Victory Series™
Superior Fit Buccal Tubes

Improving Orthodontic Treatment with Victory Series™ Superior Fit Buccal Tubes

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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.

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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.

*3M Unitek version of this prescription. No endorsement by the Doctor is implied.

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-gingival 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.

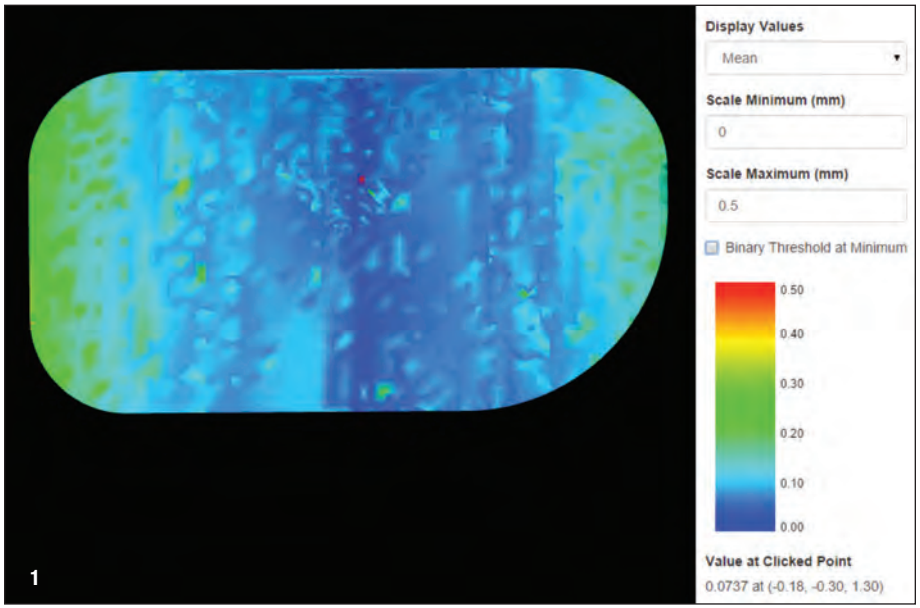

Figure 1: Heat map comparing the Victory Series™ Superior Fit Buccal Tube 1st Molar Base with representative tooth surface.

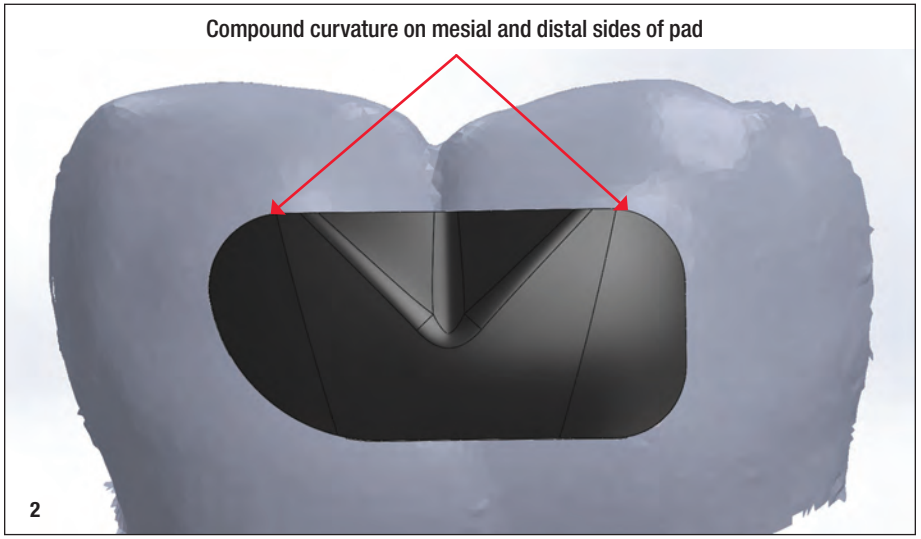

Figure 2: Victory Series™ Superior Fit Buccal Tube 1st molar base with compound curvature.

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.

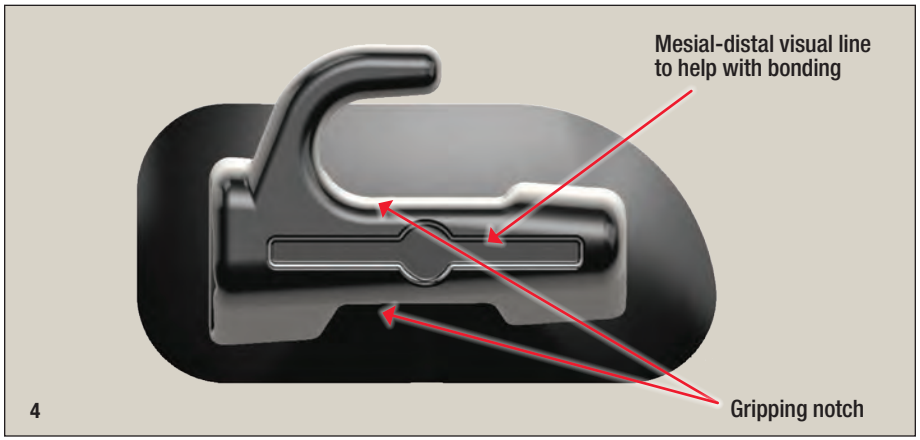

Figure 4: Buccal view of the lower 1st molar Victory Series™ Superior Fit Buccal Tube.

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.

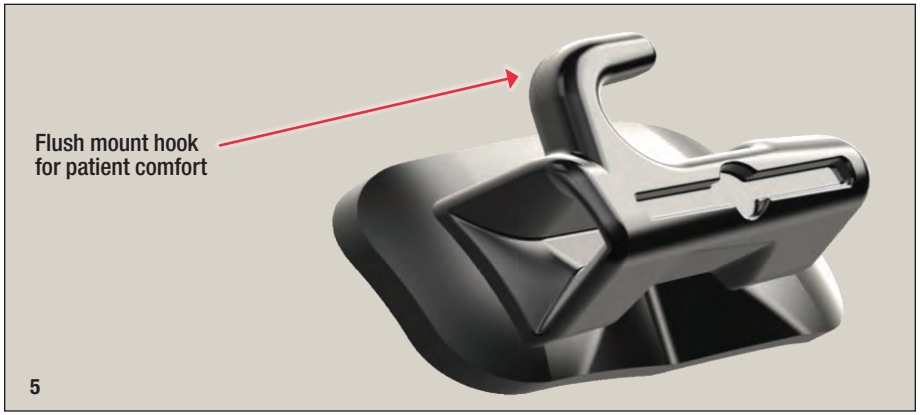

Figure 5: Mesial view of the lower 1st molar Victory Series™ Superior Fit Buccal Tube.

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.

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