

Implants in Orthodontics—The Impact of New Treatment Modalities

a report by

Frank Celenza, DDS

*Associate Clinical Professor, Department of Post-Graduate Orthodontics and Division of Implant Fellowship,
New York University College of Dentistry*

Introduction

The surgical and restorative specialties within dentistry have experienced dramatic and sweeping changes in the last ten or fifteen years as a result of the success and acceptance of implant dentistry. Accordingly, implant treatment teams, usually comprised of a surgeon and a restorative dentist, have had to reinvent their approach to treatment. This impact has been felt from initial case inception, and carried through to treatment planning, execution, and final result. Both disciplines have had to rethink treatment goals and work with new materials and techniques to achieve results that are clearly better for the patient.

While this transformation was happening, however, comparatively little impact was experienced by the orthodontic specialist. Affected somewhat indirectly, the traditional orthodontist started to realize that the semi-odontulism he might be preparing for eventual restoration was now going to be implant managed, rather than by conventional bridge fabrication. Consequently, the orthodontist may have altered their thinking, but only in a very limited scope. Basically, it meant that they would need to pay slightly more attention to detail in final tooth position, managing spaces more accurately and taking care to parallel teeth more precisely. This is because the implant restoration would not include the reduction of neighboring teeth for restoration, which often added flexibility to the orthodontic outcome. Consequently, only in this regard of space management was the orthodontist affected by implant technology. They did not, however, alter their treatment sequence, or necessarily even assemble the full team of specialists until their treatment was completed. They were not yet acting as an integral member of the team, and the referral to the implantologists would still come later.

It is the present author's contention and experience that, when feasible, if implants are placed preparatory to orthodontic therapy, their utilization as part of the orthodontic mechanotherapy will greatly facilitate the treatment. Many advantages can be realized with this approach, and this paper is intended to delineate

some of them. This approach requires, however, that the orthodontist becomes part of the implantology team, joining the surgeon and the restorative dentist in a collaborative effort from the very onset. No longer would it be acceptable for the orthodontist to initiate their treatment and make the referral after completion of their phase, as the advantages of utilizing implant anchorage would not be realized in this traditional mindset.

Anchorage Definitions

Newton's third law states that all actions have equal and opposite reactions. When applied to orthodontics, this means that all natural teeth are prone to movement in response to force application. Consequently, when attempting to effect specific tooth movements, appliances must be designed and adjusted accordingly. The orthodontist accomplishes this by managing 'anchorage', defined as a body's resistance to displacement.

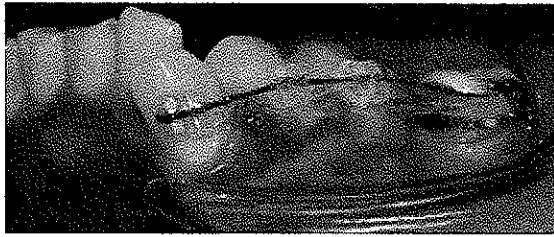
By assembling anchorage groups, largely by tying or linking teeth together, movements can be accomplished by outnumbering the teeth that are to be moved. Various categories of anchorage systems arise from this, and are termed 'minimal', 'moderate', and 'maximum' anchor strategies, reflecting the degree of reciprocal movement that is designed into the system and accepted. Reciprocal anchorage must be an accepted part of conventional orthodontic therapy whenever the anchor units are composed of natural teeth, as is most frequently the case.

However, by virtue of the success of implant inclusion in orthodontic treatment, a new class of anchorage strategy has arisen, and this class is known as 'absolute anchorage'. The implication of this modality is not to be underemphasized. If an implant can provide perfect anchorage, then the predictability of the outcome rises dramatically. Moreover, if the patient's responsibility is eliminated, then compliance is eliminated as a factor, and the operator's control over the appliance is facilitated. Appliance mechanotherapy can also be streamlined as the utilization of anchorage-enhancing



Frank Celenza, DDS, is Associate Clinical Professor in the Department of Post-Graduate Orthodontics and the Division of Implant Fellowship at New York University College of Dentistry. Dr Celenza also maintains a private practice in New York City. Dr Celenza graduated Phi Beta Kappa with a BA in Biology from State University of New York at Buffalo. He obtained his DDS in 1983 from McGill University, Montreal, Canada. He was awarded a Certificate of Periodontology from the University of Pennsylvania following a three-year combined Periodontics and Orthodontics post-graduate program. In 1988, Dr Celenza received a Certificate of Orthodontics from the Department of Post-Graduate Orthodontics at New York University. He was recently inducted into the International Team of Implantologists (ITI). Dr Celenza's previous positions include: President of the Northeastern Society of Periodontists; Membership Chairman of the Northeastern Society of Periodontists; Board of Directors of the Northeastern Society of Periodontists; Program Chairman of the First District Dental Society; and assistant clinical professor in the Department of Undergraduate Dental Education at the University of Pennsylvania College of Dentistry. Dr Celenza has lectured extensively, both nationally and internationally, and has published numerous articles in dental journals, authored textbook chapters, and mentored many research studies.

Figure 1: Example of a Dental Implant Direct Anchor System



The lower left molar is an implant-supported provisional and is being utilized to simultaneously retract three teeth.

auxiliaries is obviated. Treatment time is reduced as stronger anchor systems eliminate temporal sequencing that is needed for anchor preservation. Lastly, but perhaps most importantly, new treatment possibilities and outcomes may become possible.

Implants can be employed in various strategies for their use as absolute anchors. As with any developing technology, expansion into new arenas will no doubt arise as well, but all will fall into one of two categories.

Direct Anchorage

'Direct anchorage' is defined as "enhanced anchorage utilizing forces that originate from the actual implant". This means that the orthodontic force is applied directly upon the implant, regardless of whether it is placed in a dental location and is also supporting a dental restoration, or when the implant is in an extra-dental location, such as in the case of 'mini-screws', where the force is applied directly to the mini-screw.

When an implant is used to support a dental restoration and is included as part of the orthodontic appliance for force application, it serves as a direct anchor. Whether applying pressure or tension to such an anchor, by virtue of using elastics to push or pull upon it, respectively, the implant seems equally resistant. In fact, whereas natural teeth respond to such stimuli (evidenced in radiographic features as well as increasing mobility and eventually movement), implants seem not to react. Hence, they act as perfect anchors and will predictably overpower teeth. Further, owing to their strength as anchors, implants can be used to move multiple teeth simultaneously. The need to outnumber active teeth with anchor teeth is obviated, and so what was traditionally sequenced temporally can now be accomplished as one. The time savings that can be realized is considerable (see *Figure 1*).

Mini-screws are gaining considerable acceptance as direct anchors, owing to their ease of placement,

flexibility in location, and eventual removal. They can be placed in myriad locations, limited only by the need to avoid impinging upon vital structures such as tooth roots, nerves, and blood vessels, all of which leaves many suitable locations available. Force application to such devices is easily accomplished, and continues to develop as new designs for this purpose arise.

Indirect Anchorage

'Indirect anchorage' is defined as "enhanced anchorage utilizing an implant to stabilize dental units which in turn serve as the anchor units". This implies that the implant is located in a non-dental location, such as the hard palate or retro-molar region, and is used to stabilize teeth to which the force is in turn applied, thereby rendering those teeth as indirect absolute anchors. Mini-screws offer flexibility here as well, and can function similarly as indirect anchors.

Often, the need arises to harness an anchor that is not located within the dental arches, such as in the fully dentate patient, or when dental implant locations are not available or ideal until tooth movement is completed. In these situations it can be very effective to place a palatal implant or even retromolar implants, which are then utilized to secure teeth, which in turn become predictable sources of anchorage. Auxiliary devices such as a transpalatal arch or a utility archwire become necessary, but are well worth the advantages they offer.

Mass movements of teeth, predictable outcomes, and treatment possibilities not otherwise attainable can all be realized as a result. These types of implants are not destined for restoration, and will be subject to explantation after their function is completed. Although this may be viewed as a disadvantage, proper case selection usually indicates that their advantages clearly outweigh this consideration.

Conclusion

There is an assortment of ways in which implant technology can be employed for the purpose of facilitating orthodontic therapy. However, this modality necessitates planning and an alteration in treatment sequencing on the part of the orthodontist. The traditional sequence of placing implants after the completion of orthodontic care will not enable the practitioner to take advantage of the tremendous power and flexibility of implant-enhanced anchorage. As orthodontists embrace this thinking, they become part of a larger team sharing the responsibility of treatment planning and outcome, and will often realize better results in shorter time periods through greater efficiency and control. ■