TRIAMOND™
The Revolution

A comparative friction study of the TRIAMOND™ Wedgewise system. An independant university study.

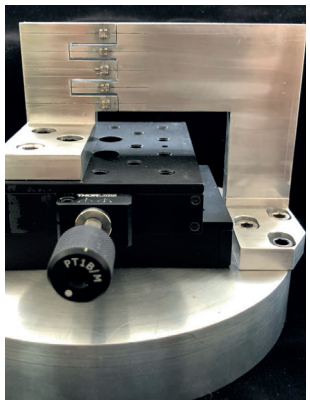
Summary

These study results show that the unique slot geometry of interplay between the slot and archwire in the TRIAMOND™ bracket avoid the inherent problems of Edgewise. These allow the TRIAMOND™ appliance to affect leveling and aligning in less time with decreased forces and is significantly more efficient during the working/finishing stage.

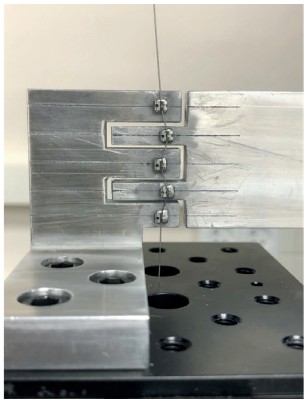
The graphs presented below depict comparisons across brackets where 0.0, 0.5, 1.0 and 1.5mm of horizontal and/or vertical interbracket malalignment, and several archwire types (i.e. 0.014", 0.016" nickel titanium, 0.016", 0.0195"x0.025" and 0.016"x0.016"/Wedgewise stainless steel) are compared between 3 common Edgewise appliances and the Wedgewise-based Triamond system. It can be seen that friction varies according to degree of malalignment and wire dimensions. The TRIAMOND™ bracket was found to express slightly more friction than the passive self-ligating Edgewise bracket when brackets were less malaligned and smaller diameter wires were used because these nearly (0.014"), or fully (0.016") fill the Wedgewise slot. The lower friction found in the latter is due to the slot "play" in the Edgewise brackets. Meaning, that there is less contact between the slot and the wire. This allows unnecessary biomechanical side effects and contributes to prolonged treatment duration. The converse is true when wire dimension or malalignment is increased which generates greater binding/notching in Edgewise. These conditions directly impact the higher level of force required to accomplish tooth movement with all Edgewise-type appliances. Whereas, fully filling the Wedgewise slot during the working/finishing stage generates far less friction.

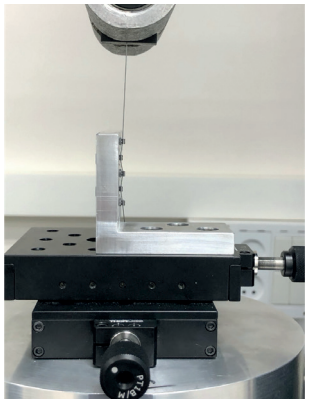
Key findings

- Friction varies according to bracket ligation type
- Friction varies according to wire alloy composition
- Friction varies according to wire shape and size
- The less horizontal and vertical discrepancy between brackets and the smaller the arch wire size, a rigid door/clip passive SLB expresses less friction.
- The more horizontal and vertical discrepancy between brackets and the larger the arch wire size is, a non-rigid door/clip passive SLB expresses less friction.



Experimental apparatus used to orient a 5 bracket segment (teeth 11-15) as it is seen from the front view.





Bracket positions can be altered vertically (on the left photo), and/or horizontally (on the right photo)

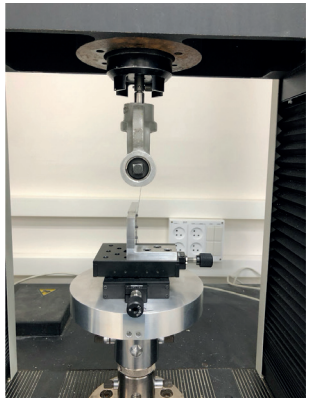


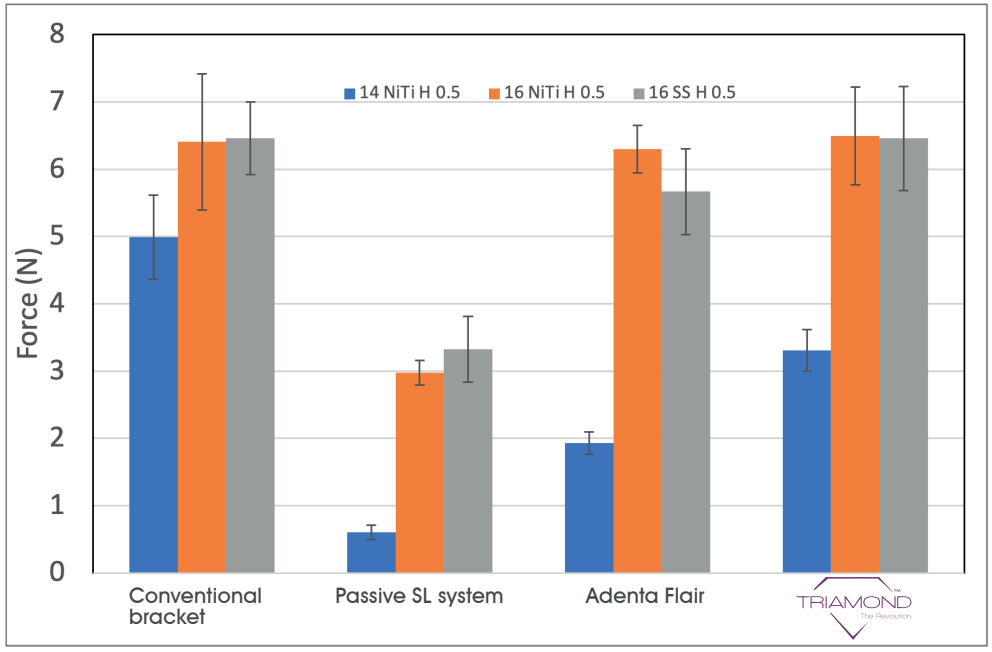
Photo of the apparatus with a straight segment of orthodontic wire held in the Instron machine in order to perform the experimental procedure.

Different sizes, shapes and alloys of wires were drawn through the 5-bracket segment with different combinations of up/down and in/out "crowding". A computer recorded the forces required to draw the wire through these bracket orientations.

pictures: Dr. Panagiotis Michailidis DMD, MSc.

Fig. 1 - 8 show that as the amount of "crowding" increases that the Edgewise variants develop greater frictional resistance than the TRIAMOND™ brackets.

This graph shows how friction is affected by alternating 0.5mm vertical (up/down) steps between the 5-bracket segment using 0.014" NiTi (Blue), 0.016" NiTi (Orange), and 0.016" stainless steel (Gray) straight wire segments. It can be seen that the 0.022" slot brackets have lower friction because the wires do not come close to filling the slots.



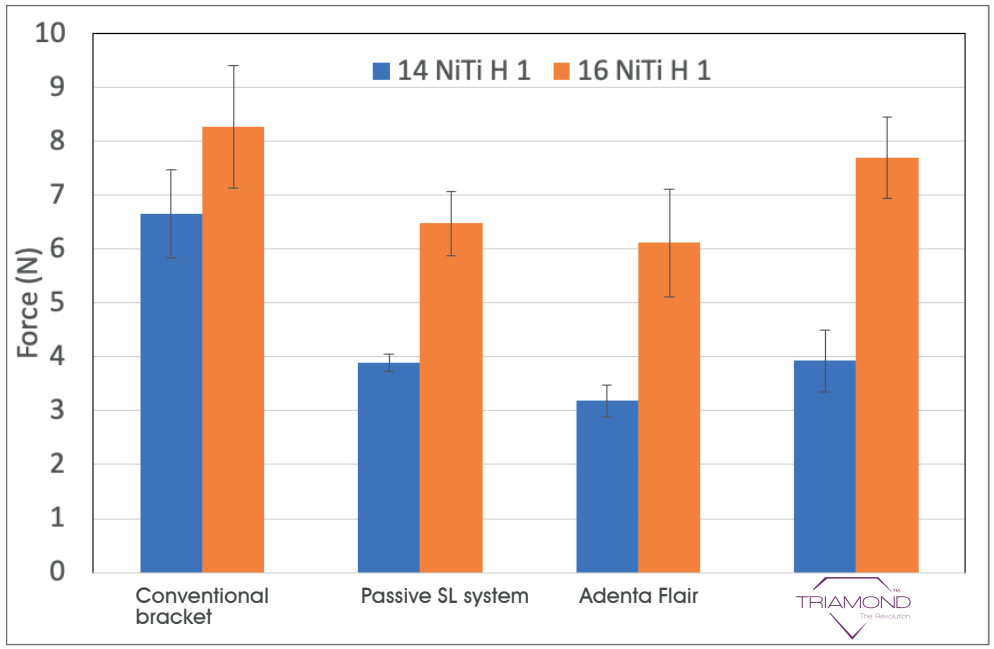


Fig 1: Force generated in tested Groups in Horizontal malalignment of 1mm

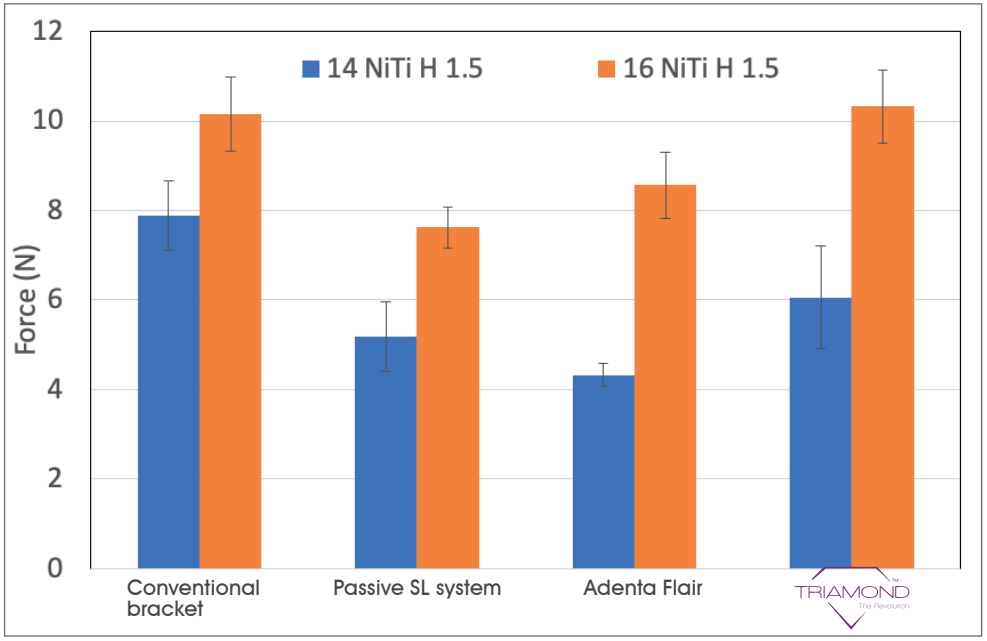


Fig 2: Force generated in tested Groups in Horizontal malalignment of 1.5mm

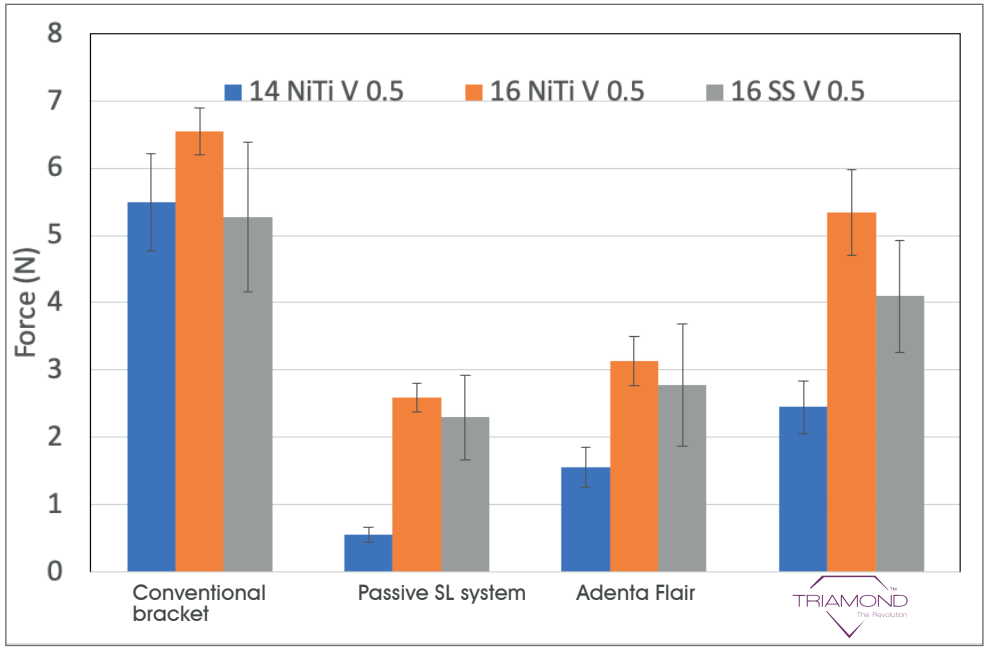


Fig 3: Force generated in tested Groups in Vertical malalignment of 0.5mm

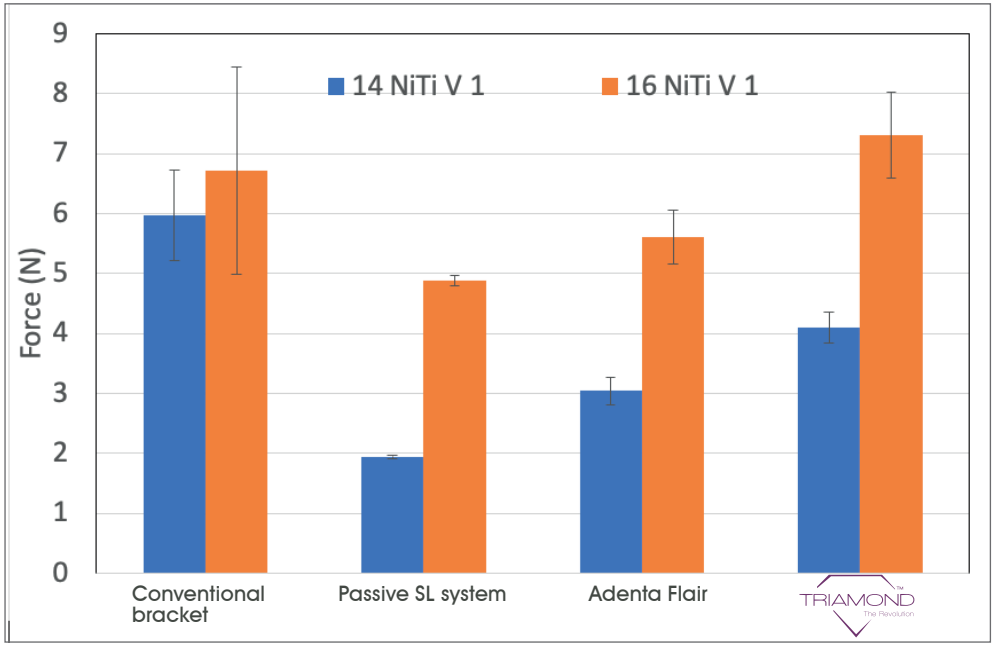


Fig 4: Force generated in tested Groups in Vertical malalignment of 1mm

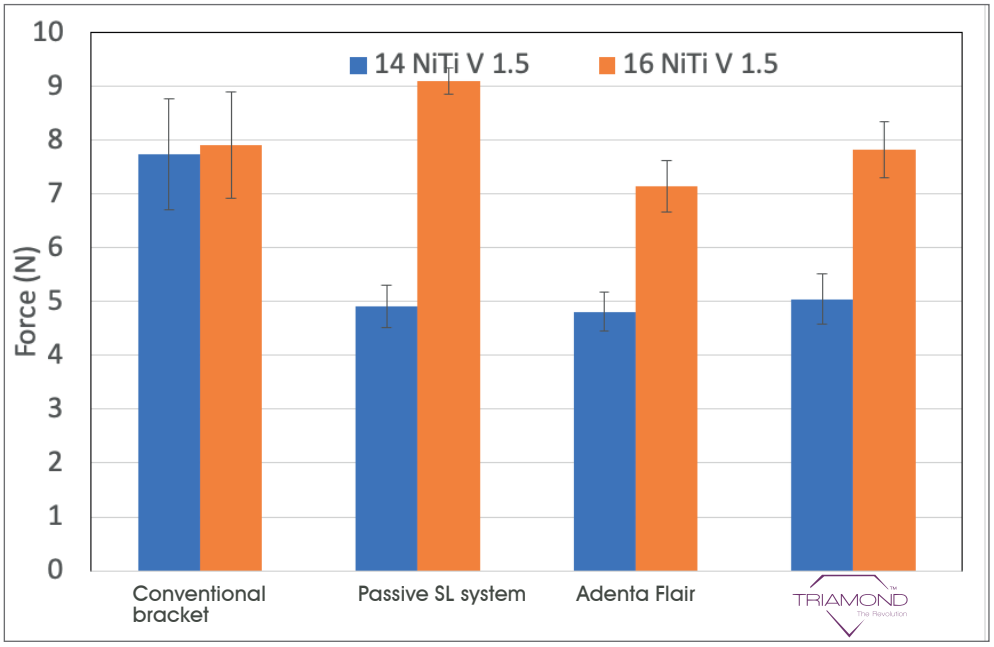


Fig 5: Force generated in tested Groups in Vertical malalignment of 1.5mm

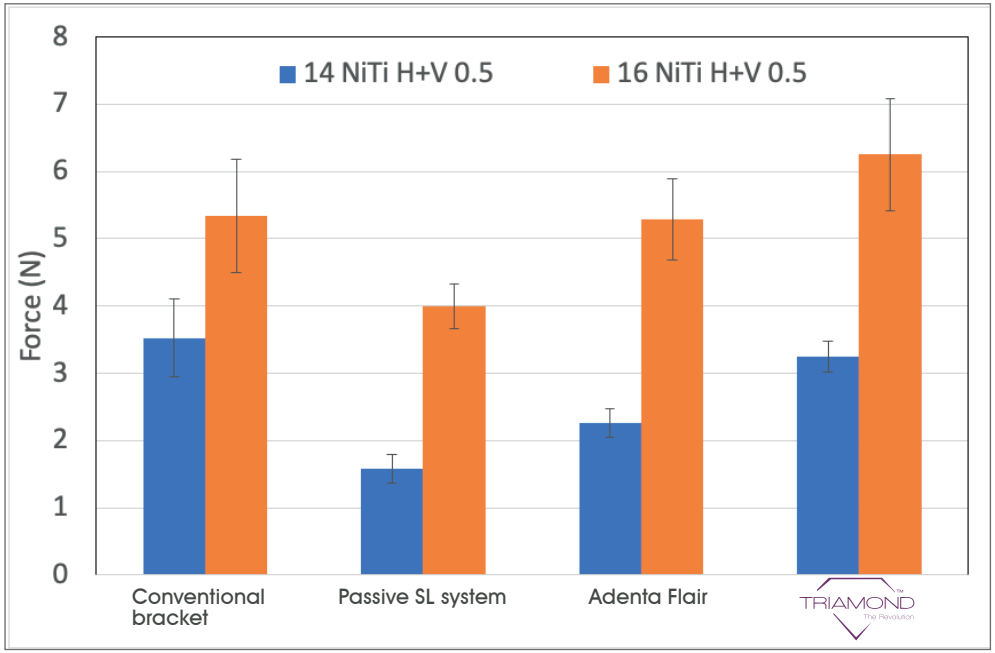


Fig 6: Force generated in tested Groups in Horizontal and Vertical malalignment of 0.5mm

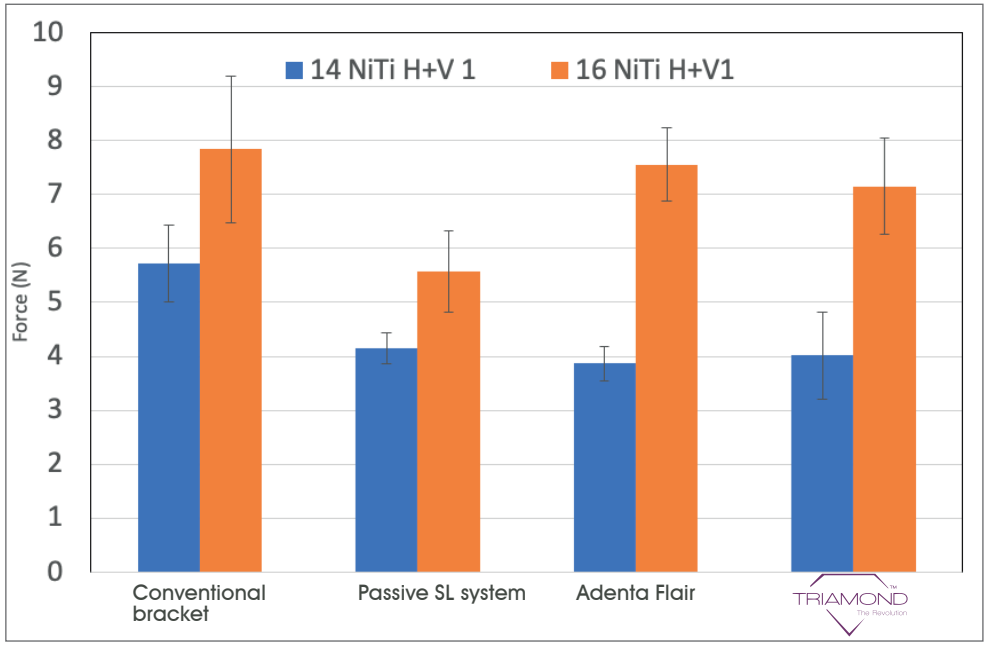


Fig 7: Force generated in tested Groups in Horizontal and Vertical malalignment of 1mm

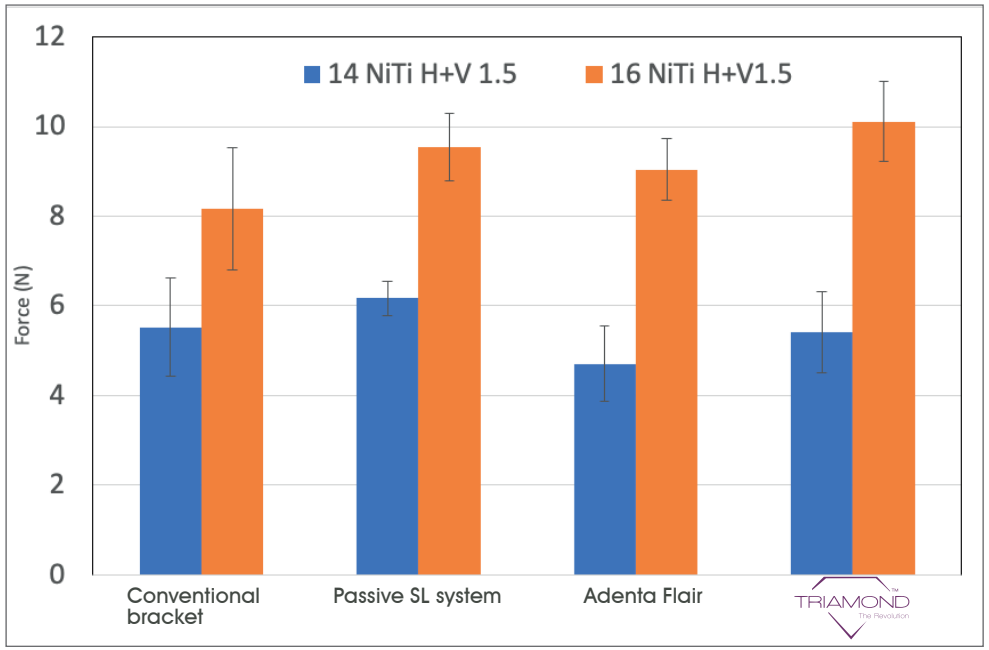


Fig 8: Force generated in tested Groups in Horizontal and Vertical malalignment of 1.5mm

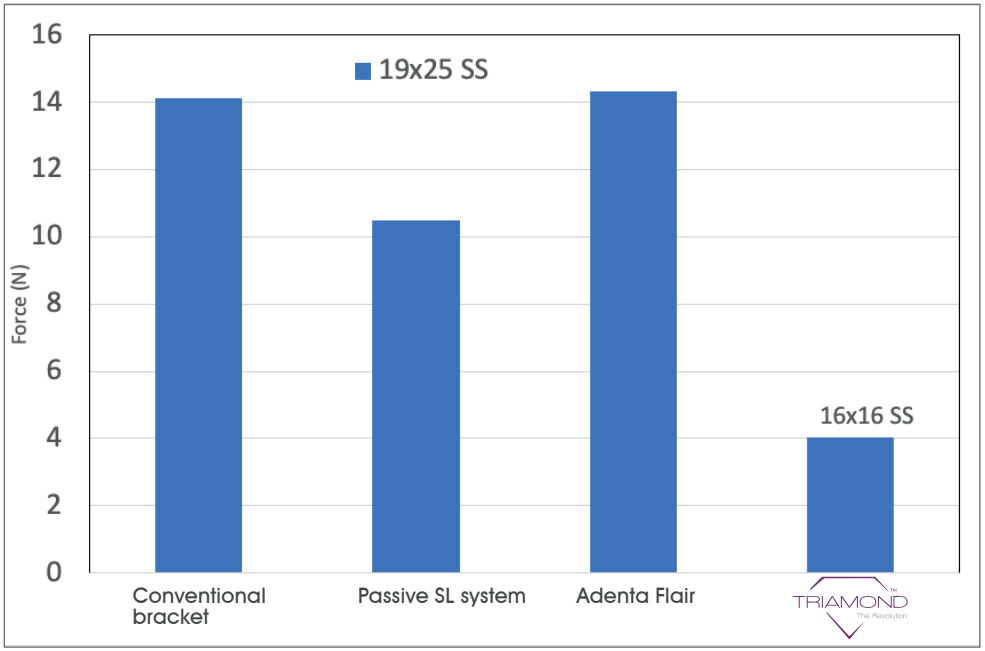


Fig 9: Force generated in tested Groups in no malalignment

This graph shows the 2.5-3.5 times greater friction found in the edge-wise variants when a 0.019"x0.025" stainless steel "working" wire is used on aligned brackets, versus the 16square stainless steel Wedge-wise working/finishing wire. The clinical implications of this significant difference is that much lower forces are needed to cause tooth move-ment. Less friction also means less time.