A New Palatal Implant with Interchangeable Upper Units

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Although self-drilling miniscrews can be inserted without making an incision, resulting in a relatively low risk of infection, they have a high rate of failure. Miniplates can be used for molar distalization and intrusion, but the insertion process is surgically invasive, with a high risk of infection. With both miniscrews and miniplates, changing the direction of retraction during treatment requires reinsertion of the device.

Choi and colleagues described the use of two midpalatal miniscrews with the retraction force applied from a sheath bonded to their heads.[1] This device combines the best features of miniscrews and miniplates: relatively non-invasive surgical placement and a low failure rate. Moreover, the direction of retraction can be easily adjusted by changing the wires in the sheath. Disadvantages are that the peri-implant tissue is difficult to keep clean because the implant is fixed, sheath failure can sometimes occur, and debonding can be time-consuming and difficult.

We have developed an implant* that not only addresses the problems of these previous designs, but has several interchangeable upper units to allow various methods and directions of retraction.

Implant Design

The new implant consists of a pair of screws (1.5mm wide, 6mm long), a base plate, two nuts to attach the screws to the base plate, and a detachable upper unit with a nut to affix it to the plate (Fig. 1). The base plate has two holes, one hexagonal and one oblong-hexagonal, to accommodate the screws. In the center of the base plate is a male

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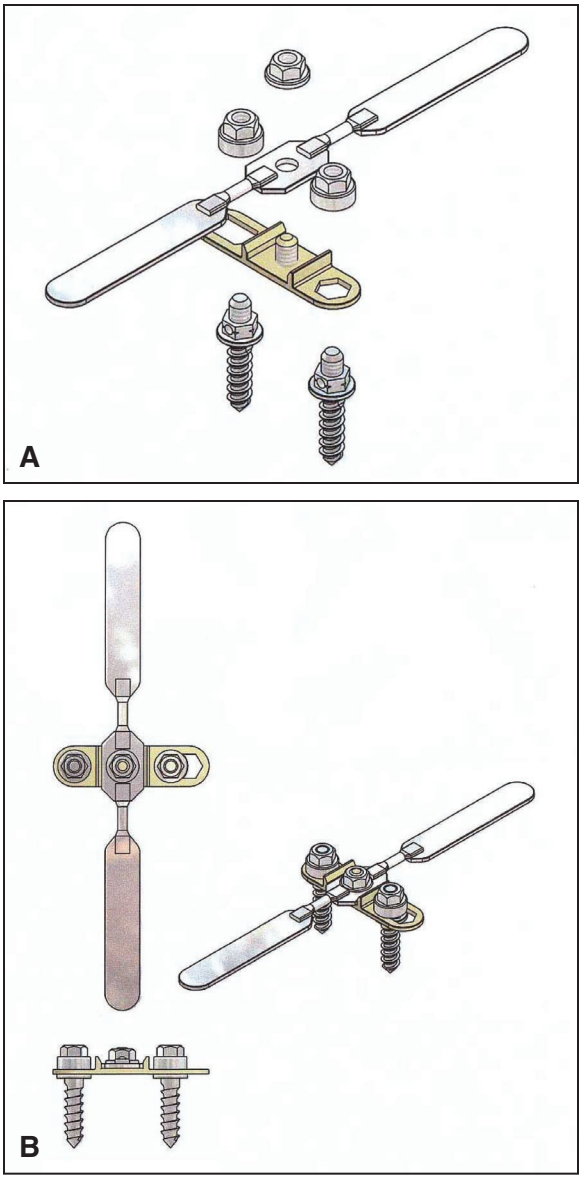

Fig. 1 Palatal implant with detachable upper unit. A. Unassembled implant. B. Assembled implant.

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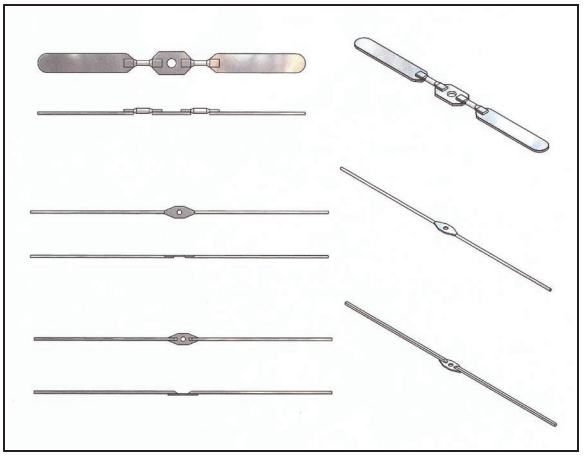

Fig. 2 Three types of upper units: with stainless steel plates, with .032" round wire, and with .032" square wire.

Fig. 3 Plate-type upper unit used for distal and lateral movement of left first and second molars.

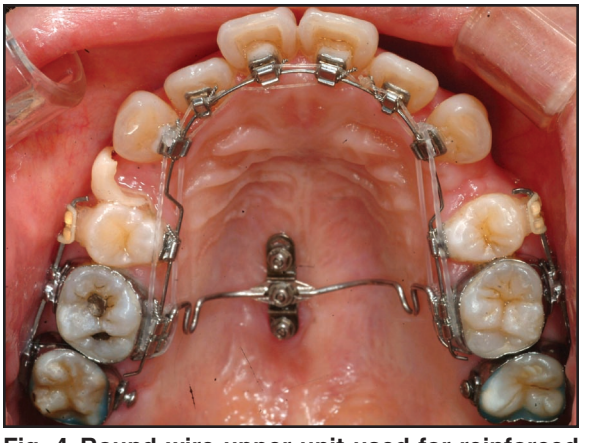

Fig. 4 Round-wire upper unit used for reinforced anchorage of maxillary first molars.

screw for connection of the upper unit, with guides on both sides to regulate the rotation of the upper attachment.

Three different types of upper units are available (Fig. 2). One, with flexible stainless steel plates on both sides of a center support, can be welded to a sheath for attachment of beta titanium wires that can move the first and second molars laterally and distally (Fig. 3). Another type of upper unit has an .032" round wire on both sides of the center support to reinforce anchorage of the maxillary first molars (Fig. 4). The third upper unit has an .032" square wire on both sides of the center support to anchor distal movement of anterior and buccal segments (Fig. 5).

Surgical Procedure

To insert the palatal implant:

1. Drill a hole at the center of the palate using a 1.2mm drill bit, and insert one screw until the disc portion contacts the palate, leaving the hexagonal portion and column protruding.
2. Place the hexagonal hole of the base plate over

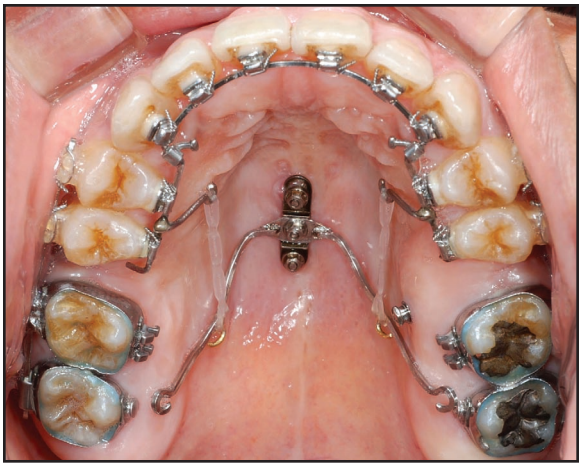

Fig. 5 Square-wire upper unit used for distal movement of anterior and buccal segments.

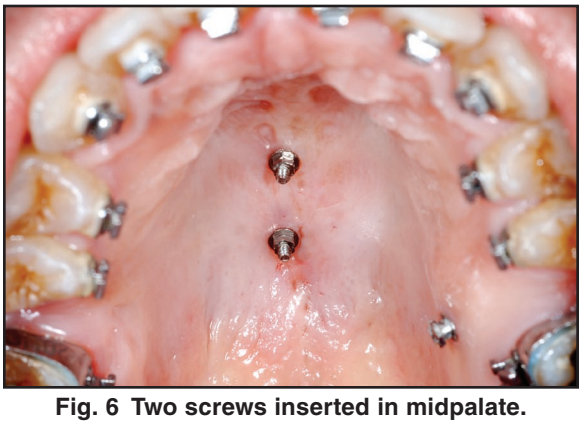

Fig. 6 Two screws inserted in midpalate.

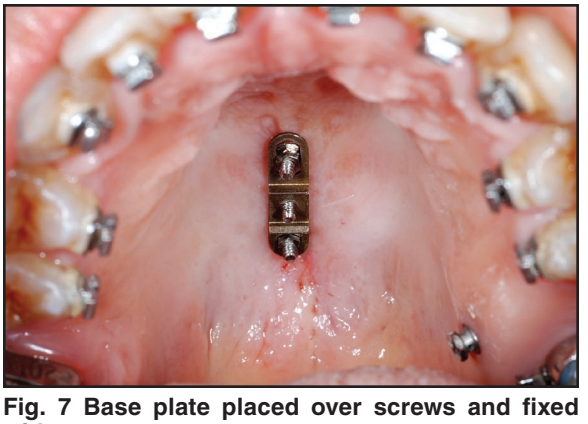

Fig. 7 Base plate placed over screws and fixed with nuts.

the implanted screw to align the second screw.
3. Drill another hole through the oblong hole of the base plate. Remove the base plate, then insert the second screw (Fig. 6).
4. Place the base plate over the two screws, and attach it with the two nuts (Fig. 7).
5. Take an alginate impression, and pour a plaster cast for fabrication of the upper unit, which is affixed to the base plate at a subsequent appointment (Fig. 5).

Case Report

A 29-year-old female presented with complaints of lip protrusion and crowding. Initial examination revealed a skeletal Class II and dental Class II, division 1 malocclusion with crowding and buccal crossbite of the maxillary right second molar (Fig. 8). The treatment goals were to reduce the crowding and improve the buccal crossbite, to correct the molar relationship, and to achieve a good facial profile. The maxillary first premolars and mandibular second premolars were extracted, and maxillary lingual brackets and mandibular labial brackets were bonded.

A midpalatal implant with a square-wire upper attachment was inserted. Elastics were attached to the lever arms of the upper unit for simultaneous distal movement of the maxillary canines and intrusive and lingual movement of the right second molar (Fig. 9). Lever arms were then extended from the maxillary canine-to-canine wire segment, and elastics were attached between these lever arms and those of the palatal implant to retract the anterior teeth (Fig. 10). After 24 months, a Class I molar relationship had been achieved, with considerable improvement of the crowding, the right second molar crossbite, and the lip protrusion (Fig. 11).

Discussion

The primary advantage of this new implant over other palatal miniplates is its ease of insertion, eliminating the need for anesthesia and invasive surgery. The disc stoppers on the screws prevent the base plate from becoming impacted in the

Fig. 8 29-year-old female patient with Class II, division 1 malocclusion, crowding, and buccal crossbite of right second molar before treatment.

Fig. 9 Maxillary canines moved distally with anchorage from midpalatal implant; right second molar intruded and moved lingually.

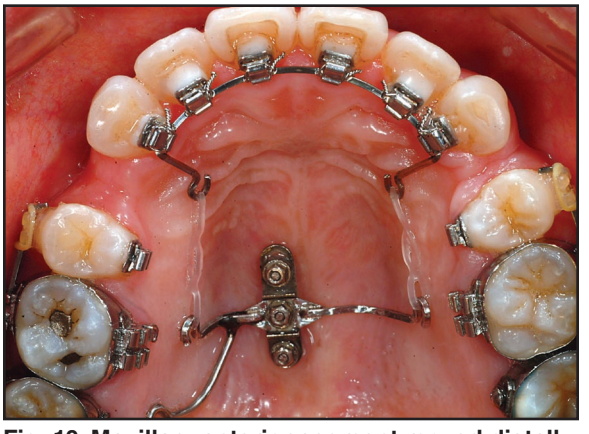

Fig. 10 Maxillary anterior segment moved distally.

mucosal tissue. The use of two screws makes the implant more stable than single midpalatal miniscrews, reducing the risk of dislodgement, and the oblong hole of the base plate allows the clinician to adjust for any minor errors in screw alignment.

In addition, the distance of the implant from the dental roots allows unobstructed tooth movements of various types. The interchangeable upper units facilitate procedures as difficult as unilateral intrusion or extrusion. After treatment, the implant is easily removed by taking off the base plate and loosening the screws.

In the case shown here, loss of maxillary molar anchorage was prevented by retracting the canines directly from the implant. Simultaneous improvement of the molar crossbite reduced treatment time, as did retracting the maxillary anterior teeth as a unit with minimal wire friction.

When single miniscrews are used, anatomical restrictions such as the location of the palatal arteries often make it difficult to direct retraction precisely. This problem is solved by connecting lever arms from the anterior wire segment to the arms of the midpalatal implant. The direction of retraction of these arms is crucial, however, to prevent lingual inclination of the anterior teeth.

REFERENCES

1. Choi, K.J.; Choi, J.H.; Lee, S.Y.; Ferguson, D.J.; and Kyung, S.H.: Facial improvements after molar intrusion with miniscrew anchorage, J. Clin. Orthod. 41:273-280, 2007.

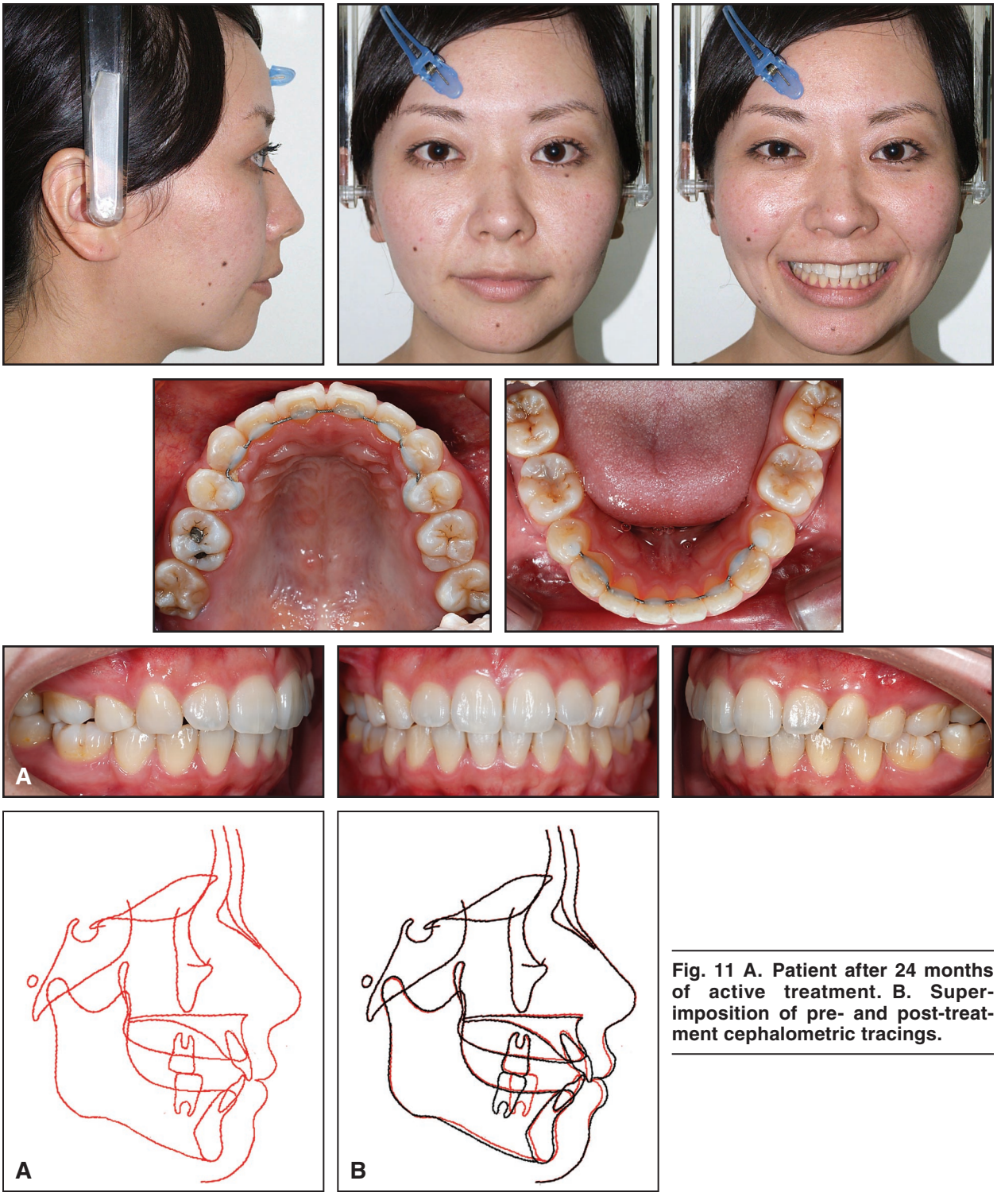

Fig. 11 A. Patient after 24 months of active treatment. B. Superimposition of pre- and post-treatment cephalometric tracings.