JCO-Online Copyright 2003 - VOLUME 37 : NUMBER 01 : PAGES (22-26) 2003

Distalization of Maxillary Molars with a Midpalatal Miniscrew

S.H. KYUNG, DDS, PHD
S.G. HONG, DDS
Y.C. PARK, DDS, PHD

Traditional methods of controlling anchorage during molar distalization tend to cause unwanted movement of other teeth and to require patient cooperation. These disadvantages can be overcome with skeletal anchorage, which is gradually gaining acceptance among orthodontists.

Byloff and colleagues have successfully moved molars distally using a Graz-implant-supported Pendulum Appliance,1 but the implant must be surgically removed after orthodontic treatment. Karaman and colleagues have distalized molars by implanting a screw, 3mm in diameter and 14mm long, 2-3mm behind the incisal canal,2 but a screw of this size runs the risk of damaging the surrounding structures. Wehrbein and Merz were able to close an extraction space by inserting a smaller implant, 3.3mm in diameter and 4-6mm long, in the midpalatal suture area.3 This is a simpler procedure and less invasive for the patient than conventional endosseous implants.4

Clinicians have assumed that because the palatal bone appears thin on a lateral cephalogram, a wider midpalatal implant or a disc-type onplant is required.5-7 If the palatal area is examined in three dimensions, however, the available bone support is greater than it appears cephalometrically. The nasal cavity is not appropriate for intrabony anchorage because it extends laterally from the midpalatal suture and is, in fact, too thin, but the nasal crest between the anterior nasal spine and the posterior nasal spine is 2mm thicker than it appears on a lateral cephalogram.8 The nasal crest has a triangular shape with a base of 5.4mm and a height of 5.6mm in the average adult (Fig. 1)--large enough for a miniscrew.9

Except in the incisal canal, the midpalate consists of cortical bone that is sufficient to support an entire miniscrew, so that the screw will not be affected by orthopedic forces.10 In addition, there are no roots, nerves, or blood vessels in the palatal area to complicate surgical screw placement. Most of the soft tissue is thinner than 1mm,11 ensuring accurate placement of the miniscrew with biomechanical stability. There is no waiting for osseointegration and no need for additional surgery, because the miniscrew is easily removed.

Procedure

Inserting a miniscrew is difficult with a conventional straight screwdriver, which forms an oblique angle with the bone surface, changing the direction of the screw and increasing the likelihood of bone damage and implant failure. Therefore, a screwdriver in a contra-angular handpiece is required, and it must be longer than the depth of the palate to avoid contact with the maxillary anterior teeth (Fig. 2). Because the cortical bone can be damaged rather easily by frictional heat, the screw should be inserted with irrigation at a rate of no more than 30 turns per minute.12 More pressure is needed than in other areas due to the density of the bone.

Care should be taken not to let the power chain directly contact the soft tissue. Educating the patient about oral hygiene around the miniscrew is also critical. Even though there is keratinized tissue in this area, the soft tissue will proliferate readily with adequate hygiene.13

Case 1

An 11-year-old male presented with the upper lateral incisors in crossbite and a crowded maxillary arch (Figs. 3A,B and 3C-F). Cephalometric analysis showed a skeletal Class III tendency.

Maxillary palatal expansion was initiated with a Hyrax appliance. After five months of maxillary anterior protraction with a facial mask, the molars were in a Class II relationship, and the expander was removed. Three months later, a midpalatal miniscrew was inserted, and a distal force of about 400g was applied with power chain.

In three months, the maxillary molars moved distally 3.5mm from the apices and 5mm from the crowns. The miniscrew was removed after another nine months, and the fixed appliances five months later.

Case 2

A 10-year-old female presented with mandibular prognathism and an anterior crossbite (Figs. 4A,B and 4C-E).

A Hyrax palatal expander was placed, and maxillary anterior protraction was begun with a facial mask. In five months, the molars were in a Class II relationship and the crossbite had improved. Upper molar distalization was initiated three months later with power chain to two midpalatal miniscrews, which were splinted together for stability.

In five months, the maxillary molars moved distally 3.5mm from the apices and 5mm from the crowns. •

FIGURES

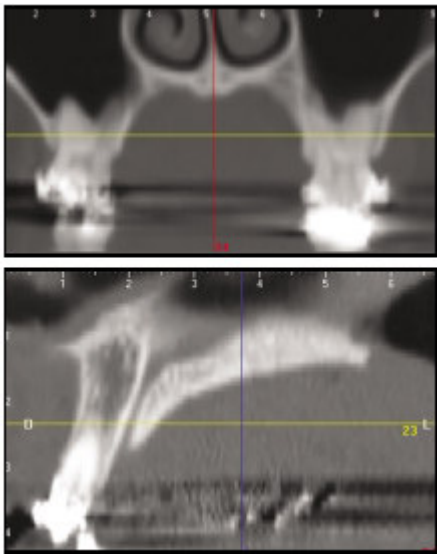


Fig. 1 Computed tomogram shows that nasal crest is 2mm thicker than it appears on lateral

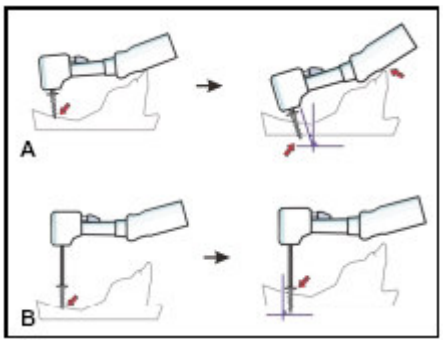


Fig. 2 Insertion screwdriver should be contra-angular and as long as depth of palate (B) to avoid contact with maxillary anterior teeth (A).

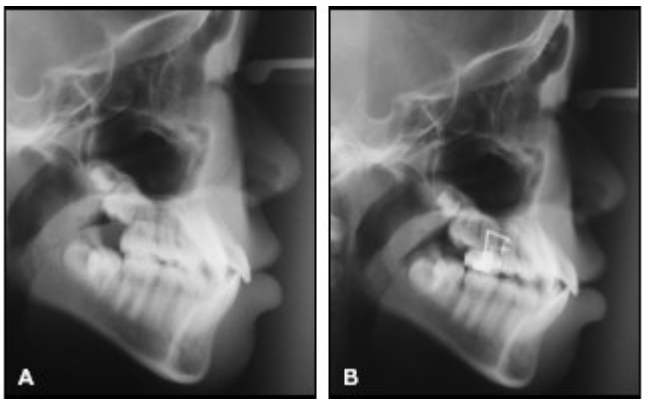
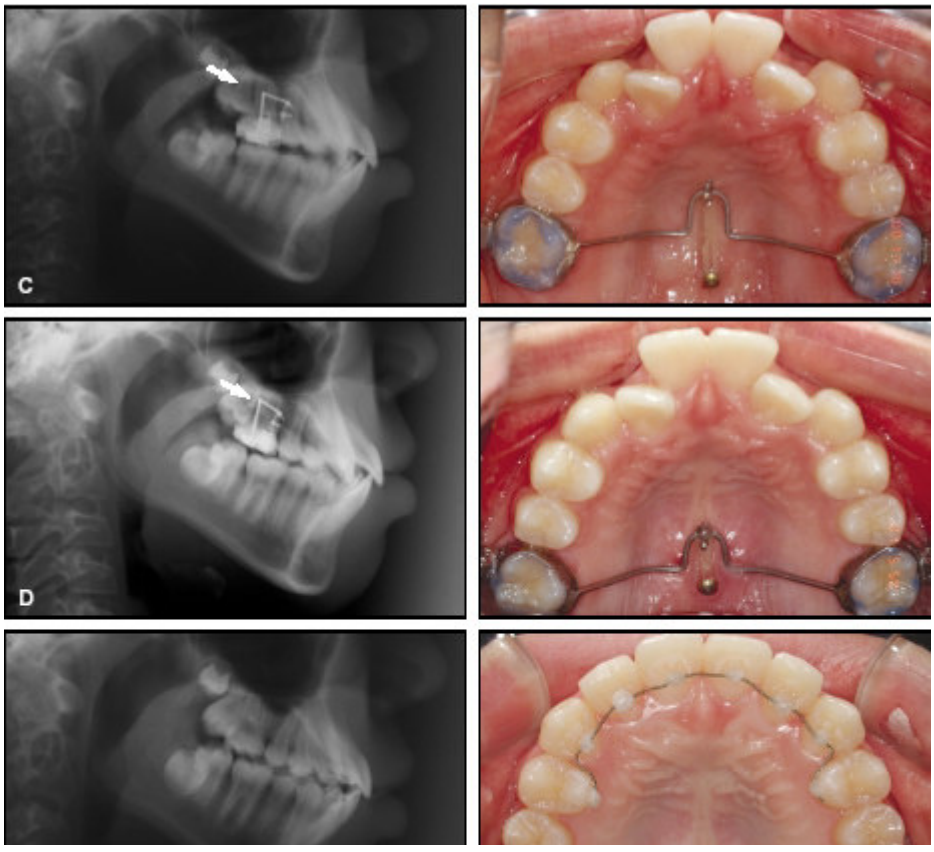


Fig. 3AB Case 1 A. 11-year-old male patient with Class I molar relationship and skeletal Class III tendency before treatment. B. After five months of maxillary anterior protraction with Hyrax expander and facial mask, molars are in Class II relationship.



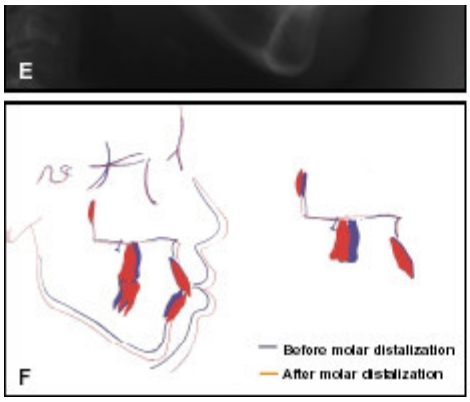


Fig. 3CF Case 1 (cont.) C. Beginning of molar distalization with midpalatal miniscrew (arrow) attached to transpalatal arch by power chain. D. Molar distalization after three months, showing relief of anterior crowding. E. Removal of appliances 14 months later, showing complete healing of miniscrew insertion site. F. Superimposition of cephalometric tracings before and after molar distalization.

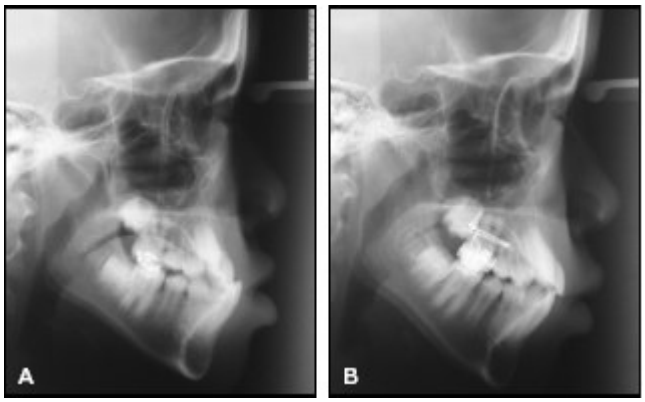
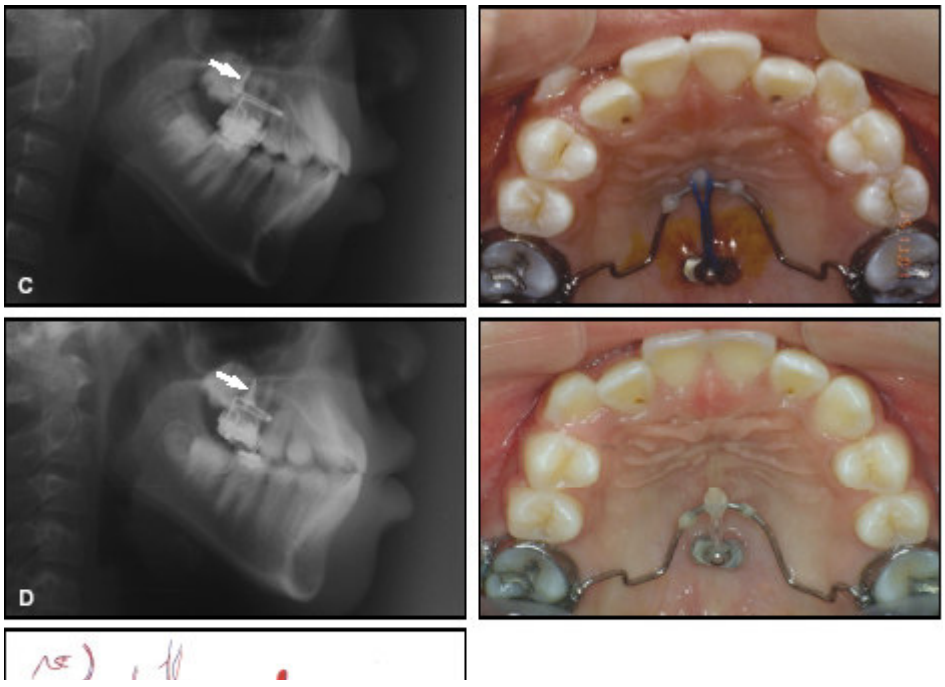


Fig. 4AB Case 2 A. 10-year-old female patient with mandibular prognathism and anterior crossbite before treatment. B. After five months of maxillary anterior protraction with Hyrax expander and facial mask, molars are in Class II relationship.



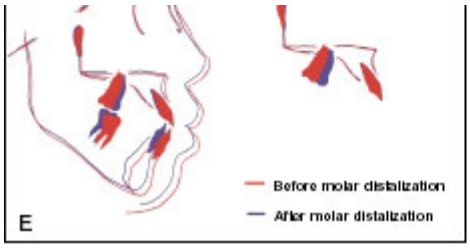


Fig. 4CE Case 2 (cont.) C. Beginning of molar distalization with two midpalatal miniscrews (arrow) splinted together for stability. Transbond [3M Unitek] resin is bonded to transpalatal arch in three places for attachment of power chain. D. Molar distalization after five months, creating space for canine eruption. E. Superimposition of cephalometric tracings before and after molar distalization.

REFERENCES

1 Byloff, F.K.; Karcher, H.; Clar, E.; and Stoff, F.: An implant to eliminate anchorage loss during molar distalization: A case report involving the Graz implant-supported pendulum, Int. J. Adult Orthod. Orthog. Surg. 15:129-137, 2000.

2 Karaman, A.I.; Basciftci, F.A.; and Polat, O.: Unilateral distal molar movement with an implant-supported distal jet appliance, Angle Orthod. 72:167-174, 2002.

3 Wehrbein, H. and Merz, B.R.: Aspects of the use of endosseous palatal implants in orthodontic therapy, J. Esthet. Dent. 10:315-324, 1998.

4 Bernhart, T.; Freudenthaler, J.; Dortbudak, O.; Bantleon, H.P.; and Watzek, G.: Short epithetic implants for orthodontic anchorage in the paramedian region of the palate: A clinical study, Clin. Oral Implants Res. 12:624-631, 2001.

5 Block, M.S. and Hoffman, D.R.: A new device for absolute anchorage for orthodontics, Am. J. Orthod. 107:251-258, 1995.

6 Triaca, A.; Antonini, M.; and Wintermantel, E.: Ein neues Titan-Flachschrauben-Implantat zur ortodontischen Verankerung am anterioren Gaumen, Inf. Orthod. Kieferorthop. 2:251-255, 1992.

7 Wehrbein, H.; Merz, B.R.; Diedrich, P.; and Glatzmaier, J.: The use of palatal implants for orthodontic anchorage: Design and clinical application of the Orthosystem, Clin. Oral Implants Res. 7:410-416, 1996.

8 Wehrbein, H.; Merz, B.R.; and Diedrich, P.: Palatal bone support for orthodontic implant anchorage: A clinical and radiological study, Eur. J. Orthod. 21:65-70, 1999.

9 Lang, J.: Clinical Anatomy of the Nose, Nasal Cavity and Paranasal Sinuses, Thieme, New York, 1989, p. 103.

10 Misch, C.E.: Contemporary Implant Dentistry, 2nd ed., Mosby, St. Louis, 1999, p. 113.

11 Yun, H.S.; Kim, H.J.; Kim, K.H.; and Park,Y.C.: The thickness of the maxillary soft tissue and cortical bone related with an orthodontic implantation, thesis, Yonsei University, Seoul, Korea.

12 Misch, C.E.: Contemporary Implant Dentistry, 2nd ed., Mosby, St. Louis, 1999, p. 355.

13 Kyung, S.H.; Lim, J.K.; and Park, Y.C.: The use of miniscrew as an anchorage for the orthodontic tooth movement, Kor. J. Orthod. 31:415-424, 2001.

FOOTNOTES

1 Pendulum, power chain: Ormco/"A" Company, 1717 W. Collins Ave., Orange, CA 92867.

2 Transbond: 3M Unitek, 2724 S. Peck Road, Monrovia, CA 91016.