Overerupted upper molars due to missing lower antagonists are a common orthodontic problem, especially in adult patients. To facilitate prosthodontic restoration in the mandible, the overerupted molars have to be intruded, which tends to cause the adjacent teeth to extrude when conventional appliances are used. In recent years, temporary anchorage devices (TADs) have allowed orthodontists to overcome these drawbacks while avoiding unesthetic full-appliance therapy.1-6

To avoid tipping the molars that are being intruded, either forces must be applied buccally and lingually or a transpalatal arch (TPA) may be placed. Miniplates inserted in the area of the zygomatic buttress can be employed to anchor a buccal intrusive force for upper molar intrusion,3,4,7-9 but their placement requires a surgical flap and full exposure of the bone. Insertion of larger mini-implants in the zygomatic buttress is a second but less advisable possibility, since coverage of the insertion site by movable mucosa increases the chances of screw failure and soft-tissue irritation.10,11 A third alternative is to insert two mini-implants in the alveolar process.1,2,5,12

Disadvantages of miniscrew placement between the roots of the upper molars include the following:

• In many cases, there is insufficient space on the buccal side to insert a mini-implant safely between the roots, especially in the region of the upper molars.13-15 Narrower implants carry a higher risk of fracture16 and failure.11,17,18
• The soft tissue is often thicker on the palatal side of the alveolar process,19 necessitating a longer lever arm that increases the likelihood of mini-implant tipping and failure.17
• Contact between a mini-implant and a dental root may cause damage to periodontal structures and possibly lead to failure.20,21
• A molar moved against a mini-implant during intrusion will cease to move, and the root surface may be damaged.22,23
• When a mini-implant is inserted in the posterior area of the upper alveolar process, there is a risk of penetration of the maxillary sinus.24

Considering these problems, it seems preferable to insert the mini-implants away from the roots and teeth to be moved. The anterior palate...
offers a location with high bone quality, thin soft tissues, and no risk of dental interference or root damage, allowing the insertion of larger mini-implants with greater stability.25,26

This article describes the use of a palatally anchored appliance for upper molar intrusion—named the “Mousetrap” because of its appearance, especially when used bilaterally (Fig. 1).

The Mousetrap Appliance

The Mousetrap is anchored in the anterior palate by two mini-implants coupled with a Beneplate*27 (Fig. 2A). One or two lever arms, as needed, extend from the Beneplate to the molar region. There are two options for the palatal lever arms: a Beneplate with an incorporated bracket can be placed, and a lever arm can be bent from an .017” x .025” wire and ligated to the bracket; or a Beneplate with an incorporated .032” stainless steel wire can be placed, with the wire adapted to the curvature of the palate and bent appropriately to function as the lever arm.

In the posterior region, the intrusive force can be applied either to a stainless steel ligature

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*PSM Medical Solutions, Tuttlingen, Germany; www.psm.ms, and PSM North America, Inc., Indio, CA; www.psm-na.us.
wire tied to the molar band’s lingual sheath or to a hook soldered to the TPA.

With the Mousetrap in a passive state, the distal ends of the lever arms are located cranial to the center of resistance of the molar. By pulling the lever arm downward and connecting it to the molar, a constant intrusive force is produced (Fig. 1).

Appliance Placement

After administering topical and/or local anesthesia and measuring the gingival thickness with a dental probe, predrill to a depth of about 3mm with a 1.4mm-diameter drill. Using a manual contra-angle or a motorized unit, insert two Benefit* mini-implants (2mm × 11mm anterior, 2mm × 9mm posterior), oriented perpendicular to the palatal curvature (Fig. 1). The Benefit mini-implant head has an inner screw thread (Fig. 2B) for fixation of various abutments.28

Since large tipping moments are produced by the Mousetrap mechanics, we recommend placing the mini-implants along the line of force. If the mini-implants are not inserted perfectly in parallel, the Beneplate body can easily be adapted with a three-prong plier. Activation applies a palatal intrusive force of approximately 100g to the molar.

*PSM Medical Solutions, Tuttlingen, Germany; www.psm.ms, and PSM North America, Inc., Indio, CA; www.psm-na.us.
but a passive TPA will prevent palatal tipping. We have found that 100g of force is sufficient for single-molar intrusion, although open-bite cases requiring intrusion of multiple teeth will require greater force.

Case 1

A 25-year-old female was referred by her general dentist for intrusion of an overerupted upper right first molar, in preparation for placement of a dental implant in the edentulous lower right molar region (Fig. 3). The upper right second and third molars and the upper and lower left third molars were scheduled for extraction. The patient declined additional treatment for her crowded lower incisors.

Two mini-implants were inserted in the anterior palate for attachment of the Beneplate with an incorporated bracket, and upper first-molar bands and a passive TPA were placed. An .017” x .025” lever arm was bent and tightly ligated to the bracket, and the bracket was coated with resin for patient comfort. A molar-intrusive force of about 100g was activated (Fig. 4).

Six months later, the molar had been intruded to the proper level (Fig. 5). A dental implant was inserted in the lower arch during orthodontic treatment, so that the patient was ready for prosthodontic restoration.

Fig. 4 Case 1. Mousetrap appliance in place, with .017” x .025” lever arm bent and tied to Beneplate bracket.

Fig. 5 Case 1. Patient after six months of treatment (TPA remained passive, with loop adjusted only to move wire away from palatal mucosa.)
Case 2

A 26-year-old female patient was referred by her general dentist for intrusion of an overerupted upper left second molar. A dental implant had already been placed in the missing lower left second-molar site, but there was inadequate space for placement of a molar crown (Fig. 6). The patient declined treatment for her Class II malocclusion.

Two mini-implants were inserted in the anterior palate, and molar bands were placed on the upper left first molar and upper right second molar. A Beneplate with an incorporated .032" stainless steel wire was adapted to the palate and affixed to the mini-implants. A TPA with a small soldered hook for attachment of the lever arm was placed, and an intrusive force of about 100g was activated (Fig. 7).

After five months, the second molar had been intruded by about 2mm (Fig. 8). The dentist asked for slightly more intrusion; two months later, the tooth was overcorrected, and a prosthodontic crown was placed on the dental implant (Fig. 9). At a follow-up appointment four months later, spontaneous relapse of the overcorrection had resulted in proper contact with the lower molar crown (Fig. 10).
Conclusion

The Mousetrap is a reliable device for intrusion of overerupted molars. Although its design may appear to be somewhat complex and bulky compared to other TAD-based appliances, it provides a constant force delivery that is easy to measure and adjust intraorally. Its anchorage in the anterior palate ensures a low risk of failure or screw fracture.
REFERENCES


25.的主要研究

