

Osseointegrated Implants for Maximum Orthodontic Anchorage

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Endosseous implants, which are commonly used to replace missing teeth in partially edentulous patients, may also provide ideal anchorage for mesiodistal orthodontic tooth movement, as demonstrated by several animal studies and clinical trials.¹⁻⁶ This article presents three such cases in which titanium endosseous titanium implants were used in orthodontic treatment.

Case 1

A 45-year-old male presented with a missing maxillary first bicuspid and first molar, which had been extracted for periodontal reasons more than 10 years earlier (Fig. 1). Tipping of the maxillary second bicuspid and second molar had closed the first molar space, leaving about 12mm of space in the first bicuspid area.

Orthodontic treatment was planned to reduce the bicuspid space for an improved prosthodontic replacement. An osseointegrated titanium implant (Exacta CV1, 11mm) was placed in the first bicuspid area and allowed to heal for six months (Fig. 2).

The maxillary second bicuspid and second molar and the acrylic abutment of the implant were banded. A lingual cleat was soldered to each band. An .016" stainless steel sectional archwire with elastic chain was placed buccally, and an elastic chain was attached lingually from the molar to the implant.

Orthodontic space closure took five months (Fig. 3). A final crown was then placed on the implant.

Case 2

An 18-year-old female presented with severely decayed mandibular right first and second molars and left first molar, all requiring extraction (Fig. 4).

Treatment was planned to move the mandibular right third molar bodily to replace the second molar. An osseointegrated titanium implant (Exacta CV1, 11mm) was placed in the right first molar site and allowed to heal for four months (Fig. 5).

During the healing period, the mandibular arch was bonded from molar to molar, and an .016" stainless steel wire was used for initial alignment. After the acrylic abutment was placed on the implant, the archwire was cut into two sections: one from the left second molar to the right second bicuspid, and the other from the implant to the right third molar. Spaces were closed in 10 months with the sectional wires and elastic chain (Fig. 6).

Case 3

A 40-year-old female patient presented with an impacted mandibular left second bicuspid. The mandibular left first bicuspid and first molar had been extracted previously because of decay (Fig. 7).

The treatment plan involved extrusion of the mandibular left second bicuspid using an

osseointegrated titanium implant (Exacta CV1, 11mm) in the first bicuspid area as anchorage. Four months were allowed for the implant to heal.

The acrylic abutment of the implant was banded, and an .016" TMA coil spring, delivering a force of 300g, was attached buccally from the implant to the impacted bicuspid (Fig. 8).

The second bicuspid was extruded in only two months (Fig. 9).

Discussion

An intact mandibular arch (from first molar to first molar) usually provides enough anchorage for mesial translation of a third molar to close a second molar space. However, this may not be appropriate in cases with Class I occlusion and good facial form, because of the relatively large size of the second and third molars.⁷

Rigid osseointegrated dental implants and even orthopedic screws have been used for orthodontic anchorage.^{1,8-10} Roberts and colleagues have demonstrated the viability of retromolar implant anchorage for orthodontic closure of mandibular first molar extraction sites.¹¹

ETA Exacta is a dental root-form implant made of pure titanium. It is available in three diameters (3.3 mm, 4mm, and 4.7mm) and four lengths (9mm, 11mm, 13mm, and 15mm). A prosthodontic connection is inserted into the hollow hexagonal cylinder and attached by a cylinder screw.

Besides the usual healing caps and prosthodontic abutments of other osseointegrated systems, ETA Exacta has an acrylic abutment that can be adapted to an orthodontic band or temporary crown in the office, without complicated surgical or prosthodontic procedures. Other advantages include:

- Patient comfort.
- Low cost of abutment.
- Esthetic appearance (using temporary crown).
- Low occurrence of breakage.
- Infrequency of adjustments (with continuous forces using TMA wires, only about every 40 days).
- No need for special instruments to insert the abutment.

The main disadvantages are the cost of the surgical procedure, the implant healing time (four to six months), and the recommendation that the patient be at least 18 years old before implant placement.

FIGURES



Fig. 1 Case 1. 45-year-old male with missing maxillary first bicuspid and first molar before treatment.

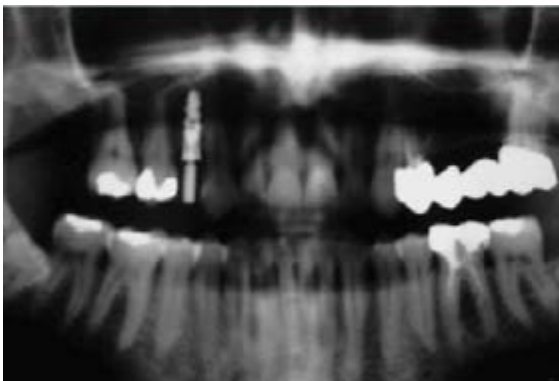


Fig. 2 Case 1. Titanium implant inserted in first bicuspid space.



Fig. 3 Case 1. After five months of orthodontic space closure with elastic chains.

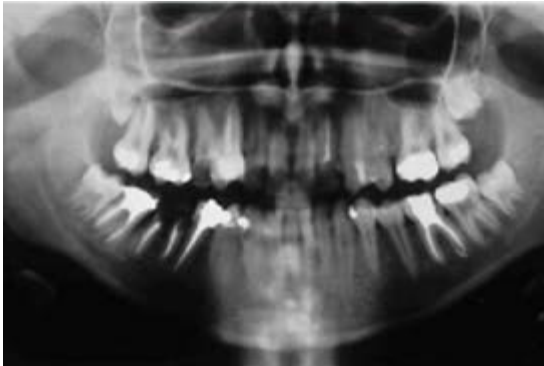


Fig. 4 Case 2. 18-year-old female with decayed mandibular right first and second molars and left first molar before treatment.



Fig. 5 Case 2. After initial alignment, titanium implant inserted to anchor mandibular right segment.



Fig. 6 Case 2. After 10 months of orthodontic space closure.



Fig. 7 Case 3. 40-year-old female with impacted mandibular left second bicuspid and missing mandibular left first bicuspid and first molar before treatment.



Fig. 8 Case 3. TMA coil spring attached from implant abutment to impacted bicuspid.



Fig. 9 Case 3. Extrusion of impacted bicuspid after two months.

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FOOTNOTES

1 Exacta: Biaggini Ormco Italia SRL, Viale San Bartolomeo 95/105, 19126 La Spezia, Italy.

2 TMA: Registered trademark of Ormco, 1717 W. Collins Ave., Orange, CA 92867.