

The 3 Pillars of Orthodontic Passive Self-ligation

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Submission: August 01, 2016; **Published:** September 08, 2016

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Abstract

The concept and technique of Self-ligation has been a hotly debated topic in Orthodontics in recent years. The claimed advantages of much-reduced or near-zero friction and the resulting light forces that can lead to more efficient tooth movement are currently being regularly researched and investigated, and although many of the proposed effects are not being entirely and consistently corroborated by clear scientific evidence to date, this treatment modality is certainly a very tempting proposition to any orthodontist.

Keywords: Self ligation; Malocclusion; Musculature; Orthodontic

Introduction

I've tried out various types of self-ligating brackets throughout my career as a specialist. I started out slowly and gradually, trying out different types of SL systems as I went along, however, I had not tried using the recommended self-ligation treatment mechanics – as opposed to traditional mechanics - until I decided to use the Damon Q bracket system. Although I had previous experience with other Self-ligating systems over the years, my research regarding the Damon system and technique led me to think that the ideas and technique advocated by Dr. Dwight Damon required a major paradigm shift in the way I thought about orthodontics in terms of treatment planning and mechanics, and so I took my time reading, researching, and attending lectures and courses surrounding the topic until I felt confident with the this different way of thinking about orthodontic mechanics.

Proposed Advantages of Self-Ligation

Distilling the basic pillars of passive self-ligation treatment mechanics - as advocated by Dr. Dwight Damon - they can be simply boiled-down to THREE basic ideas - that equally apply to any passive self-ligating system:

Variable bracket torques

Dis articulation

Early, (very) light elastics

Variable bracket torques

Dr. Dwight Damon and other passive self-ligation advocates have always emphasized the need for accurate bracket bonding from the very start, and often cite it as a major factor in smooth

treatment progression and success. “Begin with the End in Mind” is what Dr. Tom Pitts preaches. Taking this a step further, Dr. Damon advocates the use of variable torque prescriptions for anterior teeth right from the very start in order to maximize efficiency and smooth progression of tooth movement, with the basic notion that this helps initiate roots movement into their corrected positions as early as possible and maintains them in these corrected – or over-corrected – positions for as long as possible during treatment, thus improving their chances of post-treatment stability.

This torque selection starts at the treatment planning stage and depends on the type of malocclusion being treated, the individual inclinations of specific anterior teeth and the type of mechanics and elastics to be used during treatment. Indeed, the most recent Damon Q system comes with High, Standard and Low torque values for individual upper and lower anterior brackets. The choice for each individual tooth should be made at the treatment planning stage, whether using cast study models or computerized digital setups (such as when using Ormco's Insignia system for even more precise customization).

Clinical evidence has shown that this notion is indeed logical and may improve long-term chances of stability, provided that the required torque prescription is actually fully expressed by the end of treatment. In practice, and more often than not, the orthodontist may still need to introduce torque manually through the arch wire even with variable torque selection at the start, and this may be due to issues with full arch wire engagement failing to fully express built-in torque values towards the later stages of treatment, as expressed by many practitioners of self-ligating systems.

Dis-articulation

The second “pillar” is directly related to the occlusion and interdigitation of the dentition. In order to facilitate tooth movement using the very light forces of the initial aligning phase with PSL, it is recommended to “dis-articulate” the occlusion in order to minimize interdigitation that could hinder or delay tooth alignment.

This “Bite Raising” is usually performed either on the palatal aspects of upper (Class II cases) or lower (Class III cases with reverse over jet) anterior teeth in Low Angle, deep bite cases. This helps in holding/intruding the anterior teeth and maximizing extrusion of posterior teeth thus aiding in correcting the occlusion. In High Angle, reduced overbite or Open Bite cases, the bite raising should be positioned on the occlusal surfaces of posterior teeth, as needed, as this helps prevent or minimize further extrusion during alignment.

Many long time self-ligation practitioners have demonstrated that it is entirely possible to achieve excellent results without dis-articulation in every single case. However, dis-articulation right from the beginning is a more efficient way of operating as one would often end up performing this bite raising at later stages on many occasions, especially in the presence of cross-bites, if it is not done from the very start.

Early, (very) light elastics

One of the most intriguing – and indeed, anxiety-ridden – shifts from traditional orthodontic thinking and mechanics that I had personally faced was the advocated use of early elastics right from the first visit with light, round, flexible Nickel Titanium arch wires in place! Conventional wisdom and teaching with pre-adjusted appliance treatment mechanics was built on the idea that elastics are used towards the later stages of treatment once heavier, more rigid arch wires are reached, as using them early on when very light Nickel-Titanium wires are in place would produce all kinds of unwanted tooth movements, rotations and overall occlusal imbalances. Once that rather huge mind block was overcome, this single “pillar” alone would prove to be the defining strong point for my decision to continue my use of PSL. Valuable and unique research done by Badawi H [1] in Canada has shown the effect of force distribution on different teeth along the dental arch using PSL and conventional bracket systems. In PSL systems, the effect of a certain local force does not extend beyond a couple of teeth either side of the location of application, and even then, the effects were minimal. In contrast, the force distribution in conventional appliances had a more far-reaching effect all the way to teeth on the opposing side of the arch; hence, the unwanted tooth movements due to any force application were at a maximum most of the time. This notion, when extended to the use of early light elastics, helps explain how the use of such light forces even as early as the first visit and on flexible Nickel-Titanium arch wires does not – in general – have a detrimental effect on the rest of the arch. On the contrary, the light forces seem to gently help in guiding the involved teeth as they level

and align, without overpowering the surrounding musculature to any measurable extent.

Clinically, It seems there is a very reasonable clinical validity to such claims. The main noticeable issue faced at the aligning phase is the incomplete – or delayed – correction of rotations which is most probably due to the increased “play” between the small initial arch wires and the 0.022” slot of the Damon Q bracket, where full engagement against the slot base is non-existent due to the nature of the locking mechanism’s “passive” construction. Full rotational correction does not actually occur until later in treatment when –at least – an 0.016”×0.25” or 0.018”×0.25” rectangular arch wire is in place. This probably explains the findings of a study by Miles et al. [2] and others that have shown no measurable statistical difference in alignment speeds between self-ligating appliances in general and conventional appliance. In fact, some studies noted that alignment was actually faster with conventional appliances in many instances (Figure 1 & 2).



Figure 1: An example of an Adult Class III malocclusion with moderate skeletal severity, successfully-treated and camouflaged with a passive self-ligating system (Damon Q; Ormco), utilizing the techniques mentioned above.



Figure 2: Pre-treatment and pre-debond cephalometric views of the same case above demonstrating the degree of control afforded to the dental torque, inclination and soft tissue profile during treatment.

Discussion

It is true that further clear evidence is needed to backup many of the claims related to passive self-ligation, as a review by Padhraig and O’Brien [3] comprehensively investigated. However, clinical experience is clearly showing the potential

in overcoming many of conventionally ligated fixed appliances' issues we've had for decades now. Considering we still lack solid evidence for many aspects of even our current conventional fixed appliance treatment modalities, it may be a bit hasty to dismiss self-ligating systems and techniques simply because of the findings of currently available research, although indeed, the marketing approach for many such systems can only be described as Over-the-top Hype, often directly aimed at consumers, rather than orthodontic professionals [4].

Conclusion

Our minds and way of thinking have been locked for too long in a certain "mold" surrounding conventional fixed appliances, and I believe that in order for the research to be able to accurately determine the Cons and Pros of Self-ligation, we need a Paradigm Shift in the way we approach future research in the first place, as old ways of thinking and solving problems may not always be

suitable to properly judge newer ways. Until then, an open eye and an open mind are key.

The author would like to clearly point-out that he has no "invested interest" in any self-ligating appliance or system. This is simply a statement of personal experience and brief review on the use of this particular appliance system.

References

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