Indirect Anchorage Using the Palate: A Unique Application of the Unitek™ Temporary Anchorage Device

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Introduction

Various sites have been advocated by numerous authors as the “ideal placement site” for mini-screw implants (MSI)\(^1\). With the advances in maxillofacial imaging techniques, many publications have documented the bone quantity and density in the more popular interdental sites for MSI placement\(^2,3\). Common complications of interdental MSI placement include limitations of interradicular bone, deviations in placement angle, impingement of the PDL space, and potential cementum contact, all of which increase the risk of premature MSI loosening and failure\(^4\). Furthermore, interdental MSI’s inevitably end up in the path of moving teeth especially when moving the entire arch in the AP direction. When MSIs located interdentally and at a distance away from the archwire are loaded with a nitinol coil spring or a chain, a force vector in the vertical dimension is introduced (Figure 1A-B). This vertical force often causes undesirable side effects like bowing in the archwire and leading to a lateral openbite and potential increased friction during space closure (Figure 2A-C). This side-effect can simply be corrected during the final stages of treatment, by using leveling archwires and inter-arch elastics to settle the occlusion, however, they lead to increased treatment time. The palate on the other hand provides a versatile location that could be used for most anchorage sensitive cases. The purpose of this publication is to review the step-by-step protocol in palatal MSI placement and the fabrication of a transpalatal arch designed to be used for the Unitek™ Temporary Anchorage Device (TAD) as first presented in other publications\(^5,6\).

Figure 1A-B: Interdental MSI loaded using coil springs. Note vertical force vector as a result of direct loading of the MSI.

Figure 2A-C: Bowing of the archwire and lateral openbites due to vertical component of force during space closure.
Placement Protocol

The protocol for the placement of MSI in the palate is similar to those of other intraoral site with minor alterations. Upon the application of a compound topical anesthetic, the tissue thickness should be measured. In cases that the tissue is more than 2 mm thick, local infiltration or a Madajet spray is indicated to allow for profound anesthesia. The use of tissue punches to remove excess soft tissue is not advocated by experts in the field of skeletal anchorage, as the step may classify MSI placement as a surgical procedure.

The ideal implant size for palatal placement is the 6 mm Unitek TAD. This miniscrew has a tapered designed with a diameter of 1.8 mm (Figure 3) and does not require a pilot hole prior to placement. The use of the 6 mm screw can ensure safe placement without inadvertent penetration of the sinus cavities. In a study of various common brands of orthodontic mini-implants, the Unitek TAD was the only mini-implant that did not fatigue and fracture during placement, recording the highest peak torque values during placement. This finding is of great significance when placing MSI in dense palatal cortical bone, which can lead to higher insertion torque values. The Unitek™ TAD Contra Angle Driver (Figure 4) will be necessary for the placement of the MSI.

Select a placement site at the level of 1st or 2nd premolars, 1-2 mm lateral to the mid-palatal suture (Figure 5). Computed Tomography studies have determined palatal bone thickness is greatest in an area within 1 mm of the midpalatal suture, at the level of the first premolars. The bone thickness decreases as we progress posteriorly and laterally along the palatal walls. Place the MSI with the driver angulated 20-30° to the vertical and pointing towards the anterior (Figure 6). This will ensure that the entire length of the screw is in bone, without contact with the incisive foramen and the apices of the maxillary incisors. When turning the driver, use slow revolutions with multiple breaks in the turning cycles to allow for pressure to dissipate as the MSI in fully inserted. Place a healing Unitek TAD O-Cap on the screw head. The Unitek TAD O-Cap should sit flush with the tissue, without blanching of the surrounding gingival (Figure 7). An alginate impression should be made at this point, with the Unitek TAD O-Cap in place. The patient can be dismissed with the Unitek TAD O-Cap in place to prevent irritation of oral structures during the time needed for TPA fabrication.

Fabrication Procedure

For the lab fabrication of the TPA, a mini-screw analog (or previously used and sterilized MSI), and a new Unitek TAD O-Cap are necessary (Figure 8A). The analog should be placed into the cap (Figure 8B), and the analog/Unitek TAD O-Cap assembly into the impression (Figure 8C). The impression can be then poured up with
laboratory stone (Figure 9). Once set, remove the stone model from the impression. Remove the Unitek TAD O-Cap and using a sharp explorer, remove the black rubber gasket in the Unitek TAD O-Cap (Figure 10). Use 0.032 SS wire and fabricate TPA to proximate anchor teeth and solder wire to Unitek TAD O-Cap (Figure 11).

Replace the rubber gasket into the Unitek™ TAD O-Cap of the newly fabricated transpalatal bar, and polish the appliance in preparation of patient delivery.

At the insertion appointment, remove the old Unitek TAD O-Cap from the implant and place the Unitek TAD O-Cap/TPA assembly onto the MSI. The arms of the TPA should passively proximate the anchor teeth. In some instances minor chairside adjustment of the TPA may be necessary to ensure a passive fit. The anchor teeth should be pumiced, etched (using 37% Phosphoric acid etch) and sealed with the bonding agent of your choice. The TPA is then fixed to these anchor teeth by light cure band adhesive or any other light cure composite cement of your choice (Figure 12).

**Clinical Application & Conclusions**

The main advantage of the indirect anchorage system attainable by palatal MSI-TPA combination is that they rarely require any alterations in treatment mechanics. Consequently, the clinician can continue to use the same conventional orthodontic mechanics to which they are accustomed.

Depending on the design of the MSI-TPA appliance, a palatal mini-implant can be used for en-masse retraction of anterior teeth (Figure 13, 14A-C), distalization of the entire maxillary arch (Figure 15A-B, 16A-B), or protraction of the maxillary posterior segments (Figure 17A-C). A single MSI in the palate can also be used for the intrusion of supraerupted teeth (Figure 18), or the entire maxillary arch in order to correct an anterior openbite (Figure 19).
as intrusion mechanics are more favorable when performed from the palatal aspect. Similar appliance can be used to stabilize the maxillary arch during treatment using Class III mechanics to retract the mandibular arch (Figure 20A-C). In addition, the use of palatal anchorage can also reduce the number of mini-screw implants required per patient. In most cases, the same MSI can be used for distalization, retraction, or intrusion of teeth, simply by altering the design of the transpalatal arch soldered to the Unitek TAD O-Cap.

Control over final position of molars and incisors are keys to successful treatment of any malocclusion. Many appliances have been created over the years to aid in anchorage preservation, including a transpalatal arch, Nance appliance, headgear, and the pendulum appliances, to name a few. However, most of these appliances either depend on patient compliance, or have some form of anchorage loss. However, MSI located in the palate can predictably control not only the position of maxillary dentition, but also the position of almost every tooth in the mouth. The palate offers a safe haven for MSI placement for orthodontists, novice and experienced. Fabrication of a TPA attached to the Unitek TAD is a predictable, efficient and effective means to preserve anchorage and move teeth in directions and positions previously unattainable with conventional mechanics.

Clinical images provided by Dr. Razavi.

References