CASE REPORT

"Surgery First" Orthognathics to Correct a Skeletal Class II Malocclusion with an Impinging Bite

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Surgical-orthodontic treatment of jaw deformities presents challenges in both diagnosis and mechanotherapy. This is particularly true for a skeletal Class II patient with a short anterior face and an impinging bite pattern. Traditional treatment involves presurgical orthodontic preparation, including tooth alignment, incisor decompensation, and arch coordination. In short-face, deep-bite patients, however, the heavy occlusal forces often associated with strong muscles can complicate all these processes. Many clinicians therefore elect to postpone most of the orthodontic correction until after surgery.[1,2]

At Tohoku University, we have adopted a new treatment sequence for these patients: surgery first, followed by orthodontic alignment. This approach was made possible by the development of the Skeletal Anchorage System (SAS), which uses titanium miniplates as temporary anchorage devices for predictable, three-dimensional movement of the entire dentition in nongrowing patients.[3-8]

In skeletal Class III patients, the "surgery first" approach has been successful in allowing early correction of jaw deformity and


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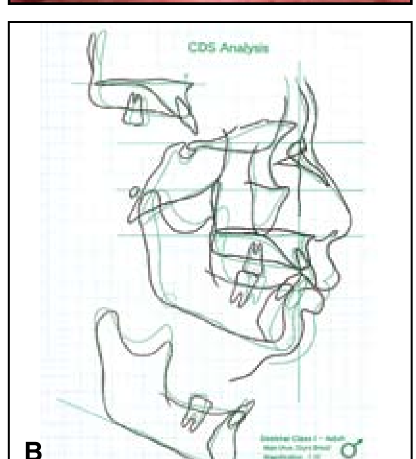

Fig. 1 A. 44-year-old male patient with retrusive mandible, skeletal Class II malocclusion, severe overjet, and deep bite before treatment. B. Superimposition of patient's initial cephalometric analysis with norms for adult Japanese males.

TABLE 1
CEPHALOMETRIC DATA

	Norm	Pretreatment	Post-Treatment
N-S	73.0mm	72.0mm	72.0mm
N-Me	134.0mm	129.5mm	134.5mm
N-ANS	60.2mm	66.5mm	66.5mm
ANS-Me	74.7mm	72.5mm	76.5mm
S'-Ptm'	19.7mm	20.5mm	20.5mm
A'-Ptm'	54.7mm	59.5mm	59.0mm
Is-Is'	30.8mm	32.5mm	34.3mm
Mo-Ms'	25.5mm	26.7mm	26.5mm
Gn-Cd	130.5mm	126.5mm	133.0mm
Pog'-Go	83.5mm	85.0mm	90.0mm
Cd-Go	69.5mm	64.0mm	64.0mm
Ii-Ii'	49.5mm	49.0mm	46.0mm
Mo-Mi'	37.2mm	36.0mm	38.0mm
Wits appraisal		6.5mm	2.5mm
SNA	84.2°	89.0°	88.5°
SNB	80.2°	79.5°	82.5°
ANB	4.0°	9.5°	6.0°
Mandibular plane-SN	30.0°	25.0°	29.0°
Ramus plane-SN	91.7°	85.5°	84.5°
Gonial angle	118.2°	119.5°	124.0°
U1-SN	107.5°	110.5°	105.5°
L1-mandibular plane	96.0°	112.0°	102.5°
Occlusal plane-SN	14.0°	16.0°	15.5°

significantly reducing treatment time.[9] This article describes how the "surgery first" method was applied with SAS mechanics in treating a patient with a skeletal Class II malocclusion and impinging bite.

Diagnosis and Treatment Plan

A 44-year-old man presented to our clinic complaining of an impinging deep bite and obstructive sleep apnea. Initial examination revealed a square, short face; a double chin; a retrusive mandible; an inadequate interlabial gap at rest; and a deep mentolabial fold (Fig. 1). The patient had a skeletal Class II malocclusion with 10mm of overjet, a short face, an excessive curve of Spee, severe proclination of the lower incisors, and a bilateral full-cusp Class II malocclusion (Table 1). These problems, particularly the mandibular retrusion, indicated the need for orthognathic surgery.

After we presented the various surgical-orthodontic options, the patient chose the "surgery first" approach. The template cephalometric analysis and Wits appraisal indicated the need for about 10mm of mandibular advancement. We initially used craniofacial drawing standards (CDS) to establish goals for improving the profile and increasing the facial height. We then predicted the final positions of the teeth and relevant soft-tissue changes at the end of treatment (Fig. 2).

Because the mandibular incisors were excessively proclined, we planned first to distalize the mandibular posterior teeth 5mm using SAS mechanics, then

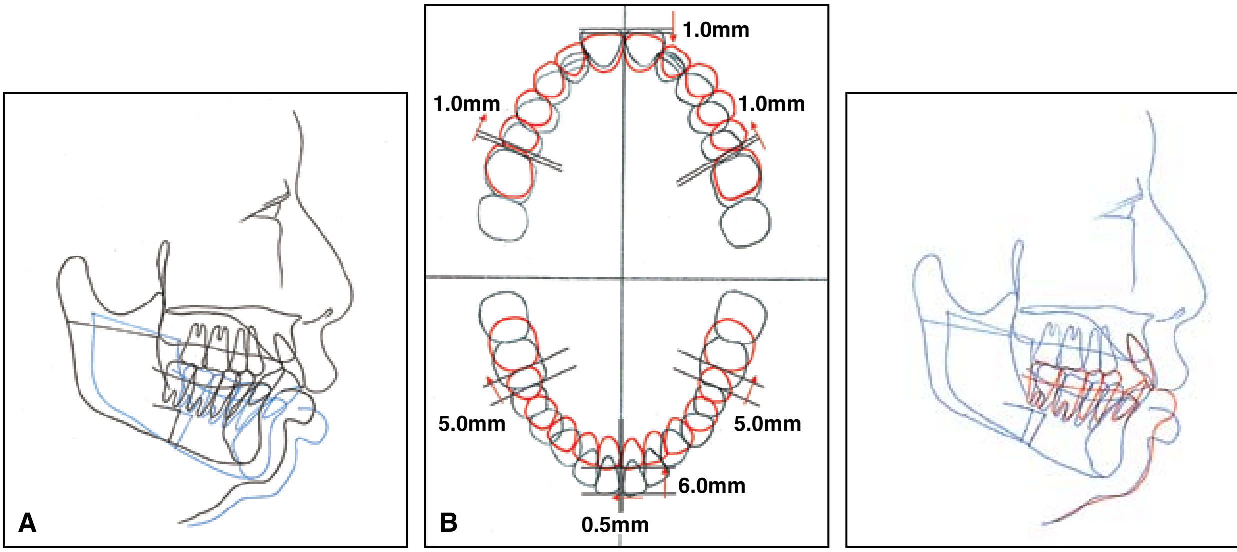

Fig. 2 Cephalometric and occlusogram predictions of treatment results. A. Immediately after orthognathic surgery (targets in blue). B. After orthodontic treatment, showing 5mm distalization of lower posterior teeth with Skeletal Anchorage System (SAS), alteration in lip position after distalization of entire lower arch, and decompensation of lower incisors (targets in red).

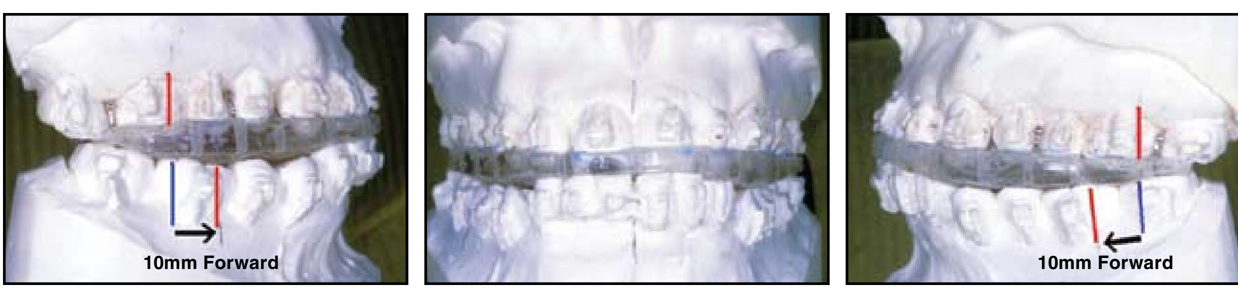

Fig. 3 Model surgery and surgical splint with bilateral 10mm mandibular advancement.

retrocline the mandibular incisors about 6mm for decompensation. Bilateral anchor plates would be placed in the mandibular body during surgery. To flatten the curve of Spee, we planned to extrude the lower premolars after surgery.

Treatment Progress

Before orthognathic surgery, the mandibular right third molar was extracted, .022" preadjusted brackets were bonded to all remaining teeth, and passive rectangular .019" × .026" archwires* were placed. A surgical splint with ball-end clasps was fabricated to cover all the incisal edges and occlusal surfaces, ensuring an optimal fit in both arches (Fig. 3).

A bilateral sagittal split ramus osteotomy (BSSRO) was then carried out to advance the mandible as indicated by the splint. Titanium anchor plates were inserted bilaterally, above the plates used for BSSRO and adjacent to the distal edges of the first molars, for distalization of the entire lower dentition and decompensation of the mandibular incisors. Immediately after surgery, the patient showed a straight profile and Class III malocclusion, with an edge-to-edge incisor relationship and lateral open bites (Fig. 4).

Postsurgical orthodontic treatment began two weeks later. The surgical splint was modified

*Elgiloy Specialty Metals, 1565 Fleetwood Drive, Elgin, IL 60123; www.elgiloy.com.

into a removable maxillary occlusal splint, which was used to stabilize the jaw position and masticatory function. While the upper archwire was left in place, the passive rectangular lower archwire was cut distal to the lateral incisors, and an .018" nickel titanium wire** was engaged in the posterior brackets, bypassing the anterior segment except for one ligature. The splint was reduced over the lower premolars to allow their uprighting and extrusion, assisted by traction

**Forestadent, 2315 Weldon Parkway, St. Louis, MO 63146; www.forestadent.com.

Fig. 4 Two weeks after surgery, showing Class III edge-to-edge malocclusion with lateral open bites; proper mandibular position maintained with surgical splint.

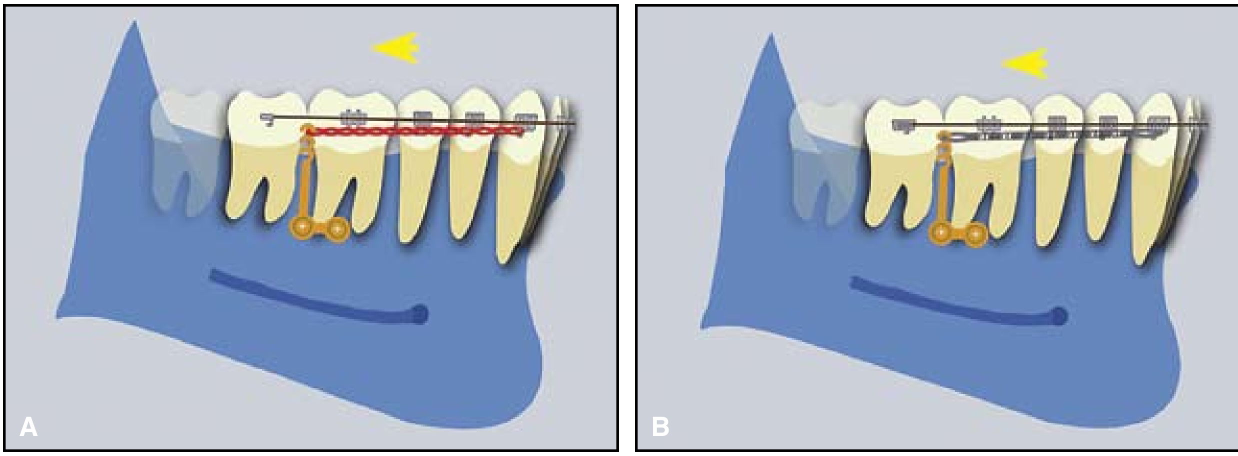

Fig. 5 Orthodontic mechanics used to distalize entire mandibular dentition with miniplate anchorage. A. Distalization with elastomeric chain. B. Distalization with nickel titanium closed-coil spring.

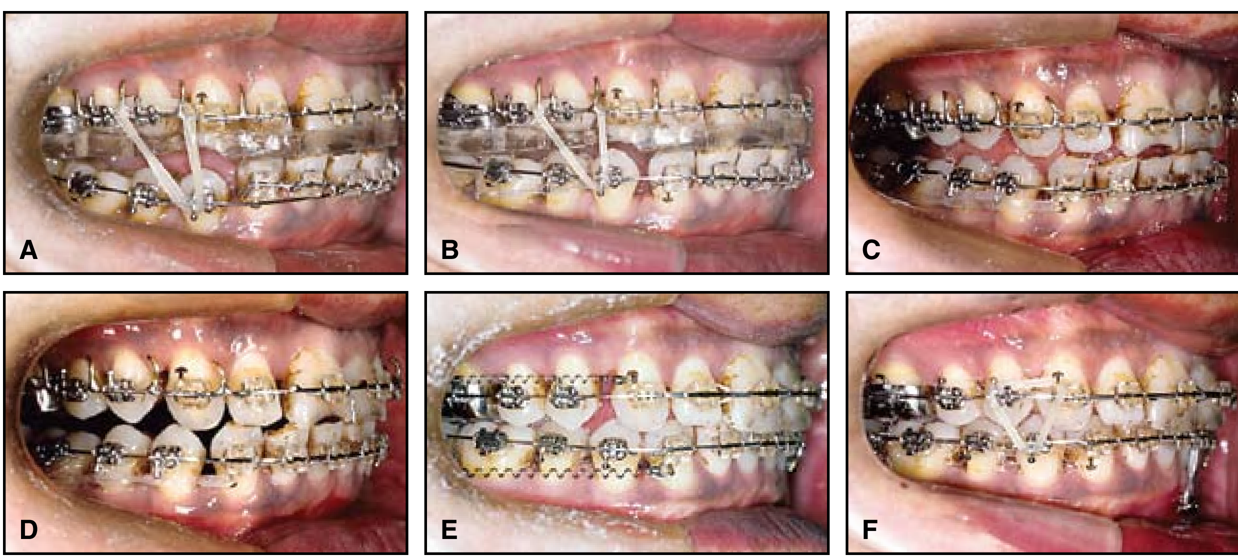

Fig. 6 Changes in canine and molar relationships during postsurgical orthodontic treatment using SAS mechanics. A. Two weeks after surgery. B. Six weeks after surgery. C. Two and a half months after surgery. D. Four months after surgery. E. Six months after surgery. F. Seven and a half months after surgery.

from intermaxillary elastics.

Leveling and alignment of the maxillary arch began three months after surgery, at which point the splint was discontinued. The incisal edges of the upper central incisors were rebuilt with esthetic composite. After the lower arch had been leveled, a rectangular archwire was engaged in all brackets for distalization of the entire dentition by means of elastomeric chain and a nickel titanium closed-coil spring between the canine brackets and the anchor plates (Fig. 5). After the mandibular incisor inclinations had been decompensated and the proper overjet obtained, an anchor miniscrew was inserted between the roots of the lower central incisors to help control intrusion and leveling. Coordination of the maxillary and mandibular arches was followed by finishing and detailing (Fig. 6).

After nine months of treatment, all brackets were debonded, and the titanium miniplates and screws were removed under local anesthesia (Fig. 7). A wraparound retainer was placed in the maxillary arch, and a braided lingual retainer was bonded to the mandibular anterior teeth.

Post-treatment examination

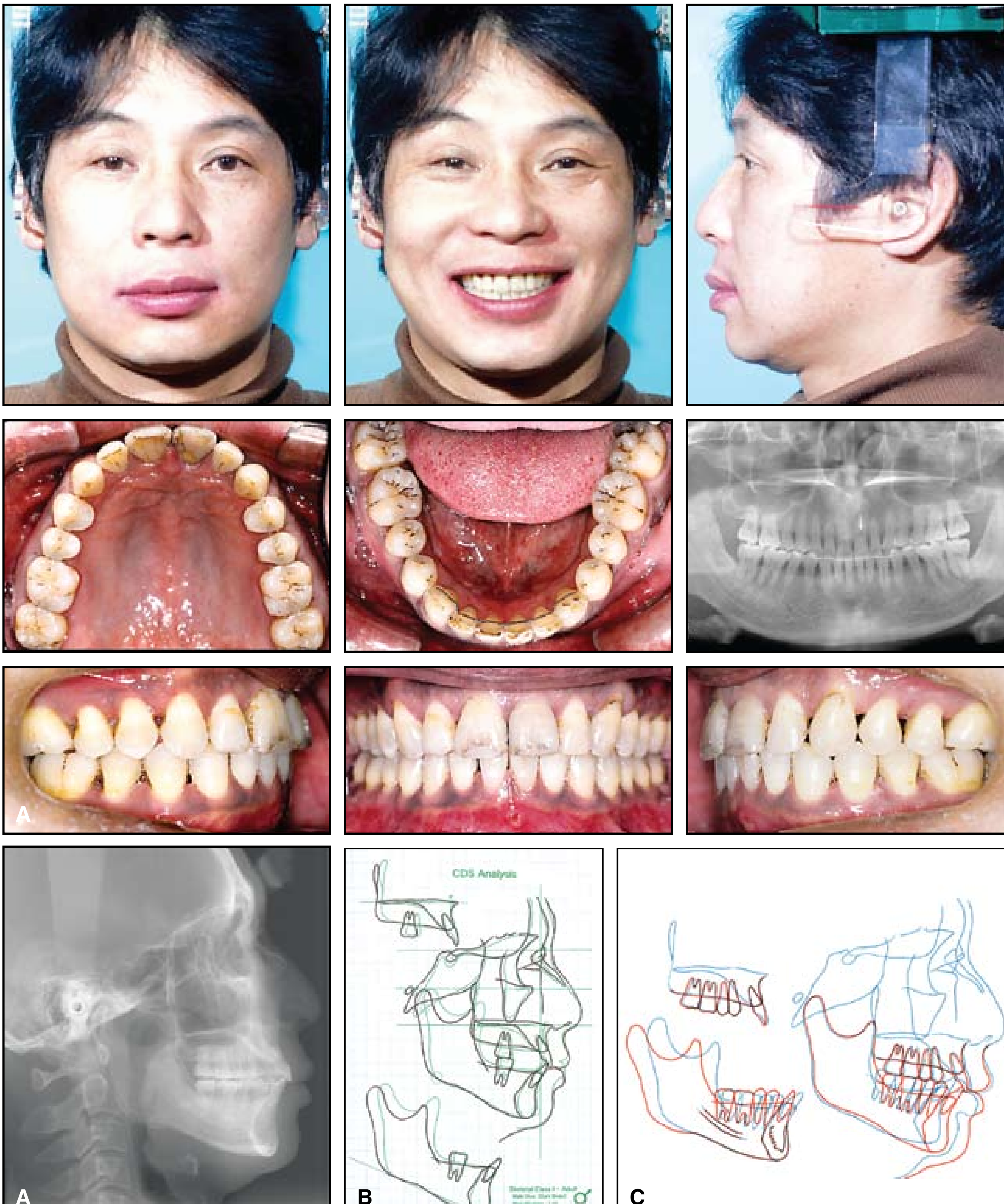

Fig. 7 A. Nine months after surgery, following removal of fixed appliances and titanium miniplates and screws, showing level lower arch and proper overjet. B. Post-treatment cephalometric analysis, showing dentofacial proportions nearly identical to norms for adult Japanese males. C. Superimposition of pretreatment (blue) and post-treatment (red) cephalometric tracings, showing significant correction of mandibular molars and decompensation of mandibular incisors; mandibular body length increased by about 10mm, with slight mandibular clockwise rotation due to increased facial height.

showed complete resolution of all orthodontic problems, resulting in a balanced profile and good occlusal relationship. The everted lower lip, deep mentolabial fold, and double chin were dramatically improved. The patient's snoring and sleep apnea were also resolved. Cephalometric analysis showed his post-treatment profile to be nearly identical to the norm for adult Japanese males (Table 1), and superimposition of pre- and post-treatment cephalometric tracings demonstrated the achievement of all treatment goals. The patient was delighted with the outcome.

Results remained generally stable three years after debonding. In particular, the increased lower facial height and flattened mandibular curve of Spee were well maintained (Fig. 8).

Discussion

A skeletal Class II patient with a short face and impinging bite typically develops an exaggerated curve of Spee and severely proclined lower incisors to compensate for the excessive overjet. When surgery is performed first in such cases, the facial height is increased, but the Class II malocclusion worsens to Class III, with an edge-to-edge incisor relationship immediately after surgery. This situation therefore requires the use of Class III orthodontic mechanics.

Because it can predictably distalize the mandibular molars in nongrowing patients, the SAS makes it possible to correct a Class III malocclusion and lower incisor proclination without premolar extractions.[10] The lower arch can be leveled at the same time by extruding the premolars. We now routinely use a "surgery first" approach for patients with skeletal Class II malocclusion who require orthognathic surgery.

This method provides many biological and psychological advantages over traditional surgical-orthodontic treatment. Patients are virtually guaranteed to be satisfied, because they see major improvements in facial height and profile at the beginning of treatment, making them more willing to accept the Class III profile resulting from orthognathic surgery. The "surgery first" approach may be particularly beneficial for a Class II patient with a retrusive mandible, impinging bite, and excessive curve of Spee, since advancing the mandible into edge-to-edge incisor contact will create the buccal vertical clearance needed to level the lower arch by premolar extrusion. In addition, total treatment time is usually shorter with the "surgery first" approach than for even the presurgical-orthodontic phase of conventional treatment.[11,12]

After surgery, incisor decompensation can be performed effectively and efficiently. Because the Class II malocclusion becomes a Class III relationship following mandibular advancement, the resulting improvement in the tone of the lower lip and tongue increases the forces acting on the incisors in both arches, thus abetting the incisor decompensation. In conventional treatment, when the decompensation is carried out before surgery, it is difficult or impossible to use post-surgical orthodontic treatment to recover from surgical errors. In contrast, with the "surgery first" approach, SAS mechanics can be used to compensate for any surgical errors or skeletal relapse.

Wilcko and colleagues have reported that corticotomy can enhance tooth movement by increasing bone turnover and reducing bone density.[13] Similarly, we speculate that bone turnover after orthognathic surgery can significantly accelerate orthodontic tooth movement.

The "surgery first" approach does have several disadvantages compared with traditional surgical-orthodontic treatment methods. First, the occlusion cannot be used as a guide to establishing treatment goals. Because skeletal abnormalities must be accurately assessed to establish an effective treatment plan, we recommend using the Wits appraisal[14] and CDS analysis.[15] Furthermore, since the postsurgical Class III malocclusion will be unstable without presurgical orthodontics, a surgical splint is essential to guide repositioning of the mandible. For the first month after surgery, the modified, removable splint (which must be worn while eating) helps stabilize the jaw position and bring the teeth into final occlusion with the aid of seating elastics. Finally, the orthodontist must be experienced and skilled in the SAS technique, which is essential to achieving predictable three-dimensional molar movement.

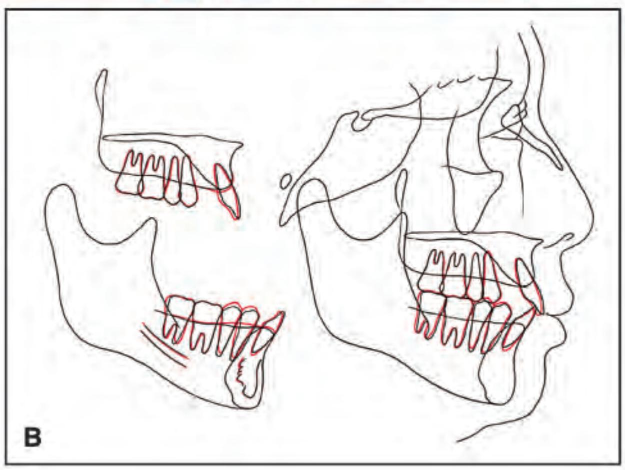

Fig. 8 A. Follow-up records taken three years after debonding. B. Superimposition of post-treatment (red) and follow-up (black) cephalometric tracings, showing negligible relapse.

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