

The Clinical Efficiency of Self-Ligated Brackets

JEFF BERGER, BDS, DOrtho
FRIEDRICH K. BYLOFF, DDS, DOrth, MD

The SPEED* bracket system (Fig. 1) has been reported to save a significant amount of time compared to conventional ligated brackets.¹⁻⁴ During the last few years, the introduction of other self-ligating systems, including Damon SL** (Fig. 2), Time*** (Fig. 3), and Twin-Lock** (Fig. 4), bears witness to the increasing interest of clinicians in ligature-free brackets. Various authors have claimed that each of these self-ligating brackets delivers the same time-saving benefits.^{1,4-7}

The differences in shape and function between these bracket systems have been described previously.⁸ This article reports the results of two studies designed to test the hypothesis that self-ligating bracket systems can reduce chairtime in archwire changes.

SPEED Survey

A mail survey was used to measure orthodontists' clinical impressions of self-ligating brackets. The questionnaire was sent to a random selection of 40 orthodontists who were using the SPEED bracket system, which was selected because it had been commercially available since 1980. To be included in the study, the orthodon-

tist had to have used the SPEED system for a minimum of one year (Fig. 5). There were 39 responses.

Nearly all of the clinicians (97%) believed that they saved time changing archwires with the self-ligated SPEED bracket compared to conventional ligated brackets. Of these, 55% indicated that the time saved was of major significance, while 40% thought it was of moderate significance, and 5% classified it as of only minor significance. Furthermore, 77% of the respondents felt that less of their chairside assistants' time was required with the SPEED bracket system than with ligated brackets.

Clinical Study

The time required to ligate both conventional and self-ligated brackets was recorded in the orthodontic office of each author. All of the

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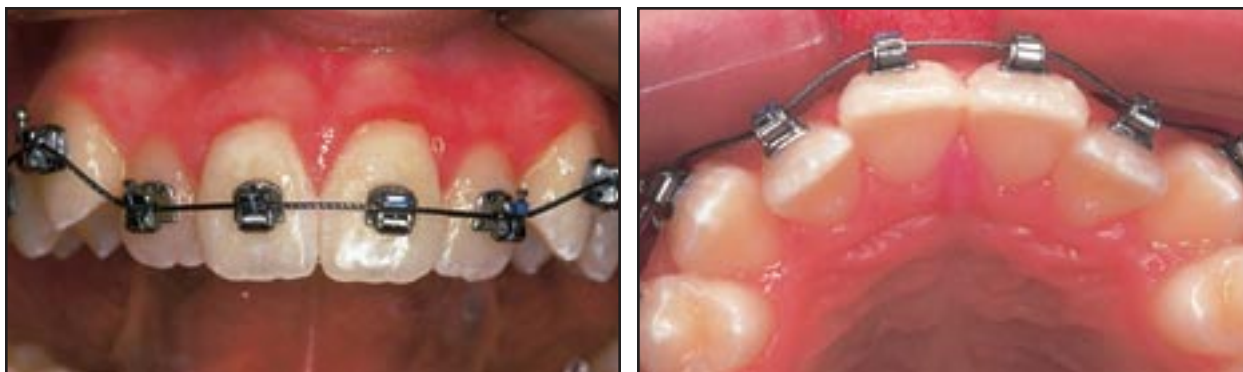


Fig. 1 SPEED self-ligating brackets.

Dr. Berger is a Clinical Associate Professor, Department of Orthodontics, School of Dentistry, University of Detroit Mercy, and in the private practice of orthodontics at 600 Tecumseh Road East, Suite 241, Windsor, Ontario, N8X 4X9 Canada. E-mail: braces@mnsi.net. Dr. Byloff is a Clinical Instructor and Faculty Member, Department of Orthodontics and Pedodontics, School of Dentistry, University of Geneva, Switzerland, and in the private practice of orthodontics in Graz, Austria.



Dr. Berger



Dr. Byloff



Fig. 2 Damon I self-ligating brackets.



Fig. 3 Time self-ligating brackets.



Fig. 4 TwinLock self-ligating brackets.

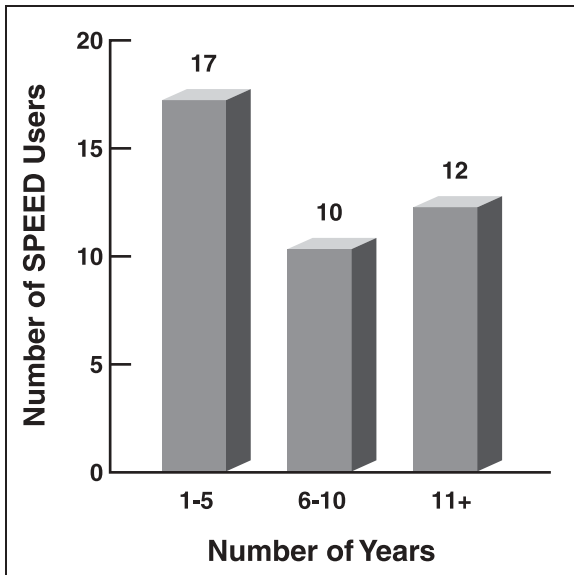


Fig. 5 Experience of respondents with SPEED bracket system.

cases were nonextraction, and the archwires were removed and inserted by a single operator proficient with the respective bracket system. All archwires were round .018" stainless steel, and all major rotations had been corrected.

The self-ligated group included 20 patients for each of four different types of self-ligating brackets:

1. SPEED (active spring clip)
2. Damon I (slide cover)
3. Time (rigid arm)
4. TwinLock (labial slide)

The ligated group, using Mini-Twin** brackets, was comprised of 20 patients ligated with stainless steel ties and 20 with elastomeric modules. Each patient had ligated or self-ligated brackets bonded from second bicuspid to second bicuspid in both arches, with either bonded molar tubes or cemented molar bands on the mandibular first and second molars.

A stopwatch was used by an assistant to measure the time needed to open the self-ligated brackets in each arch prior to archwire removal,

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and to close the brackets after the archwire was replaced or resealed. In the ligated groups, the time required to remove and replace the ligatures was recorded in the same manner.

When the results were compiled, the time-saving aspect of the self-ligating mechanism was readily apparent, regardless of which bracket was employed (Tables 1-3). Stainless steel ligatures required about six or seven minutes per arch, and elastomeric ligatures nearly two minutes per arch. The total opening and closing time per arch was less than one minute for each of the four self-ligating bracket designs, with the SPEED system taking the least average time and the Damon I the most. Opening and closing times were similar in both arches for all the self-ligating brackets except the TwinLock.

Discussion

Both orthodontic offices, although continents apart, recorded significant savings in chair-time using self-ligating brackets, as compared to conventional ligation methods. These results are supported by other clinically timed studies of self-ligating systems.^{1,4} The difference in opening and closing times for the TwinLock brackets could be explained by the mobility of the slide during the opening and closing process. (Note: This bracket is being phased out by the manufacturer.)

To determine the impact of these results on the efficiency of a typical orthodontic practice, one can use the latest JCO Orthodontic Practice Study median of 45 patients seen per day.⁹ Estimating conservatively, about half of these patients (22) would require both their maxillary and mandibular archwires changed. Based on the two-office average for the self-ligating bracket with the shortest working times—the SPEED system (Table 3)—one could expect to save one hour per day compared to elastomeric ligatures and four hours and 50 minutes compared to stainless steel ligatures. In a seven-hour day, the SPEED system would create 14% more free time than with elastomeric ligation and 69% more than with steel ligation. In a five-day week, one

TABLE 1
MEAN LIGATION TIME FROM MAXILLARY SECOND BICUSPID
TO SECOND BICUSPID (minutes:seconds)

	Remove/Open		Retie/Close		Total Time Open + Close	
	Office 1*	Office 2**	Office 1	Office 2	Office 1	Office 2
Steel Ligature	1:10	1:25	4:40	5:28	5:50	6:53
Elastomeric Ligature	:22	:25	1:18	1:22	1:40	1:47
Damon I	:26	:28	:24	:25	:50	:53
TwinLock	:25	:34	:24	:18	:49	:52
Time	:23	:23	:22	:22	:45	:45
SPEED	:16	:18	:08	:10	:24	:28

TABLE 2
MEAN LIGATION TIME FROM MANDIBULAR SECOND BICUSPID
TO SECOND BICUSPID (minutes:seconds)

	Remove/Open		Retie/Close		Total Time Open + Close	
	Office 1*	Office 2**	Office 1	Office 2	Office 1	Office 2
Steel Ligature	1:40	1:25	4:52	5:55	6:32	7:20
Elastomeric Ligature	:41	:26	1:14	1:18	1:55	1:44
Damon I	:27	:28	:29	:30	:56	:58
TwinLock	:12	:29	:10	:17	:22	:46
Time	:25	:25	:21	:21	:46	:46
SPEED	:17	:18	:10	:11	:27	:29

TABLE 3
TOTAL MEAN LIGATION TIME FOR BOTH ARCHES (minutes:seconds)

	Remove/Open		Retie/Close		Both Arches Open + Close	
	Office 1*	Office 2**	Office 1	Office 2	Office 1	Office 2
Steel Ligature	2:50	2:50	9:32	11:23	12:22	14:13
Elastomeric Ligature	1:03	:51	2:32	2:40	3:35	3:31
Damon I	:53	:56	:53	:55	1:46	1:51
TwinLock	:37	1:03	:34	:35	1:11	1:38
Time	:48	:48	:43	:43	1:31	1:31
SPEED	:33	:36	:18	:21	:51	:57

*Dr. Berger; **Dr. Byloff.

could save five hours of time compared to elastomeric ligation and more than 24 hours compared to steel ligation. The amount of time saved by any of the other three self-ligating brackets would be similar.

There are other less obvious areas of fiscal consideration. Because archwire changes with self-ligated brackets require minimal instrumentation, there are usually fewer instruments to purchase than with conventional brackets. This means fewer sterilization cycles and a subsequent reduction in sterilization costs. Combined with the elimination of wire or elastomeric ligatures from inventory, these savings more than compensate for the difference in price between ligated and self-ligated brackets.

Furthermore, the ease of archwire removal and engagement allows ligature-free systems to be classified as “two-handed” orthodontics rather than the “four-handed” technique that has traditionally been required, especially with stainless steel ties. This allows chairside assistants to perform other essential duties, thus strengthening the practice as well as reducing the need for additional staff. With staff salaries accounting for 18-20% of orthodontists’ gross income,¹⁰ the cost savings could be substantial.

Of course, there are ways to use “ligature-free time” other than scheduling additional patients. Spending the time with patients or parents will translate into a more caring and personal practice, with a resulting increase in patient referrals. Since these account for a median of 30% of all practice referrals,⁹ the extra time spent on internal marketing, if used wisely, could have significant potential to improve the long-term health of a practice.

Conclusion

The clinical study presented here confirms the clinical observations of 39 orthodontists using the SPEED bracket: that self-ligation is an extremely cost-effective treatment technique. This article also demonstrates the importance of considering the time-cost factor before making a purchase decision. The clinical advantages of self-ligating systems, including more efficient leveling, low friction, patient comfort, and minimal force¹¹—add even further to the time-saving benefits of these brackets.

ACKNOWLEDGMENTS: The authors would like to thank Dr. Erico Ostini for his contribution to this paper.

REFERENCES

1. Shivapuja, P.K. and Berger, J.L.: A comparative study of conventional ligation and self-ligation bracket systems, *Am. J. Orthod.* 106:472-480, 1994.
2. Hanson, G.H. and White, L.W.: JCO Interviews Dr. G. Herbert Hanson on the SPEED bracket, *J. Clin. Orthod.* 20:183-189, 1986.
3. Bednar, J.R.; Gruendeman, G.W.; and Sandrik, J.L.: A comparative study of frictional forces between orthodontic brackets and arch wires, *Am. J. Orthod.* 100:513-522, 1991.
4. Maijer, R. and Smith, D.C.: Time savings with self-ligating brackets, *J. Clin. Orthod.* 24:29-31, 1990.
5. Hanson, G.H.: The SPEED system: A report on the development of a new edgewise appliance, *Am. J. Orthod.* 78:243-65, 1980.
6. Heiser, W.: Time: A new orthodontic philosophy, *J. Clin. Orthod.* 32:44-53, 1998.
7. Wildman, A.J.: The Wildman TwinLock bracket, *Clin. Impress.* 7:(2), 1998.
8. Berger, J.L.: Self-ligation in the year 2000, *J. Clin. Orthod.* 34:74-81, 2000.
9. Gottlieb, E.L.; Nelson, A.H.; and Vogels, D.S. III: *1999 JCO Orthodontic Practice Study*, Index Publishers Corp., Boulder, CO, 1999.
10. White, C.: Win-win staff compensation, *J. Clin. Orthod.* 29:577-578, 1995.
11. Berger, J.L.; Byloff, F.; and Waram, T.: Supercable and the SPEED system, *J. Clin. Orthod.* 32:246-253, 1998.