# A New Appliance for Orthopedic Correction of Class III Malocclusion

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Orthopedic correction of the growing Class III patient is designed to improve the profile and occlusion by protracting the maxilla and repositioning the mandible.[1-3] Although maxillary expander-facemask appliances and reverse headgears can achieve excellent orthopedic effects,[4-10] they demand special patient compliance because they are worn extraorally, and are not as esthetic or comfortable as intraoral appliances. Proper oral hygiene can also be difficult to maintain, since mandibular growth lasts longer than maxillary growth,[11] and thus can prolong the use of fixed appliances.

Proffit believes the optimal age for maxillary protraction is about 6-7.[12] Other authors recommend such treatment before age 10, or at least one to two years before the pubertal growth spurt.[13] But because only a few permanent teeth have erupted at this young age, adequate anchorage for a maxillary protraction appliance can be problematic.

In this article, we will introduce a new appliance for treatment of growing Class III patients: the Tandem Traction Bow Appliance* (Fig. 1). The TTBA is more esthetic and comfortable than conventional devices because it is worn intraorally. It is removable, making it easy for the patient to maintain oral hygiene, and allowing treatment to be suspended or restarted whenever the clinician deems necessary, without bonding or debonding.

In clinical trials of the TTBA, structural

*Patent pending.

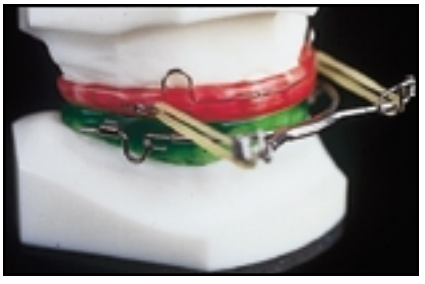

**Fig. 1 Tandem Traction Bow Appliance (TTBA).**

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superimposition according to Bjork[11] showed anteroinferior movement of the maxilla, posteroinferior repositioning of the mandible, and protraction of the maxillary dentition. Therefore, we concluded that the TTBA has a similar treatment effect to that of an expander-facemask combination.

## Appliance Construction

The TTBA comprises an upper splint, a lower splint, and a traction bow (Fig. 2). Its design allows the patient to open the mouth freely (Fig. 3).

The upper splint, which can serve the same function as a rapid maxillary expander, covers the palatal and occlusal surfaces of the maxillary teeth (Fig. 2A). A portion of the buccal surfaces are also covered, providing adequate retention to overcome the maxillary protraction force of as much as 400-500g per side. During active treatment, the labial bow is embedded in the acrylic; it is uncovered and used to retain the incisors when the TTBA is reassembled as a monoblock retainer.

The lower splint covers the buccal and lingual surfaces of the mandibular teeth to reinforce retention (Fig. 2B). Because the patient wears the TTBA while sleeping, retention is critical, and reduction of interdental resin must be avoided except in cases of severe undercuts. The splint should be relined whenever retention is inadequate.

The traction bow is a modification of a conventional headgear outer facebow (Fig. 2C). A safety hook is soldered to the adjusting U-loop to prevent disconnection of the appliance (Fig. 2D).

The position of the elastic hooks on the upper splint and the tubes on the lower splint determine the direction of force. The maxillary

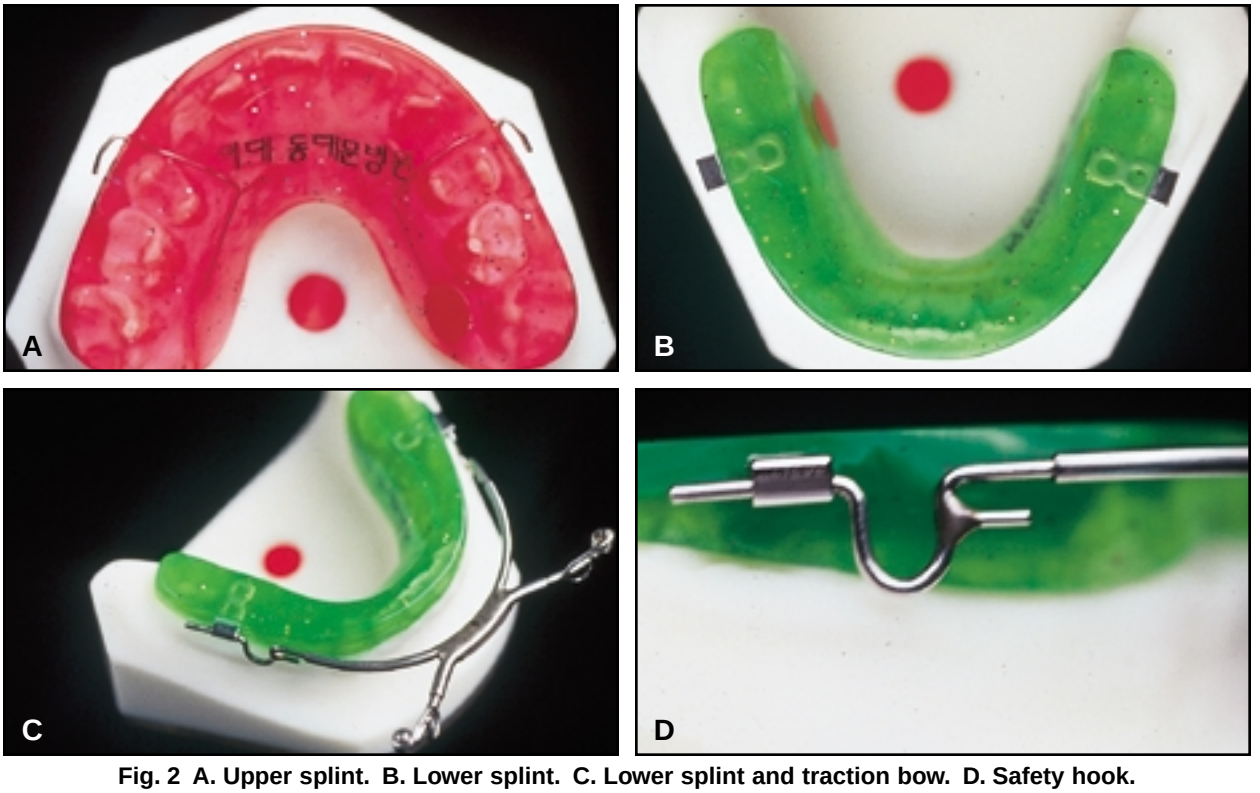


**Fig. 2 A. Upper splint. B. Lower splint. C. Lower splint and traction bow. D. Safety hook.**

hooks should be placed distal to the deciduous or permanent canines, so that the elastic force passes through the center of resistance of the maxilla (at about 20° to the occlusal plane).[14-16] The mandibular tubes should be located as posteriorly as possible.

In the deciduous and mixed dentition, the applied force should be 300-500g for orthopedic effect; in the early permanent dentition, it should be 150-300g for orthodontic effect, avoiding undue stress on the TMJ. The patient is asked to wear the TTBA 12-14 hours per day for orthopedic effect, and more than 14 hours a day for orthodontic effect.

After the crossbite is overcorrected, the two splints are fused into a monoblock and used as a retainer (Fig. 4).

The TTBA can be modified for use with bonded fixed appliances if necessary (Fig. 5).

## Case Report

A female patient age 11 years, 3 months, presented with a bilateral Class III malocclusion (Fig. 6). The patient had a concave profile, a reverse overjet of 6mm, and an overbite of 10mm, with maxillary anterior crowding and a lingual crossbite on the right side. There were severe irregularities of the maxillary incisors and an arch-length discrepancy of 11.5mm. Skeletally, the maxilla was normal, but the mandible was anteriorly positioned.

Because the patient's growth was decelerating, the opportunity for orthopedic correction was limited. Therefore, the patient wore the TTBA at night for only five months (Fig. 7).

After correction of the anterior crossbite to an edge-to-edge bite, full maxillary edgewise appliances were bonded for correction of the crowding. A mandibular bite block was placed until positive overjet was achieved. After alignment of the maxillary teeth with an expansion loop, the mandibular second molars were extracted, and fixed appliances were bonded in the mandibular arch. Class III elastics were then used to move the mandibular dentition distally.

Once proper overbite, overjet, and molar

**Fig. 3 Patient can open mouth freely while wearing TTBA.**

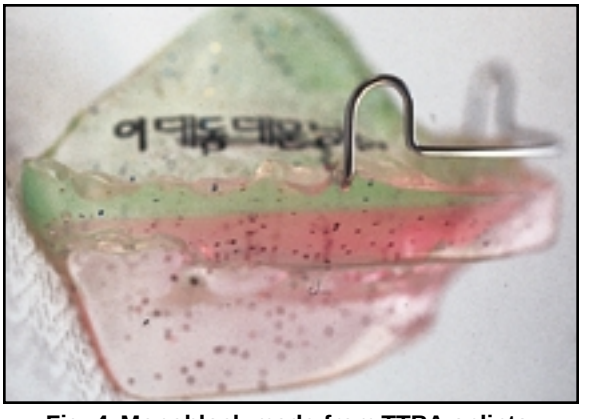

**Fig. 4 Monoblock made from TTBA splints.**

**Fig. 5 TTBA adapted for use with fixed appliances.**

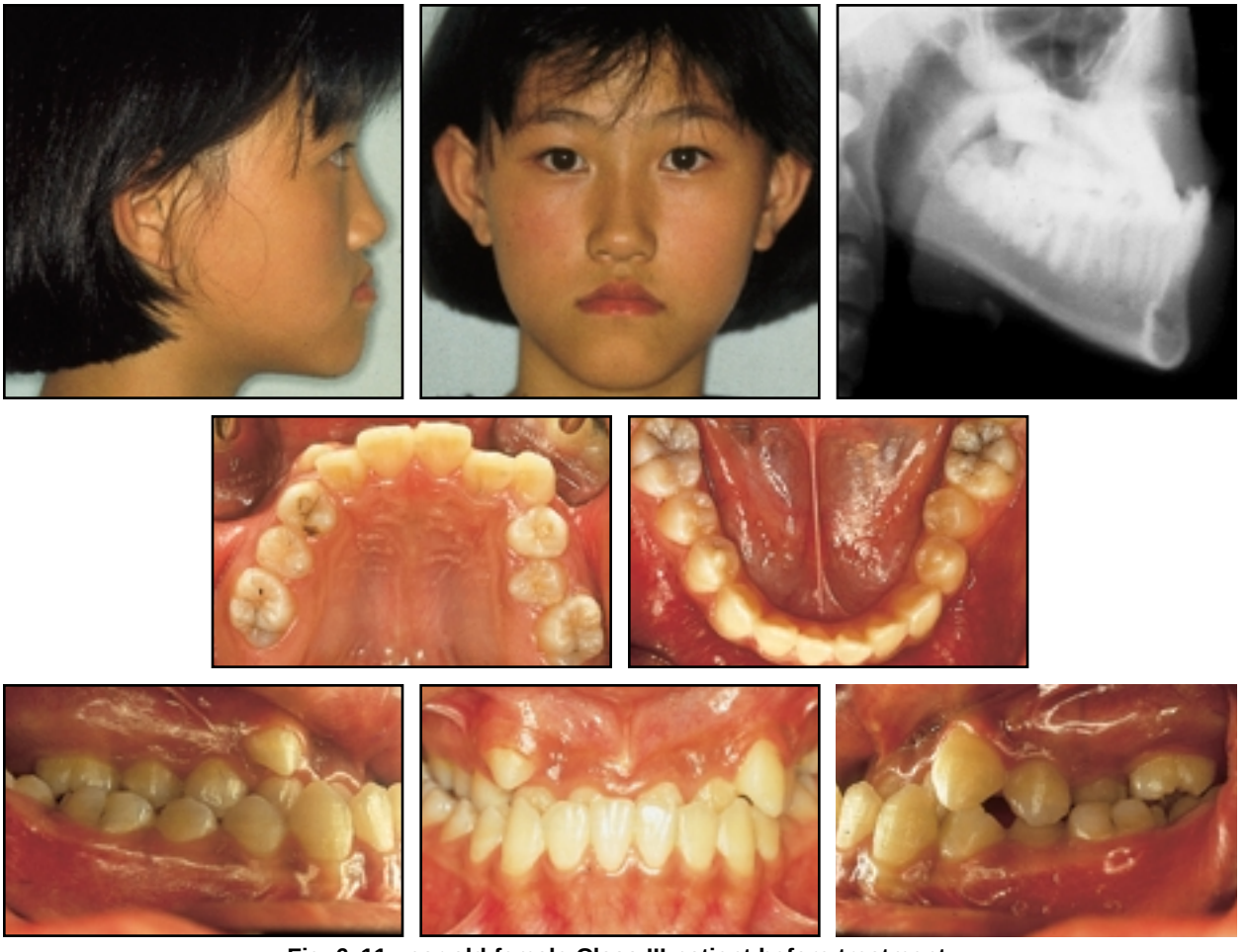

Fig. 6 11-year-old female Class III patient before treatment.

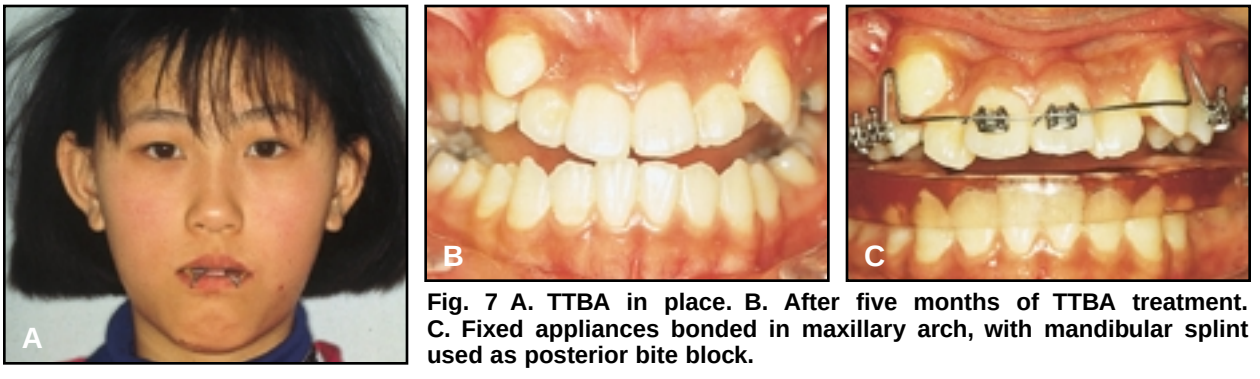


Fig. 7 A. TTBA in place. B. After five months of TTBA treatment. C. Fixed appliances bonded in maxillary arch, with mandibular splint used as posterior bite block.

**Fig. 8 Patient after treatment.**

relationship were achieved, fixed appliances were removed (Fig. 8). The patient was asked to wear Class III elastics to hooks on her removable retainer.

Superimposition of cephalometric tracings showed forward and downward movement of the maxilla and clockwise rotation of the mandible (Fig. 9). Records taken three years after treatment confirmed the stability of the results, with the mandibular third molars guided into the position of the second molars (Fig. 10).

## Conclusion

While the treatment effect of the TTBA is similar to that of a facemask, the TTBA is much more convenient for both clinician and patient. It has the following advantages:

• Promotes patient compliance, because it is more esthetic and comfortable than extraoral appliances. The TTBA is so small that it can be stored in a removable appliance case. Night-time

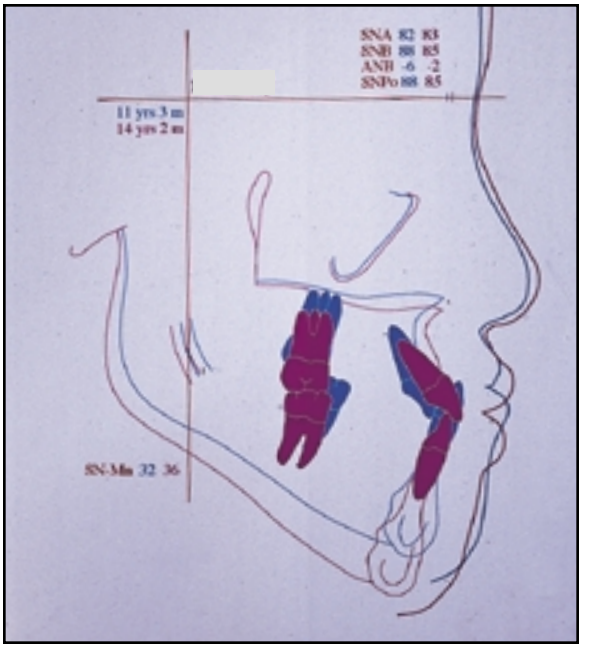


**Fig. 9 Superimposition of cephalometric tracings before and after treatment.**

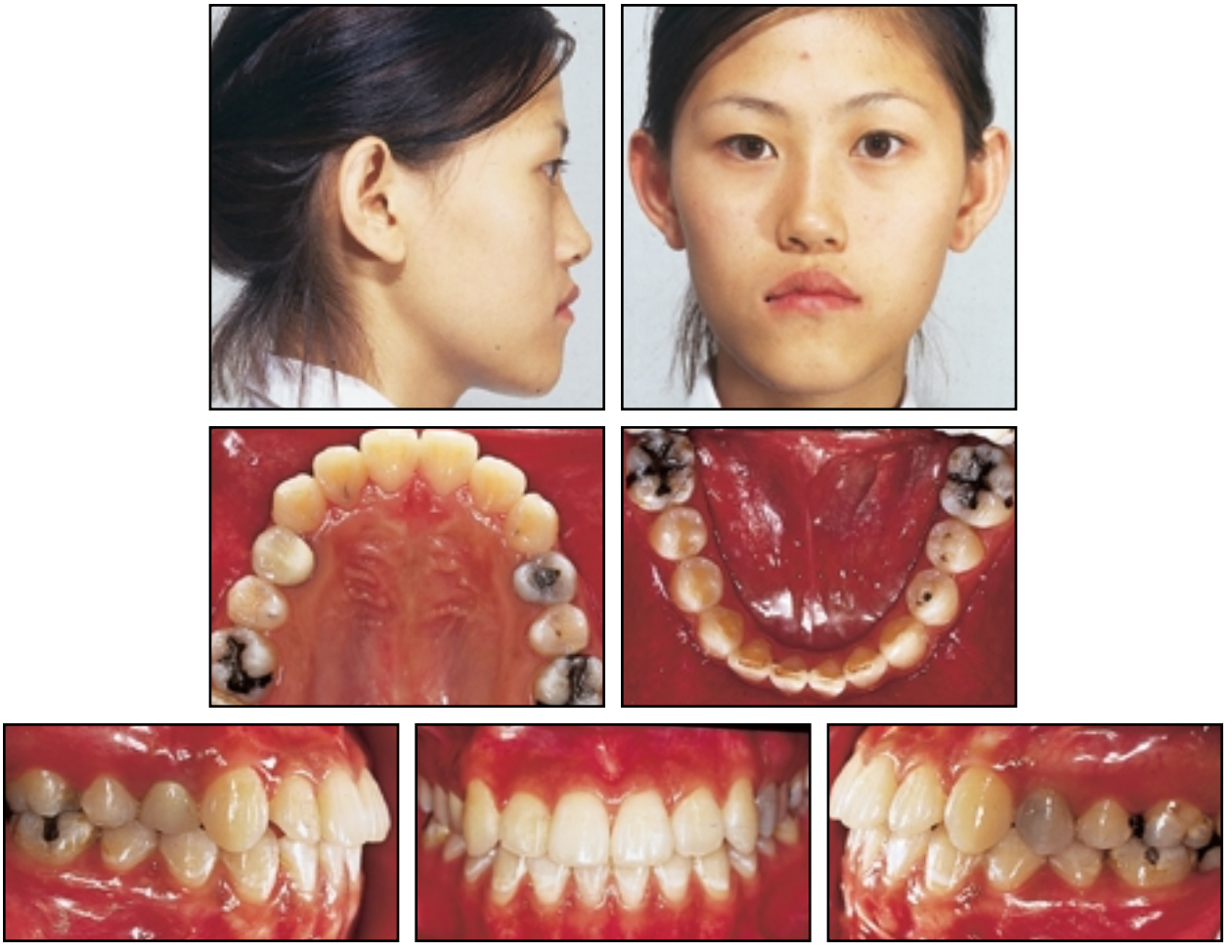

**Fig. 10 Three years after treatment.**

wear is adequate for an orthopedic effect.
• Promotes good oral hygiene, because it is removable.
• Allows early treatment of any Class III malocclusion, due to optimal retention in the deciduous, mixed, or early permanent dentition.
• Distributes the force of protraction to all maxillary teeth.
• Permits free mandibular movement, with its polished occlusal surface, so that a functional shift is easily corrected.
• Maintains arch length, unlike extraoral maxillary protraction appliances that tend to produce anterior crowding.
• Requires no additional biteplate for correction of anterior crossbite.
• Can be changed to a monoblock retainer at chairside for maintenance of crossbite correction.
• Can be used in conjunction with fixed appliances if necessary.

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