

The “Surgery First” Approach with Passive Self-Ligating Brackets for Expedited Treatment of Skeletal Class III Malocclusion

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Various authors have recently suggested a “surgery first” approach (SFA) before orthodontic treatment.¹⁻⁴ SFA avoids the need for dental decompensation and consequent deterioration of esthetics and function, especially in skeletal Class III cases. Patients can benefit from an immediate improvement in the facial profile after surgery.^{1,4} In addition, treatment time can be reduced by the dental repositioning achieved in surgery and by the effect of the regional acceleratory phenomenon (RAP).⁵

The RAP is a complex physiological process that involves rapid bone remodeling and loss of regional bone density. It accelerates tissue reorganization and healing by means of a transitory increase in localized bone resorption and subsequent remodeling.^{6,7} Although the RAP is not yet fully understood, it explains why tooth movement can be accelerated during the four to five months after

orthognathic surgery.⁵ This period thus becomes the perfect time to use a passive self-ligating system that reduces friction⁸ and a treatment plan that calls for the early use of elastics. With proper torque selection and bracket positioning, the orthodontist can create a synergy with the physiological postoperative effects of the RAP.

This article shows a Class III patient in whom SFA was combined with the Damon Q* passive self-ligating system to expedite treatment.

Case Report

The patient was a 17-year-old female. An 18-month first phase of treatment, beginning at age 9, had involved orthopedic maxillary expansion, a facial mask, and serial extraction. The upper first

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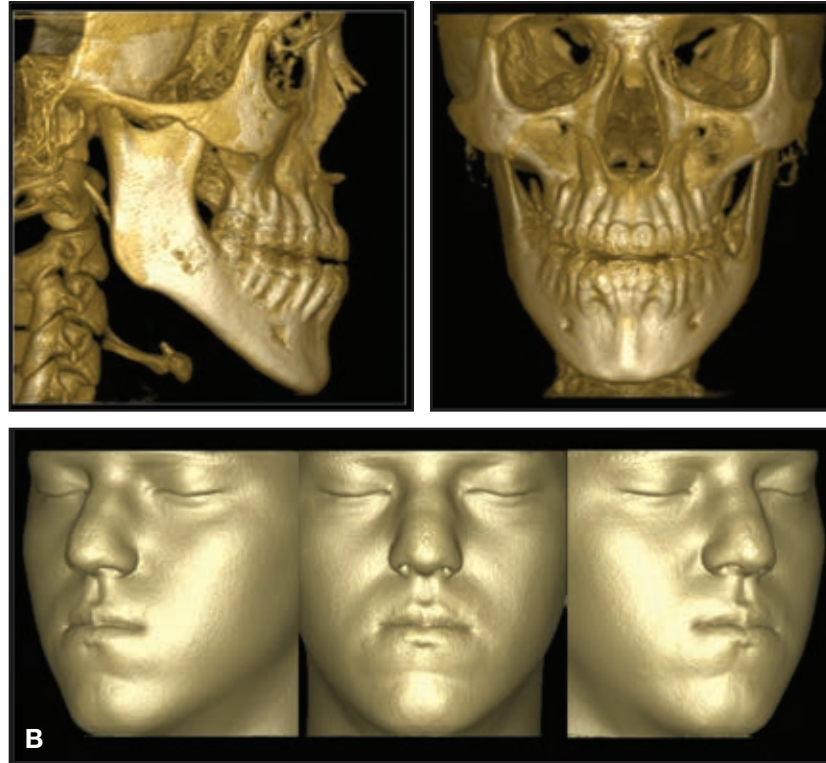


Fig. 1 (cont.) B. Three-dimensional reconstruction from cone-beam computed tomography (CBCT).



Fig. 2 Damon Q* self-ligating brackets bonded one month before surgery.

premolars were extracted because of the high risk of upper-canine impaction. Fixed appliances were used to align the upper arch, with cantilevers attached for traction of the upper canines.

At age 17, the patient had a straight profile, malar hypoplasia, a slightly excessive lower facial height, and a protrusive lower lip (Fig. 1). She was

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diagnosed with a Class III malocclusion, a narrow upper arch, severe crowding of the lower arch, anterior and posterior open bites, an anterior cross-bite, a skeletal Class III pattern, posterior and lower mandibular rotation, maxillary micrognathism, mandibular macrognathism, proclination of the upper incisors, and retroclination of the lower incisors. The lower right third molars were impacted.

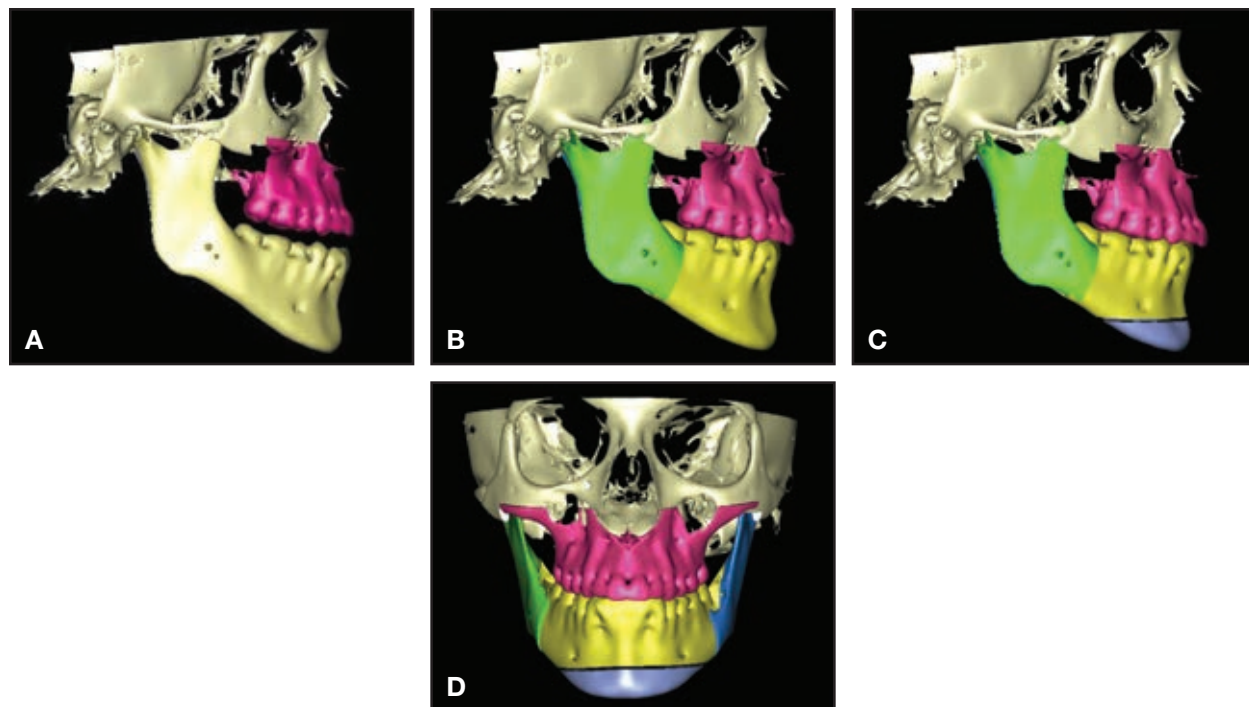


Fig. 3 Surgical planning. A. Le Fort I maxillary advancement and impaction. B. Mandibular bilateral sagittal split osteotomy. C. Genioplasty. D. Frontal view.



Fig. 4 A. Infrazygomatic miniplates inserted on both sides. B. Postsurgical overjet. C. Miniplates inserted in lateral mandibular body on both sides; Class III elastics worn from lower canines to upper second premolars.

The skeletal and dental objectives of the treatment plan were closely related. These included closing the dental and skeletal open bite to achieve a positive and functional overbite, correcting the skeletal Class III pattern, improving the profile, increasing the overjet, resolving the crowding in the lower arch, improving the inclination of the incisors, and obtaining better archforms.

The treatment options presented were pre-surgical orthodontic treatment followed by bimaxillary surgery and genioplasty; SFA followed by orthodontics to align, level, and stabilize the occlusion; or orthodontic dental compensation with extractions followed by a genioplasty. Considering that the patient's chief concern was her facial esthetics, it was decided to proceed with surgical



Fig. 5 Profile before and after orthognathic surgery.

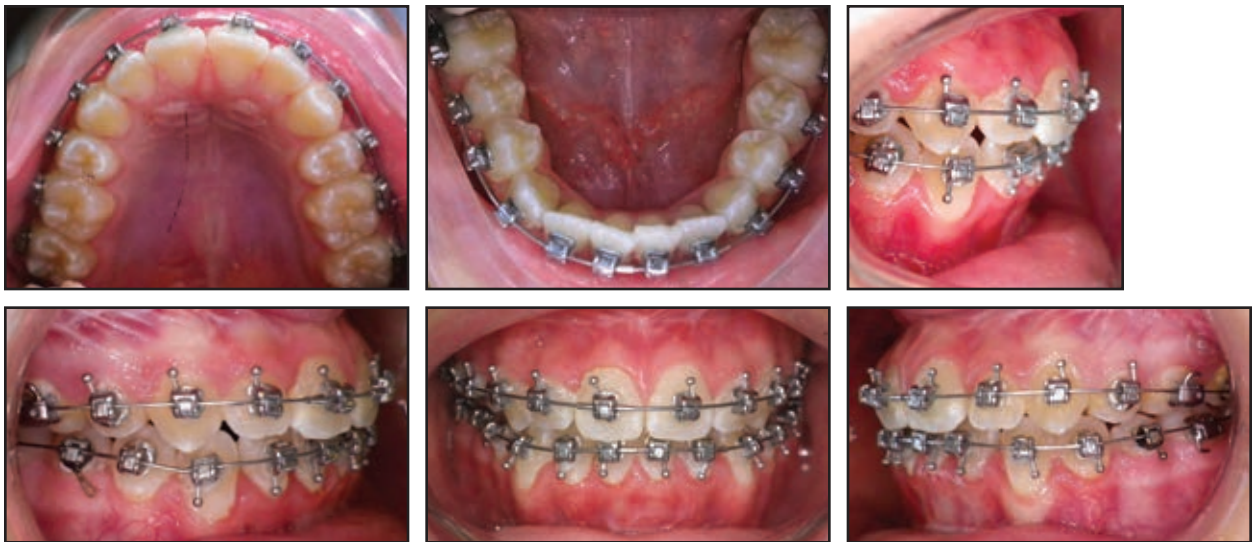


Fig. 6 After five months of leveling and alignment.

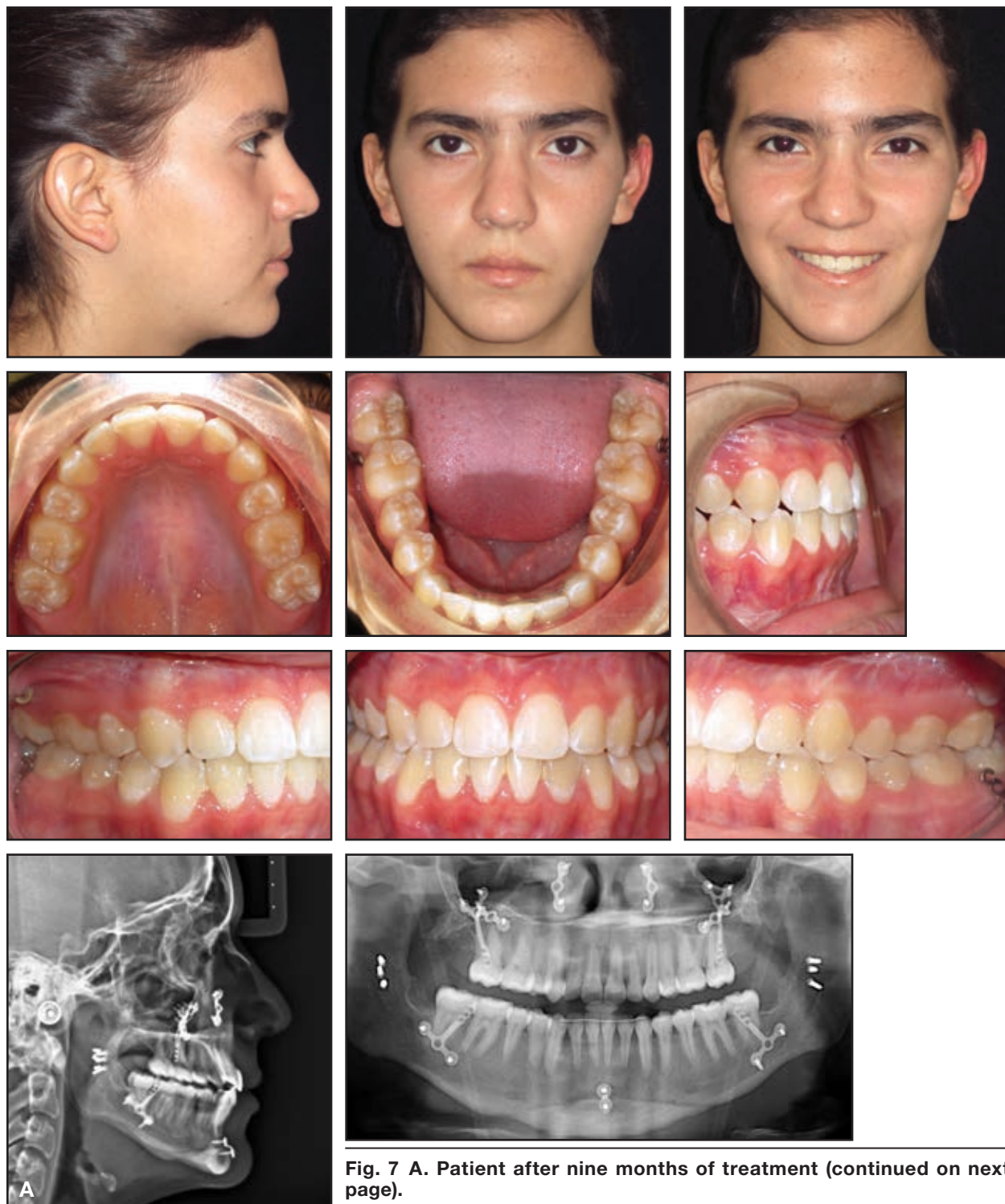
treatment. SFA was chosen because the patient wanted an immediate facial change. This approach would avoid any deterioration in her profile and malocclusion during presurgical orthodontics, and would also take advantage of the biological potential of the RAP.

One week before surgery, Damon Q brackets with hooks were bonded without archwires, using standard torque for the upper and lower anterior teeth, to avoid altering tooth positions and ensure

that the surgical splints fit properly (Fig. 2). The maxillary brackets were positioned gingivally to improve the smile arc and gingival display.

Surgical planning and prediction were done with SimPlant OMS software.** The plan was to perform bimaxillary orthognathic surgery consisting of a maxillary high Le Fort I with 3mm of advancement and 3mm of impaction (Fig. 3A), a mandibular bilateral sagittal split osteotomy with 4mm of reduction (Fig. 3B), and a genioplasty with 3mm of impaction and 2mm of advancement (Fig. 3C,D).

**Materialise, Leuven, Belgium; www.materialise.com.



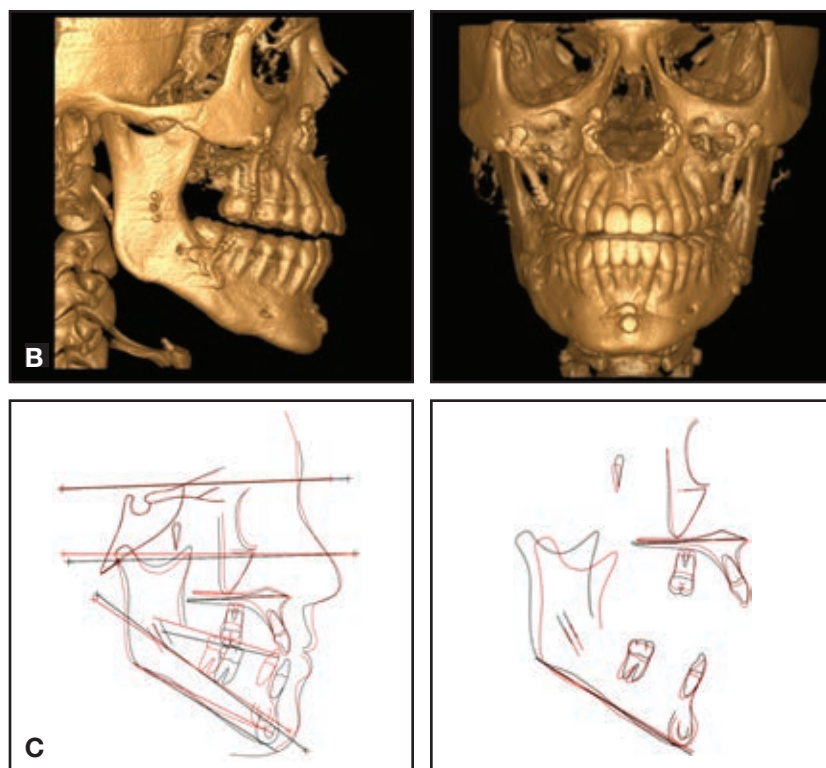


Fig. 7 (cont.) B. Post-treatment CBCT images. C. Superimposition of pre- and post-treatment cephalometric tracings.

During surgery, two miniplates (Skeletal Anchorage System) were inserted on each side: one in the infrazygomatic crest and one in the lateral portion of the mandibular body (Fig. 4A). After the soft tissues were sutured, .014" NiTi*** archwires were placed in both arches, with intermaxillary elastics ($\frac{3}{16}$ ", 3.5oz) worn from the lower canines to the upper second premolars (Fig. 4B,C). An immediate improvement was observed in the soft-tissue profile after surgery (Fig. 5).

Visits were scheduled every 15 days to take advantage of movement acceleration during the leveling and alignment phase. A conventional archwire sequence was used, progressing from .014" to .014" \times .025" to .018" \times .025" copper nickel titanium (Fig. 6). Elastic chain was attached for two months from the mandibular miniplates for vertical molar control. During the finishing stage, when

appointments were scheduled every three weeks, upper .019" \times .025" TMA* and lower .017" \times .025" TMA archwires were used in combination with elastics ($\frac{1}{4}$ ", 3.5oz).

After nine months of treatment, the brackets were debonded and the miniplates were surgically removed. Post-treatment records confirmed that we were able to optimize the patient's facial and dental esthetics, showing a considerable enhancement of her profile, correction of the Class III skeletal pattern, improvement of the overjet and overbite, and alignment of the dental arches into a functional Class I occlusion (Fig. 7).

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An Essix appliance[†] was prescribed as an upper retainer, and a bonded lingual wire and Hawley retainer were used in the lower arch. After 24 months in retention, the results remained stable (Fig. 8).

Discussion

Surgical-orthodontic treatment traditionally follows a three-phase approach: presurgical ortho-

donics for dental alignment, incisor decompensation, and arch coordination; orthognathic surgery with splints and rigid fixation to correct the skeletal discrepancies; and postsurgical orthodontics to settle the occlusion.⁹⁻¹⁹ Although such procedures generally produce positive results,²⁰ the presurgical orthodontic phase has the disadvantage of

[†]Registered trademark of Dentsply Raintree Essix Glenroe, Sarasota, FL; www.essix.com.



Fig. 8 Patient after 24 months in retention.

temporarily worsening the patient's esthetics and function.²¹⁻²³ In addition, this phase may take 15-17 months,^{24,25} or even 24 months,²⁶ and the post-surgical orthodontic phase requires another seven to 12 months.²⁶

SFA was first proposed by Nagasaka and colleagues in 2009.⁴ With the orthognathic surgery performed before the orthodontic correction, total treatment time could be reduced to even less than the average period for presurgical orthodontics.^{24,25,27} Considering the number of patients who want orthognathic surgery mainly for esthetic reasons and would appreciate a shorter treatment time, SFA offers an attractive alternative for managing skeletal malocclusions while improving patients' self-esteem and function at the beginning of treatment.²⁸

There is no doubt that this approach requires precise and accurate diagnosis and planning. Post-surgical orthodontic movements must be carefully executed according to the surgical plan, which implies constant communication between orthodontist and oral surgeon. The stability of the surgery must be ensured with perfect rigid fixation. Miniplates are an excellent adjunct to orthodontic biomechanics, enabling three-dimensional control of any relapse tendencies and efficient resolution of any mild discrepancies that may occur after surgery.¹

The use of high-tech archwires during leveling and alignment allows the orthodontist to take full advantage of the postsurgical acceleration in tooth movement. The RAP, as evidenced by an increase in bone turnover following a mechanical alteration, reportedly begins a few days after surgery, peaks between the first and second month, and lasts from six months to more than 24 months before declining.^{7,29,30} In the case shown here, the teeth were completely aligned in four months.

As long as the correct torque values are selected at the beginning of treatment, the light forces produced by the Damon Q passive self-ligating system with high-tech archwires will control the transverse dimension in coordination with post-surgical sagittal changes.^{31,32} Full-time elastic wear is safe, as noted by several authors,^{1,2} and can actually contribute to postsurgical stability. The com-

bination of SFA and self-ligating brackets thus makes overall treatment of skeletal Class III malocclusion more efficient.

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