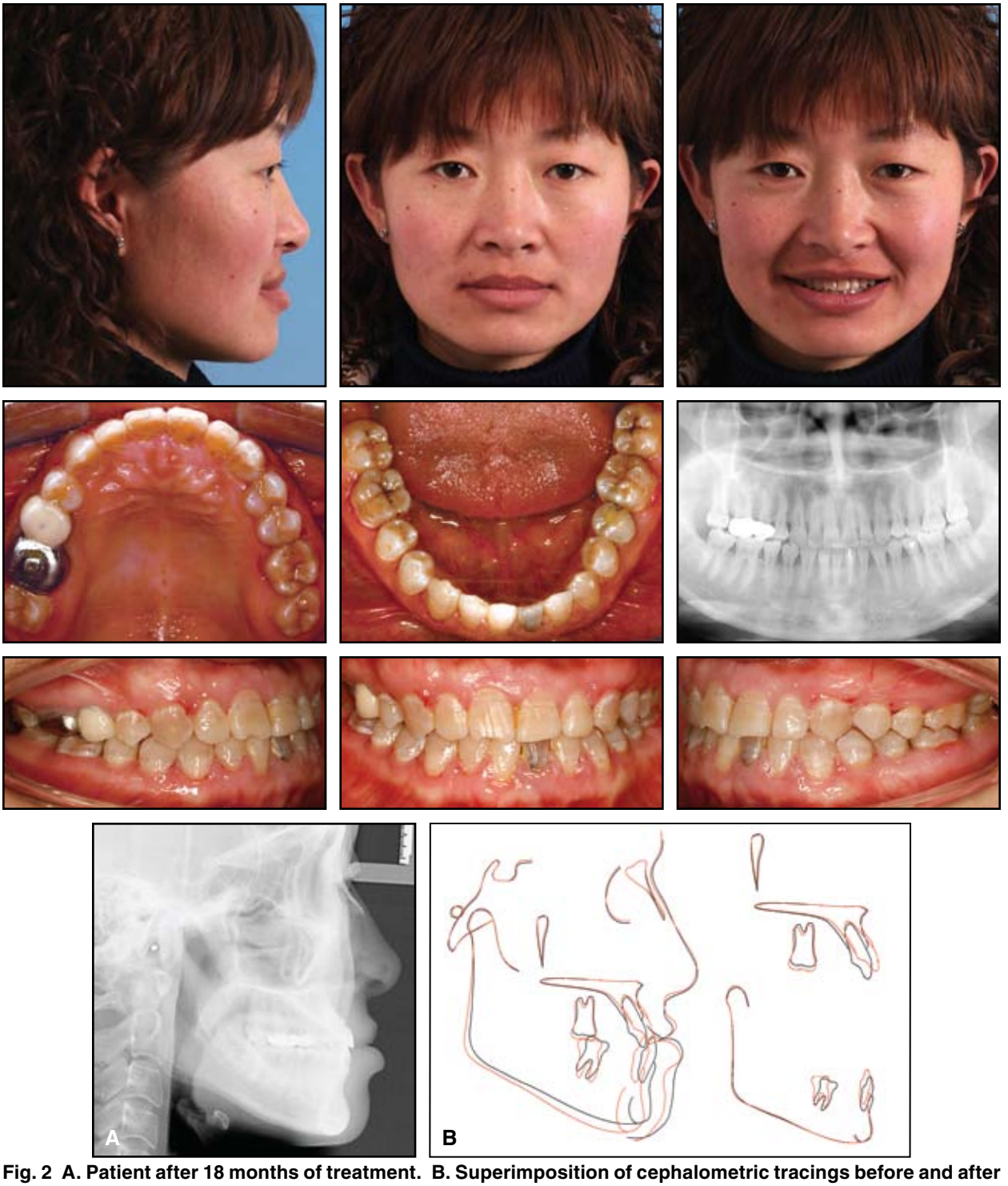

Fig. 2 A. Patient after 18 months of treatment. B. Superimposition of cephalometric tracings before and after treatment.

Fig. 3 Patient two years after treatment.

Discussion

Both anteroposterior and vertical maxillary deficiency can contribute to Class III malocclusion.[3] If the maxilla does not grow vertically, the mandible will rotate upward and forward, creating the appearance of mandibular prognathism. In such a scenario, the mechanical interference from overclosure of the mandible may further affect the growth of the maxilla and, in turn, the alignment of the maxillary dentition. Because individuals with Class III malocclusion may have various combinations of skeletal and dentoalveolar components,[4] careful consideration of each factor is crucial to ensure appropriate treatment of the underlying discrepancy.

Skeletal crossbite usually requires surgery involving a bilateral sagittal osteotomy to retract the mandible, a Le Fort I procedure to advance the maxilla, or a combination of the two.[1] According to Kerr and colleagues, however, if ANB is greater than −4.5° and lower incisor angulation greater than 83°, orthodontic treatment alone can help camouflage both the skeletal and dental aspects of the malocclusion, thereby improving esthetics and function.[5]

Conventional camouflage Class III treatment in adults relies on the extraction of lower premolars or incisors, which typically masks the skeletal discrepancies without providing significant correction. If the mandibular symphysis is thin, as is usually the case in skeletal Class III patients, and there is a diastema in the lower arch, excessive lingual inclination or distal movement of the incisors after extractions can negatively affect a concave profile[6] and induce unwanted complications such as root exposure or resorption of the labial cortical plate, with subsequent gingival recession and fremitus.[7-9] Furthermore, adult molar distalization is one of the most difficult biomechanical problems in clinical orthodontics, which is why arch-length deficiencies are typically calculated anterior to the first molars. In the present case, the mandibular third molars were extracted, allowing the second molars to tip distally and facilitating anteroposterior correction. By utilizing the space posterior to the second molars, the mandibular buccal teeth were distalized within the alveolar bone. This indicates that well-erupted and -positioned third molars might be useful indicators of the posterior limits of the alveolar region. Alternatively, a skeletal anchorage system might be used for efficient distal movement of the mandibular buccal segments or even the entire mandibular dentition.[10]

Braun and Legan showed that small changes in the cant of the occlusal plane can result in significant alterations in occlusion.[11] Therefore, it is critical to control the upward and forward rotation of the occlusal plane in skeletal Class III patients.[12,13] In the present case, upper accentuated-curve and lower reverse-curve archwires and Class III elastics produced extrusion of the incisors and uprighting of the molars in the lower arch and proclination of the incisors and extrusion of the molars in the upper arch, leading to a counterclockwise rotation of the functional occlusal plane. This method is similar to the multiloop edgewise arch wire system (MEAW),[14] except that the multiloop, gable-bend stainless steel archwires used in MEAW are replaced with more resilient, superelastic Chinese nickel titanium archwires with excellent shape-memory characteristics.[15] These archwires are simpler and less time-consuming to place, more hygienic, and less irritating to the soft tissues.

The success of the orthodontic camouflage treatment shown here can be attributed at least in part to significant dentoalveolar compensation and excellent patient compliance with elastic wear. Complications were minimal, most likely because the mechanics produced vertical incisor movement within the symphysis while minimizing direct lingual inclination. Nevertheless, the simultaneous extrusion of the upper and lower molars, which caused a slight clockwise rotation of the mandible, probably resulted in an increase in ANS-Me. In a patient with a hypodivergent skeletal pattern, an increase in facial height and reduction in chin prominence might be beneficial, but in this case, the minor change in the mandibular plane was not enough to significantly improve the patient's facial profile. A surgical approach might have achieved even better results from an esthetic standpoint.

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