

**3M** Science.  
Applied to Life.™

# Orthodontic Perspectives Innova

News, Information, and Clinical Case Studies



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**3M** Unitek



Mary Jo Abler

## Message from the President 3M Unitek

It's hard to believe another AAO session is upon us, but it's wonderful to be in San Francisco. I'm looking forward to meeting many of you and hearing your comments and questions about our products. We're pleased to partner with you to provide the tools you need to continue doing a great job for your patients.

3M Science. Applied to Life™. This is more than just a phrase you will frequently see on items from 3M. It is our way of going about our business. It is what we do in serving you, our customers.

We apply 3M Science to provide benefits in everyday life, often by combining technologies in new ways. For example, the APC™ Flash-Free Adhesive Coated Appliance System uses our expertise with advanced adhesives and nonwoven fiber materials to offer an advanced product that saves you time, has a low bond failure rate and improves the patient experience. Using science to change lives – that's what really matters.

In this issue you will have the opportunity to learn about our new Victory Series™ Superior Fit Buccal Tubes. Extensive research into buccal tubes with those who use them, discovering how they can be made better, and applying the depth of 3M Science has resulted in an appliance that has features to improve the user experience and help toward better treatment results.

Another way we strive to improve the treatment experience is by offering aesthetic options for patients who don't want the look of wearing braces. Our Clarity™ ADVANCED Ceramic Brackets are comfortable and provide excellent aesthetics by blending in with the patient's natural tooth color. And the Incognito™ Appliance System combines the completely invisible look many patients want with the functionality (for you and your staff) of a treatment system that can include full digital workflow.

3M™ Self-Ligating Appliance Systems offer a full range of designs that provide treatment efficiency and can save patient's time. In this issue we highlight our Victory Series™ Active Self-Ligating Brackets, introduced last year, with the experiences of users and the results they achieved. There is also an article about our SmartClip™ and Clarity™ SL Self-Ligating Systems.

I hope you'll take a few minutes to enjoy this issue of *Orthodontic Perspectives Innova*. If you're in San Francisco for this year's AAO Annual Session, please stop by our booth and share your insights with us. Or give us a call or send us a note. We always enjoy hearing from you – and partnering with you – to better meet patients' needs.

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# Victory Series™ Superior Fit Buccal Tubes Introduced

## Better Fit for Better Results

Victory Series™  
Superior Fit Buccal Tubes



Armineh Khachatoorian, Brand Manager, 3M Unitek

Armineh Khachatoorian received her B.S. in Chemistry from the University of Southern California. She worked as an R&D and Product Development Engineer before joining 3M Unitek in 1997 as a Sr. Technical Service Engineer in R&D. In 2002 she became a Marketing Product Manager, and is now Brand Manager responsible for Adhesives, Ligated Appliances, Tubes and Bands, and APC™ Adhesive Systems. She has participated in the introduction and marketing of the Ortholux™ Luminous Curing Light, the APC™ Flash-Free Adhesive System and other adhesive products.

“We all loved the design of the actual tube. The fluted/flared mesial opening **made wire insertion simple**, even in difficult mesially rotated molars. The tube is **easily held for placement** during bonding... **extremely secure** and very unlikely to slip or spin as occurs frequently with other tubes we have used.”

Dr. Ross Taddeo  
Orlando, Florida

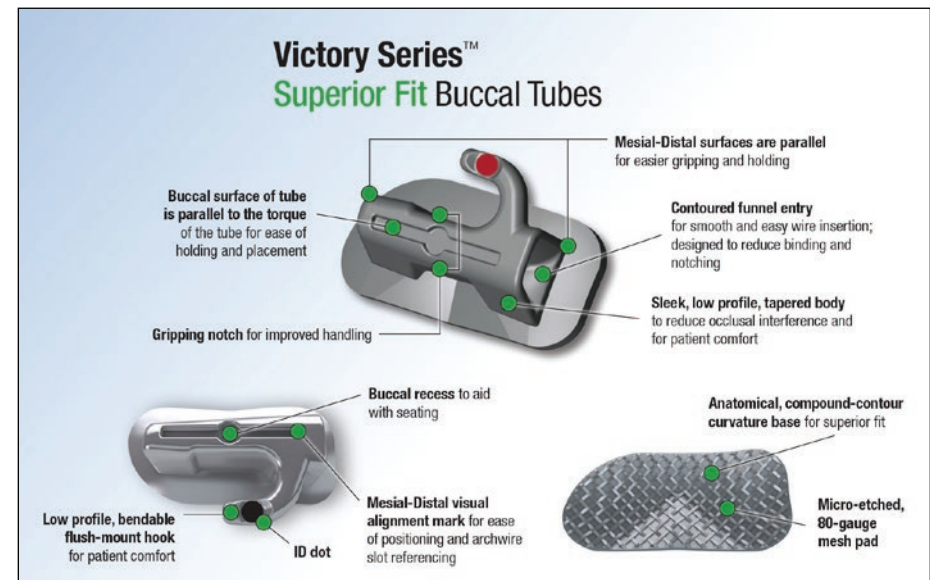
3M Unitek surveyed orthodontists from around the world to understand the performance and features they deemed most important in buccal tubes. Their top priorities were good tooth-to-base fit, ease of wire insertion, patient comfort and ease of positioning and handling.

**Victory Series™ Superior Fit Buccal Tubes** were designed to meet orthodontist requirements, starting with a large compound contour base for superior fit and stability. They also feature an exclusive contoured funneled archwire slot for easy wire insertion, a low profile and flush-mount hook for added patient comfort, and improved gripping and handling characteristics.

For more information, read the article that follows, visit [3MUnitek.com/SuperiorFit](http://3MUnitek.com/SuperiorFit), or contact your 3M Unitek representative!

“Being a huge advocate of only banding lower molars, I was very skeptical of even trying a bonded bracket on the lower 6's. **The new Victory Series™ Superior Fit Buccal Tubes just fit so well into the occlusion**, and having them fit right into our pre-coated bonding system made it seamless. **Overall, I could not be happier...**”

Dr. Scott McCrannels, West Palm Beach, Florida



# Improving Orthodontic Treatment with Victory Series™ Superior Fit Buccal Tubes



**Todd Oda, Product Development Engineer, 3M Unitek**

Todd Oda is a Product Development Engineer at 3M Unitek. He has over 15 years of experience in the orthodontic industry focusing on developing innovating self-ligating brackets. He received his B.S. in Mechanical Engineering from California State University, Long Beach. Todd has over 25 years of experience in the medical, semiconductor, and welding industries.



**Ana Trinh, Product Development Engineer, 3M Unitek**

Ana Trinh is a Product Development Engineer at 3M Unitek. She has over eight years of experience in the medical and aerospace industries. She received her B.S. in Mechanical Engineering from University of California, San Diego, and her M.S. in Mechanical Engineering from California State University, Fullerton.

Reliable anchorage is an important aspect of the orthodontic bonding process, affecting efficiency throughout treatment. Along with treatment choice and mechanics, selection of the buccal tubes is an important determinant of success.

3M Unitek surveyed users of buccal tubes, worldwide, asking them to name the most important attributes of a buccal tube. The respondents were users of tubes from many manufacturers, including 3M Unitek. The results of the survey indicated that good tooth-to-base fit was the number one requirement among all respondents, followed by ease of wire insertion, ease of positioning and handling, and patient comfort.



Using this information, the 3M Unitek design team leveraged 3M's advanced technologies and 60+ years of orthodontic design experience to develop Victory Series™ Superior Fit Buccal Tubes. Complex 3D modeling, finite element analysis and the 3M Software, Electronic, and Mechanical Systems (SEMS) group's custom software were all used in the design.

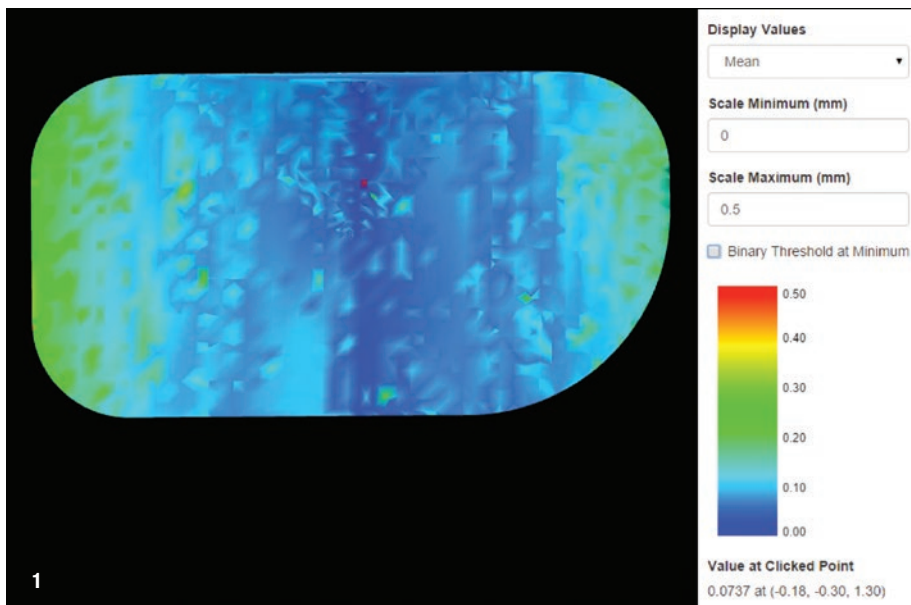
Victory Series Superior Fit Tubes are made of 316L stainless steel and use 3M Unitek's proven Metal Injection Molding (MIM) technology for the most consistent and dimensionally accurate parts possible. The new tubes will initially be introduced in the MBT™ Appliance System Rx for the upper and lower 1st and 2nd molars, followed by Roth\* Rx tubes. Double convertible tubes for both prescriptions will be available for the upper and lower 1st molar teeth. All of the Victory Series Superior Fit buccal tube bases use the 3M Unitek 80-gauge micro-etched mesh for consistent and reliable bonds.



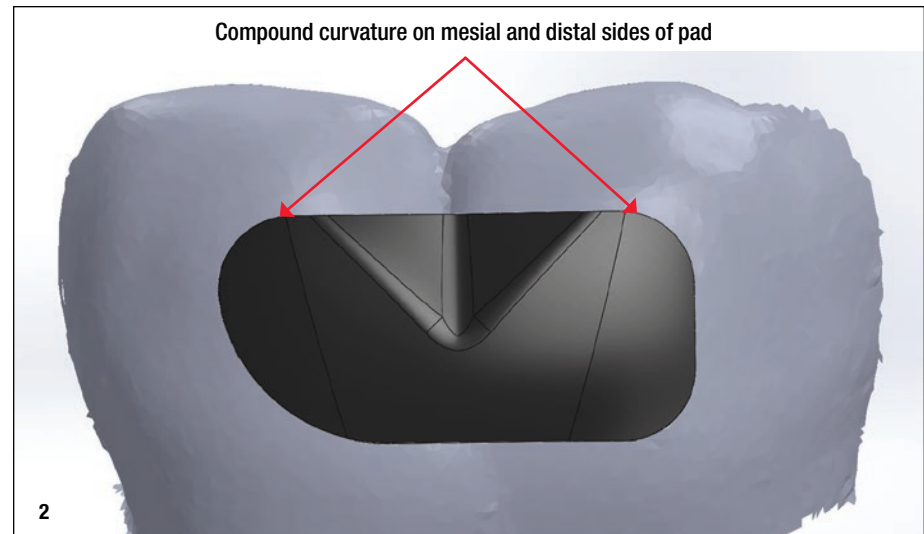
## Optimum Tooth-to-Base Fit

As optimum tooth-to-base fit was one of the top priorities in designing the new Victory Series™ Superior Fit tubes, the SEMS group at the 3M corporate labs developed a proprietary software that created an ideal base from many patient samples, which was representative of the general population. New “ideal” bases were then designed around representative 1st and 2nd molar teeth.

Figure 1, shown below, illustrates a heat map comparing the computer generated molar to the Victory Series Superior Fit 1st molar base. In conjunction with the ubiquitous mesial-distal and occlusal-lingual curvatures of the base, outboard “wings” were added to the mesial and distal sides of the bases, shown in Figure 2. These proprietary “wings” bend around and “hug” the clinical crown of the tooth to add a new level of base to tooth fit.



**Figure 1:** Heat map comparing the Victory Series™ Superior Fit Buccal Tube 1st Molar Base with representative tooth surface.



**Figure 2:** Victory Series™ Superior Fit Buccal Tube 1st molar base with compound curvature.

## Low Profile and Funnel Entry

In addition to improved tooth-to-base fit, the new Victory Series Superior Fit tubes feature improvements in reduced size, a newly designed funnel entry for ease of wire insertion and a flush-mounted hook for enhanced patient comfort.

Keeping the lower 1st molar buccal tubes out of occlusion with the upper teeth was a major design input criteria. Considerable effort was spent sculpting and reducing the occlusal profile of the tube. To maintain a reasonable funnel area with such a low profile tube, the mesial end of the tube was allowed to “grow” in the gingival direction. This increased the funnel entry area without negatively impacting the occlusal profile of the tube.

The funnel entry itself features curved funnel sides (instead of the normal straight sides) that gradually taper tangentially to the archwire (Figure 3). This allows the archwire to be smoothly inserted into the archwire slot without hitting any angled transition areas that are normally present with most straight-sided funnel entry systems.



**Figure 3:** Curved funnel entry of the lower 1st Victory Series™ Superior Fit Buccal Tube.

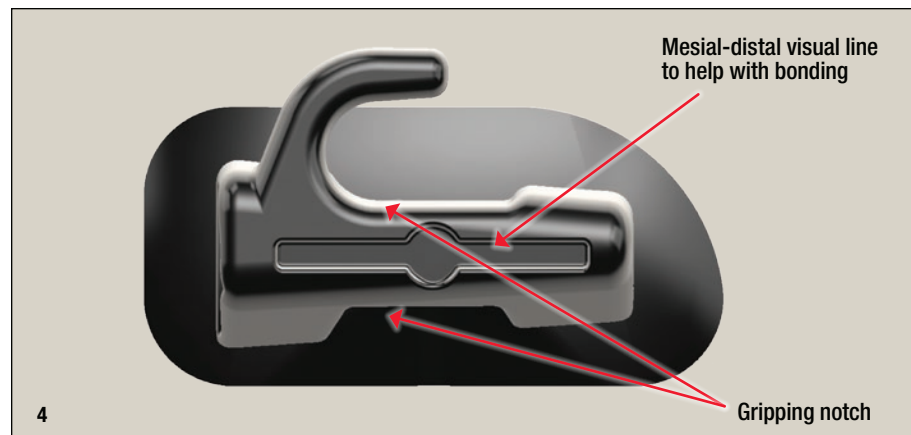
## Easier Bond Placement

To aid in bond placement, several new features were added. The gripping notch of the buccal tube was made substantially perpendicular to the torque plane of the bracket. In addition, the buccal side or top of the buccal tube was made parallel to the torque plane of the buccal tube. Having these surfaces either perpendicular or parallel to the torque plane gives the clinician multiple areas to push the buccal tube onto the tooth without having the buccal tube “shift away” during the bonding process. A mesial-distal visual line was also added along the buccal side of the tube to help the clinician align the buccal tube during placement on the tooth. Figure 4 illustrates the new features on the Victory Series Superior Fit buccal tubes used for bonding.

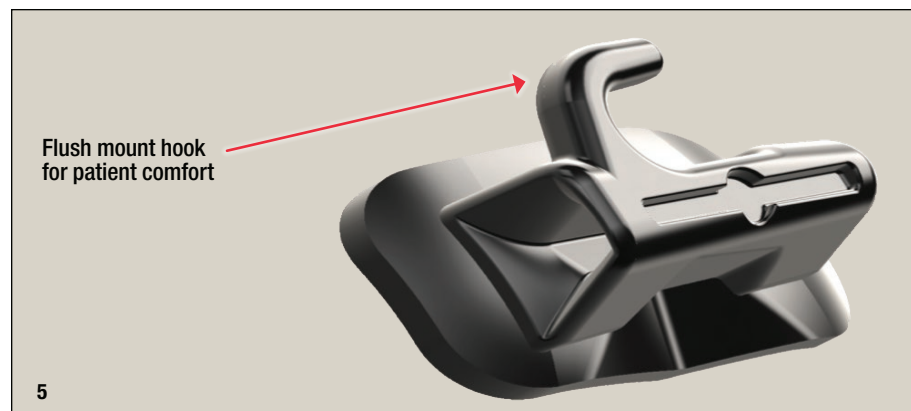
## Enhanced Patient Comfort

The need for patient comfort was an important factor in the design of Victory Series™ Superior Fit tubes. Buccal tube hooks tend to protrude in the buccal direction to allow ease of elastic engagement. But this also can be a major source of irritation to the soft tissue inside the mouth. Unplanned visits for hook to soft tissue irritation is not uncommon if the doctor forgets to bend the hook lingually to reduce the amount of hook protrusion.

Victory Series Superior Fit tubes feature hooks that are flush with the buccal surface of the tube, and are also laid back lingually to reduce point load irritations to the soft tissue in Figure 5. Because the buccal tube is Metal Injection Molded from 316L stainless steel, which is a durable and malleable material, the hooks are fully bendable. The hook design as well as the low profile of the tube provide enhanced patient comfort.



**Figure 4:** Buccal view of the lower 1st molar Victory Series™ Superior Fit Buccal Tube.



**Figure 5:** Mesial view of the lower 1st molar Victory Series™ Superior Fit Buccal Tube.

## Conclusion

Victory Series Superior Fit Buccal Tubes bring together in one design the most important features and desired improvements voiced by surveyed orthodontists worldwide. Many users in customer evaluations note that they can both see and feel the differences between these tubes and others they have been using, with noticeable improvement in tooth-to-base fit, ease of handling and positioning, and simple archwire insertion.

## 3M™ Self-Ligating Appliances: User Success Stories



**Silviya Karapetian, Global Brand Manager, 3M Unitek**

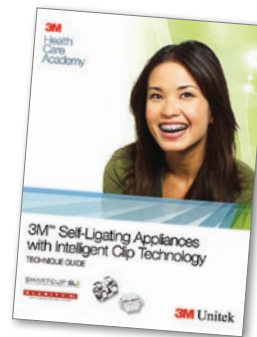
Silviya Karapetian joined 3M Unitek in 2007 and is the Global Brand Manager for 3M™ Self-Ligating Systems including SmartClip™, Clarity™ SL, Victory Series™ Active SL and Unitek™ Gemini SL Self-Ligating Brackets. Silviya received her BS and MBA degrees from the Marshall School of Business at the University of Southern California.



In 2004, 3M Unitek introduced the unique SmartClip™ Self-Ligating Appliance System. With the addition of the Clarity™ SL Self-Ligating Appliance System in 2007, users had a complete solution of metal and aesthetic self-ligating appliances, providing valuable efficiencies for their practices. From chair time savings to extended appointment intervals, these two 3M Self-Ligating Appliances, incorporating Intelligent Clip Technology, set them apart from competitors. The availability of APC™ Flash-Free Adhesive is the latest addition to the efficiency available with these systems.

**SMARTCLIP™ SL3**  
SELF-LIGATING APPLIANCE SYSTEM

To see how doctors from around the world treat with SmartClip and Clarity SL Appliances, check out the newly published *Technique Guide for 3M™ Self-Ligating Appliances with Intelligent Clip Technology*, available on the 3M Unitek website in the Self-Ligating Appliances section. Also, the article following in this issue by Dr. Awbrey is just one testimonial of how SmartClip Appliances can transform the way that users run their office.



In recent years, 3M Unitek has expanded its self-ligating offering with the addition of the Victory Series™ Active SL and the Unitek™ Gemini SL Appliance Systems. Both appliances are offered with APC™ II Adhesive pre-coating to allow offices to enjoy bonding time savings for doctor, staff and patients. The systems have gained popularity around the world. See what Dr. Jeffrey Housley (page 10) and Dr. Mario Chorek (page 12) have to say about their experience with the appliances.

With a full range of self-ligating systems, 3M Unitek now provides orthodontists with more treatment options for you when you search for the ideal treatment for each patient.



# The SmartClip™ Self-Ligating Bracket

SMARTCLIP™ SL3  
SELF-LIGATING APPLIANCE SYSTEM



## Commentary by Dr. James Awbrey

Dr. James Awbrey is a native of Atlanta, GA. He received his BA from Auburn University and attended Dental School at the University of Alabama, School of Dentistry. He went on to complete his Orthodontics residency at Louisiana State University School of Dentistry. Dr. Awbrey is a member of the American Board of Orthodontics and has a private practice in Alpharetta, GA.

*“There is **no question in my mind** after trying many bracket systems over the past 25 years that the **SmartClip™ Bracket’s self-ligation design** is unequivocally the **best bracket design on the market today.**”*

The paper clip’s original design, developed in 1872, is still in use today. Over the past 140 years it has gone through many transformations. However, today we are still using its original design. And why? The paperclip works perfectly in its simplest form. There has, however, been some innovation to the paper clip itself. They gave it color!

A similar analogy can be said about Dr. Brainerd Swain’s Siamese twin-wing bracket design. This design, invented in 1949, improved some of the inefficiencies during orthodontic movement from Dr. Angle’s original single-wing “edgewise” bracket. Over the years the twin bracket has gone through many transformations, none the less, today the most widely used bracket globally is still this true-twin bracket design. Why? Because it is simple, extremely efficient at moving teeth, and it works. So why change? 3M Unitek did just that by innovating Dr. Swain’s original design, which has worked so well over the past 70 years. They added clips for self-ligation to create the SmartClip™ Self-Ligating Bracket.



There is no question in my mind after trying many bracket systems over the past 25 years that the SmartClip Bracket’s self-ligation design is unequivocally the best bracket design on the market today.

Like so many self-ligating bracket systems available, creating a passive system has resulted in reduced friction between the wire and bracket interfaces, allowing for a reduction in treatment times, efficient space closure, added patient comfort and overall improvement in treatment efficiencies. This is an evidence-based fact first developed by Dwight Damon.

However, the SmartClip™ Bracket is not just a passive system, but due to its inherent design, it possesses the ability to function as an active system as well.

**This is where the magic begins.** The SmartClip Bracket's unique design creates a true active system, by allowing the placement of two light round wires to fully engage each bracket slot. If the brackets are positioned correctly, fully engaging each bracket will express all 1st and 2nd order tooth movements and limited 3rd order movements.



The other added benefit, unlike many of its top competitor's self-ligating designs, which are narrow, especially in the anterior region, is the bracket's medium width. Because the further away you are from the long axis of a tooth, the greater the moment arm or effective control over tooth movements. Remember Moment ( $M = F \times D$ ). Thus we can use lighter forces i.e. tandem round wires to effect the same time of movement. This leads to excellent rotational and angulation control and significant efficiencies during finishing stages of treatment. Combine the SmartClip bracket's medium size true-twin design with the added benefit of having the actual clip's location lateral to each tie-wing, increasing the bracket width, and you have a system that delivers unprecedented in/out, rotational and angulation control.

*...you have a system that delivers  
unprecedented in/out,  
rotational and angulation control.*

So, the ability to place two round wires in tandem, rather than one large rectangular wire completely filling the slot, or even worse using elastic, a very low force and low friction system is created. That is because the round wires are only touching each other and the walls of each bracket at point contact interfaces, significantly reducing friction. So coupled with the fact you can fully engage each bracket with light tandem, low force round wires in a very low friction environment, astounding treatment efficiencies are enabled.



If each bracket slot can be fully engaged, then the key to treatment success is precise bracket positioning. Unlike other top competitors on the market, the SmartClip bracket is rhomboidal in shape, maintaining Dr. Andrew's original "Straight-wire" design developed in 1970. This rhomboidal shape, paralleling walls of each tie-wing and an open face, rather than a door or clip, increase your ability to precisely place each bracket along the long axis of each tooth. This translates to superior treatment efficiencies and beautiful finishes.

Treating malocclusions without elastics would be like opening a locked door without a key. In order to properly finish an orthodontic case it will require elastics at sometime during treatment, and the best time is the day the braces go on. We have found combining the SmartClip system, with light forces, low friction, tandem round wires fully engaging each bracket slot and early elastics will profoundly reduce treatment times. Placing hooks on strategic brackets is required in order to properly implement the use of elastics. Without them, the staff chair time to place auxiliaries hooks would increase considerably. Rest assured, unlike some of the top competitors, there is a standard size hook on tie-wings from canine to second molar, making the ease of elastic placement effortless for all our patients.

*This translates to superior treatment efficiencies and beautiful finishes.*

And last but not least, from our clinical experience and a practice management standpoint, the two most important attributes of the SmartClip system include the ease of ligation between wire changes, increasing appointment efficiencies and significantly reducing staff chair time. Secondly, using tandem wires, to create an active system, allows us to significantly extend appointment intervals, resulting in fewer patient visits over the course of treatment. The overwhelming benefits in overhead reduction from reduced staff chair time and fewer patient visits by extending appointment intervals will lead to greater profitability, making it almost impossible to sacrifice not using this bracket based solely on cost.

I challenge any practice to compare 3M Unitek's SmartClip self-ligating bracket system side-by-side with one of the top competitors. You and your staff will see that the SmartClip bracket will win hands down every time. I guarantee it!

**James J. Awbrey IV D.M.D., P.C.**  
Diplomate American Board of Orthodontics

SmartClip™ Self-Ligating  
Brackets are now available with

**APC™ Flash-Free**  
Adhesive Coated Appliance System



# Victory Series™ Active Self-Ligating Brackets

**Victory Series™**  
Active Self-Ligating Brackets



**Dr. Jeffrey A. Housley**

Dr. Jeffrey Housley attended Oklahoma State University where he received a degree in Biology. He went on to the University of Oklahoma College of Dentistry, where he received his dental degree and orthodontic specialty training. He has published articles in professional journals relating to anterior crossbite and mandibular expansion. He has also lectured to hygiene and dental students at the University of Oklahoma College of Dentistry. He has a private practice in Owasso, OK.



Self-ligating brackets have been around in orthodontics now for quite some time. Over the first 12 years of my practice, I have had the chance to use several different types of self-ligating brackets. While there are a lot of factors that make a self-ligating bracket perform clinically at a high level, there are a few that we see as the most important on a day-to-day basis. Those factors are: ease of placement during bonding, ease of opening and closing the doors throughout treatment, and ease of removal whether we are taking braces off or repositioning brackets in the middle of treatment.

## Ease of Bracket Placement

We have been using the Victory Series™ Active Self-Ligating Bracket since March of 2014. From the initial bonding, these brackets have been some of the easiest to bond thanks to the APC™ Adhesive Coated Appliance System. Whether from a doctor's or a staff's point of view, this feature makes the bonding appointment flow much more smoothly than having to add adhesive to each bracket individually. The precise amount of adhesive makes for great adaptation of the base to the tooth surface, with minimum cleanup of residual adhesive.

One thing I really like about the packaging of the brackets is that the brackets come with the doors in the "closed" position. This makes it much easier to place the bracket on the tooth and clean the flash from around the edges of the bracket. Our gauge placement is also easily done with the doors closed, as the gauge fits right into the concavity of the bracket door. Also, when bonding the lower arch, it is easy to check the patient's bite without them biting against the open doors. Our patients also like the fact that the brackets are "sealed" in packets and are being opened for the first time just for their teeth.

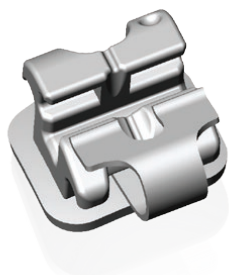




## Ease of Door Opening and Closing

Opening and closing the doors of Victory Series™ Active SL Brackets seems to be pretty easy over the first 12 months. We really haven't had any issues with doors getting stuck.

The bracket design allows for easy positioning of the instrument used to open the bracket door. We haven't noticed any doors getting "loose" either as we have seen with some of the competitive brackets. As patients get further into treatment, we used to notice some doors getting harder to open and close, as calculus can build up around the brackets. So far, this has not been an issue with the Victory Series Active SL Brackets.



“We really haven't had any issues with doors getting stuck.”

## Ease of Debonding

Another advantage that we have noticed is the ease of debonding when repositioning brackets. We use both ligature cutters and debonding pliers to debond the brackets. We place the pliers in an occlusal-gingival position and then rock the plier up and down. This procedure allows for easy debonding without deforming the bracket.

With other self-ligating brackets, we would notice that the door mechanism and/or the bracket pad would get deformed in the process of debonding. This ultimately drives up your cost per case as you would have to utilize a new bracket whenever you were repositioning. With the Victory Series Active SL Brackets, they debond just as easily as our normal twin Victory Series™ Brackets, and we are able to reposition them easily.

Overall, we have been really impressed with the Victory Series Active SL Brackets. As with all of the 3M products that we have used, they are engineered with precision and quality. We are excited to have this technology on hand to utilize in treating our patients. Following are images of a patient we are currently treating with Victory Series Active SL Brackets.

*Case photos provided by Dr. Jeffrey A. Housley.*

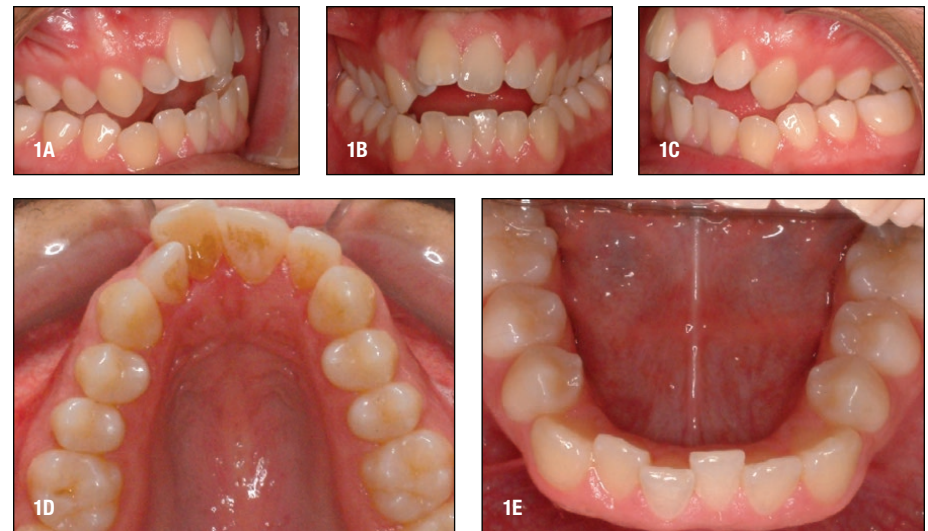


Figure 1A-E: Initial bonding.

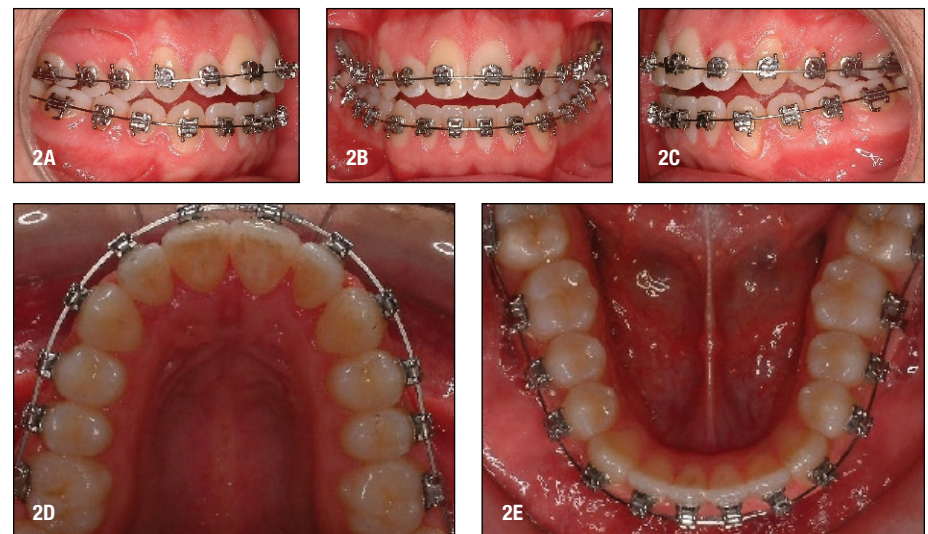


Figure 2A-E: Progress, 5 Months.



## Success with the Unitek™ Gemini SL Self-Ligating Bracket



**Dr. Mario Chorak**

Dr. Chorak is a Seattle native, attending the University of Washington for his undergraduate degree. He graduated with High Distinction from the University of Kentucky College of Dentistry in 1999 and earned his Certificate of Orthodontics and Dentofacial Orthopedics from the Oregon Health Sciences University in 2001. In school, he earned numerous honors and awards including the American and International Awards in Dental Research. He has published articles for the American

Association of Dental Research and the Journal of Clinical Virology. He acquired Fairwood Orthodontics in July of 2001, and in January 2003 opened Mercer Island Orthodontics. He divides his time between the two practices and has served as the secretary, vice president and president of the Washington State Society of Orthodontists.

Self-Ligating bracket systems have been instrumental to the success of my two orthodontic practices. They have allowed me to practice in a way that yields more consistent, predictable, and maximally esthetic results, they are less time consuming for me and my assistants, and are much more cost-effective. I am able to produce beautiful, perfect smiles in less time and with happier patients.

Because I am a believer in self-ligation, I have studied and applied a variety of systems, having even been the President of the Damon Study Club and the 3M Study Club. More recently, I had exclusively used the Damon® Bracket System for the many advantages and superior outcomes it held over its competition. However, I began to notice several inherent flaws in its design that prevented me from achieving the perfect result. Providing feedback to Ormco yielded no improvement. And so the quest to find the optimum self-ligating treatment system continued... until now.

3M Unitek recently released the Unitek™ Gemini SL Bracket, which I believe is quickly proving to be far superior to any other leading systems in the market today. Its design allows many inherent advantages, from the rotational and torque control, to the clinical and chairside advantages and, most importantly, to the fast yet comfortable and maximally aesthetic end result for the patient.



## Benefits of the Unitek™ Gemini SL Bracket Design

Bracket design is what sets the Unitek™ Gemini SL bracket apart from the rest. While it is shaped like a traditional bracket, it performs with all the essential dynamics of a self-ligating bracket. One major benefit is that the design of the Gemini SL bracket features the ideal slot dimension of .027 mm whereas the Damon bracket slots measure at .031 mm. This has a profound influence on the torque expression and allows the doctor to manipulate force without bending the wire. This leads to more consistent, predictable results since it allows the wire and the system to do the work and reduces the independent variable of archwire bends. An additional benefit to the smaller slot depth is that it is much easier for rotations to be corrected and for the assistants to engage the wire. Further, it allows a vastly more comfortable application for the patient since smaller, less forceful wires are used.



**Figure 1:** Note the ideal alignment and torque expression after 9 months of treatment with Unitek™ Gemini.



**Figure 2:** Note the rotation and improper torque with finishing wire using Damon® Brackets.

The other clinical advantages lie in the fact that the bracket width is properly designed for the different sizes of teeth. This means that the Unitek Gemini SL bracket is tooth size specific. This gives the bracket the ideal width for correcting rotations and creating the perfect in/out dimensions required to have the occlusion fit properly. This also allows the teeth to remain aligned and not have to be ligated together like other self-ligating systems, in order to keep them in their ideal position. Because the base of the bracket is the ideal width for each specific tooth and is also flat at the occlusal, it helps the doctor visualize the long axis of the root, thus contributing to ideal bracket placement.



**Figure 3A-B:** Note the multiple rotations and differing torques.



**Figure 4A-B:** Four months of alignment with Unitek™ Gemini SL Brackets.

The base of the bracket is of ideal size mesial-distally to fit on the ideal position of the tooth. Additionally, the flat occlusal base and the tie wings provide visual references needed by the doctor to place the bracket in the ideal position. Other leading systems, such as the Damon Bracket System, tout very small, uniformly-sized brackets, which on the surface seem to be quite an aesthetic plus. Upon application, however, they do not provide enough torque and width to adequately align the teeth, consequently requiring mid-treatment re-bonding appointments and significant wire bends for most patients. These, in turn, decrease productivity considerably in terms of clinic time, schedule flow, cost efficiency, and patient time and comfort. 3M has heeded orthodontists' feedback to address these major concerns with their design of the Unitek Gemini SL bracket system.

## Patient Comfort

The Unitek™ Gemini SL bracket system, like many other self-ligating brackets, is even more merciful to the patient as it is still much smaller than the traditional bracket and is more flush with the tooth, leading to less irritation inside a patient's mouth. My patients have been very enthusiastic about how the Gemini bracket system looks and have reported very little discomfort due to irritation.

## Bracket Placement

As with any self-ligation system, bracket placement is the key to the ideal result and is the most important independent variable. When the brackets are placed properly, thus efficiently manipulating force and torque, minimal bends in the finishing wires need to be placed. The orthodontic cases where the brackets are properly placed turn out the best, both in a productivity sense as well as an esthetic sense. With its design, the Gemini Bracket system makes this process easy.



**Figure 5:** Inadequate torque control with Damon® Brackets.



**Figure 6:** Complete torque control with Unitek™ Gemini SL Brackets.

## Easy to Ligate when Necessary

The Unitek Gemini SL bracket system is designed in such a way that provides efficiencies for the chairside assistant while enhancing comfort for the patient. Unitek Gemini bracket doors open to the occlusal on both the upper and lower arches, which prevents harm to the patient should the instrument slip. Further, the brackets open with ease and do not require an extra instrument. In our office, we use a ligature director with an explorer end to open the ligating mechanism. The tie wings of the Unitek Gemini SL brackets are large enough for a ligation wire, and can also accept a power chain if needed.

Another advantage of Unitek Gemini SL brackets is that they have soldered hooks. This eliminates drop-in hooks which saves time for the patient and assistant. And, because they are soldered onto the bracket, these hooks do not come out or break, eliminating time-consuming emergency appointments. The fixed hooks also eradicate bite correction delays due to lost or broken hooks. There are simply fewer emergency appointments and treatment setbacks such as the increased possibility of over-rotation and displacement of teeth and delays in bite corrections.

## Fewer and Faster Appointments

The Unitek Gemini SL Bracket system allows for enhanced patient compliance, hygiene, comfort, and time. Unlike other leading self-ligating systems, the Unitek Gemini SL bracket system works best if wires are engaged for 8-10 weeks at a time. This significantly reduces the number of appointments required for a patient to attend while significantly increasing efficiency of the practice... a win for everybody! This protocol has proven effective in my office as the tooth movement has been remarkably fast and predictable. With other systems I have used, patients needed to be seen approximately every six weeks and often, tooth movement was unremarkable. However, with the Unitek Gemini system, notable changes were observed within the first six weeks.

Once patients were seen at 8-10 week intervals, the alignment and rotational correction that occurred were dramatic. This is not only a featured benefit of self-ligation in general but 3M has taken it to the next level with its introduction of the Unitek Gemini SL bracket system.

Another highlight is that the adjustment appointments are much easier on patients and take only approximately 15 minutes – a full 30 minutes less than appointments using traditional braces, and at least 10 minutes faster than using Damon brackets. Further, colored ties are not placed until the front incisors are aligned, usually occurring by the second appointment due to the absence of friction. By explaining that colors are an incentive for keeping the teeth clean and gums healthy, patients are more apt to comply with hygiene proficiency in order to be rewarded. Then, we place them only on the upper 3-3 so that they are virtually only for aesthetics while the remainder of the dentition moves into alignment.

The most important patient benefit is that with this system I have seen treatment times reduced by 3-6 months and the overall average number of visits decrease by five. This in and of itself make the Orthodontist a hero in the books of a wide range of patients. The Clinical efficiency and advantages of the Gemini SL bracket system over other systems are vast while maintaining the patient satisfaction and comfort of self-ligation in general.



## Transitioning to Unitek™ Gemini SL Brackets

For those already using self-ligation, transitioning to the Unitek™ Gemini SL bracket system should be seamless and easy. Because I have been using self-ligation in my office for over eight years and have developed a process that works well, I was initially hesitant to change. However, the Unitek Gemini SL bracket system has enhanced my self-ligation protocol without any significant alterations. I continue to use open coils on light Nitinol wires and I still initially utilize light elastics. And, I remain a firm believer in disarticulating the occlusion to stimulate the self-ligation process and allow for unencumbered initial leveling and alignment.

One clear and major advantage that the Unitek Gemini SL system offers is that it has just two prescriptions for variable torques, which is needed to practice self-ligation to the optimal extent. I use the MBT™ Appliance System prescription for all Class II correction and Deep Overbites with retroclined upper and lower incisors. If cases need to be extracted for bi-maxillary protrusion, I use the MBT system prescription and invert the lower incisors to prevent them from becoming retroclined.

On most Class I crowded cases, I use the Roth prescription because it allows for ideal torque on the incisors. Class III cases also benefit most from the Roth prescription but require inverting the upper incisors to counteract the effect of the Class III elastics. The Unitek Gemini SL bracket system has perfected the torque capabilities and has allowed me to continue using effective prescriptions without the excessive inventory and confusion that is seen with other companies with more options.

## Conclusion

Self-ligation, *when done correctly and with due diligence*, is proving to be the utmost efficient way to treat, although not without a price. Most self-ligating bracket systems are pricier than traditional braces. Nonetheless, because it allows for less chair time and fewer appointments for the patient, the profitability of the brackets outweighs the initial cost. Having used Damon brackets, I had opted to pay a premium amount for each bracket because I knew that the treatment turned out better than any other system at the time.

When I was asked to try the Unitek Gemini SL bracket system and be an evaluator for the company, I was thrilled with the opportunity to try a bracket that not only addressed nearly all of the design concerns I had with other brackets but also came at a price that was substantially less expensive than what I was previously paying. Imagine my delight when I could get *better results* with *less cost* to my practice.

After using a wide variety of self-ligating systems in my office for the past eight years, I have been able to narrow down what works and what doesn't. I can also say, without a doubt, that self-ligation is here to stay having proven its significant advantages over traditional braces clinically and aesthetically. The Unitek Gemini SL bracket system has earned its honor as the new leader in self-ligation.



Figure 7: Class I Crowding Case pre-treatment.



Figure 8: Nine months into treatment with Unitek™ Gemini SL Brackets.



Figure 9A-B: Class I Crowding pretreatment.



Figure 10A-B: Nine months into treatment.



Case photos provided by Dr. Mario Chorak.



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## 3M™ True Definition Scanner wins Edison Award



Prestigious awards honor outstanding product innovation

Professionals who use the 3M™ True Definition Scanner already know it has game-changing capabilities for a practice. Now, the breakthrough digital scanning device has been recognized by the larger community of inventors. The system was honored with an Edison Award at a ceremony held April 23 in New York City.

The Edison Awards—named for Thomas Alva Edison, whose inventions earned 1,093 U.S. patents—honor excellence in new product and service development, marketing, human-centered design and innovation. Award winners represent “game changing” products and services with innovation centered around four criteria: Concept, Value, Delivery and Impact.

## 3M Unitek – Active in the Community

by 3M Unitek Staff

3M Unitek has had a longstanding tradition of being active in the community. Annually, the company located in Monrovia, CA, dedicates a portion of its budget to support local organizations such as Boys & Girls Club, Habitat for Humanity and Foothill Unity Center to name a few.

3M Unitek is a subsidiary of 3M Corporation headquartered in St. Paul, MN. The 3M Foundation partners with locations across the United States to support areas of investment that are engaging and inspiring programming or curriculum focused on STEM (Science, Technology, Engineering, Math) or business literacy. The 3Mgives programs also



support post-secondary programs that attract, retain and graduate students in higher education. 3Mgives also encourages locations to support organizations that seek to make a lasting positive impact on the Earth and promote science-based environmental education.

3M Unitek engages its employees annually to participate in a variety of projects where donations are collected and/or employees volunteer their time to help those in need. One particular area that 3M Unitek is proud to share their involvement is in their partnership with Boys and Girls Club of the Foothills. 3M Unitek has supported Boys & Girls Club of the Foothills with an annual grant for several years, issuing funds for their sewing club, Project Learn, SMART Girls and Passport to Manhood programs. 3M Unitek employees also contribute on an individual basis through employee donations and by volunteering with their Time to Read program. This year, 3M Unitek approached the national 3M Foundation to secure a grant for renovations at the Mary Wilcox Youth Center for the teen program. 3M Unitek was honored with the Community Partner of the Year Award at a recent ceremony.

“3M Unitek is honored to be recognized for the strong partnership that we have with the Boys & Girls Club of the Foothills,” said Juli Cote, Business HR Manager. “We have been privileged to see the team at BGCF do wonderful things in the lives of our community’s youth. The initiatives we have been fortunate to support are so vital in enriching the lives of our youth, which in turn strengthen the future of the community. We are grateful to have the opportunity to partner with John Wilson and his team, who make it all look easy even when we know it’s not.”

Boys & Girls Club of the Foothills opened its doors in 1994 in response to high numbers of problem youth in the densely populated, multi-ethnic areas of Monrovia and Duarte in Los Angeles County. Their mission is to enable young people to reach their full potential as productive, caring, and responsible citizens.



3M Unitek also partners annually with the organization, Foothill Unity Center, to provide school supplies to fill backpacks for children whose families are unable to provide them. The entire 3M Unitek employee base pitches in to provide supplies and/or volunteer to help the kids get their much needed wares in anticipation of school starting.

Employees also enjoy donating their sweat equity by assisting the local Habitat for Humanity chapter in refurbishing or building homes for veterans or those who are less fortunate.

At 3M, we have a longstanding tradition of corporate and employee involvement that touches students, teachers, communities, and natural resources around the world. 3M and the 3M Foundation donate cash and products to boost the quality of life in our communities. Employees and retirees participate in 80 percent of 3M giving through matching programs and service on advisory committees, nonprofit boards, and community projects. Thousands of employee and retiree volunteers have made award winning and lasting impacts in our communities that shape our giving strategies.

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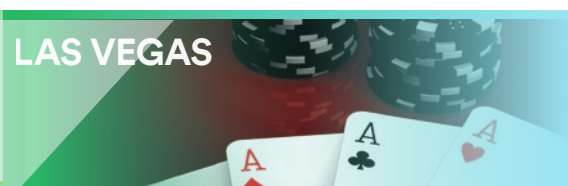
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## Build Your Future on Aesthetics





# Clinical Cases



# Clinical Function of the Cantilever in the Straight-Wire Mechanics

## MBT™ Appliance System with SmartClip™ and Clarity™ SL Self-Ligating Brackets

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**Dr. Martín J. Navarro García**

Orthodontist, private practice, Malaga, Spain.



**Dr. Encarna de Fernando Caballero**

Associate Professor of Orthodontics, University Complutense,  
Madrid, Spain.

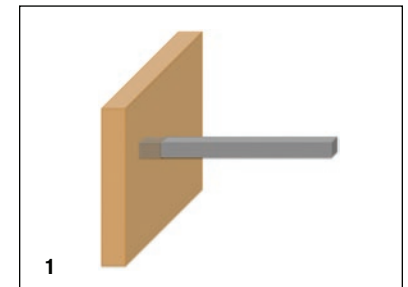
### Abstract

The orthodontic function of the cantilever system, mainly to correct impacted teeth (primarily canines), is explained. Also, its use in moving impacted molars is examined, both with first molars in the mixed-dentition phase and with second and third molars in the permanent phase. Attention is given to its use with temporary anchorage devices (TADs).

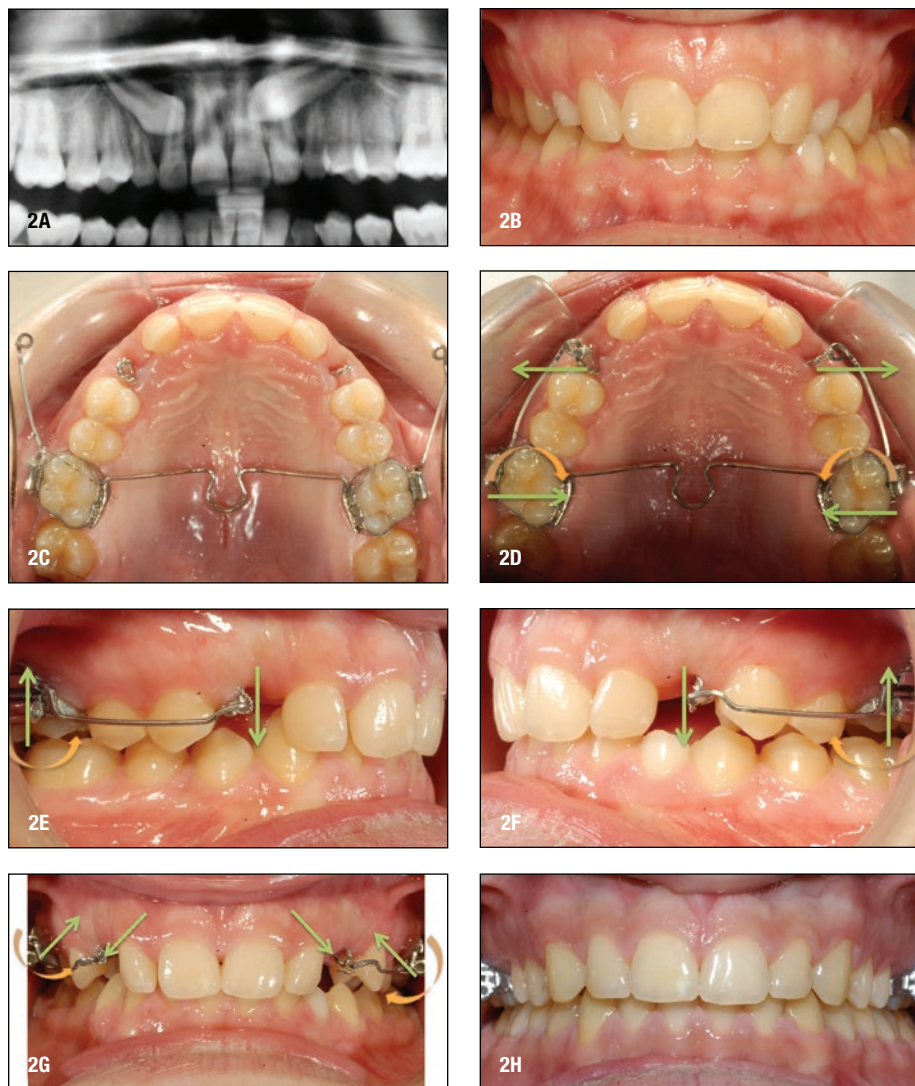
Clinical cases are cited to explain the biomechanics of the cantilever, identifying the best type of wire to be used as a .019"×.025" B-titanium when using a .022"×.028" slot. The advantages of this system are specified, as are its anchoring requirements. Finally, the precautions are discussed for some cases with complex biomechanical requirements, where the cantilever is not the most suitable system and where another type of force system would be recommended.

### Definition

In orthodontics, the cantilever (Figure 1) is simply a finger spring such as that used in a removable orthodontic plate, where it is commonly used with one of its ends embedded in resin. When it forms as a part of a fixed orthodontic appliance, one end is inserted into a bracket or molar tube in such a way that the free end can be tied at a given point, whether passively or under a certain force. As a means of preventing rotation inside the bracket or molar tube, the wire must be rectangular in section.



**Figure 1:** A cantilever can be defined as a beam or a similar structure that, fixed on one end, projects beyond its support.



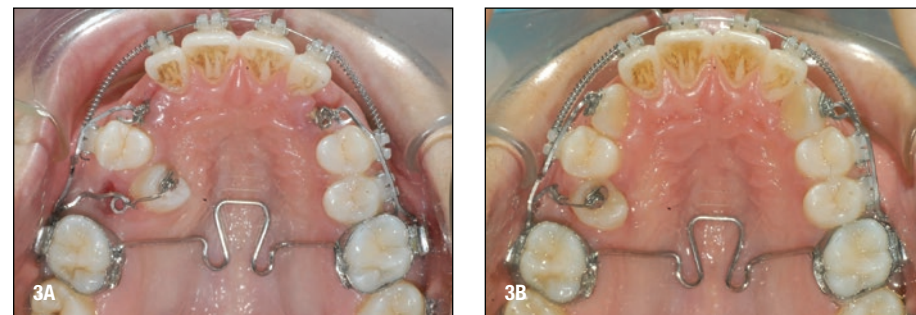
**Figure 2A-H:** The most characteristic use of the cantilever in orthodontics is for the moving of palatally impacted maxillary canines (A and B). In this patient, 14 and a half years old, two segments of  $\beta$ -titanium arch measuring .019" x .025" were used. The photographs show the force system exerted on each side, the free end being attached to the anchorage of each canine and being displaced from the passive configuration (C) to the active one (D); an extrusion and vestibulization force is applied to the canine, as can be appreciated on each plane of the space (D-G); at the same time a reaction force occurs in the molar tube, tending to cause intrusion and lingualization (D-G); finally, a couple exerts a moment that tends towards mesiolingual rotation, mesial tilt, and lingual inclination of the first molar (D-G). Also, the final position of the maxillary canines is shown (H).

## Biomechanics of the Cantilever

For the desired function and optimal results, a solid understanding is needed of cantilever mechanics, which, although simple, is highly effective. With one end of the cantilever inserted into a molar tube and anchored on the other end at a given point of a tooth crown, we can apply one couple and a force on the tube into which the spring has been inserted, while with the anchored end we apply only one force. Therefore, biomechanically, it belongs to the one-couple orthodontic appliance systems (Figure 2A-H).

The mechanics of the cantilever should be appropriate, in accordance with the direction of the tooth movement desired. Also, the amount of force applied should be optimal to promote the intended tooth movement and also to control the anchor pieces, which serve as support but which we do not wish to move.

The cantilever, biomechanically, can be considered to be quite a simple system of applying orthodontic forces (Figure 3A-B). It is a device with a long distance between its two fixed points (insertion and anchoring), which therefore provides a low load/deflexion relation and a large range of action. It can develop relatively constant forces and moments that gradually displace teeth towards the desired positions. As mentioned, a couple is exerted on the inserted piece while equal forces are applied in opposite directions both at the inserted end as well as at the anchored end.<sup>1</sup> Extending between only two points, one being an insertion point and the other an anchor, both the forces as well as the moments can be easily discerned by the clinician. Because this is a system of clearly defined forces, both in action as well as reaction, we say that this is a statically determinate force system.<sup>2</sup>



**Figure 3A-B:** With double-tube bands and sufficient anchorage, it is possible to use even two cantilevers per side simultaneously, as in this patient of 27 years of age who presented impaction of the two maxillary canines and ectopic position of the upper-right second premolar.



## Type of Wire

Although stainless steel was used in the past, the type of wire most suitable for the cantilever system is  $\beta$ -titanium (80% titanium, 11.5% molybdenum, 6% zirconium and 4.5% tin)<sup>3</sup>, measuring .019"×.025" thick with a slot size of .022" (Figure 4A-D). For orthodontic purposes,  $\beta$ -titanium was introduced in 1979 by Goldberg and Burstone<sup>4</sup>, after achieving an alloy having a force during the disactivation period of 1/3 that of stainless steel and double that of nickel-titanium, which admitted soldering and presented good formability. However, its surface was rough and presented a high kinetic coefficient of friction (0.029), which limited its usefulness in sliding mechanics. Recently, its manufacturing process has improved (Beta III titanium™)<sup>5</sup>, its main characteristics being medium-low rigidity (Young modulus being less than half that of stainless steel), high maximum elastic deflexion (YS/E) in relation to the production of more constant forces during deactivation, and good formability (the final tensile strength before fracture is high).<sup>6</sup>



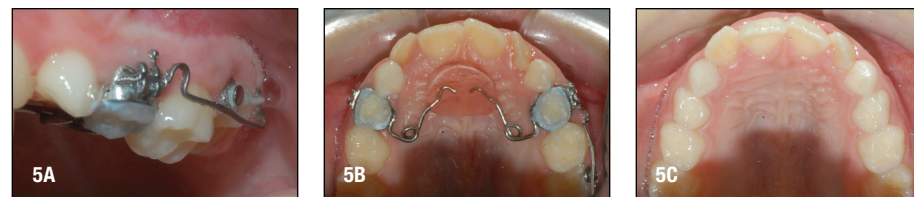
**Figure 4A-D:** With the .019"×.025" rectangular  $\beta$ -titanium wire of the cantilever, characterized by its good formability, inserted into the .022"×.028" molar tube slot in which it cannot rotate, two types of deformations were made: one of "convenience", to avoid rubbing against other teeth or with the base arch, which might even cause sores in the soft tissues, and another of "activation", according to the direction and intensity of the force that must be applied. In this way, when it is ligated to the canine, it should appear passive.

## Advantages of Cantilever Mechanics

The main advantages of the cantilever are that its biomechanics is simple and the resulting tooth movements are easily predictable because the moments and forces exerted are easy to deduce and measure. Another advantage is that when this system is used, a relatively low load/deflexion relation develops, constant and continuous forces are produced, and therefore frequent reactivation becomes unnecessary. Furthermore, undesirable effects on the tooth to be displaced are uncommon. Nevertheless, unwanted reactions can arise in the anchor unit, which should be minimized as much as possible by distributing the stress uniformly throughout the periodontal ligament of the roots of the anchor teeth. The aim is to optimize the potential of the anchoring unit by reducing the rate of the catabolic remodeling of bone in the anchorage pieces and therefore the rate of the tooth movement in that unit.

## Anchorage Reinforcement

The anchoring unit is usually a first upper or lower molar, although it could even be a first temporal molar (Figure 5A-C). However, anchorage is usually reinforced by its connection to another tooth or other teeth by means of a transpalatal arch, a lingual arch, a Nance button with mucous attachment in the palatal rugae, or a Haas or Hyrax expander anchored over four teeth. In some cases, the anchorage may be reinforced by interarch mechanisms, such as intermaxillary elastic bands or with an extraoral appliance.



**Figure 5A-C:** Distal movement of an impacted first upper-left permanent molar with a cantilever in a girl 7 years and 3 months of age. As an anchoring system, a Nance button, connected to the first upper deciduous molars and with mucosal support, was used.



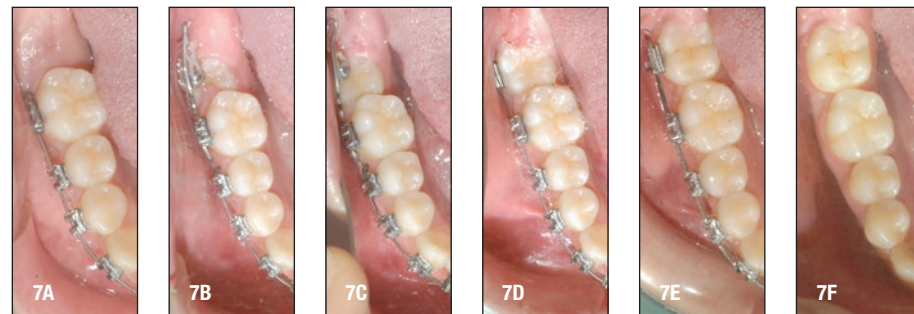
The use of temporary anchorage devices (TADs) in the clinic daily has made it possible in certain instances to achieve absolute anchorage when cantilever devices are used. There are miniscrews with heads bearing bracket slots into which a rectangular .019"×.025" wire can be inserted (Figure 6A). This absolute anchorage also permits the use of a reverse cantilever—that is, the end of the rectangular wire is inserted into the tooth that we wish to move, while the other end is connected to the anchoring unit, composed in this case of a TAD (Figure 6B). Only one force would be used, while the couple exerted at the end inserted into the bracket slot would serve to avoid the rotation of the rectangular wire of the cantilever, which usually includes a closing loop in this case.



**Figure 6A-B:** Examples of cantilever used from TADs. In the first case (A), the head of a miniscrew was used as the point of insertion, while in the second case (B), the cantilever was inserted into a bracket, while the miniscrew was used as an anchor to activate the spring incorporated in this cantilever system.

## Applications of the Cantilever

The cantilever constitutes a mechanical aid to be used in straight-wire systems for displacing ectopic or impacted teeth towards their correct position in the dental arch and also to straighten inclined or impacted molars.<sup>7</sup> Also, this same force system can be used in the form of an auxiliary arch during the leveling of the dental arches<sup>8</sup> or to correct a tilt towards one side of the occlusal plane of an arch or a deviated dental midline. The main causes of impaction of the second and third lower molars are the ectopic position or obstacles in the eruption pattern, as well as failures in the eruption mechanism or primary failure of eruption. The most common complications include caries in the preceding tooth, local periodontitis, and cyst formation. Multiple techniques have been suggested for impacted mandibular molars that are not related to primary failure of eruption. Figure 7A-F shows the efficacy of the cantilever system in moving an impacted lower second molar during orthodontic treatment.

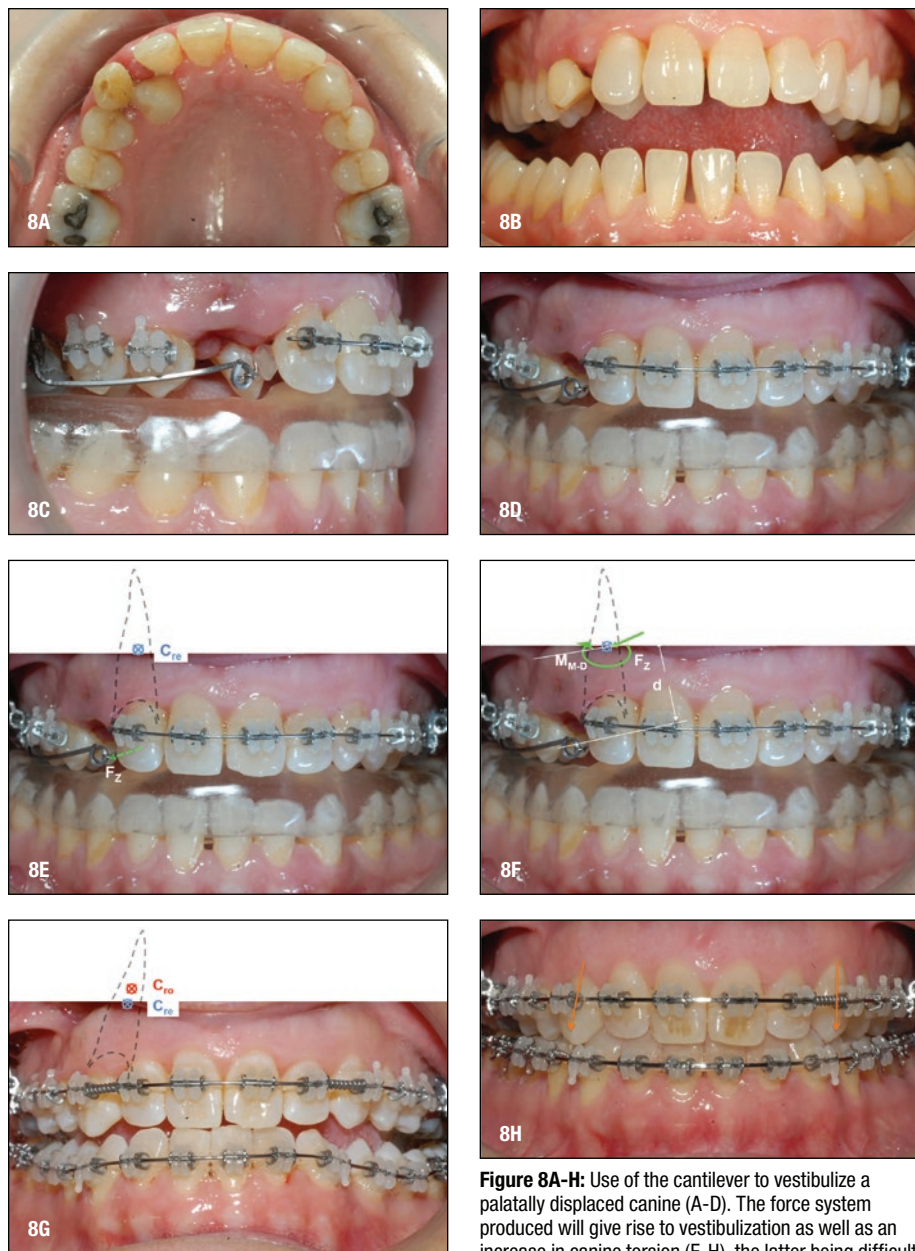


**Figure 7A-F:** Straightening of an impacted molar with a cantilever inserted into the tube of the first molar, which extends distally from the impacted second molar. The distal tilt of the crown of the second molar is activated by the tying of the free end of the wire to a button cemented on the crown, whether with a long metal tie or with an elastic chain.

## Precautions in Cantilever Use

The cantilever system offers excellent performance in clinical situations described to date. Specifically, in the theoretically more difficult case of palatally impacted canines, if we use a technique of closed traction (lifting a palatal flap and slight osteotomy, cementing of the anchor in the canine, and finally the closing of the flap), the canine will appear in the alveolar area without major tilting problems. Most probably, the canine will appear rotated, but the position of its root will not vary markedly from the normal buccolingual inclination. No problems should arise during the final treatment if the brackets have previously been properly repositioned. However, problems arise when the maxillary canine is palatally ectopic and, rather than being impacted, has a completely erupted crown (Figure 8A-H), frequently even lingual to the temporary canine, which has not yet exfoliated and can even have its root almost intact. The use of the cantilever system in these cases can give rise to problems of buccolingual inclination that prove very difficult to correct during the final stage of treatment. In these cases, as with the crown, the apex of the ectopic canine has also usually shifted from the position that it should occupy towards a more central position of the palate. This should be taken into account in order to use a force system appropriate to correct such a position.

The use of a cantilever to vestibulize a canine that erupted on the palatal side (Figure 8A-D) applies a force on the canine crown only in the linguo-vestibular direction ( $F_z$ ). To analyse the action of this force, we can replace it (Figure 8E) with an equivalent force and couple (Figure 8F), both applied in the centre of resistance ( $C_{re}$ ) of the canine root. The force ( $F_z$ ) will



**Figure 8A-H:** Use of the cantilever to vestibulize a palatally displaced canine (A-D). The force system produced will give rise to vestibulization as well as an increase in canine torsion (E-H), the latter being difficult to correct in the final phases of treatment.

cause the vestibulization of the canine. However, the moment produced by the couple around the mesiodistal axis ( $M_{m-d}$ ), the intensity of which is equal to  $F_z$  multiplied by the distance ( $d$ ) from the point of the crown to which the traction is attached and the centre of resistance ( $C_{ce}$ ) of the canine, will provoke excessive torque of the canine (Figure 8F). In its displacement towards the vestibule, the canine turns around a centre of rotation ( $C_{ro}$ ) situated slightly towards the apex from the  $C_{ce}$ . Once the crown is aligned with the other teeth of the arch, it becomes more difficult to correct the excess torque despite the fact that the bracket slots are filled with a steel arch of .021"×.025" and that the bracket of the canine is changed to one of the second lower premolars (Figure 8G), which in theory can provide up to 17° of buccal root torque. Therefore, in the cases in which the ectopic tooth shows inappropriate torque that is difficult to correct, it is best to use a different force system (a two-couple orthodontic appliance system).<sup>9</sup>

Case photos provided by Dr. Martín J. Navarro García and Dr. Encarna de Fernando Caballero.

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## Vertical Control Assisted with TADs: A Case Report

CLARITY™ | ADVANCED  
advanced ceramic brackets



**Dr. Laura López Ruiz**

3rd year student at Universidad de Murcia.



**Dr. María Dolores Campoy**

Orthodontic practice at Murcia.



**Dr. Pedro Álvarez-Gómez**

Orthodontic practice at Murcia and Cartagena.

### Appliances

Straight Wire (Clarity™ ADVANCED Ceramic Brackets)

### Diagnosis

- Left mandibular deviation
- Increased lower facial height
- 3 mm gap at rest
- 1 mm superior facial midline deviation
- Convex profile

### Smile analysis

- Asymmetric smile
- Low incisor exposure
- 5 + 5 amplitude
- Not harmonic to lower lip



Figure 1A-F





Figure 2A-E

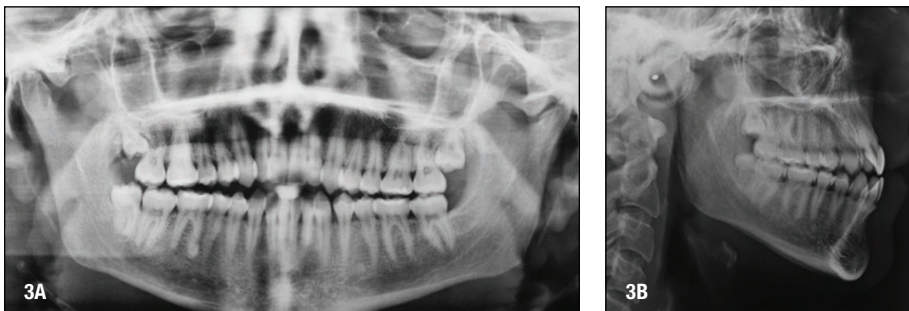


Figure 3A-B

### Intraoral inspection

- Molar Class III right subdivision
- Cuspid Class III right subdivision
- 0 mm overjet
- 1.5 mm anterior open bite
- Cross bite 13, 14
- 2 mm deviation of the lower mid line regarding the upper

### Functional inspection

- When mouth is open, dental mid lines are aligned
- Asymptomatic TMJ

### Panoramic X-rays

- Complete dentition
- 18 and 28 blocked
- 48 semi blocked
- Non restorations, cavities or radicular resorption
- Appropriate bone level

### Lateral X-rays

- Vertical growth pattern (29.1° Ricketts mandibular plane and 51.1° lower face height)
- Skeletal Class I (2.3 ANB)
- Upper incisor in norm (111° to palatal plane)
- Lower incisor in norm (91.2° IMPA)
- Upper and lower retruded lips

## Model analysis

- Light crowding in the upper and lower arch -3.8 and -0.6
- Bolton at bicuspid level, lowers are 4.1 mm larger than they should be

## Diagnostic brief

- Good perio health
- 1.5 mm anterior open bite
- Molar Class III right subdivision
- Light crowding
- Skeletal Class I and light vertical pattern

## Treatment objectives

- Close the bite and get right function and occlusion
- Leveling and aligning
- Smile aesthetics
- Stability
- Patient satisfaction

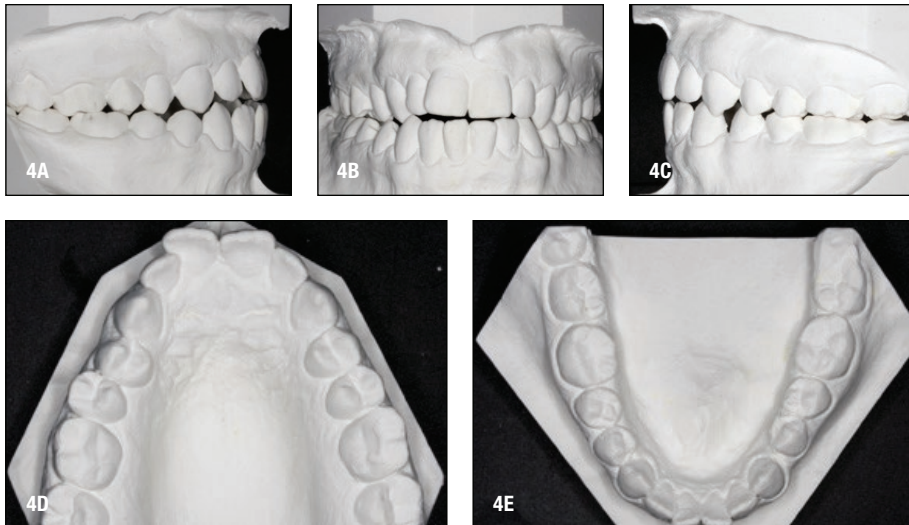


Figure 4A-E

## Treatment options

1. After explaining to the patient the causes of her condition, a surgical plan was suggested, but the patient rejected this plan.
2. Bicuspid extraction was also discarded due to the risk of increasing the naso-labial angle and flattening the profile. However, extractions remain as an option in case good vertical control is not achieved.
3. We decided to make orthodontic treatment assisted with TADs in the upper arch in order to get effective vertical control of the molars and close the bite. The patient is advised that long-term stability can be compromised.

## Treatment plan

Four TADs were placed in the upper arch in order to:

- Have torque control in the posterior segment
- Anchorage
- Close the bite by anterior extrusion and posterior intrusion. Four TADs were placed, two on the vestibular side between first and second molar and two on the palatal side between the second bicuspid and the first molar.
- Class III and open bite correction were achieved with the use of intermaxillary elastics
- Bolton discrepancy was fixed with lower IPR
- The patient demanded to be treated with aesthetic appliances, and therefore, Clarity™ ADVANCED Brackets were selected.



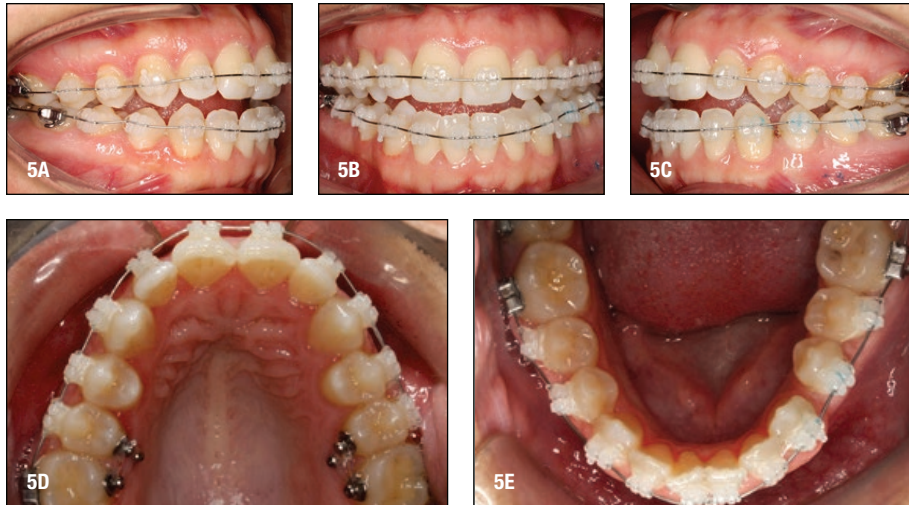


Figure 5A-E

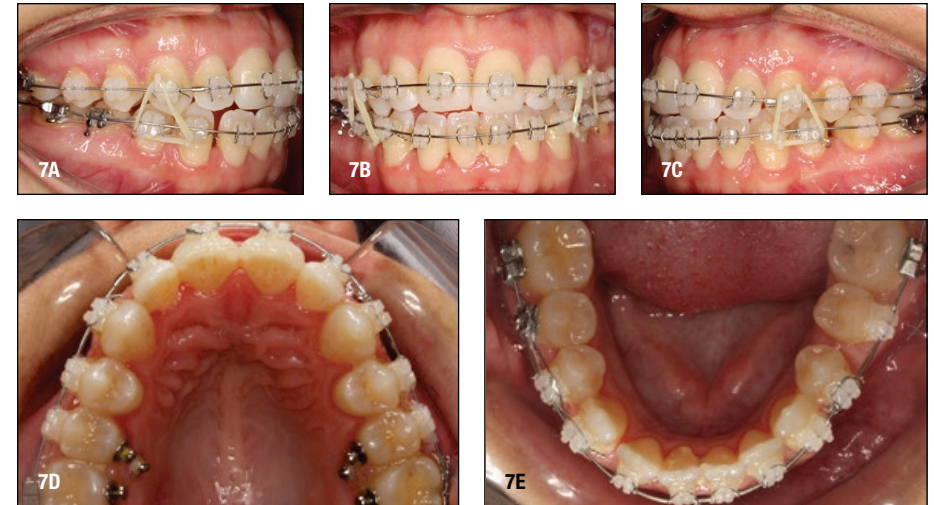


Figure 7A-E



Figure 6A-E

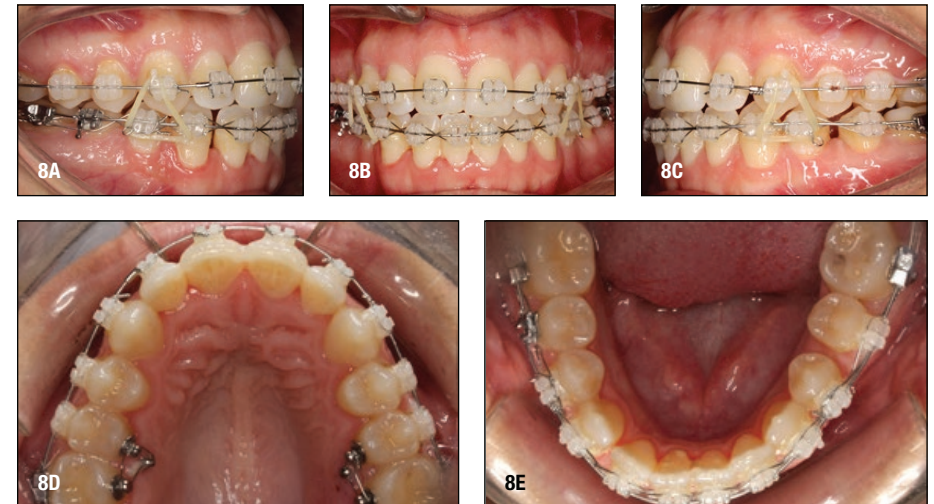


Figure 8A-E



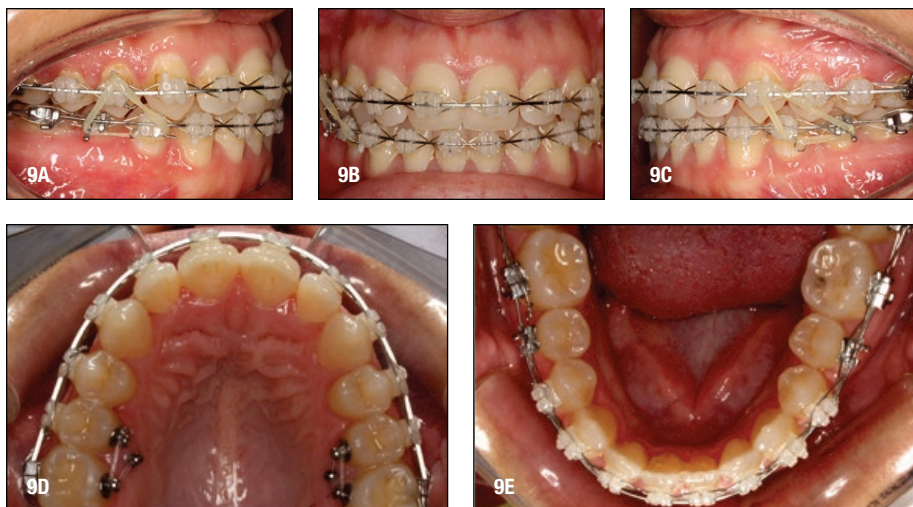


Figure 9A-E

## Treatment progress

– Upper braces were bonded including second molars in order to get control over posterior fulcrum. In the same appointment, vestibular and palatal TADs were placed and activated from the beginning with elastic thread in order to avoid molar extrusion and even intrude the posterior segment. For the activation, two lingual buttons were placed on the second bicuspid and first molar. Independently, the vestibular TADs were activated with metal ligature.

Wire sequences for upper and lower arches were different: for the upper arch, the sequence was over expanded .014 CuNiTi, .016, over expanded CuNiTi, .017 X .025 NiTi in the square form and .019 X .025 NiTi in the square form.

For the lower arch, the sequence was .014 NiTi, .016 NiTi in the ovoid shape and a .018 SS with bends.

After four months of treatment, anterior seating elastics were used (3-3, 4). In the lower arch, diastemas were closed using metal ligature.

After 10 months of treatment, vestibular TADs were removed due to mobility. At that time, the overbite was good, however, the palatal TADs remained activated in order to avoid relapse.

Once diastemas were closed, metal ligatures were placed in order to keep the spaces closed and seating elastics were used, on the right one (14-44,45) and the left with a Class II component (23-34, 35).

At 14 months of treatment, we did some IPR in the distal of the 23 and distal of the 42 in order to align the upper and lower midlines.

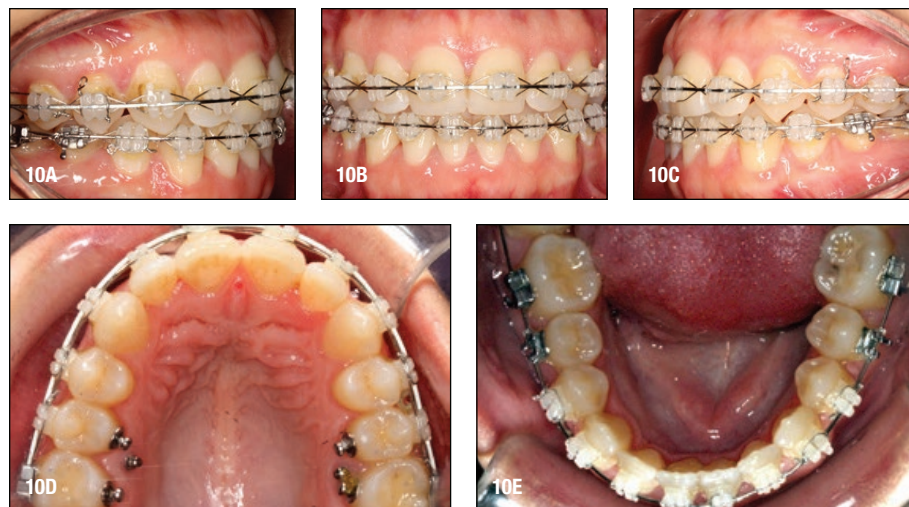


Figure 10A-E

## Final results

At the end of treatment, we achieved correct overjet (1.5 mm) and overbite (2.0 mm). Molar and cuspid Class I in both sides and centered mid lines. In the X-rays we can observe a light retroclination of the lower incisors, but they are within the norm.

Even when our objective with the TADs was to get vertical control and to avoid an increase in open bite, the cephalometric tracings show a significant intrusion of the upper molars that contributes to an anterior mandibular rotation (1.5° decrease in lower facial height), improving the soft tissue profile.

Also, in the smile analysis, we observed harmony between the upper incisors and the lower lip; the patient is satisfied with the outcome.

Regarding the long-term stability, we believe that the upper molars intrusion will contribute to keep the result. However, it will be necessary to follow up and re-evaluate to confirm the result.



Figure 11A-F



Figure 12A-E



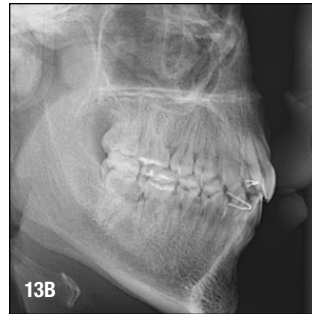


Figure 13A-B

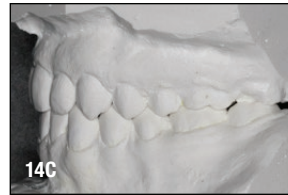
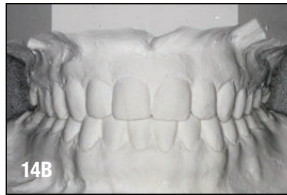
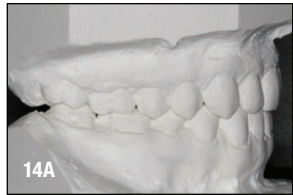


Figure 14A-E

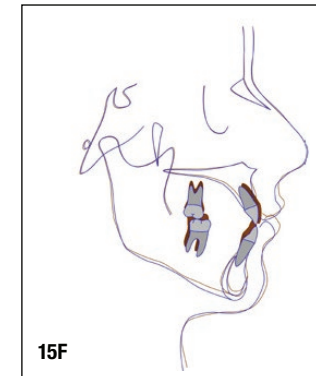
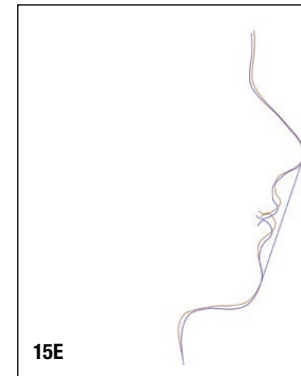
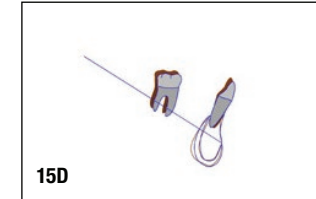
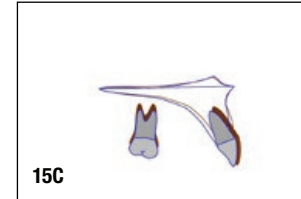
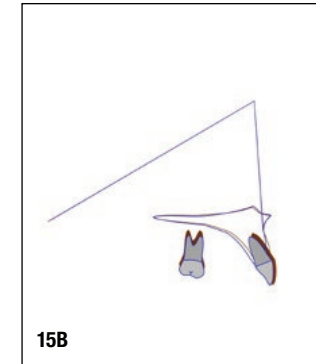
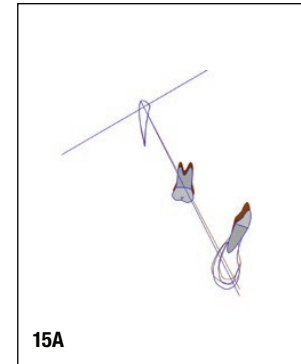


Figure 15A-F





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UNITED STATES  
2724 South Peck Road  
Monrovia, CA 91016 USA  
U.S. and Puerto Rico Phone:  
1-800-423-4588 • 626-574-4000  
[www.3MUnitek.com](http://www.3MUnitek.com)

CANADA  
Health Care Division  
300 Tartan Dr.  
London, ON N5V 4M9 Canada  
Phone: 800-443-1661  
[www.3MUnitek.com](http://www.3MUnitek.com)

AUSTRALIA & NEW ZEALAND  
A Division of 3M Australia Pty Limited  
and 3M New Zealand Limited

Building A, 1 Rivett Road, North Ryde  
NSW 2113 Australia  
ABN 90 000 100 096  
Phone: 1300 363 484  
[www.3MUnitek.com.au](http://www.3MUnitek.com.au)

94 Apollo Drive, Rosedale  
Auckland 0632 New Zealand  
Phone: 0800 441 622  
[www.incognitobraces.com.au](http://www.incognitobraces.com.au)