ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 11, Issue, 11, pp.8585-8587, November, 2019

DOI: https://doi.org/10.24941/ijcr.37299.11.2019

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

SELF LIGATION BRACKETS: KNOW THE UNKNOWN

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ARTICLE INFO

Article History:
Received 24th August, 2019
Received in revised form
08th September, 2019
Accepted 25th October, 2019
Published online 30th November, 2019

Key Words:

Self-Ligating Brackets.

ABSTRACT

Self-ligating brackets have been gaining popularity over the past several decades. Although the self-ligating edgewise bracket was introduced to orthodontists 75 years ago, recent advances in bracket technology have resulted in a number of new selfligating bracket ''systems'' and greater interest in their use. Much of this interest is in response to information comparing the benefits of self-ligating systems with conventional edgewise brackets. Often, this information comes from marketing materials and non refereed sources claiming that self-ligating bracket systems provide superior treatment efficiency and efficacy. Various advantages for these systems have been claimed. The current situation regarding self-ligating brackets is reviewed. Recent developments, clinical advantages, and remaining imperfections are described. The evidence regarding treatment efficiency is reviewed. Self-ligating brackets have reached a stage of design and production control, where the advantages are significantly greater than the remaining imperfections.

Citation: Dr. Toshniwal, N.G., Dr. Shubhangi Mani, Dr. Nilesh Mote, Dr. Vishal Dhanjani and Dr. Somit Das. **2019.** "Self ligation brackets: know the unknown", *International Journal of Current Research*, 11, (11), 8585-8587.

INTRODUCTION

Self-ligating brackets have been gaining popularity in recent years. However, self-ligation is nota new concept. The first self-ligating bracket, the Russell attachment, was introduced by Stolzenberg1in the early 1930s. Perhaps because of skepticism in the orthodontic society at that time, or the lack of promotion, it did not gain much popularity. During the past several decades, interest in self-ligating brackets hasbeen rekindled, with the introduction of various types of new self-ligating systems. These self-ligating brackets have been touted to possess many advantages over conventional edgewise brackets. Russell Lock edgewise attachment being described by Stolzenberg1 in 1935. Many designs have been patented, although only a minority have become commercially available. The author has used several types from the list in Table 12–4 and has also used self-ligating Begg brackets. New designs have continued to appear, the Time bracket becoming available in 1994, the Damon SL bracket in19965,6 and the Twin Lock bracket in 1998, being three designs from that decade. This continued activity is inspite of the fact that self-ligating brackets have, untilrecently, never attracted more than a small percentage ofbracket sales. The latest and most significant developmentshave been the Damon2 and In-Ovation brackets in 2000.

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These brackets exhibit major advances in robustness and ease of use, have rapidly grown in popularity and merit a scrutiny of the current situation in this class of bracket. The most compelling potential advantages attributed to SLBs are a reduction in overall treatment time and less associated subjective discomfort. Other purported improvements include more efficient chair side manipulation and promotion of periodontal health due to poorerbiohostability. Preliminary retrospective research has pointed to a definite advantage, with a reduction in overall treatment time of 4 to 7 months and a similar decrease in required appointments.5,6 Consequently, the use of SLBs has increased exponentially; over 42% of American practitioners surveyed reported using at least one system in 2008.9 This figure was just 8.7%in 2002. Retrospective research may be confounded by a variety of factors including operator enthusiasm, different appointment intervals and arch wire sequences, and multiple operators. However, prospective research relating to SLBs has emerged in recent years. The claim of reduced friction with self-ligating brackets is often cited as a primary advantage over conventional brackets. This occurs because the usual steel or elastomeric ligatures are not necessary, and itis claimed that passive designs generate even less friction than active ones. With reduced friction and hence less force needed to produce tooth movement, self-ligating brackets are proposed to have the potential advantages of producing more physiologically harmonious tooth movement by not overpowering the musculature and interrupting the periodontal vascular supply.

Bracket	Year
Russell Lock	1935
OrmcoEdgelock	1972
Forestadent Mobil-Lock	1980
Orec SPEED	1980
'A' Company Activa	1986
Adenta Time	1994
OrmcoTwinLock	1998
Ormco/'A' Co Damon 2	2000
GAC In-Ovation	2000
GAC In-Ovation R	2002
Adenta Evolution LT	2002

Therefore, more alveolar bone generation, greater amounts of expansion, less proclination of anterior teeth, and less need for extractions are claimed to be possible. Other claimed advantages include full and secure wire ligation, better sliding mechanics and possible anchorage conservation, decreased treatment time, longer treatment intervals with fewer appointments, chair time savings, less chair-side assistance and improved ergonomics, better infection control, less patient discomfort, and improved oral hygiene.

Properties of an ideal ligation system: The concept that brackets are ligated via tie-wings is so prevalent that it is worthwhile considering a list of ideal properties of any ligation system. This exercise puts in perspective any assessment of the benefits and difficulties with current self-ligating systems. Ligation should:

- To be secure and robust;
- To ensure full bracket engagement of the arch wire;
- To exhibit low friction between bracket and arch wire;
- To be quick and easy to use;
- Permit high friction when desired;
- Permit easy attachment of elastic chain;
- Assist good oral hygiene;
- Should be comfortable for the patient.

It is instructive to consider the performance of conventional wire and elastomeric ligatures in relation to these requirements.

Advantages of self-ligating brackets

These advantages apply in principle to all self-ligating brackets, although the different makes vary in their ability to deliver these advantages consistently in practice:

- More certain full arch wire engagement;
- Low friction between bracket and arch wire;
- Less chair side assistance;
- Faster arch wire removal and ligation.

Secure, full archwire engagement: Full engagement is a feature of self-ligation because aclip/slide is either fully shut or it is not. Unintentional partial engagement is not possible. There is no problem of decay of the ligature as with elastic ligatures. However, security of ligation will depend on the clip/slide being robust and not inadvertently opening. Until very recently, this requirement for security of performance was not fully met by self-ligation designs. Secure, full arch wire engagement maximizes the potential long range of action of modern low modulus wires and minimizes the need to regain control of teeth where full engagement is lost during treatment.

Low friction: Very low friction with self-ligating brackets has been clearly demonstrated and quantified in work by various authors, for both Activa and Speed brackets, and Edgelok. Voudouris14 has reported greatly reduced friction with Sigma and Interact win prototypes and with Damon brackets. The friction is dramatically lower than for elastomeric rings with conventional brackets and seems to be an inherent characteristic of self-ligatingbrackets. Thomas *et al*. confirmed extremely low friction with Damon brackets compared to both conventionalpre-adjusted and also Tip-Edge brackets. Kapur found dramatically lower friction with both stainless steel and nickel-titanium wires for Damon brackets compared to conventional brackets. With NiTiwires, the friction per bracket was 41 g with Mini Twinand conventional ligation and 15 g with Damon brackets; whilst with stainless steel wires, these values were 61 and only 3.6 g, respectively. Pizzoni *et al*. have reported that Damon brackets showed lower friction than Speed which in turn had less friction than conventional brackets stating that: 'In the case of rectangular wires, the Damon bracket was significantly better than any of the other brackets and should be preferred if sliding mechanics is the technique of choice'. Meling *et al*. examining the effect of friction on wire stiffness concluded that each elastomeric placed in an 'O' configuration produces an average of 50 g of frictional force.

Less chairside assistance and faster ligation/archwireremoval: The original motive when developing the earlier selfligatingbrackets was to speed the process of ligation. For example a paper by Maijer and Smith8 demonstrated a four-fold reduction in ligation time with Speed brackets compared to wire ligation of conventional brackets. Shivapuja and Berger have shown similar results but also that the speed advantages compared to elastomeric ligation are less dramatic (approximately 1 minute per set of arch wires). Voudouris has also reported a fourfold reduction in archwire removal/ligation time with prototype Interact win brackets which lead to the commercially available In-Ovation brackets. A study by Harradine found statistically significant, but clinically very modest savings in ligation/re-ligation time with Damon SL—an average of 24 seconds per archwire removal and replacement. It should, however, be remembered that archwire 'ligation' using self-ligating brackets does not require achairside assistant to speed the process, since self-ligatingbrackets require no passing of elastomeric or wire ligatures to the operator during ligation. Although the evidence suggests that this is the least significant advantage of self-ligation, it is still perhaps worthwhile.

However, self-ligating brackets have some disadvantages, including higher cost, possible breakage of the clip or the slide, higher profile because of the complicated mechanical design, potentially more occlusalinterferences and lip discomfort, and difficulty in finishing due to incomplete expression of the arch wires. Many in-vitro studies have investigated parameters such as frictional resistance and torque expression inself-ligating systems. Many have shown that less friction is generated with self-ligating brackets compared with conventional brackets in the laboratory, and, therefore, less force is required to produce tooth movement. However, the suitability of applying the results from in-vitro studies to clinical situations and the importance of friction in alignment, sliding mechanics, and total treatment time have not been fully addressed.

Cost and treatment efficiency: Currently available self-ligating brackets are more expensive than most good quality tie-wing brackets. Amodest balancing factor is the cost of elastic ligatures, which are, of course, not required. However, this significant extra cost must be measured against savings in time—an expensive commodity. If self-ligating brackets save any appreciable chair side time as some studies suggest, this would provide an offsetting saving. A study of treatment efficiency by Harradine26 found the following:

- A very modest average time saving from a reduction in arch wire placement/removal of 24 seconds per arch;
- A mean reduction of four months in treatment time(from 23.5 to 19.4 months)
- A mean reduction of four visits during active treatment (from 16 to 12).

This finding of a mean reduction of four months in treatment time was also reported by Dr Robert Fry in a presentation at the AAO Annual Session in Toronto 2001. He had converted one of his two offices to Damon SL. The office management software subsequently revealed that his treatment times reduced by an average of 4 months compared to his other office where he had, for the time being, stayed with conventional ligation. A study by Eberting et al. of intra-practitioner differences in three practices found an average reduction in treatment time of 7 months (from 30 to 25) and seven visits (from 28 to 21) for Damon SL cases compared to conventional ligation. The final average ABO occlusal regularity score was slightly better for the Damon cases. These three reports support a view of clinically significant improvements in treatment efficiency with passive selfligatingbrackets. The more recent bracket types would be expected to show still better treatment efficiency and this is an appropriate area for further studies.

Conclusion

Currently available self-ligating brackets offer the veryvaluable combination of extremely low friction and secure full bracket engagement and, at last, they deliver most of the potential advantages of this type of bracket. These developments offer the possibility of a significant reduction in average treatment times and also in anchorage requirements, particularly in cases requiring large tooth movements. Whilst further refinements are desirable and further studies essential, current brackets are able to deliver measurable benefit with good robustness and ease of use.

REFERENCES

Badawi HM., Toogood RW., Carey JP., Heo G., Major PW. 2008. Torqueexpression of self-ligating brackets. *Am J Orthod Dentofacial Orthop.,* 133:721-8.

Berger J., Byloff FK. 2001. The clinical efficiency of self-ligatedbrackets. *J Clin Orthod*., 35:304-8.

Berger JL. 1994. The SPEED appliance: a 14 year update on thisunique self-ligating orthodontic mechanism. *Am J Orthod Dentofac Orthop.,* 105: 217–223.

Berger JL. 2008. The SPEED system: an overview of the applianceand clinical performance. *Semin Orthod.,*14:54-63.

Budd S., Daskalogiannakis J., Tompson BD., 2008. A study of thefrictional characteristics of four commercially available selfligatingbracket systems. *Eur J Orthod.,* 30:645-53.

Damon DH. 1998. The Damon low-friction bracket: a biologicallycompatible straight-wire system. *J Clin Orthod*., 32:670-80.

Damon DH. 1998. The rationale, evolution and clinical application ofthe self-ligating bracket. *Clin Orthod Res.,* 1:52-61.

Eberting JJ., Straja SR., Tuncay OC. 2001. Treatment time, outcome,and patient satisfaction comparisons of Damon and conventionalbrackets. *Clin Orthod Res.,* 4:228-34.

Forsberg CM., Brattstrom V., Malmberg E., Nord CE. 1991. Ligaturewires and elastomeric rings: two methods of ligation, and theirassociation with microbial colonization of Streptococcus mutansand lactobacilli. *Eur J Orthod.,* 13:416-20.

Griffiths HS., Sherriff M., Ireland AJ. 2005. Resistance to sliding with3 types of elastomeric modules. *Am J Orthod Dentofacial Orthop.,*127:670-5.

Harradine NW. 2001. Self-ligating brackets and treatment efficiency. *Clin Orthod Res.,* 4:220-7.

Harradine NWT, Birnie DJ. 1996. The clinical use of Activaselfligatingbrackets. *Am J Orthod Dentofac Orthop.,* 109:319–328.

Henao SP., Kusy RP. 2005. Frictional evaluations of dental typodontmodels using four self-ligating designs and a conventionaldesign. *Angle Orthod*., 75:75-85.

Khambay B., Millett D., McHugh S., 2004. Evaluation of methods ofarchwire ligation on frictional resistance. *Eur J Orthod.,* 26:327-32.

Kim TK., Kim KD., Baek SH., 2008. Comparison of frictional forcesduring the initial leveling stage in various combinations ofself-ligating brackets and archwires with a custom-designed typodontsystem. *Am J Orthod Dentofacial Orthop.,* 133:187.e15-24.

Maijer R., Smith DC. 1990. Time savings with self-ligating brackets. *J Clin Orthod.,* 24:29-31.

Paduano S., Cioffi I., Iodice G., Rapuano A., Silva R. 2008. Time efficiencyof self-ligating vs conventional brackets in orthodontics:effect of appliances and ligating systems. P*rog Orthod.,* 9:74-80.

Pizzoni L., Ravnholt G., Melsen B. 1998. Frictional forces related toself-ligating brackets. *Eur J Orthod.,* 20:283-91.

Shivapuja PK., Berger J. 1994. A comparative study of conventional ligationand self-ligation bracket systems. *Am J Orthod Dentofacial Orthop.,* 106:472-80.

Sims AP., Waters NE., Birnie DJ., Pethybridge RJ. 1993. A comparisonof the forces required to produce tooth movement in vitro usingtwo self-ligating brackets and a pre-adjusted bracket employingtwo types of ligation. *Eur J Orthod.,* 15:377-85.

Stolzenberg J. 1935. The Russell attachment and its improvedadvantages. *Int J Orthod Dent Children.,* 21: 837–840.

Wildman AJ. 1972. Round table—the Edgelok bracket.*J Clin Orthod.,* 6: 613–623.

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