Are self-ligating bracket (SLB) systems a fad or the future? In 2007, 18 percent of practicing U.S. orthodontists routinely used SLB systems. As SLB claims are made, it can be confusing for the orthodontist who is contemplating the use of SLBs. The purpose of this article is to guide the orthodontist to make a more informed decision about SLBs.

**Similarities and Differences of Self-ligating Systems**

The similarity of all SLBs is they are simply brackets with a cover (Figure 1). The cover engages the wire into the slot similar to a steel ligature tie or an elastomeric tie. The covers have a variety of looks, but the covers simply hold the wire into the bracket slot.

SLB differences can be categorized as either "active" or "passive" with variable being the outer (buccal) wall orientation. This outer wall position creates a difference in the dimensions of the slot in the horizontal plane (Figure 2).

In passive SLBs the dimensions of the slot in the vertical and horizontal plane are conventional. While in active SLBs, the clip’s curved shape reduces the slot size in the horizontal dimension (gingival wall is smaller than the normal-sized occlusal wall).

The spring clip differentiates an active SLB from a passive SLB (rectangular slot as in traditional twin bracket systems) with a slide or cover.
The advantage of any active bracket over the passive bracket system is the curved shape of the adjustable fourth wall or active clip. The clip allows a smaller arch wire to contact the buccal or fourth wall earlier in treatment to initiate expressive control of the inclination (torque control) and angulation (tip and rotation) of the individual tooth position as a smaller arch wire can be contact with the curved active clip earlier into treatment (Figure 3).

### Advantages of SLB over Traditional twins systems

1) **More hygienic**

Several well done studies have shown that there is less bleeding and fewer pathological organisms with SLB’s compared to brackets with elastomers on twin brackets.

2) **Reduced chair time**

In our office, under timed conditions, it takes one minute longer to remove and replace elastomeric ties on both arches than it does to open and close the doors of a SLB system. If you perform 20 double arch changes per day that provides 20 more minutes per day to “look” and interact with your patients.

3) **More efficient tooth movement**

Most of the evidence regarding more efficient tooth movement comes from in vitro studies analyzing friction. The assumption that less friction should also mean more efficient and therefore faster tooth movement. The clinical orthodontist infers that the information from bench (in vitro) studies will transfer to clinical applicability (in vivo). This may or may not be true.

Most clinical studies comparing SLBs with Twin systems clearly demonstrate fewer office visits, but significant treatment time reduction outcomes are mixed. Most seasoned clinicians are well aware that treatment time reductions are more a function of an accurate diagnosis. This requires complete diagnostic pre treatment records that identifies a centered jaw position, a clear concept of the finished occlusion (Andrews’ Six Keys to Occlusion) with proper over jet and overbite to provide a mutually protected occlusion in a well balanced facial profile.

### How do you evaluate the evidence?

While the evidence pyramid gives us some insight in evidence reliability, each category has its strengths and shortcomings.

Does the evidence come from the manufacturing company, a reputable clinician or an unbiased author? Case reports or cohort studies? In vitro or in vivo studies?

Does the author look at a practice as a whole (cohort study) or is the evidence presented just one component of an orthodontic treatment (leveling, torque control or space closure rate)?

This can be very confusing for the clinician. It is important to analyze in vitro studies, yet well done cohort studies by reputable clinicians are very helpful to make clinical decisions. The outcomes must be measured with similar treatment goals in order to integrate that new knowledge into clinical protocol.

### Cohort Studies

Over the last 18 years, our office has conducted four cohort studies...
with samples of almost 100 consecutively started orthodontic patients.

- Group 1 (control Twin brackets)
- Group 2 (twin brackets and integration of specific diagnostic and treatment changes)
- Group 3 (group 2 criteria, greater use of nickel titanium leveling wires and five years of experience with the integration of the previously mentioned diagnostic and treatment changes)
- Group 4 (group 3 changes plus an active self-ligation bracket system).

In each sample, the finished cases were independently measured by orthodontists using either the Andrews grading system, PAR analysis and/or the ABO grading system (Figure 4, on previous page). Figures 5 and 6 are examples of cases in group 4.

### Individual Component Analysis

Another approach in evidence analysis is to look at one component of an orthodontic treatment. As an example, Pandis, et. al. observed the “speed of leveling” in crowded cases. A sample of 54 non-extraction cases with irregularity indices greater than 2 were studied. One group was treated with a SLB Damon 2 and the other group with twin brackets systems.

Their conclusion was no difference in speed of unraveling crowding. However, when the sample was subdivided into irregularity index less than 5, SLB sample was a 2.7 times faster correction. With irregularity index greater than 5, there was marginal insignificance! So when analyzing the “pooled” data, no difference, but when subdivided there were differences. Upon further analysis of the tables, the reason for no significant difference was the mean difference between SLB and twin systems was only 23 days. Had the mean difference been only a few days more, there would have been a statistical difference. In real clinical orthodontics, 23 days can be a big deal in the eyes of that client.

Other studies examined other aspects of orthodontic treatment such as rate-of-space closure. Organize your perspective of SLB advantages based upon personal observations and literature references as seen in Figure 7.

### SLB clinical learning curves

With any new technology, there are learning curves. Below are a few helpful hints that may assist you in your transition into SLBs.

- Bracket placement requires reorienting your eyes to the center of the clinical crown for accurate bracket placement (Figure 8).
- Use of crimp stops to overcome the free sliding wires to avoid the “nuisance” pokey wire appointments (Figure 9).
Double-checking to make sure the “doors” are closed
Allow the current wire to fully express itself using size and shape to interact with the active clip to move the tooth toward the optimal tooth position.
An advantage of SLBs is that you cannot engage the next stiffer wire size until the current wire is fully expressed in the wire bracket slot interplay.

Future of SLB will be in several areas
1) Customized base designs based on individual tooth shape to increase the accuracy of bracket-tooth contact.
2) Changes in active clip design and alloys to improve clinical efficiency.
3) Wire slot interplay. Currently most orthodontic wires are used as edgewise wires. Because of the active clip, a ribbon arch wire (an edgewise wire rotated 90 degrees so the adjustable wall begins earlier contact with arch wire introducing torque control earlier in treatment (enhancing more efficient clinical tooth movement)) (Figure 10). Different shapes (rounded edges to rectangular or square wires) to various alloys (stainless steel, Beta Titanium, tubular multistranded wires) to further reduce friction of the adjustable clip to the wire.

The future in wire bracket efficiency depends on the clinician who can integrate a specific malocclusion with specific alloys and shapes for optimal tooth movement.

Summary
As SLB and wire bracket technology improves, we will continue to see advantages to be a more hygienic appliance and reduced chair time.
More efficient tooth movement will occur when it is combined with a complete diagnosis, and measurable treatment goals and more efficient use of the wire-bracket interplay.
The most interesting advantage with less “doing” at each patient visit is more time to “see” treatment progress at each visit such as bracket and tooth positioning and connecting with the patient to maintain cooperation.

References
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