Introduction

The past decade in orthodontics has been marked by major advancements in mechanics using skeletal anchorage. One specific area that has been significantly affected is vertical control of the dentition.

Multiple clinical and research papers have demonstrated the efficacy of temporary orthodontic implants—often called TADs, mini-implants or miniscrews—to intrude maxillary posterior teeth. In certain cases, it is clinically advantageous to control the crown torque of individual maxillary posterior teeth, or to intrude smaller or unilateral groups of teeth. In this article, I will introduce an appliance called the multi-tooth intruder (MTI) and demonstrate its use in both fixed appliance and clear aligner cases.

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Maxillary posterior intrusion

Multiple techniques have been proposed for orthodontic intrusion of maxillary posterior teeth. One of the most common techniques is the use of palatal TADs and a transpalatal arch, with elastic or coil-spring traction from the TADs to the transpalatal arch. Another well-accepted technique is the fabrication of an occlusal splint that allows for en masse intrusion and transverse stabilization using palatal TADs, buccal TADs or both.

Common to the above techniques is the en masse nature of the movements. In other words, there is a single point of application of the intrusive force to the dentition. This can be a very successful strategy in the treatment of many forms of vertical malocclusion, including anterior open bite. However, some cases require more specific control over the torque of individual teeth, or vertical movements of smaller or unilateral groups of teeth. The MTI appliance was developed to address this need in both fixed appliance and clear aligner cases.

The MTI is a generic soldered appliance that can be used with any skeletal anchorage system. Two palatal TADs are placed in the anterior palate. After 1–2 weeks, stability of the TADs is confirmed and a pickup impression is taken to create a working model. The MTI is soldered in the lab per the specific needs of the case, and can be fabricated in a bilateral or unilateral fashion. The main features of the appliance are cantilevered shepherd’s hooks, which allow for attachment of an elastic force to multiple posterior teeth. For additional stability, the appliance can have a transverse crossbar, and could also be bonded to the canines or first bicuspids.

Clinically, the MTI is bonded to the TADs using flowable composite. Bonded buttons are placed on the palatal surfaces of the posterior teeth needing intrusion, and elastic chain is activated from the shepherd’s hook to the bonded buttons. If necessary, buccal TADs can be added to help control the transverse constriction effects of the palatal intrusion mechanics.

The activation of intrusion forces on specific teeth can be changed throughout the case, making the MTI an extremely flexible appliance. Furthermore, the proximity of the shepherd’s hooks to the palatal wall promotes vertical forces along the long axis of the tooth, allowing for excellent torque control of the palatal roots and minimal transverse constriction. The case reports that follow will demonstrate the clinical use of the MTI with fixed appliances and with clear aligners.

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A 51-year-old patient with a history of previous orthodontic treatment with extraction of four bicuspids presented for an orthodontic consultation to correct his bite.

Clinical examination noted narrow arches, an edge-to-edge anterior occlusion, a bilateral posterior lateral open bite, an excessive buccal overjet and significant extrusion of the maxillary molar palatal cusps. Because of the significant need for posterior torque control, the ideal treatment plan involved intrusion of the maxillary molar palatal cusps using TADs and an MTI. The MTI initially was bonded to the canines, but the canine bonds were removed for the final settling of the occlusion.

Treatment with fixed appliances, the MTI appliance, and finishing elastics was completed in 19 months.

**Case 1:**
**Adult open bite, fixed appliances**

**Fig. 1a:** Pretreatment records

**Fig. 1b:** After initial alignment and decompensation of the dentition in the initial round wires, the transverse discrepancy and torque of the maxillary molars worsened. An MTI was fabricated to intrude the palatal cusps of the maxillary molars. The appliance allowed for an individual intrusive force to be applied to each molar.

**Fig. 1c:** Final photos. Treatment goals were achieved. Because of Class III tendency and Bolton discrepancy, a space was left between #10 and #11 for cosmetic bonding.

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A 45-year-old patient was referred by her prosthodontist to intrude teeth #2 and #3 before implant placement in the lower right quadrant. Patient declined treatment with fixed appliances and would only undergo treatment with clear aligners.

The teeth had overerupted owing to long-term partial edentulism in the lower arch. A significant advantage of using the MTI device in this case was the ability to place the TADs anteriorly in ideal thickness of palatal bone, yet extend the appliance distally to provide a stable and direct intrusive force to #2 and #3.

Another advantage was the ability to use unilateral mechanics and avoid cross-arch stabilization. No change in torque was prescribed, so to prevent transverse side effects, buccal TADs were placed. Intrusion of #2 and #3 was programmed into the clear aligners, and treatment progressed as planned. Treatment was completed in 11 months.

Sufficient interocclusal space was created to fabricate ideal implant crowns at the correct occlusal plane. Because the patient declined to wear fixed appliances, ideal uprighting of #18 and #32 was not achieved.
Case 3:  
Class I malocclusion with CR/MIP shift

A 13-year-old patient presented for comprehensive orthodontic treatment with a Class I malocclusion.

During treatment with fixed appliances, a CR/MIP shift developed, characterized by an increase of buccal and anterior overjet, and development of a Class II posterior relationship. Analysis of the progress records, including mounted models, revealed vertical interferences of the palatal cusps of the maxillary

Fig. 3a: Pretreatment occlusion.

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posterior teeth that were responsible for the CR/MIP shift. TADs were placed, an MTI was fabricated, and intrusion of the palatal cusps of the maxillary posterior teeth was initiated. The occlusion was evaluated at each visit to determine the specific teeth that needed to be intruded to remove the functional interferences.

The occlusion improved significantly as the mandible auto-rotated into Class I and settled vertically. This case further demonstrates the MTI’s unique ability to correct vertical orthodontic problems, including CR/MIP shifts, with skeletally based orthodontic mechanics. This process of sequential removal of occlusal interferences is analogous to adjusting a splint, and familiar to most orthodontists.

**Conclusion**

The MTI appliance is an effective adjunct to comprehensive orthodontic treatment with fixed appliances or clear aligners. It is useful in cases that benefit from specific torque control of maxillary posterior teeth or in cases that benefit from unilateral or partial maxillary posterior intrusion.

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**Case 3:**

(continued)

**Class I malocclusion with CR/MIP shift**

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*Fig. 3b: Clinical photos and mounted models showing development of CR/MIP discrepancy.*

*Fig. 3c: An MTI was fabricated to intrude palatal cusps of maxillary posterior teeth and eliminate the CR/MIP shift.*

*Fig. 3d: Final occlusion.*