Micro-Implant Anchorage for Forced Eruption of Impacted Canines

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Microscrews are gaining popularity as a source of skeletal anchorage in contemporary orthodontics because of their advantages over osseointegrated implants and miniscrews.[1-4] In many clinical situations, microscrew implants are strong and stable enough to allow tooth movement without reciprocal loss of anchorage.[5-7] This article shows the potential of Micro-Implant Anchorage for orthodontic eruption of impacted canines.

Procedure

The position of the impacted canine should be evaluated with radiographs taken at several different angulations. This technique is not designed to produce root movement and thus is contraindicated for a canine that is horizontally impacted or has the root in a more palatal position than the crown.

A small implant should be used due to the lack of alveolar bone in the canine area, especially after extraction of the primary canine. Because the force needed to extrude the tooth is less than 50g, a microscrew is ideal.

The impacted canine's crown and root can be drawn on the working cast to determine the direction of force required to bring the tooth into the arch. The microscrew should be placed in the labial cortical alveolar bone on this line of force, at an angle of 10-20° to the bone surface and as parallel to the tooth's long axis as possible. This keeps the apex of the microscrew on the buccal side and reduces the likelihood of its contacting the root. While the head of the microscrew should be located as incisally as possible to maximize the vertical component of force, an implant that is positioned too high can become unstable due to the increase in the accompanying moment.

An attachment is bonded to the labial surface of the impacted canine to allow derotation of the tooth without overrotation. Once the canine has been moved into the arch, a lingual bracket can be bonded for more precise control.

Case 1

A 21-year-old female patient presented with an impacted upper right canine. She had a Class I molar relationship, with no arch-length discrepancy in either arch (Fig. 1). Because of her attractive profile, nonextraction treatment was planned; the impacted upper right canine would be brought into the arch orthodontically.

After extraction of the primary upper right

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canine, a microscrew implant (1.2mm in diameter, 8mm long*) was placed in the buccal cortical bone, and an attachment was bonded to the labial surface of the exposed canine (Fig. 2). An esthetic pontic was bonded to the lateral incisor. Two weeks after surgery, 50g of elastic force was applied from the head of the microscrew implant to the canine attachment.

After nine months of treatment, criss-cross elastics were used to correct the remaining crossbite relationship. The implant was unscrewed, and the patient was finished with good interdigitation in 12 months of total treatment (Fig. 3).

Case 2

A 25-year-old female patient presented with an impacted upper right canine and a missing lower left first molar (Fig. 4). The patient did not want to wear labial braces. Our treatment plan involved extraction of the primary canine, movement of the impacted canine into the arch, alignment with a lingual appliance, and closure of the lower first molar space by mesial movement of the second and third molars.

After extraction of the primary upper right canine and placement of a microscrew implant (1.2mm in diameter, 6mm long**) in the extraction site, an esthetic pontic was bonded to the lateral incisor (Fig. 5). The impacted canine was exposed, and a lingual button was bonded to its facial surface. About 50g of elastic force was applied from the microscrew implant to the canine.

Five months into treatment, the microscrew was removed, and criss-cross elastics were used to help move the canine buccally. Three months later, lingual brackets were bonded. The upper right canine was well aligned after 11 months of treatment.

In the mandibular arch, a mesial protraction force was applied from a microscrew implant,** which was placed at the level of the center of resistance of the molars, in an occlusogingival direction, to minimize mesial tipping (Fig. 6). The second and third molars were banded and connected with sectional rectangular wires on both the buccal and lingual sides. A lever arm was extended gingivally from the molar tube, so that the force passing through the center of resis-

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Fig. 1 Case 1. 21-year-old female patient with impacted upper right canine before treatment.

Fig. 2 Case 1. A. Microscrew implanted in buccal cortical bone; attachment bonded to labial surface of exposed canine. B. Pontic bonded to lateral incisor. C. Canine moved into arch with elastic force from microscrew. D. Criss-cross elastic used for crossbite correction after nine months of treatment. E. Removal of microscrew.

Fig. 3 Case 1. Patient after 12 months of treatment.

Fig. 4 Case 2. 25-year-old female patient with impacted upper right canine and missing lower left first molar before treatment.

Fig. 5 Case 2. A. Microscrew implanted in primary canine extraction site; pontic bonded to lateral incisor. B. Upper right canine aligned after 11 months of treatment.

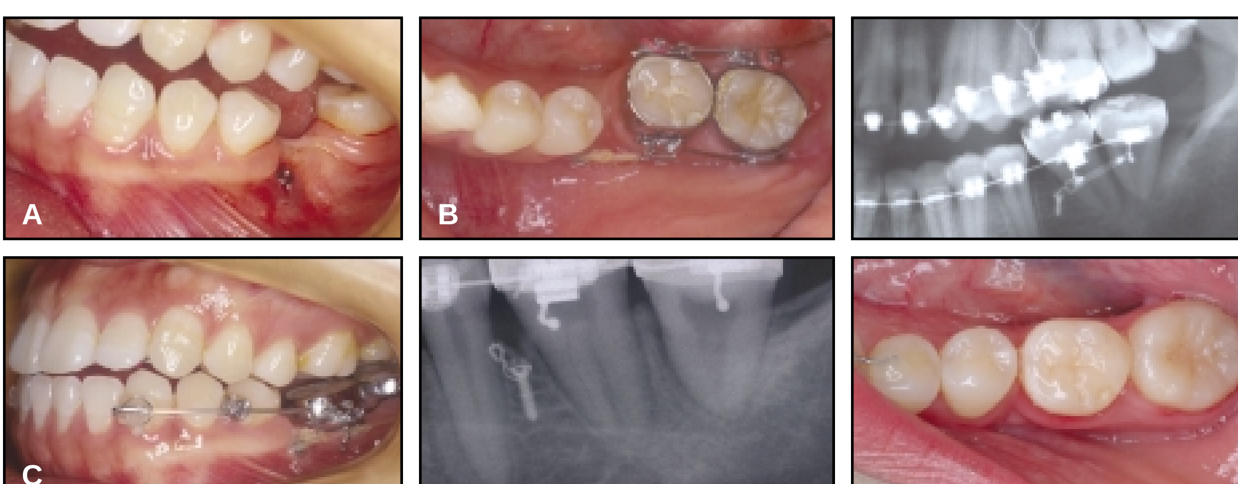

Fig. 6 Case 2. A. Microscrew implanted at level of lower molars' center of resistance. B. Second and third molars connected with sectional rectangular wires on both sides. C. Mesial bodily movement of second and third molars, with elastic attached between microscrew and lingual cleat on second molar band to prevent rotation.

Fig. 7 Case 2. Patient after 24 months of total treatment.

tance of the molars would produce bodily mesial movement. To prevent rotation, an elastic force was applied from the lingual cleat on the second molar band to the microscrew.

After 24 months of total treatment, most of the first molar space was closed (Fig. 7). A cephalometric superimposition showed that the lower second and third molars were protracted forward without loss of anchorage in the anterior segment (Fig. 8). The alveolar bone, which was initially constricted buccolingually, remodeled enough to accommodate the slow bodily movement of the large posterior teeth. This would not have been possible if tipping and uprighting movements had occurred.

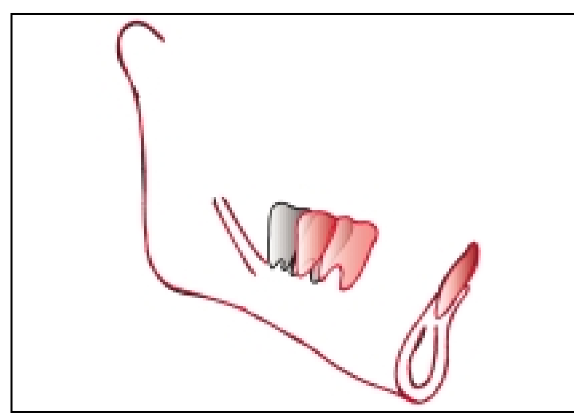

Fig. 8 Case 2. Mandibular cephalometric superimposition, showing bodily molar movement.

Discussion

Because of the relatively large size of the canine compared to the adjacent incisors, the force required to move a palatally impacted canine into the arch often causes distortion of the archform. In lingual treatment, the smaller archwires that are required for the shorter interbracket distances and smaller bracket slots may be unable to resist such distortion.[8] To prevent loss of anchorage in labial treatment, a spring can be extended from a transpalatal arch,[9] but a labial extension of a wire from a molar tube is considered unesthetic by lingual patients. Moreover, the impacted canine needs to pass over the archwire during buccal movement. These considerations make skeletal anchorage for eruption of impacted canines even more appealing in lingual orthodontics than in labial appliance treatment.

The small amount of alveolar bone in the maxillary canine area will accommodate a microscrew, but not a dental implant or miniscrew.

The force required to extrude a canine is small enough, however, that a microscrew will be stable and effective. The impacted canine can be brought into the arch without deleterious effects on the archform. Bonding of orthodontic brackets can be delayed until the canine is nearly aligned, if not in perfect position, which will improve esthetics during treatment.

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