Correction of Posterior Crossbite with a Nickel Titanium Appliance and Indirect Skeletal Anchorage

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The "dragon helix" appliance was developed for correction of crossbite through simultaneous intrusion and palatal tipping of the affected teeth using indirect skeletal anchorage.[1] The original version of the appliance consisted of two arms and a coil spring made from .016" × .022" stainless steel wire. Although it was effective, this appliance was time-consuming to fabricate; moreover, its bulky spring often caused patient discomfort because of gingival impingement and food impaction.

To address these problems, we modified the dragon helix appliance by eliminating the coil spring and changing the material from stainless steel to nickel titanium wire. The modified crossbite corrector takes less time to fabricate and causes less patient discomfort than the original version. It allows the application of light, continuous forces for effective intrusion of extruded molars.

Fabrication and Insertion

A setup model should be used to construct the crossbite corrector (Fig. 1). In a case of crossbite involving an overerupted maxillary molar, the setup model should incorporate a 20-30% overcorrection of the molar to provide enough space for the mandibular molar to be uprighted without interference.

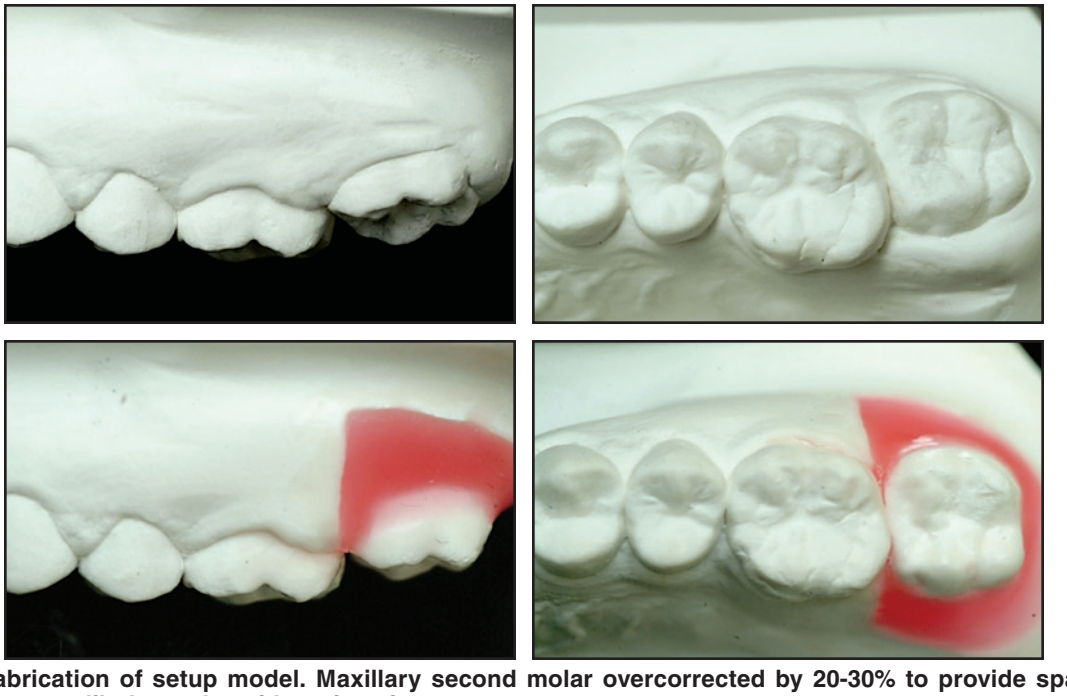

Fig. 1 Fabrication of setup model. Maxillary second molar overcorrected by 20-30% to provide space for uprighting mandibular molar without interference.

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The appliance is fabricated from a segment of .018" × .025" nickel titanium wire. The bends in the wire are made using a three-pronged nickel titanium plier* and the Bender Soarer II** (Fig. 2A). First, the wire is bent gingivally against the distobuccal cusp of the maxillary first molar (the anchor tooth). The wire is then marked for the second bend, which is made distally at a distance from the first bend equal to the height of the maxillary second molar (the target tooth). The third bend is made occlusally at the buccal groove of the maxillary second molar. The fourth and final bend brings the end of the wire over the occlusal surface of the maxillary second molar.

To ensure easy and accurate bonding, a composite base molded to the patient's tooth is fabricated for each arm of the crossbite corrector (Fig. 2B). First, a separating medium is applied to the setup model. A conventional composite adhesive is applied to bond the wire ends to the occlusal surface of the target tooth and the buccal surface of the anchor tooth. After the composite bases are separated from the setup model, the bonding surfaces are sandblasted to enhance their mechanical retention.

A conventional composite is then used to bond the arms of the crossbite corrector to the patient's teeth. We recommend bonding the appliance first to the occlusal surface of the maxillary second molar and then to the buccal surface of the maxillary first molar. The tooth impressions in the

*Hu-Friedy, 3232 N. Rockwell St., Chicago, IL 60618; www.hu-friedy.com.

**Tomy, Inc., 818, Shinmachi, Ohkuma-machi, Futaba-gun, Fukushima-ken, 979-1305, Japan; www.tomyinc.co.jp.

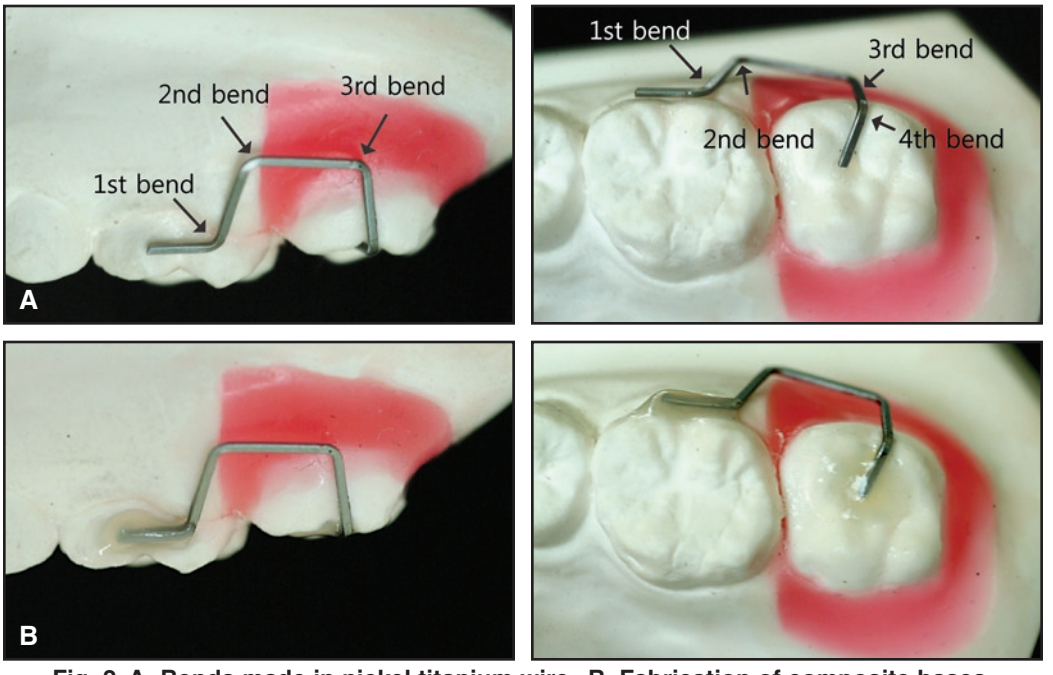

Fig. 2 A. Bends made in nickel titanium wire. B. Fabrication of composite bases.

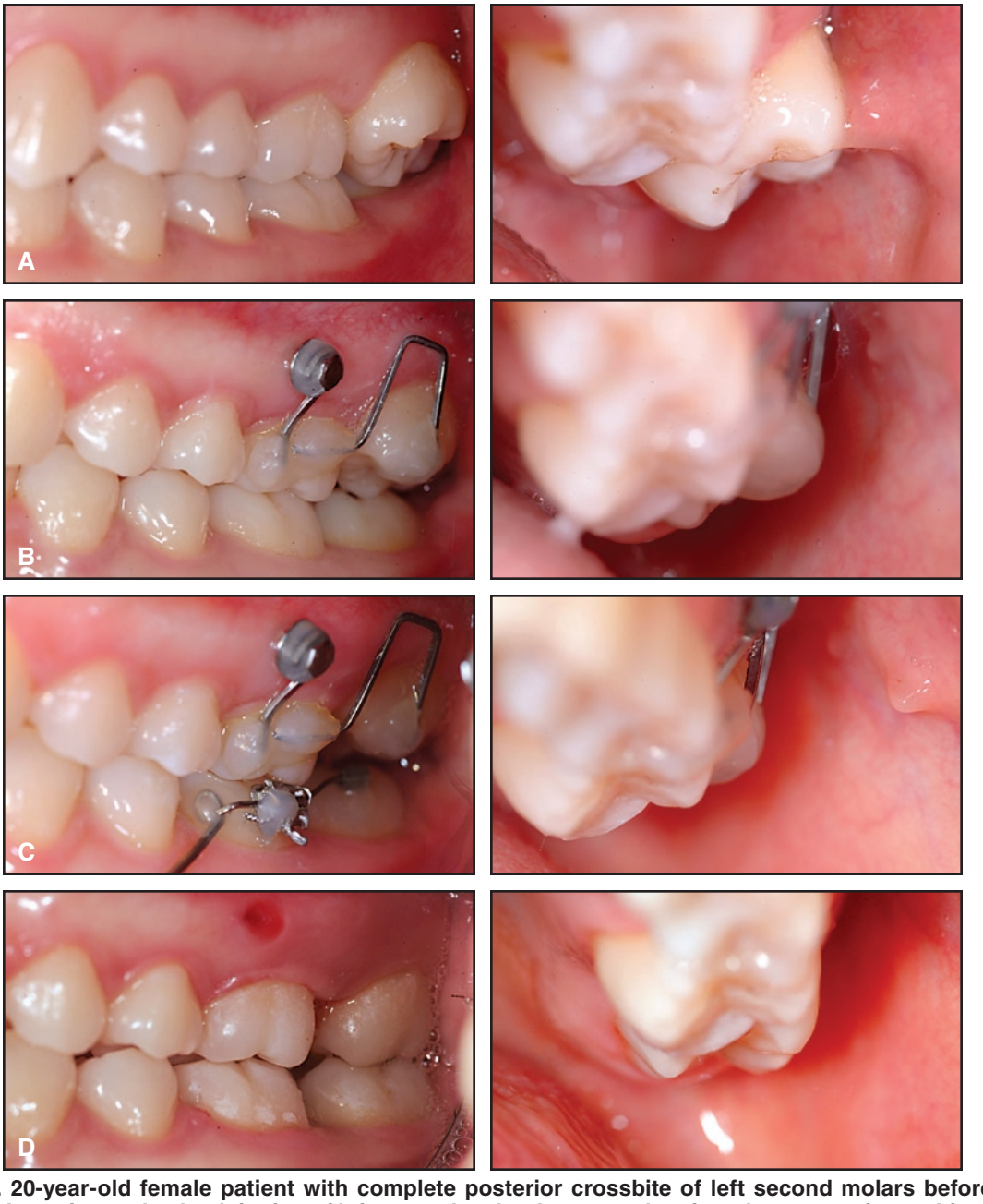

Fig. 3 A. 20-year-old female patient with complete posterior crossbite of left second molars before treatment. B. Intrusion and palatal tipping of left second molar three months after placement of crossbite corrector in maxillary arch. C. Space created for uprighting of mandibular molar four months after placement of maxillary crossbite corrector. D. After 16 months of maxillary arch treatment.

preformed composite bases allow accurate positioning, and because the appliance was fabricated passively on the overcorrected setup model, it is activated as soon as it is placed in the mouth. Reactivation is not necessary until the second molar has been moved to the target position.

Case Report

A 20-year-old female presented with the chief complaint of complete crossbite of the left second molars (Fig. 3A). Initial examination revealed a convex facial profile with lip protrusion and mild anterior crowding in both arches, as well

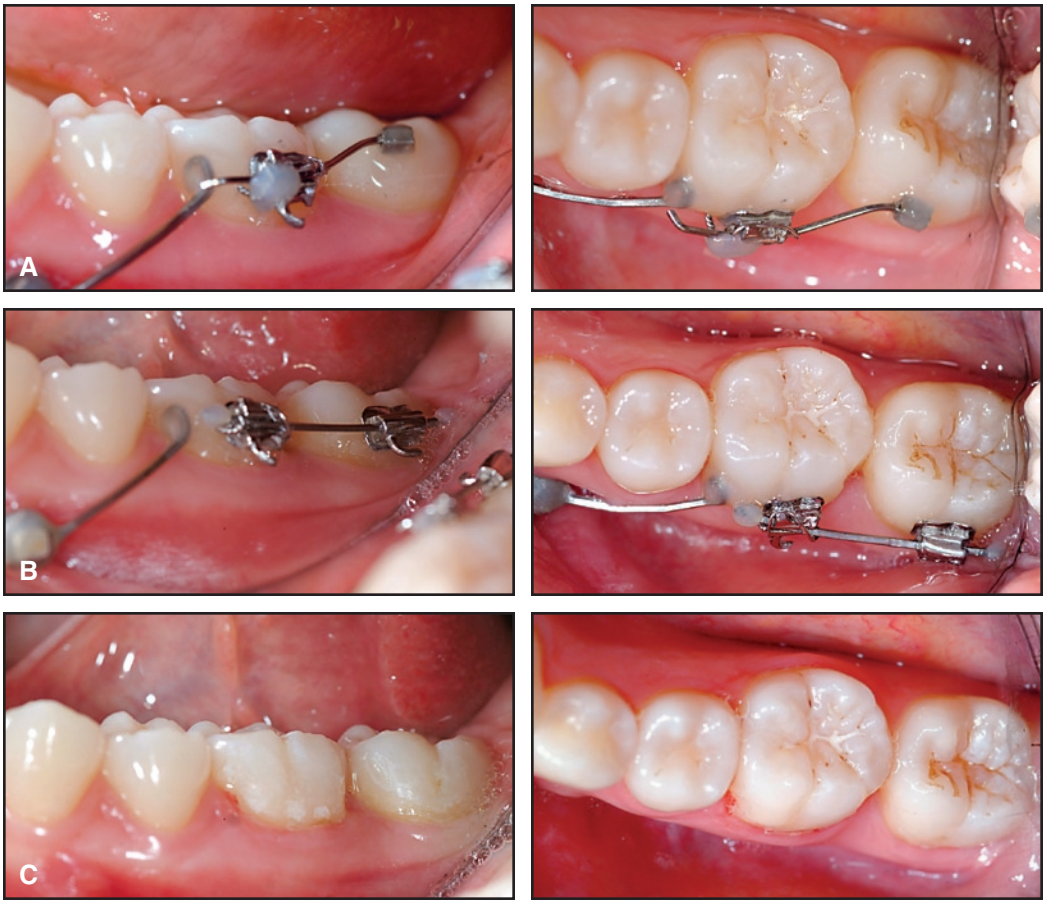

Fig. 4 A. Mandibular second molar uprighting initiated four months after placement of maxillary crossbite corrector. B. After seven months of mandibular molar uprighting, first molar bracket repositioned and second molar tube replaced with bracket for finishing. C. After nine months of mandibular arch treatment.

as Class II canine and molar relationships. No significant transverse skeletal deviation was observed. Although the patient was diagnosed as having a Class II, division 1 malocclusion, she elected to have only the crossbite corrected.

For indirect skeletal anchorage, a 1.6mm × 8mm miniscrew*** was placed between the maxillary left second premolar and first molar under local anesthesia. The screw was connected to the mesiobuccal surface of the maxillary first molar with .019" × .025" stainless steel wire. The crossbite corrector was then bonded to the maxillary left first and second molars. Three months later, significant intrusion and palatal tipping of the left second molar were observed (Fig. 3B). After another month, the interocclusal clearance was sufficient to begin uprighting the mandibular left second molar (Fig. 3C). Treatment of the maxillary arch took a total of 16 months (Fig. 3D).

A second screw was placed between the mandibular left premolars and connected to the mesiobuccal surface of the mandibular left first molar with .019" × .025" stainless steel wire. Since the mandibular second molar was not intruded and there was already enough clearance for conventional appliances, there was no need to use the crossbite corrector on this tooth. A bracket was bonded to the first molar, and a tube was bonded to the buccal surface of the second molar (Fig. 4A). A nickel titanium wire was placed and activated to tip the second molar buccally. After seven months, mandibular uprighting was complete. The mandibular first molar bracket was repositioned, and a second molar bracket was placed for more detailed leveling and alignment (Fig. 4B). Mandibular arch treatment lasted nine months (Fig. 4C). The total duration of treatment was 16 months (Fig. 5).

***OSAS self-drilling screw, Part No. 1D16109, EPOCH Medical, Seoul, South Korea; www.osas.co.kr.

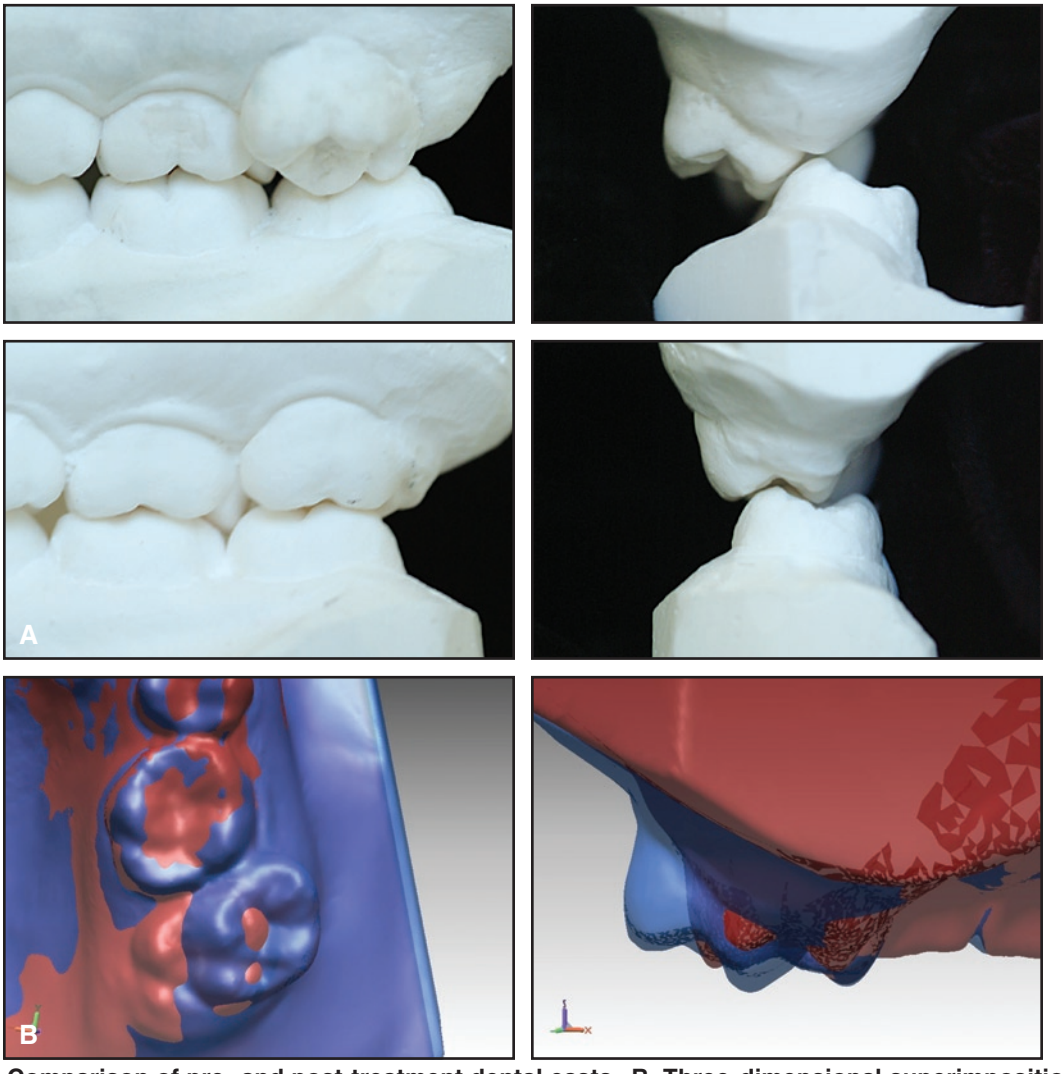

Fig. 5 A. Comparison of pre- and post-treatment dental casts. B. Three-dimensional superimposition of pre- and post-treatment maxillary dental casts.

Discussion

The small, nickel titanium crossbite corrector allows effective tooth movement with less gingival impingement and patient discomfort than was found with the original dragon helix device. Indirect skeletal anchorage with a single miniscrew provides sufficient stability, comparable to that of an ankylosed tooth.[2,3] The screw can be placed wherever there is adequate interradicular space. Other orthodontic treatment can be performed simultaneously with no loss of anchorage.

Use of the modified crossbite corrector with indirect skeletal anchorage requires special attention to several issues. First, because the mechanics involved rely on absolute anchorage, the miniscrew must be checked frequently for mobility. Second, accurate positioning of the crossbite corrector is essential for proper direction of force. Third, as with other systems for intrusive tooth movement, periodontal pocket depth must be regularly monitored. The importance of good oral hygiene should be emphasized to the patient to minimize the risk of periodontal problems.

REFERENCES

1. Yun, S.W.; Lim, W.H.; Chong, D.R.; and Chun, Y.S.: Scissors-bite correction on second molar with a dragon helix appliance, Am. J. Orthod. 132:842-847, 2007.
2. Chang, Y.J.; Lee, H.S.; and Chun, Y.S.: Microscrew anchorage for molar intrusion, J. Clin. Orthod. 38:325-330, 2004.
3. Yun, S.W.; Lim, W.H.; and Chun, Y.S.: Molar control using indirect miniscrew anchorage, J. Clin. Orthod. 39:661-664, 2005.