Clinical Information for the Orthodontic Professional

Versatile Treatment Solutions

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Orthodontists are constantly on the lookout for ways to improve their practices and enhance their service to their patients. This is true whether they are in Europe, where I was recently located, or in any part of the world. An important part of this quest for continuous improvement is “appliance choice”.

Which orthodontic appliance to use is very much a personal decision. What are the advantages of traditional brackets? Self-ligating appliances? Lingual brackets? Which system and prescription will work best in meeting treatment goals? Should I consider a change from my current appliance? What do patients want? Today, there are more options to consider and more ways to provide treatment than ever before.

Contributors to this issue of Orthodontic Perspectives highlight a wide range of 3M Unitek products, show how they are being used in treatment, and offer reasons why the 3M Unitek products are preferred by these authors.

I think you will find the presentations informative and worth your consideration, with topics such as the use of the palate for indirect anchorage, using Forsus™ Class II Correctors when treating with the Incognito™ Appliance System, and also using Forsus Correctors for older patients. There is an article on arch form integrity and the MBT™ Versatile+ Appliance System, and another about how one Orthodontist chose SmartClip™ Self-Ligating Appliances.

If you haven’t used these products before, let this be an opportunity to discover how they might be of advantage in your practice. If you do use them, there may be new information you will find useful. With the trend toward an improving economy, the efficiency of these products and their unique features could be an additional practice differentiator, helping toward increased patient starts.

On a personal note, I am extremely pleased with the opportunity to join the 3M Unitek family. This is a great organization that has always focused on the satisfaction of its customers and their patients. Building on this solid foundation, you can be assured that we intend to earn your continuing trust by providing excellent service and innovative products that bring increased efficiency and value to your practice.

Bill Cruise comes to 3M Unitek from assignment in England, where he was most recently Director for 3M’s Western Europe Health Care Business. A long-time 3Mer, Bill has led business teams throughout the world, including Europe, the Middle East and Africa.

– Editor
Incorporating the Forsus™ Fatigue Resistant Device with the Incognito™ Appliance System

by Dr. Neal D. Kravitz

Dr. Neal D. Kravitz is a Diplomate of the American Board of Orthodontics, as well as clinical faculty and research advisor at the University of Maryland and Washington Hospital Center. Dr. Kravitz received his undergraduate degree from Columbia University and received a DMD at the University of Pennsylvania.

Dr. Kravitz has been published in multiple orthodontic journals, books, and educational materials. He lectures throughout the country and internationally on modern advancement in orthodontics and treatment planning. Dr. Kravitz currently maintains two orthodontic practices in South Riding, Virginia and White Plains, Maryland, and is a leading provider of the Incognito™ Appliance System.

Efficient non-extraction correction of Class II malocclusion is integral to the success of a busy orthodontic practice. While various methods exist to reduce overjet in patients with traditional labial appliances, treatment options were thought to be limited in patients receiving invisible orthodontic care, notably removable aligner therapy.

This article will review non-extraction correction of Class II malocclusion using the Forsus™ Fatigue Resistant Device in conjunction with the lingual Incognito™ Appliance System. Various set-up techniques will be provided, including: hybrid-lingual treatment (maxillary lingual and mandibular labial appliances) with laboratory-fabricated saddle bands and dual-arch lingual treatment with traditional maxillary bands.

The Incognito Appliance System features fully individualized, computer-designed and computer-manufactured lingual brackets and wires to deliver efficient and highly predictable invisible orthodontic treatment (Figure 1A–C).

The Forsus Fatigue Resistant Device is a spring-loaded, fixed Class II corrector, connected chairside from the maxillary first molar headgear tube to the mandibular labial archwire, resulting in rapid dentoalveolar compensation (Figure 2).

Figure 1A–C: Fabrication of Incognito™ Appliance System. Set-up models are scanned to create digitally designed, custom lingual brackets manufactured from cast gold.

Figure 2: Forsus™ Fatigue Resistant Device. Operates similar to a spring-loaded Herbst® Appliance resulting in rapid maxillary molar distalization and mandibular incisor advancement. (Photo courtesy of Dolphin Aquarium, pink color added to highlight location of spring).
Hybrid-Lingual Treatment with Laboratory Fabricated Saddle Bands

A 31 year-old Caucasian female presented with a Class II division 1 malocclusion, moderate maxillary crowding with winged incisors, and agenesis of the mandibular left second premolar. The treatment plan included compliance-free Class II correction with a Forsus™ Fatigue Resistant Device. Even in compliant patients, correction of a >50% canine-Class II malocclusion may be inefficient with interarch elastics alone.

On the Incognito™ Appliance System prescription form, the laboratory technician was instructed to fabricate saddle bands on the maxillary first and second molars. The maxillary first molar bands were designed with a buccal occlusal headgear tube to receive a Forsus™ Correctors L-Pin (a preference of the author). The technician was instructed to provide good retention on the first molar band, extending its length to the gingival margin (Figure 3A-C). The author recommends the use of maxillary second molar saddle bands to ease wire insertion, open the occlusion, and reduce the risk of debonding.

After initial leveling and aligning, maxillary 0.016×0.024 and mandibular 0.016×0.022 stainless steel wires were placed and both arches were ligature-tied. Twisting steel-ligature can be cumbersome with lingual appliances; therefore, the clinician may consider placing a single or double power chain instead. The length of time needed to correct the majority of Class II malocclusion with a Forsus Fatigue Resistant Device is approximately 6 months (Figure 4A-I, 5A-J, 6).
**Dual-Arch Lingual Treatment with Traditional Maxillary Bands**

A 35 year-old African American woman presented with maxillary hyperplasia, Class II division 1, subdivision right malocclusion, mild bimaxillary dentoalveolar protrusion, and unilateral left-side posterior dental crossbite with corresponding functional shift. The patient was treatment planned for dual-arch Incognito™ Appliances with elastics for correction of the subdivision and crossbite. After six months of noncompliance with elastics, treatment with the Forsus™ Fatigue Resistant Device was discussed.

To prepare the arch for Forsus Correctors insertion, the maxillary first molar lingual brackets were removed and spacers placed. Two weeks later, traditional maxillary molar bands with occlusal headgear tubes were seated. Alternatively, the clinician may consider mailing the maxillary pre-treatment plaster-cast to Incognito System laboratories and order laboratory-fabricated saddle bands with buccal occlusal headgear tubes. (Traditional bands were opted for in this patient to expedite insertion of the Forsus Appliances.)

A segmental 0.018 stainless steel wire was cinched behind the first molar and bonded to the second premolar to prevent unwanted space opening. Ceramic brackets were placed on the mandibular canines and first premolars. Connecting the brackets was a segmental 0.016×0.022 stainless steel wire that was cinched and ligature-tied to receive the lower push rod.

Lingually, the patient received maxillary 0.018×0.025 and mandibular 0.016×0.022 stainless steel wires extending to the second molar. Prior to insertion, the maxillary archwire was expanded to aid crossbite correction. The archwire bypassed the lingual surface of the first molar band and was cinched behind the second molar tube. The maxillary arch was ligature-tied second molar to second molar and the mandibular arch was power chained for ease. Due to the skeletal dysplasia, bilateral Forsus springs were inserted (Figure 7A-I).

**Conclusion**

Incorporation of the Forsus Fatigue Resistant Device with custom lingual braces has enabled orthodontists to provide efficient, invisible, compliance-free correction of moderate to severe Class II malocclusions. It is another option available to providers of the Incognito Appliance System to both develop the smile aesthetically and correct the bite effectively.

*Case photos provided by Dr. Neal D. Kravitz.*
Indirect Anchorage Using the Palate: A Unique Application of the Unitek™ Temporary Anchorage Device

by Dr. Mohammad Razavi

Dr. Razavi received his dental training at Case Western Reserve University – DDS (‘02), Orthodontic Certificate (‘05), and MSD (‘05). Upon completion of his Orthodontic training, he was invited to join the department as an Assistant Clinical Professor, where he founded and directed the Skeletal Anchorage Clinic, and has integrated various TAD systems into the training program. He is a member of the craniofacial team at the Cleveland Clinic Foundation, and has served as the Orthodontist for the Cleveland Browns. Dr. Razavi is a diplomate of the American Board of Orthodontists, a Fellow of the Royal College of Dentists in Canada, and an ad hoc reviewer for the American Journal of Orthodontics, and the Journal of Clinical Orthodontics. Dr. Razavi maintains a private practice in Ottawa, Canada.

Introduction

Various sites have been advocated by numerous authors as the “ideal placement site” for mini-screw implants (MSI). 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. 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. Furthermore, interdental MSIs 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 open bite 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 interarch 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.

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 open bites 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 any 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.7

The ideal implant size for palatal placement is the 6 mm Unitek™ TAD. This miniscrew has a tapered design 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.8 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 is 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 gingiva (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 it rarely requires 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 open bite (Figure 19),...
as intrusion mechanics are more favorable when performed from the palatal aspect. Similar appliances 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. 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.

Case photos provided by Dr. Mohammad Razavi.

References

Dr. Stephan Tisseront received his DDS degree at the University of Paris VII in 1993 and practiced general dentistry in Paris, France for two years. He received his MS in Orthodontics at the Oregon Health Sciences University in 1998. Dr. Tisseront has been in private Orthodontic practice since 1998 in Reston, Virginia, with a focus on aesthetics in Orthodontic treatment. His practice serves a large adult patient population, many of whom seek the combination of effective treatment and discreet aesthetics during treatment. Dr. Tisseront is very active in community activities and holds, among other roles, the position of official Orthodontist of the DC United soccer team.

The Forsus™ Fatigue Resistance Device is widely used for Class II malocclusion correction. Its ease of use and reliability have made it an effective choice for noncompliance Class II correction. There are numerous clinical reports of its success and efficiency in growing patients and more recently in young adults. But should the use of the Forsus Correctors stop with young adults? Is there an age limit to the successful use of Forsus appliances?

Class II malocclusions in adults are commonly treated using upper premolar extractions, orthognathic surgery, or Class II elastics. Often, Class II malocclusions are due to mandibular deficiency and mandibular advancement should be the treatment of choice. However case acceptance for orthognathic surgery is low and premolar extractions for camouflage often have a poor aesthetic outcome. Even with diligent compliance, Class II elastics are a poor treatment choice for adults, especially for significant malocclusions that would require Class II elastic wear for extended period of time.

As has been well documented, Class II elastics have an undesirable vertical force, resulting in the extrusion of the mandibular molars and maxillary incisors. The extrusion of the mandibular molars leads to the autorotation of the mandible downward and backward, worsening the Class II relationship. Clinically, we end up chasing our tails in the hope that the A-P movement will eventually be greater than its vertical side effect. Long-term Class II elastic wear can also contribute to an anterior open bite which may be challenging to correct in adult patients.

The detrimental vertical effect of Class II elastics in adult patients makes the force system delivered by the Forsus appliance a much more effective choice for the treatment of Class II in adult patients. In addition to the anteroposterior Class II correction force, the Forsus appliance generates an intrusive force on the maxillary molars and mandibular anterior teeth. This prevents the downward and backward rotation of the mandible, even though the occlusal plane rotation is the same as with Class II elastics. Controlling the backward and downward rotation of the mandible is particularly crucial in these non-growing adults as compared to our growing adolescent patients. Since the force system of the Forsus seemed ideal for Class II correction in adult patients, I early on integrated into my adult treatment plans when indicated.

**Figure 1:** Force vectors for Class II elastics.

**Figure 2:** Force vectors for Forsus™ Appliance.
Case Report

William B., a male 59 and 8 months old, presented to my office with a Class II Division 2 malocclusion. His diagnostic summary included mandibular deficiency, short lower face height, severe overbite, maxillary crowding, buccal crossbite of the left premolars, gingival recession, incisal wear, and a deep mentolabial fold. (Figure 3A-G) Three treatment recommendations were presented: Orthodontic treatment combined with 1) mandibular advancement, 2) Forsus™ Correctors, or 3) extraction of maxillary first premolars. The patient declined surgery and elected to proceed with orthodontic treatment with the Forsus appliance.

The patient was bonded with maxillary Clarity™ Ceramic Brackets and mandibular Victory Series™ Brackets in the MBT™ Versatile+ Appliance System prescription.

Initial alignment and leveling of the mandibular arch was completed in 4 months. Right and left Forsus springs were then inserted with 20×20 nickel titanium maxillary and 19×25 stainless steel mandibular wires in place. A large but flexible maxillary nickel titanium archwire was chosen to allow distal tipping of the maxillary first molars and unlock their occlusion.

The Forsus springs were used for 12 months. Cross elastics were used to correct the buccal crossbite of the left premolars. Once a solid Class I occlusion was achieved, the second molars were included in the appliance. Class I occlusion was maintained throughout treatment using Class II elastics full time on the right and at night on the left. Treatment was completed in 2 years and 7 months and retained with Essix retainers worn 10 hours a day.

Treatment Outcome

Class I occlusion was achieved along with ideal overbite and overjet. There was a significant decrease of the mentolabial fold leading to an improved appearance of his profile. Cephalometric analysis shows significant mesialization of the mandibular arch with good control of the lower incisor angulation (Figure 4, 5, 6A-G).

Figure 3A-G: Pre treatment photos.
Figure 6A-G: Post treatment photos.

Figure 3A: Pre treatment ceph.
Figure 4: Pre treatment ceph.
Figure 5: Post treatment ceph.
Figure 6A: Pre treatment ceph.
Figure 6B: Post treatment ceph.
Figure 6C: Pre treatment ceph.
Figure 6D: Post treatment ceph.
Figure 6E: Pre treatment ceph.
Figure 6F: Post treatment ceph.
Figure 6G: Post treatment ceph.
Long-Term Stability
His dental correction has been well maintained. After two years of retention, the patient has a very satisfying occlusion with a slight Class II relapse on the right side (Figure 7A-E).

Conclusion
The force system delivered by the Forsus™ Appliance overcomes many of the undesired side effects of Class II elastics and is therefore ideal for Class II malocclusion correction in adults as well as children. Forsus Correctors should be considered as an effective alternative to upper premolar extraction. In many adults, camouflage treatment has a detrimental cosmetic outcome. I now reserve upper premolar extraction for protrusive incisors only and use Forsus Corrector therapy for adult patients who would benefit from orthognathic surgery but have decided against it. This case report pushes the age limit of Forsus Corrector treatment further than ever before. I believe there is not an age limit to the usage of the Forsus Device and invite you to push the limit further!

Other Considerations
In treating adults with Forsus Correctors, you can tailor how you use the appliance to the clinical outcome you desire. You can control whether you want distalization of the maxillary arch or mesialization of mandibular arch by choice of different wire sizes and stiffness and/or the inclusion of TADs with your treatment. I have found that initiating Forsus Corrector therapy on a very light upper wire (16 NiTi) is very helpful in unlocking posterior occlusion in brachycephalic patients. In patients with an open bite tendency, it is beneficial to use stiff rectangular wires with passive negative crown torque in the upper arch to prevent buccal tipping of the maxillary molars and further bite opening.

Adults are often more sensitive to initial discomfort, so it is wise to systematically place comfort caps (Comfort Solutions, Inc) on the rod when the Forsus appliance is placed. Patients can be instructed to remove them if they become discolored.

Careful assessment of the Forsus spring activation should be made early on. Some patients have a tendency to posture their mandible forward. In this case, the Forsus appliance may require slightly more activation than usual.

For adults concerned with aesthetics, I also incorporate the use of the Forsus Corrector in conjunction with the Incognito™ Appliance System.

References
1. Jayade, Chetan V., Applicability of the Forsus™ Fatigue Resistant Device as a Class II Corrector in Young Adults, Orthodontic Perspectives Vol. XVII No.1.

Case photos provided by Dr. Stephan Tisseront.
One of the most enjoyable aspects of practicing orthodontics is the diversity of the malocclusions we see. Our patients are all different, and these differences provide opportunities for thought-provoking treatment planning sessions.

As I reflect on my orthodontic residency training, many of us (if not all) were taught to have some level of respect for the existing mandibular arch form. There were many reasons given to keep the integrity of the mandibular arch, including long-term stability and periodontal health. As we treatment-plan our cases two challenges become evident: when should we maintain the integrity of the lower arch, and when should we deviate from it to achieve the results we want; and how to maintain the mandibular arch form in an efficient manner during the operation of a busy orthodontic practice.

Evidence for maintaining the lower arch integrity is abundant in our literature. As with most subjects in the practice of orthodontics we can find articles to support just about any position we want to take. However, there is definitely a preponderance of evidence pointing us in a certain direction on this subject. The typical result of deviating from a patient’s existing arch form is a relapse to pre-treatment arch width dimensions. The most often quoted studies come from those conducted at the University of Washington, although there are numerous other studies showing even greater links between arch form preservation and long-term stability in our treatment results1,2,3,4.

Our evidence regarding periodontal effects of arch expansion is admittedly much thinner. We have all seen the effects on the periodontium of teeth that have been moved out of the alveolar bone. Yared, et al, in 2006 provided some hints at the periodontal effects of excessive proclination of lower incisors in orthodontically treated individuals when they reported significant recession associated with proclination in excess of 95 degrees to the mandibular plane. They also point out that tissue type plays a bigger role in whether recession occurs. This information can help us in determining which patients may tolerate some proclination and which can’t. A patient who has upright incisors and thick keratinized tissue will tolerate a treatment involving arch expansion better than a patient with proclined incisors and thin keratinized tissue.

I hope that as cone beam technology is advanced we will be able to look closer at what our treatment does to the underlying bone. This will advance our ability to provide the best treatment for the long-term health of the supporting structures of the teeth. It is unwise to forget about treatment planning for the functionality of the teeth. We can have the best functioning occlusion and fail in this goal of treatment if the teeth are compromised due to breakdown of the periodontal structures.
It undoubtedly takes more time to customize archwires for each of our cases. It is much easier to grab an archwire from a box and throw it in. This allows a shorter appointment time, however, we are compromising the stability of our final result. Multiple studies have shown that mandibular canines that have been expanded will relapse to their pre-treatment positions\(^1\),\(^2\),\(^3\). If we ignore that fact then our treatment goal to provide long-term stability to our final results will fail. Whenever possible we should devise treatment plans that allow that width to be maintained. In those cases that require deviation from the pre-treatment width we should inform the patient that lifetime retention is necessary to maintain the alignment and bite.

3M Unitek offers many archwires in various arch forms. Our initial wires (.012 and .014 NiTi) are of insufficient stiffness to drive teeth to a different arch form. However, as we increase wire dimensions we must start to shape our wires to avoid distorting the arches. This is where keeping an inventory of at least three different arch forms can save time and still allows maintenance of lower arch integrity. In my practice I use a tapered, ovoid, and square arch form for any wire larger/stiffer than a .016 NiTi. When the original treatment plan is made, the pretreatment models and 3M Unitek’s archwire templates are used to determine whether a patient is tapered, ovoid, or square.

Prior to forming the final wire, the templates assist in determining how much distance is needed between the posts on the finishing archwire.

![Figure 5: Customizing the final .019×.025 stainless steel ovoid 26 mm posted lower archwire to the pre-treatment models.](image)

![Figure 6: Determining distance needed between hooks to accommodate mesio-distal width 2-2. In this case 36 mm is appropriate allowing for the resolution of the crowding 2-2.](image)

Having three arch forms means less time for me chairside, adjusting the wire to fit the patient’s original models. We now have a wire that is customized to the patient’s original arch form, yet took very little of my time chairside to create. Much of this process can even be delegated to properly trained staff members.

There are times when a deviation from the original lower arch form is indicated, such as an increased Curve of Wilson or retroclined lower incisors; however this deviation should be justifiable. Most of our cases should be treated to conform to the patient’s original lower arch form, and 3M Unitek has provided a simple way to achieve that.

In those cases where expansion or narrowing of one or both arches is necessary, care should be taken to do this without distorting the original arch form. Take, for example, the case that has been expanded with an RPE and needs an expanded archwire to hold it while treatment is completed. This wire should have some progressive palatal crown torque (or buccal root torque) and be expanded so that as it is activated it conforms to the lower arch form.

![Figure 7: Expanded maxillary archwire.](image)

If this step is not taken, the practitioner risks distorting the arches by, for example, narrowing or expanding the canine region too much. Sometimes it is necessary to constrict the lower arch, and care should be taken so that when the lower arch is activated it conforms to the original shape of the lower model.

![Figure 8: The terminal ends of the archwire are forced inward (activated) to check for arch coordination.](image)
If we have taken care to maintain arch integrity during treatment, then settling at the end of treatment can take place. The archwire can be cut distal to the maxillary 2’s or 3’s and vertical elastics worn at night for approximately 2-3 weeks. When this is done the maxillary arch is laced 7-7 and the 6 bands removed to allow band space to close (unless the patient is bonded 7-7). Vertical 3/16” 6.5 oz triangle elastics are worn starting with the apex on the maxillary canine and the base on the mandibular canine and first premolar.

We all desire the best treatment possible for those trusting us with their care. We need to be conscious of what information our research as a specialty has given us. We also need to find ways to implement that knowledge in our everyday practice. Clearly there is a strong relationship between arch form distortion and post treatment relapse. There is a more tenuous relationship between arch expansion and loss of periodontal support. The three different arch forms available to us as part of the MBT™ Versatile+ Appliance System philosophy allows us to preserve our patients’ original arch forms through a clinically efficient means. Combine this with accurate bracket placement through indirect bonding and meticulous finishing, and we can finish each of our cases to the highest standard possible in as short a time as possible. It does require more inventory, however the savings in time chairside and the reassurance we are doing the best for our patients are well worth it.

Case photos provided by Dr. Ryan Moses.

References
Other references available upon request.

Figure 9: Finishing elastics. If the 7’s are not included in the appliance, the 6 bands are left in place so the rotational effects of the lacing are not left on a premolar.

Figure 10: Finished case maintaining lower arch integrity.

Three are worn per side at night for 2-3 weeks to allow final settling of the occlusion. If arch forms have been grossly violated then this may not be a good idea.
Michael W. Scott received his DDS degree in 1982 from the University of Tennessee, Memphis, and an MSD in Orthodontics in 1984 from the Baylor College of Dentistry, Dept. of Orthodontics, Dallas. A Diplomate of The American Board of Orthodontics, Dr. Scott maintains a private orthodontic practice in Longview, Texas and also maintains two satellite offices.

Dr. Scott’s chief practice interests are in the areas of practice management, early treatment, orthodontic mechanics, and orthodontic product research and development. A published author, Dr. Scott has presented one-, two- and three-day seminars to orthodontic groups, study clubs and societies in the United States, Canada, Europe, Asia and the Middle East.

My Orthodontic Journey to Self-Ligation

by Dr. Michael W. Scott

Appliances I Have Used and How I Chose SmartClip™ Self-Ligating Brackets

When I began my orthodontic training at Baylor College of Dentistry in 1982, my orthodontic mind was a clean slate that would be filled with knowledge over the following two years. The person I am today as an orthodontist and the attitude I have toward practice I owe, in large part, to two individuals. Dr Moody Alexander selected me as one of his residents, thereby giving me the opportunity to become an orthodontist. And, Dr. R.G. “Wick” Alexander taught me much of what I learned as a resident at Baylor. Thank you. I will always be indebted.

I began private practice in Longview, Texas in June, 1984. At that time, I committed to always use what I considered to be the best and most efficient orthodontic appliances available. That journey has now entered into its 26th year. My “journey” has been longer than many of yours who are reading this article. The biggest difference in your journey and mine is that I have had the opportunity to make more mistakes. It is through those miscues and mistakes that one learns the most.

So, let’s talk about braces, especially self-ligation. For the record, I use a .018 slot. Always have and always will.

Most decisions start with a question. Here is the question. Why should a person consider changing the bracket system they currently use? If the appliance system you currently use works well and you are happy, why consider a change? The motivation to consider a change should come from one’s desire to always use the best and most efficient appliances available. Several years ago, I decided that self-ligation was worth a look.

If I was to ultimately make a change, I needed to consider how that would affect my practice/treatment goals. Those are:

1. Treat non-extraction whenever it is possible and biologically sound.
2. Consider the patient’s face and achieve optimal facial harmony.
3. Place all mandibular teeth in the center of mandibular alveolar bone.
4. Construct the maxillary occlusion to the ideal placement of the mandibular teeth.
5. Establish proper root artistic positioning (root paralleling).
6. Upright mandibular molars both mesiodistally and buccolingually.
7. Establish Class I molar and cuspid occlusion.
8. Produce consistent, predictable high quality results.
9. Practice with great efficiency.
10. Start all the cases I care to start.
11. Make a reasonable profit.
12. Have fun!

So, if a person is going to consider changing the bracket system they use, that new system MUST satisfy the above goals in a way that is BETTER than what is currently being used – otherwise, why change?

In my 26 years of practice, my bracket evolution has been:

1. Alexander™
2. Elan/Insignia™
3. Orthos™
4. Damon™

That experience led to my search for a more efficient and reliable self-ligating bracket that did not compromise my practice goals, thus:
5. In-Ovation R™
6. SmartClip™ Self-Ligating Appliance System

Along the way I was exposed to various other bracket systems through transfer cases:
7. Time™
8. Speed™

And, there is always:
9. This piece-of-junk bracket
10. That piece-of-junk bracket

I had progressed through my thought process to the conclusion that self-ligation was where I wanted to go. It would meet all of my practice / treatment goals in ways that I concluded would be better.

So, which one would best meet my practice/treatment goals? I considered the physical characteristics of several brackets.

Figures 1-3 show facial, lateral and lingual views of Ormco’s Damon 3™ Bracket, GAC’s In-Ovation R™ Bracket and 3M Unitek’s SmartClip™ Bracket.

I gave myself the time I needed to treat enough cases with each bracket to be able to evaluate all aspects of daily use. I considered:

• How do the brackets bond to the teeth?
• Do the brackets stay on the teeth over time?
• These are “self-ligating” brackets. How do the wires actually insert and how are they removed?
• How does my clinical staff feel about each bracket system?
• Are the brackets effective? That is, do they move the teeth to the desired position?
• Are the brackets efficient? That is, do they make life in the operatory better for me, my staff and my patients?
• How would each company support me as I went through the learning curve of each bracket system?

I Chose SmartClip™ Brackets. Why?

I like the brackets. Each bracket fits the individual tooth well and gives an easy sense of feel that it is in the correct position when bonded.

The brackets stay on the teeth long-term. I’ve found the mesh on the lingual (base) of the bracket along with 3M Unitek’s Transbond™ Plus Self Etching Primer and Transbond™ XT Light Cure Adhesive offer a bond strength that is superior. That makes the efficiency factor skyrocket!

The SmartClip Bracket makes it virtually impossible to debond a bracket while engaging an archwire – the clip will let the archwire disengage before bond failure – no other bracket has that feature.

Also, when a progress pano is made to assess root paralleling, 3M Unitek has an instrument that makes debonding the SmartClip Bracket easy and comfortable for the patient and does not distort the bonding base (Figure 4A-D).
In addition, the bonding bases on the upper and lower bicuspids and first molars are large. Figure 5A-D above shows the “jumbo” pads on bicuspids and first molars.

**If You Do Not Read Any Other Part of This Article, Read This!**

The SmartClip™ Bracket is the only true self-ligating bracket on the market. As I had evaluated the Ormco Damon 3™ and the GAC In-Ovation R™ Brackets, I had simply grown to hate “doors”. As one reads this article, the thought might come to mind that new products have come out since I made my decision to use SmartClip Brackets exclusively in my practice. For example, the Damon Q™. Just because I chose SmartClip Brackets does not mean that I have stopped looking at new technology. My response: it is still a bracket with a “door”.

I timed my clinical staff as we evaluated bracket systems. We timed an archwire change for traditional ligated brackets, Damon 3 brackets, and SmartClip Brackets.

Using traditional ligated brackets, it took a trained clinical staff member 11 minutes to remove an archwire and place a new one using elastomeric modules.

Using the Ormco Damon 3 bracket system, it took 6.5 minutes to open the doors, remove an archwire, place the new wire and close all of the doors.

Using 3M Unitek’s SmartClip Bracket System, it took 3 minutes to disengage an archwire and seat the new wire into the SmartClip Brackets.

Seating an initial round Nitinol type wire is easy on both the clinical staff and the patient. In most situations, these types of wires can be seated in the SmartClip Brackets using light finger pressure. These wires are able to be seated and engaged in the SmartClip Brackets in less than a minute!

Changing an archwire using SmartClip Brackets is one of the biggest assets of the system. In removing a round Nitinol type wire, an instrument such as a scaler can be used to disengage the wire from the four anterior teeth and, the wire will simply slide out from the rest of the brackets. If the next wire in sequence is a rectangular Nitinol or Beta Titanium, it is easily seated into the SmartClip brackets using an amalgam plugger or similar instrument. Simply support the tooth from the lingual with a finger as each bracket is engaged.

Larger rectangular wires are easily disengaged using the SmartClip™ Appliance Wire Disengagement Hand Instrument (REF 804-160). The above series of photographs demonstrates the sequence. (Figures 6A-D)

The next question was, how does my clinical staff feel about how they used each system we had chosen to evaluate. Unanimously they loved the SmartClip system. They also had grown to have an extreme dislike for “doors”. The learning curve of how to open and close the doors was hampered by the fact that, even in patients who were good brushers, the doors accumulated plaque. That one issue, along with all of the positive experiences using SmartClip brackets, made their decision easy.

Are the brackets effective and efficient? Those 2 questions are easily combined, and the answer is yes. The SmartClip bracket system is effective in how it gives me the ability to move teeth to the desired positions. It is efficient in that it lets me be effective easily.

Let’s get into that in detail, as this is one of the most important concepts that SmartClip™ Brackets offers the orthodontist.

**Tandem Archwires**

The concept of using tandem archwires is very powerful. First, what does that mean? When the patient has their bonding appointment, my initial archwire is usually a .014 Nitinol HA. The next
appointment is scheduled for 9 weeks later. At that appointment, another .014 Nitinol HA wire is placed in the arch on top of the first wire. There are now 2 wires in the maxillary arch and 2 wires in the mandibular arch. The first wire, placed at the bonding appointment has a stop on it to prevent archwire drift. The tandem wires do not need stops because they intertwine with the first wire and will not drift. Figure 7 shows in graphic form the idea of tandem wires.

Below is a series of clinical photos taken at the initial exam, at the bonding appointment, 9 weeks into treatment and 14 weeks into treatment.

Figure 7: SmartClip™ SL3 Bracket with Tandem Archwire.

3. When inserting the tandem wire, a stop is not needed. The tandem wires will intertwine and not drift.
4. When inserting the tandem wire, to avoid confusing which wire is the tandem, cut it longer than needed and insert it through the molar tube. Then, use a plier to pull the tandem wire through the tube before engaging the tandem wire into the SmartClip brackets.
5. Don’t get in the way of effective and efficient treatment by needing to do something too soon. Once the tandems wires are in place, let them “cook” for at least 14-18 weeks.
6. 9 weeks after seating the tandem is a great time to take a progress pano to evaluate root paralleling.
7. Patients love the idea of an “observation visit” to make sure everything is working well!
8. When I use the Nitinol HA wires with SmartClip brackets, we never cool the wire prior to insertion. Cooling transitions the wire from austenite to a martensite state, allowing for a more resilient wire. When the wire returns to it’s austenite state, it can easily disengage from the brackets.

A question all of us ask from time to time is, “What can I do to make myself more efficient and eliminate at least 1 appointment from a patients time in treatment?” Using tandem wires is how you do it! This is more powerful than you think and it will absolutely make you more efficient if you stay out of the way!

**Bonding Technique**

The following is offered as a method to simplify bonding:

1. Do not pumice the teeth (unless hygiene is an issue). A rubber cup, whether on a slow-speed handpiece or a hand held polisher, causes the crevicular fluid to flow. That fluid will interfere with the bond at the gingival margin and reduce bond strength, especially in the bicuspid area.

2. Acid etch all teeth for 10 seconds and rinse. Moisture is not a problem at this point. Cheek retractors can be removed and the patient can sit up and be comfortable until you are ready to sit down and place brackets.

3. When you are ready to place brackets the patient is reclined, cheek retractors can be removed and the patient can sit up and be comfortable until you are ready to sit down and place brackets.

4. Scrub each tooth for 5 seconds with self-etching primer and lightly blow excess away with air.

5. Place each bracket and light cure.
Below is a photo (Figure 12A-D) of the Transbond™ Plus Self Etching Primer module and the roller used to mix the ingredients.

**How to Avoid Drifting Archwires**

For round wires such as .014, .018 Nitinol wires, I have found two good methods to avoid drifting. One involves placing one or two stops on the wire at a position that will not interfere with tooth movement but will also not let the wire drift in any direction resulting in a “sticker”. In the lower arch, the best place to position a stop is somewhere near the midline, out of any area of crowding or rotations. In the maxillary arch, I have found that placing two stops, one on either side of a maxillary central incisor works great to prevent archwire drift. Figure 13.

The second method involves leaving the archwire long and using an instrument to bend the protruding wire to the lingual. This is done using a Distal Cinchback Plier from 3M Unitek (REF LP5). The plier will work in all quadrants. This method is illustrated in Figure 14A-D.

For rectangular finishing wires such as Beta Titanium or Stainless Steel, I have found that using a crimpable tube or a crimpable “C” stop placed mesial to the first molar work extremely well as a way to tie back. That technique is shown in Figure 15A-D.

**Suggested Archwire Sequence**

(This is how I do it, NOT how it has to be done)

I like the archwire selection that 3M Unitek offers. The combination of technologies offered through the Nitinol series along with the Beta Titanium properties make patient progress very effective and efficient. The following is a typical, but not cookie cutter, sequence of how I progress through the wire series, which has worked well in my clinic.

**Maxillary Archwire Choices (non-extraction):**
- Initial Wire: .014 Nitinol HA or .012 Nitinol HA
- Intermediate Wire: .014 Nitinol HA Tandem .016×.025 or .017×.025 Nitinol HA
- Final Wire: .017×.025 Beta III Titanium or .017×.025 S.S. .018 Nitinol HA if needed for settling

**Mandibular Archwire Choices (non-extraction):**
- Initial Wire: .014 Nitinol HA or .012 Nitinol HA
- Intermediate Wire: .014 Nitinol HA Tandem .016×.025 or .017×.025 Nitinol HA
- Final Wire: .017×.025 Beta III Titanium or .017×.025 S.S.

**Conclusion**

This article has been written in an attempt to convey to you, the reader, my experiences as I have journeyed to my place in self ligation. It is by no means an all-inclusive “movie” of my journey. I hope it will serve to help you as you decide what works best for you, and prevents you from making some of the errors I made in my learning curve.

**So, Where Does That Leave You?**

Does the SmartClip™ system satisfy the demands that are placed on it for you to change?

As I asked earlier, if a person is going to consider changing the bracket system they use, that new system MUST satisfy their goals in a way that is BETTER than what is currently being used – otherwise, why change?

For me, the answer was a definite YES.

Furthermore – WHY WOULD I EVER GO BACK?!

*Case photos provided by Dr. Michael W. Scott.*
The Ortholux™ Luminous Curing Light was introduced to North America and Europe in May 2009 at the AAO Annual Session. This curing light is a fast LED-type orthodontic curing light that incorporates the latest LED technology with a sturdy stainless steel, cordless handpiece powered by a Lithium ion battery.

The black-coated, 8 mm light guide contributes to the 1600 mW/cm² output by optimizing the orthodontic curing pattern for the recommended mesial and distal curing technique or the alternate interproximal curing technique. The black coating of the light guide assures the user that the high-intensity blue light is being directed into the oral cavity and not extraneously throughout the operatory. As a result, the Ortholux Luminous curing light can cure ceramic brackets in 3 seconds and metal brackets in 6 seconds, reducing overall bonding time.

<table>
<thead>
<tr>
<th>Appliance</th>
<th>Adhesive</th>
<th>Ortholux™ Luminous Curing Light</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metal Brackets</td>
<td>Transbond™ XT Adhesive</td>
<td>3 seconds mesial × 3 seconds distal</td>
</tr>
<tr>
<td>Ceramic Brackets</td>
<td>Transbond™ PLUS Color Change Adhesive</td>
<td>3 seconds through the bracket</td>
</tr>
<tr>
<td>Buccal Tubes (Direct Bond)</td>
<td>APC™ II Adhesive Coated Brackets</td>
<td>6 seconds mesial × 6 seconds occlusal</td>
</tr>
<tr>
<td>Lingual Retainers</td>
<td>Transbond™ LR Adhesive</td>
<td>3 seconds mesial × 3 seconds distal</td>
</tr>
<tr>
<td>Molar Bands</td>
<td>Transbond™ Plus Band Adhesive</td>
<td>12 seconds (3 seconds per cusp)</td>
</tr>
<tr>
<td>Indirect Trays (Metal Brackets)</td>
<td>Transbond™ Supreme LV Low Viscosity Light Cure</td>
<td>6 seconds mesial × 6 seconds distal through the</td>
</tr>
<tr>
<td>Indirect Trays (Ceramic Brackets)</td>
<td>Cure Adhesive</td>
<td>Trays</td>
</tr>
</tbody>
</table>

Table 1: Recommended cure times for the Ortholux™ Luminous Curing Light.
In April 2010, a customer satisfaction survey was conducted in the United States and Canada to determine satisfaction of, and future opportunities for, the next generation of curing lights. Responses were received from 123 orthodontic offices that had used one or more of the Ortholux Luminous lights for a minimum of two months.

Here are highlights from the responses.

- 97.5% of the respondents were either Extremely Satisfied or Satisfied with the quick cure time of the light.

- 73% of the respondents agreed that their bonding process was faster as a result of the use of this light.

- 97.5% of the respondents were Extremely Satisfied or Satisfied with the overall performance of the light.

- 89% of the respondents said they would recommend the Ortholux™ Luminous Curing Light to their colleagues.

- The best and most trusted recommendation for any product is generally from peers and current users. At 89%, the Ortholux™ Luminous Curing Light has a very high recommendation rating from its current users.
Figure 8: The Ortholux™ Luminous Curing Light is designed with the orthodontic practice in mind.

Q10: How Satisfied Are You With the Ease of Operation?

<table>
<thead>
<tr>
<th>Satisfied Level</th>
<th>Number of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extremely Satisfied</td>
<td>27</td>
</tr>
<tr>
<td>Satisfied</td>
<td>7</td>
</tr>
<tr>
<td>Neutral</td>
<td>1</td>
</tr>
<tr>
<td>Dissatisfied</td>
<td>1</td>
</tr>
<tr>
<td>Extremely Dissatisfied</td>
<td>0</td>
</tr>
</tbody>
</table>

Respondent satisfaction remained high with battery performance and ease of operation.

Through the generations of modern orthodontics, 3M Unitek has remained a consistent source of innovation, quality and service, consistently finding new solutions that are designed to provide more efficient performance. The results of the Customer Satisfaction Survey attest to the efforts made by the 3M Unitek product development team to incorporate recommendations and comments of orthodontists in order to create a curing light optimized specifically for orthodontic applications. We thank those orthodontists on the 3M Unitek Doctor Panel who evaluated and commented on the curing light during the various stages of its inception and development.

If you have not experienced the performance of this curing light in your practice, ask your 3M Unitek Field or Inside Sales Representative for an in-office demonstration.

Call your Sales Representative today for more information.

Information is Your Most Valuable Tool

Upcoming Educational Events

October 16-17, 2010
3M Unitek Regional Summit
Dr. Terry Selke, Dr. Thomas Ziegler, Dr. Mohammad Razavi
Baltimore, MD

October 22-23, 2010
2010 Incognito™ Appliance System Users Meeting
Las Vegas, NV

November 19-20, 2010
Incognito Appliance System Certification Course
Dr. Magali Mujagic
Miami Beach, FL

November 26-27, 2010
MBT™ Versatile+ Appliance System Symposium – 2010 and Beyond
Dr. Lars Christiansen, Prof. Dr. Dietmar Segner, Dr. Colin Melrose, Dr. John Scholey, Dr. Davide Mirabella, Dr. Hugo Trevisi
Berlin, Germany

November 13, 2010
Forsus™ Class II Correctors: Stress-Free and EZ, Efficiencies in Practice
Dr. Lisa Alvetro
Anaheim, CA

December 3-4, 2010
Optimizing the Orthodontic Treatment Experience: From Excellence to Eminence with the EVIDENCE
Dr. Jackie Berkowitz
Tufts University, Boston, MA

January 21-22, 2011
Forsus Class II Correctors and Practice Management
Dr. Lisa Alvetro
South Lake Tahoe, CA

February 11-12, 2011
Temporary Anchorage Devices in Orthodontics: Techniques for Success
Dr. Mohammad Razavi
Park City, UT

February 25-26, 2011
2011 3M™ Self-Ligating Appliances National Users Meeting
Miami Beach, FL

March 18-19, 2011
Efficiency in Practice: The Alvetro Orthodontics In-Office Seminar
Dr. Lisa Alvetro
Sidney, OH

April 1-2, 2011
3M Unitek 14th Annual MBT Appliance System Summit in Las Vegas
Las Vegas, NV

April 15-16, 2011
The Essence of Efficiency: Dr. Anoop Sondhi’s Two-Day In-Office Course
Dr. Anoop Sondhi
Indianapolis, IN
2011 3M™ Self-Ligating Appliances National Users Meeting
Integrating Self-Ligation in the Successful Practice

February 25-26, 2011
Fontainebleau Resort • Miami Beach, Florida

The 3M™ Self-Ligating Appliance Users Meeting offers attendees insights toward the achievement of a higher level of treatment excellence and efficiency in the orthodontic practice. From scientific validation of lighter force mechanics to implementation of self-ligation technology, attendees will find valuable concepts and thought provoking information. For Doctors and Staff in exciting South Miami Beach.

14th Annual 3M Unitek Summit in Las Vegas
Efficient Interdisciplinary Treatment

April 1-2, 2011
Wynn Las Vegas • Las Vegas, Nevada

Make plans to join us at the 14th Annual 3M Unitek Summit in Las Vegas. Learn how to apply the core principles of the MBT™ Versatile+ Appliance System to properly prepare a case for interdisciplinary treatment and to work cooperatively toward an excellent result.

Register online at www.3MUnitek.com or www.3MUnitekTraining.com

International Events

MBT™ Versatile+ Appliance System Symposium – Treatment Philosophy 2010 and Beyond

November 26-27, 2010
Grand Hyatt Berlin • Berlin, Germany

This year’s symposium will host the following presenters:

Dr. Lars Christensen  Prof. Dr. Dietmar Segner
Dr. Colin Melrose  Dr. John Scholey
Dr. Davide Mirabella  Dr. Hugo Trevisi

For more information and to register visit www.MBT-Berlin2010.de

3M Unitek Symposium II in Dubai

March 4-5, 2011
Mina A’Salam Hotel • Dubai

Adult orthodontics poses a unique set of challenges. The symposium agenda includes information on both new and longstanding techniques for success. Different workshops and hands-on sessions as well as the International Incognito™ Appliance System Users Meeting on March 6, 2011 will complete your unforgettable visit of Dubai.

For more information and to register visit www.3MUnitekDubai2011.com