Research Paper Dental Sciences

an Assessment of Treatment Outcome of three Commonly used self Ligating Bracket Systems – A Prospective Clinical study

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ABSTRACT

Background & Objectives: Self-ligating brackets are becoming common in the marketplace with many manufacturers offering diffrent forms. Various studies have evaluated the frictional characteristics of self ligating brackets with only few studies actually evaluating their treatment quality. This study was done to compare effectiveness of three contemporary self ligating bracket systems (Smart Clip, In-Ovation, Damon 2).

Methods: This was a prospective in- vivo study in which a total of 24 patients were randomly divided into 3 groups treated with Smart Clip, In-Ovation, and Damon 2 bracket systems. As a measure of quality of treatment, the ABO scores were measured at the end of treatment.

Results: The mean ABO score in Smart Clip, In-Ovation, and Damon 2 group were 24.1 $\pm$ 1.3, 26.5 $\pm$ 2.6, and 25.6 $\pm$ 1.9 respectively.

Interpretation and Conclusion: There was no statistically significant difference in the quality of treatment outcome between the three bracket systems.

KEYWORDS Smart Clip, In-Ovation, Damon 2, ABO score

INTRODUCTION

Orthodontic mechanotherapy is primarily dependent upon the material science and design. Bracket designs and archwires greatly affect the efficiency of treatment. There has been a continuous ongoing research for better and faster methods of treatment.

The last few years saw a revival of self ligating brackets of different types sparking off controversies on the efficiency of bracket design and treatment efficiency. Two types of self ligating brackets have been developed: those with a spring clip that presses against the archwire ('active' SLBs) and those with a clip that does not press against the archwire ('passive' SLBs). With every self ligating bracket, whether active or passive, the movable fourth wall of the bracket is used to convert the slot into a tube[1].

Various studies[1-17] have been undertaken to compare the self ligating brackets with conventional brackets, however, there is a lack of studies which have actually compared the clinical efficiency of the different type of self- ligating brackets designs.

This study aims to compare 3 commonly used self ligating bracket systems with regard to final finishing.

The objective of this study was to evaluate the quality of treatment outcome by measuring post treatment study models and radiographs using the grading criteria for certification as set by the American Board of Orthodontics (ABO).[18]

METHODOLOGY

24 patients were selected from the patients seeking orthodontic treatment. The selection of patients in the sample was such that there was a requirement of premolar extraction.

Inclusion criteria:

- Patients with full complement of permanent teeth for that particular age.
- Patients within the age range of 16-25years.
- Patients requiring premolar extraction.

Exclusion criteria:

- Patients having poor oral hygiene.
- Periodontally compromised patients.
- Patients requiring surgical line of treatment.
- Patients with impacted teeth.
- Non cooperative patients.

The study was aimed at evaluation and comparison of effectiveness of different self ligating brackets

Three self ligating brackets were investigated in this study:

- Smart Clip (3M Unitek) (Fig 1)
- In-Ovation (GAC International) (Fig 2)
- Damon 2 (Ormco) (Fig 3)

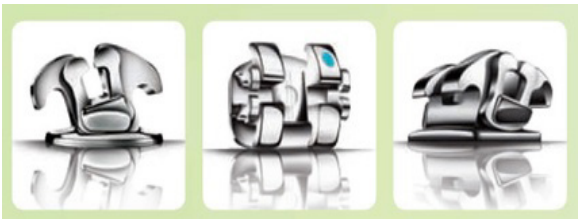


Fig. 1 SMART CLIP



Fig. 2 IN-OVATION

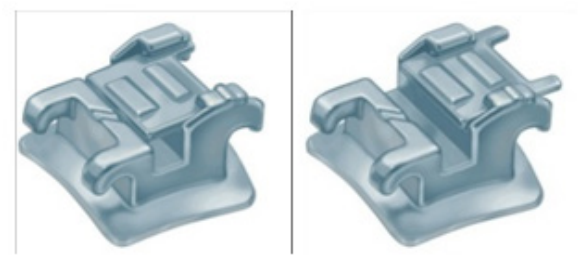


Fig. 3 DAMON 2

The patients included in the study were equally divided into 3 groups of 8 patients each:

Group 1 : Patients treated with Smart-Clip self ligating bracket system

Group 2 : Patients treated with In-Ovation self ligating bracket system

Group 3 : Patients treated with Damon 2 self ligating bracket system

The treatment was carried out as per the guidelines given by MBT.[19]

These three groups of patients were compared for treatment effectiveness. As a measure of effectiveness (quality) of treatment, the ABO scores were measured at the end of treatment from the post treatment dental casts and OPG.

STATISTICAL ANALYSIS

Results were expressed as Mean ± SD and Range values. One way ANOVA was used for multiple group comparisons followed by Post hoc Tukey's test for group wise comparisons. A P value of 0.05 or less was considered for statistical significance.

RESULTS

ABO scores (Table 1, 2 & 3)

The parameters that were used to evaluate the final ABO scores of the patients in the 3 groups were Alignment, Marginal Ridges, Bucco-Lingual Inclination, Occlusal Relationship, Occlusal Contacts, Interproximal Contacts, Overjet, and Root Angulation.

The mean of total ABO score for Smart Clip self-ligating brackets was 24.1 ±1.3, for In-Ovation, it was 26.5 ± 2.6 and for Damon 2 it was 25.6 ± 1.9. The mean difference in ABO score of Smart Clip and Damon 2 was 1.5, between Damon 2 and In-Ovation it was 0.9 and between In-Ovation and Smart Clip 2.4. The difference in mean ABO scores between Smart Clip and In-Ovation was found to be statistically significant.

(Table 1 & 2)

TABLE: 1 DESCRIPTIVE STATISTICS FOR DIFFERENCES IN ABO SCORE BASED ON BRACKET TYPES

Measurement	SMART CLIP		IN-OVATION		DAMON 2		ANOVA	
	Mean ± SD	Range	Mean ± SD	Range	Mean ± SD	RANGE	F*	P
ABO score (deductions)	24.1 ± 1.3	22-28	26.5±2.6	21-29	25.6 ± 1.9	23-29	1.41	0.23,NS

* One way ANOVA

TABLE 2: DESCRIPTIVE STATISTICS FOR GROUP WISE COMPARISON BETWEEN THE 3 BRACKET SYSTEMS

Measurement	SMART CLIP VS. IN-OVATION		SMART CLIP VS. DAMON 2		DAMON 2 VS. IN-OVATION	
	Mean difference	P**	Mean difference	P**	Mean difference	P**
ABO score (deductions)	2.4	0.04, S	1.5	0.19, NS	0.9	0.37,NS

** Post hoc Tukey's test

TABLE 3: DESCRIPTIVE STATISTICS FOR INDIVIDUAL ABO SCORES OF THE 3 BRACKET SYSTEMS

		Alignment	Marginal ridges	Bucco-lingual inclination	Occlusal relation	Occlusal contacts	Interproximal contacts	Overjet	Root angulation
SMART CLIP		3.6±0.6	4.5±0.6	3.7±0.8	3.4±0.6	3.8±0.7	1.0±0.7	1.5±0.8	2.5±0.5
IN-OVATION		6.4±0.4	4.0±0.4	3.5±0.6	3.5±0.6	3.9±0.7	1.0±0.7	1.6±0.8	2.6±0.6
DAMON2		4.37±0.5	4.1±0.5	3.8±0.5	4.0±0.8	3.6±0.8	0.9±0.5	2.1±0.6	2.9±0.8
ANOVA	F*	17.3	0.08	0.18	0.22	0.07	0.16	1.56	1.48
	P	<0.02, S	0.88, NS	0.74, NS	0.70, NS	0.92, NS	0.64, NS	0.22, NS	0.29, NS
SMART CLIP vs DAMON2 **		0.54, NS	0.90, NS	0.76, NS	0.74, NS	0.94, NS	0.62, NS	0.88, NS	0.67, NS
SMART CLIP vs IN-OVATION **		<0.01, S	0.97, NS	0.94, NS	1.00, NS	0.98, NS	0.92, NS	0.69, NS	0.38, NS
DAMON2 vs INOVATION **		<0.03, S	0.90, NS	0.94, NS	0.91, NS	1.00, NS	0.97, NS	0.58, NS	0.59, NS

* ONE WAY ANOVA **POST HOC TUKEY'S TEST

DISCUSSION

Though a number of studies have been undertaken to compare the self ligating brackets with conventional brackets, there have been no studies which have compared the clinical efficiency of the different types of self- ligating brackets.

The purpose of our study was to evaluate and compare the effectiveness or the quality of the treatment outcome of these self ligating brackets by evaluating post-treatment study models and panoramic radiographs using the grading criteria for certification as set by the ABO.

Three bracket systems with different self ligation mechanisms were included in our study - Smart Clip, In-Ovation and Damon2 self ligating brackets. The In-Ovation bracket is an active twin self ligating bracket with a sliding spring clip made of stainless steel which encroaches on the slot from the labial aspect, potentially placing an active force on the archwire. The Damon 2 bracket is a passive single wing self ligating bracket with a single slide to entrap the archwire which creates a passive labial surface to the slot with no intention or ability to invade the slot or store force by deflection of the metal clip. The Smart Clip bracket is a passive twin self ligating bracket which engages the wire by NiTi clips adjacent to the wings and contains no moving door or latch. It has a familiar tie-wing design which allows for the use of traditional ligation as an option to the clinician. This design also facilitates simple and easy use of chain ligatures when needed for space closure.

The mean ABO score for Smart Clip self-ligating brackets was 24.1 ± 1.3 for In-Ovation, 26.5±2.6 and for Damon 2 it was 25.6 ± 1.9. The difference in mean ABO score of Smart Clip and In-ovation was 2.4, between Smart Clip and Damon

2 was 1.5 and between Damon 2 and In- Ovation was 0.9. The differences in mean ABO scores between the Smart Clip and In-ovation groups was statistically significant wherea statistically no significant difference was found in the remaining other two groups.

Significant differences were found in the scores for alignment between the In-Ovation group as compared to both Smart Clip and Damon 2. The In-Ovation group had significantly poor ABO score for alignment than the other 2 groups. The reason for this may be explained by the fact that the In-Ovation bracket is an active SLB producing more amount of friction.

Another factor that may influence the final treatment outcome was the torque expression of the 3 bracket systems. Badawi [20] have shown that the active SLBs are more effective in torque expression which is a direct result of their active clip forcing the wire into the bracket slot and the amount of archwire bracket slop is considerably less for active than passive SLBs. However, in our study, no difference in treatment outcome was noted as a result of difference in torque expression between the 3 bracket systems.

CONCLUSION

The present study evaluated and compared the final orthodontic treatment outcome (ABO scores) for the three bracket systems.

All the 3 bracket systems showed almost similar quality of orthodontic treatment outcome. The differences in mean ABO scores between the Smart Clip and In-ovation groups was statistically significant whereas the statistically no significant difference was found in the remaining other two groups..

Thus, it can be concluded that the quality of orthodontic treatment outcome was better for Smart Clip than In-ovation group.

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