

SmartClip™ SL3 Self-Ligating Brackets: Improved clip enhances usability and adds more rotation control.

SMARTCLIP™ SL3
SELF-LIGATING APPLIANCE SYSTEM



Darrell James, 3M Oral Care

Darrell S. James is Senior Technical Service Engineer for 3M Oral Care. He received his Bachelor of Science Degree in Biology from Kent State University in 1983. He has worked at 3M since 1985. For 20 years he was primarily involved in adhesive development. For the last 10 years he has been in Technical Service contributing to a variety of products. His main focus has been in the 3M digital products such as Incognito™ Appliance System and the Unitek™ Treatment Management Portal.



Ming-Lai Lai, 3M Oral Care

Ming-Lai Lai received his PhD and MS in mechanical engineering from State University of New York at Buffalo in 1988 and 1984 respectively. He earned his BS in Aeronautical Engineering from National Cheng-Kung University, Taiwan in 1979. He joined 3M in 1989 and moved to 3M Unitek in 1999, where he started work on the SmartClip™ Self-Ligating Appliance concept, leading the team from the concept through product scale-up phase. Later, Ming joined the ceramic bracket teams to develop new, non-self-ligating and self-ligating aesthetic brackets and led design efforts on the next generation of SmartClip Appliance products.

Leading the science of orthodontic bracket technology.

Introduced in 2004, the SmartClip™ Self-Ligating Appliance System has provided doctors a different and more efficient passive self-ligating system when compared with other available systems. The SmartClip appliance does not have a door that can deform, break or become difficult to open during treatment. Instead, super-elastic nickel-titanium clips permit simple archwire insertion and removal without the need to open or close a sliding door.

The unique design of SmartClip brackets also provides a substantial list of performance features unavailable with other self-ligating brackets. Twin-wing design accommodates ligation if needed, for a passive/active-on-demand system. This also permits selective archwire engagement of a single tie-wing in severe cases, unlike door systems. The open design also helps improve hygiene, with less area where plaque can build up. Also unique is the availability of pre-coating with APC™ Flash-Free Adhesive, for the most efficient bonding in orthodontics.



Used in the treatment of more than one million patients, clinicians using the system have reported shorter treatment time, fewer office visits, and reduction in chair time.*

Improved clip enhances performance.

In a process of continuous improvement and responding to user input, the clip mechanism has evolved over time. The latest clip, announced in May 2016, noticeably reduces the amount of force required to engage larger archwires. The clip has also shown improved rotation control, by reducing the “play” of larger archwires in the slot.

The lower forces can increase the ease of use of the appliance, chair time efficiency and patient comfort. The significant improvement of the rotation control may reduce the use of step bends for rotated teeth, helping to achieve more efficient and better finishes.

▶▶ [Click here to visit the 3M website.](#)

*Orthodontic Perspectives, October 2012.



Lab tests confirm significantly improved archwire engagement forces.

In vitro testing of SmartClip SL3 brackets with the existing clip compared to the brackets with the improved clip show significantly reduced engagement forces on large archwires. The force required to deliberately disengage archwires is reduced as well, while maintaining the ability to hold the wire throughout treatment.

Comparisons were made of the engagement forces between the improved clip and previous clip of the SmartClip SL3 brackets for 0.016"×0.025" and 0.019"×0.025" SS archwires. On average, the improved clip provides a 19% reduction in force for 0.016"×0.025" archwires and a reduction of 15% for 0.019"×0.025" archwires.

Lab tests show a significant reduction in rotation play.

The amount of play in the bracket slot can adversely affect the archwire's ability to exert rotational control on a tooth. This is especially important in regard to rotating lower anteriors, a common occurrence in crowded cases. The improved clip design of SmartClip SL3 Brackets shows a 59% reduction in rotation play in the lower anterior brackets compared to the previous clip version when using 0.016"×0.025" archwire, and a 74% reduction in rotation play in lower anterior brackets when using 0.019"×0.025" archwire.

Overall, the SmartClip SL3 Brackets with the improved clip show an average 28% reduction in rotation play using 0.016"×0.025" archwires and 54% when using 0.019"×0.025 archwires. With the enhanced clip, all averages were less than 2 degrees of play with 0.016"×0.025" archwires and less than 1.5 degrees with 0.019"×0.025" archwire.

SmartClip SL3 brackets with the improved clips outperform Damon® Q Brackets in average rotation play angle, as shown in Figures 1A and 1B. SmartClip SL3 Brackets with the improved clip show on average 45% less rotation play than Damon Q brackets with 0.016"×0.025" archwires and on average 69% less rotation play with 0.019"×0.025" archwires.

SmartClip™ SL3 Brackets... average less rotation play than Damon® Q brackets.

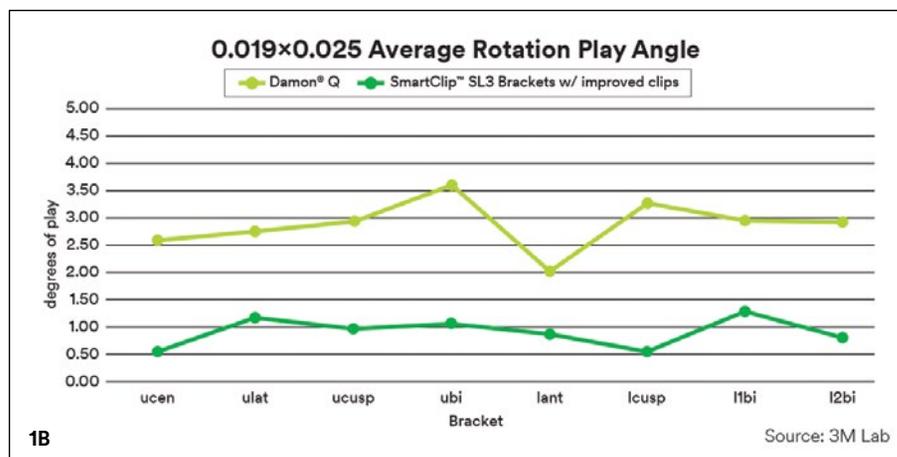
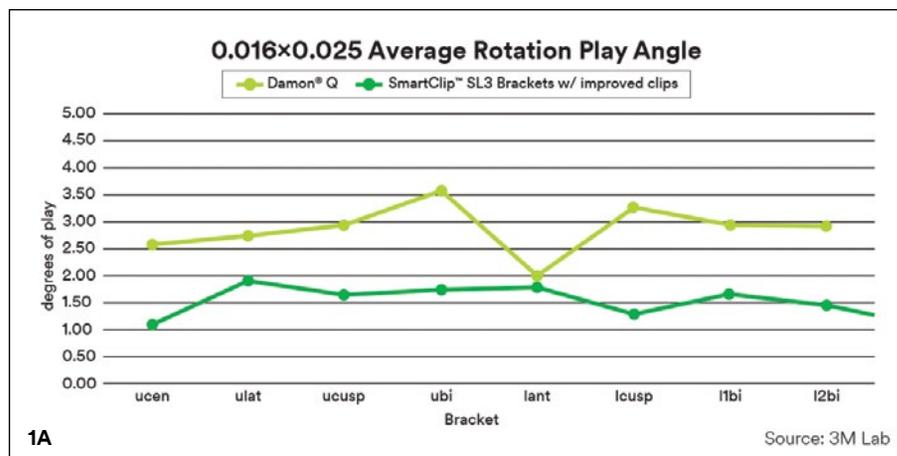


Figure 1A-B: Comparisons of rotation play angles between SmartClip™ SL3 Brackets with improved clip and Damon® Q Brackets.

Evaluators in clinical practice see performance improvements.

Before releasing appliances with the improved clip, 18 experienced SmartClip Bracket practitioners from the U.S., Canada, China, and Europe were asked to evaluate the new clip. They were provided 10 cases of the SmartClip SL3 Brackets with the improved clip, upper and lower, 5x5, 0.022 slot, in the MBT™ Appliance System prescription.

Over the course of the evaluation, 82% of the evaluators stated that they would purchase SmartClip SL3 brackets with the improved clip design over the previous design. Many commented how the noticeable change in the forces required to engage and disengage the archwire would be more comfortable to patients.

Patient comfort is of paramount importance when disengaging and engaging mid-size to larger size archwires. The customer evaluation data shows that the improvements made to the SmartClip SL3 Bracket clip have made a noticeable improvement in patient comfort. In the evaluation, a total of 90 mid-sized to larger archwires ranging from 0.014"x0.025" to 0.021"x0.025" were disengaged and engaged. Overwhelmingly, the evaluators felt that the rectangular wires were either "Easy" or "Very Easy" to disengage (89%) and engage (82%).

Conclusion.

The results of the evaluation show that the minimized clip forces for engagement and controlled disengagement with the improved clip design of the SmartClip SL3 Brackets is noticeable to the evaluators and viewed positively, as is the improvement in rotational control.

The improved clip design allowed for effective archwire engagement while reducing the force required to remove archwires at wire changes. The added benefit of improved rotational control of the improved clip as shown by the lab data and verified in the evaluation is also supported.