# A Case for Absolute Anchorage

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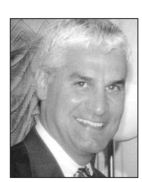
## ABSTRACT

It would be an understatement to say that implant technology has changed the face of dentistry in the past 10 years or so. Both the surgical and restorative specialties have undergone dramatic transformation from treatment planning through all phases of rehabilitation. However, the same cannot necessarily be said for the specialty of orthodontics. Although it could be argued that implants have had an impact on the planning and setup of orthodontic cases (such as in congenitally missing teeth situations), the actual utilization of implants as an integral part of mechanotherapy has only begun to be realized. The ultimate extension of this application of using implants to enhance tooth movement would be to employ implants that are designed solely for the purpose of facilitating orthodontic therapy, with no intention to restore, but rather to explant such implants, after their purpose is fulfilled.[1]

The use of endosseous implants as anchor units has been well studied and documented in the literature. Once osseointegrated, rigid endosseous implants can provide excellent orthodontic and orthopedic anchorage.[2-4] In fact, more recently it has become apparent that implants not only withstand orthodontic loads quite satisfactorily, but they seem to adapt to orthodontic load and demonstrate localized bone densification in response to it.[5]

Predictable and controlled molar distalization has always been a problematic movement to accomplish in orthodontics, because it places great demands on an insecure and imperfect anchor system in the natural dentition. However, achieving successful molar distalization (or "distal driving") would be a desirable outcome in many cases, because it can transform an extraction case into a non-extraction case by regaining lost space and arch length, among other reasons.

In a recent issue of *Orthodontic Seminars*, Cisneros summarized the findings of a pool of experienced orthodontists with regard to their experi-



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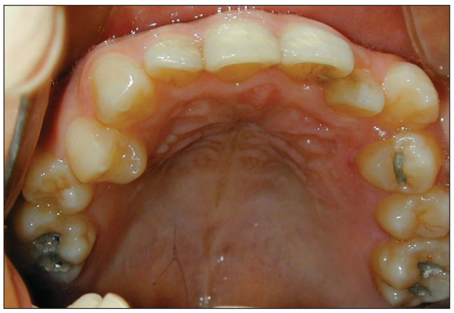

**Figure 1.** Pretreatment maxillary occlusal. Note crowded nature of dentition and labially locked upper left cuspid with insufficient arch space for correction.

**Figure 2.** Preparation of the palatal osteotomy is achieved by soft tissue punch and single drill to prepare osteotomy and shoulder.

**Figure 3.** Lateral cephalogram with implant in place.

ences with molar distalization.[6] Each of these clinicians commented on their experience using the various conventional mechanics with which they are familiar. The overriding finding in that study was that molar distalization is achievable, but is always associated with some degree of untoward side effect. The most common side effect is anterior dental protrusion.

Interestingly, because implants are rigidly attached to their investing bone, they offer to orthodontists the potential to provide what is known as "absolute anchorage." The implication is that predictability of the orthodontic outcome increases dramatically, and furthermore, control of the appliance is placed entirely in the operator's hands thereby eliminating the great variable of patient compliance.

The purpose of this paper is to present a case report which illustrates the use of a single palatal implant for absolute anchorage to achieve distal driving.

## Material and Method

A 35-year-old female patient presented with an Angle Class II malocclusion due to maxillary protrusion. Conventional orthodontic therapy commonly would lend the option of upper first bicuspid extraction to regain lost space, particularly on the patient's upper left quadrant, where the cuspid is locked out of arch alignment buccally (**Figure 1**). By using controlled molar distalization mechanics, in an absolute anchorage system afforded by the inclusion of a palatally placed endosseous implant, the upper posterior dentition can be driven posteriorly into a Class I occlusion, and then harnessed to retract the anterior teeth into a proper overbite and overjet relation, obviating the need for extraction.

The patient was already missing upper second molars, which made the treatment somewhat easier, but that is not a requirement. Moreover, since the dentition was already deficient in tooth number, preservation of all remaining teeth became even more critical.

The case was initiated by the surgical placement of a single mid-palatal implant. The Straumann Orthosystem was designed for this purpose and is very simple and expedient to use. A single carpule of local anesthesia is delivered to the palatal mucosa in the region between the bicuspid teeth on both sides of the midline. A mucosal trephine was used to punch out a core of soft tissue at the implant site, completing the entirety of the soft tissue management of the implant placement. This "punch and place" technique eliminates the need for incision, flap and sutures.

A round bur was introduced to the center of this punch to score the palatal bone and initiate the preparation of the hard tissue osteotomy. A spade was used with copious water irrigation to drill the osteotomy to its full 6 mm depth, simultaneously preparing a shoulder for seating of the implant, in one drilling motion (**Figure 2**). A 6 mm long, by 3.3 mm diameter orthosystem implant was carried by hand in its carrier and self tapped into the fresh osteotomy using a ratchet wrench and seated until the underside of the collar was seated in the prepared shoulder and flush with the underside of the palatal bone. Full seating of the implant should be verified by visualizing a lateral cephalogram (**Figure 3**).

Various healing caps and abutments can be placed over the implant, including an occlusal screw to protect the abutment threads and keep the implant as unobtrusive as possible (**Figure 4**).

The implant should be firm and immobile, with primary stability, at placement. The patient must be instructed not to contact or mobilize the implant during the initial healing phase. Orthodontic therapy can commence immediately, if not prior to placement of the implant, for the pur-

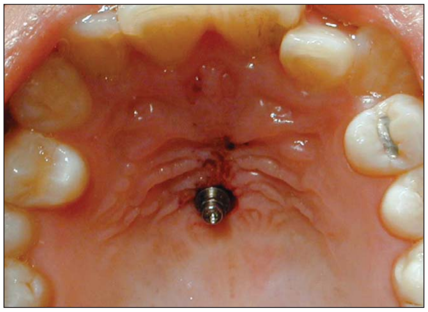

**Figure 4.** Implant in place with occlusal screw.

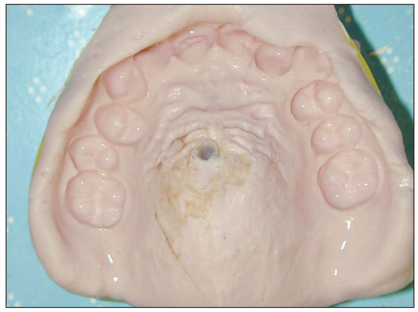

**Figure 5.** Impression lifts off impression cap and registers implant position.

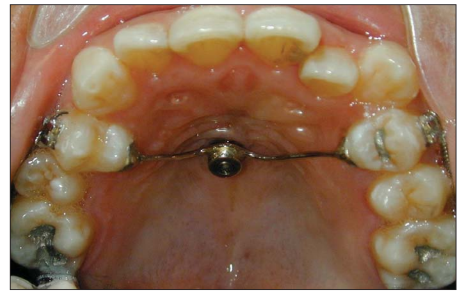

**Figure 6.** Transpalatal arch in place, bonded to first bicuspids and soldered to implant abutment, establishing indirect absolute anchor system. Sectional orthodontic appliance is activated by virtue of buccal coil springs.

**Figure 7.** Molar distalization complete.

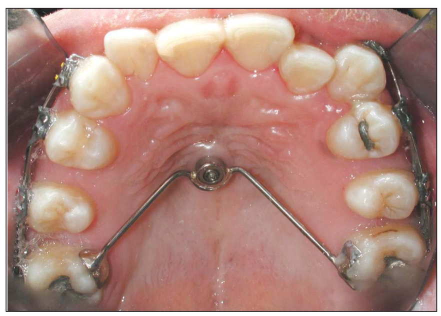

**Figure 8.** Transpalatal arch is retrieved and reconfigured to secure molars as absolute anchors.

pose of initial leveling and aligning of the dentition and to get the fixed appliance up to working arch wire gauge before actually loading the implant. This was accomplished through buccal sectional appliance placement, from the first biscpsids through the first molars. This has the added advantage of eliminating the need to place appliances on the anterior teeth during the actual distal driving phase of treatment.

After eight weeks of integration, an alginate impression can be made to register the implant location. This can be accomplished by placing a plastic impression cap onto the head of the implant, packing alginate around it, and lifting it off with a conventional alginate impression tray (**Figure 5**). It is not necessary to impress the entire dentition, or even the buccal surfaces of the teeth, however; it should be pointed out that this process is greatly simplified if the operator uses a bonded rather than a banded appliance, as is illustrated presently.

Once the impression is obtained, a lab analog is placed in the index, and the laboratory model is poured and sent to the lab where a stainless steel transpalatal bar is fabricated to be bonded to the palatal surfaces of the maxillary first bicuspid teeth and soldered to the stainless steel abutment that will be placed upon the implant.

After 10 weeks from implantation, the implant can be loaded. This is accomplished by acid etching and sealing the palatal surfaces of the maxillary premolars, using conventional orthodontic bonding materials. The transpalatal arch was positioned by placing the abutment to which was soldered over the implant and securing it with the occlusal screw. Light cured resin was flowed into the areas to be bonded and cured. The absolute anchor system is now intact (**Figure 6**).

The orthodontic appliance is then activated by compressing open coil springs on a .020-inch stainless steel sectional archwire bilaterally from first bicuspid to molar tube. The force application is sent entirely to the molar teeth by virtue of the immobile indirectly anchored first bicuspids.

At subsequent visits, the appliance is checked for bond failure of the transpalatal arch and repaired immediately and easily, if necessary. Continuous activation of the appliance is ensured by placing longer coil springs as the arch expands distally. The second bicuspid teeth are noted to also drift distally despite not being loaded directly, and this is presumed to occur through tension in the transeptal fiber system as the molar teeth move.

When the upper first molars have been distalized to the point of acceptable relation (Class I or super-Class I), the transpalatal arch can be refabricated to allow retraction of the anterior teeth (**Figure 7**). This is accomplished by replacing the open coil springs with closed coils to maintain the space created between first bicuspid and molar

**Figure 9.** Completion of orthodontic treatment.

**Figure 10.** Post-treatment panorex.

during lab fabrication. The transpalatal arch is debonded from the bicuspids, and unscrewed from the head of the implant. A new impression is taken just as before, and now a transpalatal arch to be bonded to the palatal surfaces of the (relocated) molars and soldered again to the implant abutment is fabricated. This new transpalatal arch is then secured just as before but now to the molar teeth establishing another absolute anchor system to be used to retract the anterior teeth (**Figure 8**).

The orthodontic appliance should be completed by this stage so that all teeth are engaged in a full archwire, which is then used to guide the teeth into alignment by using chain elastics or stretched coil springs attached to the molar teeth thereby effecting retraction (**Figures 9 and 10**). When proper arch form is achieved with acceptable occlusion, the anchor system can be dismantled as before, and a suitable orthodontic retainer is fabricated, followed by debonding of the appliance and explantation of the implant.

Implant explantation is achieved by debonding the transpalatal arch, and unscrewing the abutment from the implant. Under local anesthesia again, an explantation guide sleeve is introduced by screwing it into the implant. The explantation trephine is used to core the implant out of the palate taking care to visualize the depth markings on its surface and coring down about two-thirds the length of the implant. Integration is then broken by reverse torquing the implant out using the implant carrier and wrench. A small socket is left by the removal of the implant, which requires no special dressing or closure. Healing is usually uneventful and the wound is barely evident after two to three weeks.

## Discussion

A relatively simple means to achieve dramatic molar distalization has been presented and illustrated by employing an indirect absolute implant anchor system. One obvious advantage of this modality is that it obviated the need for further tooth extraction for the purpose of achieving orthodontic alignment. However, numerous other advantages of this system were realized by using it. First, the appliance mechanotherapy was greatly simplified. No intricate archwire bending or forming is necessary to hold teeth in place as would be needed if the dentition were the sole source of anchorage. The appliance as outlined is quite streamlined and comfortable. Moreover, no activation or intervention of any auxiliary or extraoral devices (such as a headgear) by the patient is relied upon, thereby eliminating the dependency on patient compliance. Further, the expediency of treatment is greatly facilitated by this anchor system, not because excess force can be applied to the teeth, but because teeth can be activated and mobilized as a block. This is afforded by the strong anchor system which does not run the risk of being overpowered by the active segment and so preservation of the anchor system is not critical.

## Conclusion

A simple and practical means to achieve molar distalization has been presented, which for the first time, incurs no untoward side effects and is achieved with great predictability and operator control. CDA

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**Additional Information /** Celenza, Implant Enhanced Tooth Movement: Indirect Absolute Anchorage, *IJPRD* 23(6):533, 2003.

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