Temporary Replacement of Maxillary Lateral Incisors with Miniscrews and Bonded Pontics

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Replacement of congenitally missing lateral incisors poses special problems in growing patients.[1-5] Because an adolescent is typically self-conscious about removing an appliance and revealing a large edentulous space before eating, a removable single-tooth partial denture or retainer is an undesirable option. Even if a resin-bonded fixed partial denture is placed, the alveolar and gingival contours, oral hygiene, and esthetics may all be compromised. More important, the use of a removable or fixed appliance for anterior tooth replacement in a growing patient promotes alveolar bone loss due to the lack of alveolar loading.[6,7] The buccolingual thickness of the alveolus will be maintained only in sites that have been prepared orthodontically by pushing anterior teeth apart to create space for implants.[8]

Osseointegrated implants are not appropriate for use in patients who have facial growth remaining because, unlike natural teeth, these implants will submerge as the surrounding dentition erupts.[9,10] An arbitrary minimum age of 15 in females and 18 in males has been suggested for placement of osseointegrated implants.[11] This guideline, however, does not account for individual variations in growth patterns.[12,13] A restorative option that could be adjusted to adapt to patient growth would be a welcome alternative to current techniques.[14,15]

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Use of Miniscrews for Temporary Incisor Replacement

In the two cases presented here, orthodontic miniscrews were used for interim restorations before completion of skeletal growth. The esthetic and retentive benefits are obvious—since the patient does not need to remove the artificial tooth before eating or have a fixed prosthesis attached to the adjacent teeth, the patient can brush and floss normally and wear conventional orthodontic retainers.

The biological benefits are not as obvious, but are nonetheless compelling. Theoretically, a miniscrew inserted into the edentulous space conducts bone-preserving forces during mastication and provides continuous lip and tongue stimulation. Alveolar bone height and buccolingual thickness can thus be preserved, avoiding the need for bone-grafting procedures before final implant placement. A study measuring pre- and post-treatment alveolar bone volume with prospective cone-beam computed tomography is in progress to determine exactly how much bone is preserved using this technique.

Another benefit of using a 2mm miniscrew for temporary tooth replacement is that it displaces only a small volume of bone. Even the smallest-caliber osseointegrated implant can be placed immediately after removal of the miniscrew.

In each case shown here, the miniscrew was inserted using a strong topical anesthetic, Profound PET,* followed by administration of

*Steven's Pharmacy, 1525 Mesa Verde Drive E., Costa Mesa, CA 92626; www.stevensrx.com.

local anesthetic with a needle-free delivery system, the MadaJet XL.** A denture tooth was adapted and bonded to the miniscrew with orthodontic acrylic (Fig. 1). Neither patient reported any discomfort during or after the procedure.

Case 1

This patient requested limited orthodontic treatment for a congenitally missing maxillary left lateral incisor (Fig. 2). She was 14 years old on the date of appliance removal (Fig. 3). After a discussion of all restorative options, the patient and parent chose interim tooth replacement with a miniscrew and artificial tooth.

An 8mm miniscrew*** was inserted into the crest of the alveolar ridge directly through the attached gingiva (Fig. 4). A denture tooth was

**Mada, Inc., 625 Washington Ave., Carlstadt, NJ 07072; www.madamedical.com. Distributed by Ormco Corporation, 1332 S. Lone Hill, Glendora, CA 91740; www.ormco.com.
***Ortho Implant, Imtec, 2401 N. Commerce, Ardmore, OK 73401; www.imtec.com.

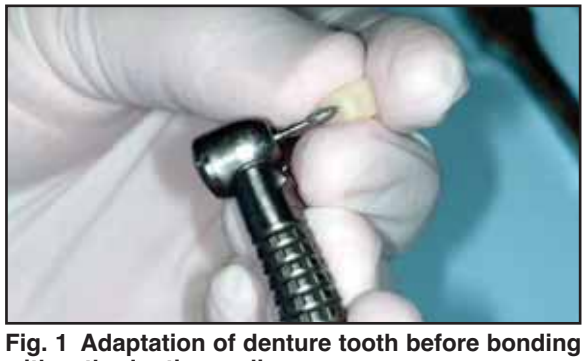

Fig. 1 Adaptation of denture tooth before bonding with orthodontic acrylic.

Fig. 2 Case 1. Female patient with pontic on maxillary archwire in area of missing left lateral incisor.

Fig. 3 Case 1. Patient immediately after debonding, at age 14.

Fig. 4 Case 1. After insertion of miniscrew (2mm in diameter, 8mm long) in edentulous area. Note blanching due to pressure from miniscrew.

then adjusted for a proper "emergence profile" and bonded directly to the miniscrew with orthodontic resin (Fig. 5). The pontic was positioned slightly out of occlusion; because the right lateral incisor required gingival recontouring, the denture tooth was not relieved at the apical margin. The patient was told to brush, floss, and eat normally and was given a clear plastic retainer to wear at night.

At the one-month follow-up visit, a slight mobility of the miniscrew was noted, and the miniscrew and pontic were removed. A clear, vacuum-formed retainer with a denture tooth was fabricated and delivered on the same day. The patient returned one month later for placement of a 10mm miniscrew and a new denture tooth. A lingual retainer was bonded from canine to canine, and another removable retainer was delivered. The 10mm miniscrew has remained stable for 14 months, with no pain or loss of function reported by the patient (Fig. 6).

Fig. 5 Case 1. After bonding of pontic to miniscrew.

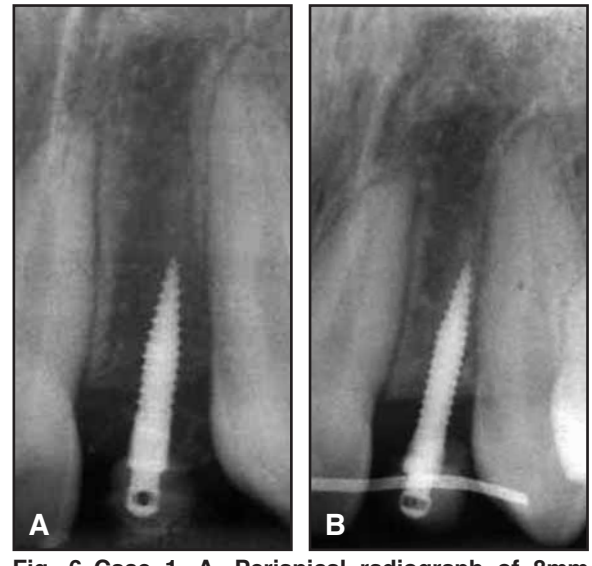

Fig. 6 Case 1. A. Periapical radiograph of 8mm miniscrew that failed after one month; note engagement of 11 threads in bone. B. Periapical radiograph of 10mm miniscrew that has remained stable for more than one year; note engagement of 13 threads and presence of bonded lingual retainer.

Case 2

A 16-year-old female patient with a congenitally missing maxillary right lateral incisor and a maxillary left peg lateral incisor was nearing her debonding appointment. A growth evaluation† determined that more than one year of skeletal growth remained. After discussion of all options with the patient and her parents, it was decided to perform an interim restoration with a miniscrew until the completion of maxillary growth.

†GrowthTek, 2625 E. Lake Road, Skaneateles, NY 13152; www.growthtek.com.

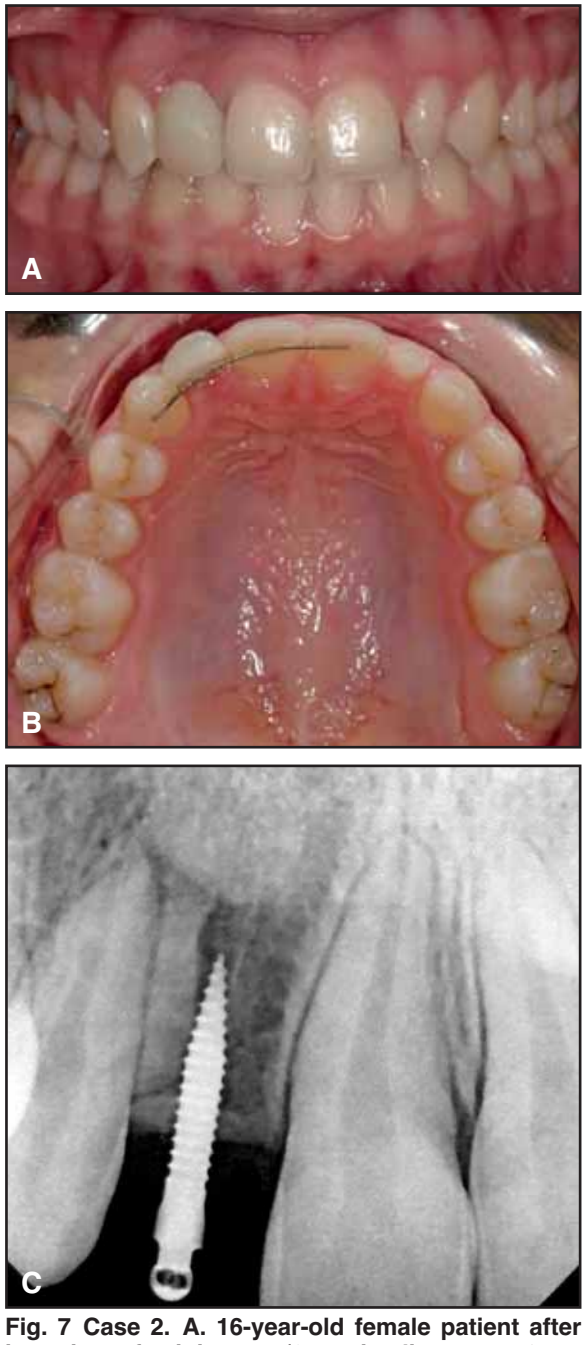

Fig. 7 Case 2. A. 16-year-old female patient after insertion of miniscrew (2mm in diameter, 10mm long) and bonded pontic in place of missing maxillary right lateral incisor. B. Lingual retainer bonded from right canine to left central incisor to allow restoration of left peg lateral incisor. C. Periapical radiograph taken with miniscrew in place.

Fig. 8 Case 2. Patient eight months after interim restoration, with left peg lateral incisor yet to be restored.

Following the same protocol as in Case 1, a 10mm miniscrew was inserted and bonded to a pontic (Fig. 7). A lingual retainer was bonded from the right canine to the left central incisor to allow restoration of the left peg lateral incisor, and a clear plastic retainer was fabricated for the patient to wear at night. The miniscrew has remained stable for eight months, with the patient reporting no loss of function (Fig. 8).

Discussion

Single-tooth replacement is not a new concept; in fact, tens of thousands of single-tooth implants have been placed worldwide. Dentatus‡ produces such implants with diameters as small as 1.8mm. Nobel Biocare,†† the world's leading manufacturer of osseointegrated implants, is one of several companies that have introduced ultra-small-diameter implants. At 3mm, the Nobel Biocare implant is only 1mm wider than the 2mm orthodontic miniscrews I have used for temporary anterior tooth replacement. In my experience (the

longest being 14 months with a non-compliant teenager), none of these miniscrews has fractured during use.

It may be argued that interim restoration of missing teeth with orthodontic miniscrews should be performed only by restorative dentists or prosthodontists. This argument, however, is based on the assumption that miniscrews are simply mini-dental implants. Actually, the American College of Prosthodontists describes dental implants as follows: "These fixtures are placed into the jawbone and allowed to heal until they are 'integrated' into the bone. Dental implants may be used to replace one, many or all of a patient's teeth."[16] Miniscrews are not surface-treated to promote osteogenesis, and complete osseointegration of miniscrews has never been reported in the literature.

Orthodontists have been pioneers and leaders in the use of miniscrews. Orthodontists have also been performing temporary replacement of congenitally missing teeth in growing patients for decades. The union of the two functions is inevitable and appropriate. Orthodontists already maintain contact with their missing-tooth patients to ensure appropriate spacing and root alignment at the time of surgery and restoration. This is not to say that general dentists or other specialists should not insert miniscrews for temporary anterior tooth replacement, but merely that this procedure is a natural extension of the orthodontist's clinical expertise.

Conclusion

The absence of anterior teeth in the growing individual has always presented a clinical conundrum. The benefits of using a miniscrew for an interim restoration are twofold: the patient need not remove a retainer and pontic before eating, and, more important, the crestal and buccolingual alveolar bone volume is preserved until the completion of facial growth. Every other treatment option condemns the alveolar bone to disuse atrophy, which often necessitates future bone grafting. The possibility of an interim restoration with a miniscrew and a bonded pontic is an attractive alternative for the growing patient.

‡Dentatus USA Ltd., 192 Lexington Ave., New York, NY 10016; www.dentatus.com.

††Nobel Biocare USA, 22715 Savi Ranch Parkway, Yorba Linda, CA 92887; www.nobelbiocare.com.

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