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Randomized Control Study of Self Ligating Vs Conventional Ligating Bracket System during Efficiency of Leveling and Aligning

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ABSTRACT: *Introduction of self-ligating brackets has revolutionized in orthodontics. Self ligating brackets used initially had several advantage and disadvantage. But smart clip brackets claims automatic closer of the clip and fully secured engaging of arch wire without any moving door or latch. The aims and objectives of this study were to evaluate and compare the appliance efficiency in leveling, aligning and decrowding, Chair side time saving and Bracket bond failures between Self Ligating Brackets and Conventional Ligating Brackets. 14 patients were examined in both the groups (7 with SLBs and 7 with CLBs). All the cases were operated by single operator. The various parameters were compared in both the groups. The results showed statistically significant reduction in the number of days observed when both the groups compared for appliance efficiency (in leveling ,aligning and decrowding). During the archwire change Self ligating brackets were 2.76 times quicker than Conventional ligating brackets Therefore, the smart clip Self ligating brackets can be considered more advantageous than the conventional ligating brackets.*

Key words: *Self ligating bracket, smart clip, Bond strength, Appliance efficiency*

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I. Introduction

Efficiency has become a key word in defining the benefits of orthodontic appliances and techniques, allowing the patient to expect more efficient and timely treatment. Efficiency is said to be influenced by three key factors: efficiency of mechanics, decreased chair side time per office visit, and fewer appointments to complete treatment. Roth[1] claimed in 1987 that he could save 3 to 6 months treatment time by using his prescription and gain 20% chair time reduction in extraction cases. Mayerson[1] in 1977 claimed the same advantages. However, both present weak evidence in support of those claims.

With the latest versions/designs of self-ligating brackets, claims of more efficient mechanics and shorter treatment time have partly been referred to in terms of a "reduction of friction" in the systems. Elastomeric ligatures create friction by pressing the archwire into the slot according to Meling and Coworkers.[2] Friction as binding is influenced by bracket type, size and alloy, and wire size, shape and alloy, which is true for both self-ligating and conventional brackets. Although statements of improving the efficiency of orthodontic tooth movement are made by advocates of self-ligating bracket systems, there is still little in vivo evidence to support those claims.

. SmartClip brackets are the only true self-ligating brackets, because the clip automatically closes and secures the archwire in the wire slot. Because of the true twin design the clinician has the option of selectively engaging the archwire in only one clip when teeth are severely malaligned. In addition, the familiar tie-wing design allows the use of traditional ligation. The design also facilitates simple and easy use of elastomeric chain ligatures when needed for space closure. Careful engineering of the geometry of the clip ensures proper archwire insertion and disengagement forces and stress-strain distributions for fatigue resistance.The SmartClip Self-Ligating Appliance System features the MBT (3M Unitek, 3M Corporate Head-quarters, 3M center st. paul, MN 55144-1000) system prescription.

The aims and objectives of this study were to evaluate and compare:
Appliance efficiency in leveling,aligning and decrowding of Self Ligating Brackets SLB and Conventional Ligating Brackets CLB.

II. Materials And Method

The study was conducted in Division of Orthodontia & Dentofacial orthopedics of Rajah Muthiah Dental College and Hospital Chidambaram, Tamil Nadu, India. 14 M/F subjects aged between 15 -25 years in which subjects are randomly divided in to 2 groups of 7 each. Group A for self ligation & Group B for conventional ligation system.

Inclusion Criteria -

Subjects having a class I malocclusion with class I skeletal base, lower anterior crowding with Little's crowding index score of more than 7 in the lower arch and all their permanent teeth erupted except third molar erupting or missing, subjects needing therapeutic extraction of all four 1st premolars with healthy periodontium were included.

Exclusion Criteria -

Subjects with congenitally missing permanent teeth/tooth, Systemic disease condition, allergic to nickel, history of orthognathic surgery and/or previous orthodontic treatment. Class II and class III malocclusion with any space in lower arch, history of trauma to the orofacial region & known congenital craniofacial anomaly were excluded from the study.
The demographics of these subjects were listed. Lateral cephalogram and OPG with same machine & same operator, extra oral & intra oral photographs and dental stone models made with alginate impression.

Materials and method
Bonding procedure –
All the incisal edges were recontoured for any irregularities. Direct bonding techinique is used for both groups .d-tech etchant and Transpodt sealent and adhesive is used

Arch Wire Sequences -
a)0.014'' Heated activated NITI b)0.016'' Heated activated NITI c)0017'' x 0.025'' Heated activated NITI d)0.017'' x 0.025'' Stainless Steel e)0.019'' x 0.025'' Stainless Steel

1) Evaluation of Appliance Efficiency in Leveling, Aligning and Decrowding
The date of bonding of each patient is recorded as D1 and all the patient are followed monthly. Complete leveling & aligning will be judged by visual inspection of correction of proximal contacts, then the patient is considered as complete and alignment date D2 is recorded. The time of alignment (D2 –D1) of each patient will be calculated in days for both bracket systems. At D2 an alginate impression for model construction made & photographs taken. Littles crowding index for decrowding is assessed for all patients.

III. Results

A total of 7 patients were examined in both the groups (SLB and CLB), for comparing the appliance efficiency in leveling, aligning and decrowding

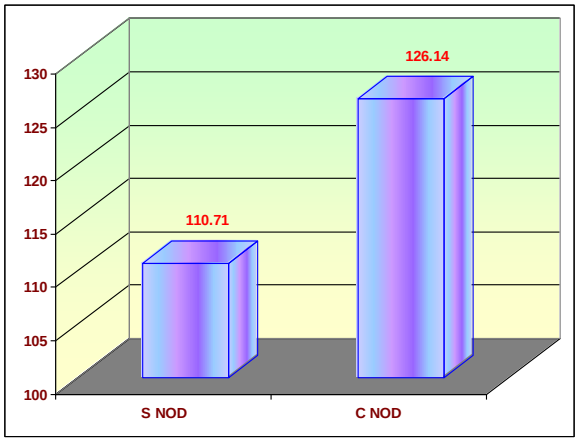
Appliance efficiency in leveling, aligning and crowding:

Table I Comparison of SLB Number of Days and CLB Number of Days

Groups	N	Mean	SD	t-value	P-value
S NOD	7	110.71	4.15	6.872	0.000 (S)
C NOD	7	126.14	3.34		

Table-1 and Graph-1 shows that in SLB there is a statistically significant reduction in number of days taken for leveling, aligning and decrowding compared to CLB

Graph-I: Comparison of Number of Days between SLB and CLB



IV. Discussion

Introduction of SLBs in 1935 by Dr. Jacob Stolzenberg[3] left many practitioners unfamiliar with the advantages of these revolutionary brackets. The mechanism of ligation in these revolutionary brackets was in stark contrast to the traditional approach of tying steel ligatures around each bracket. Treatment with these brackets was considerably more comfortable to the patient as well as for the orthodontist, as the former enjoyed shorter office visits, lesser percutaneous injuries. Some authors reported low frictional resistance in self ligation,[3,10,18,35] secure & full ligation of arch wire in self ligation system,[12,13] reduced microbial colonization[14] & longer appointment interval.[15] Damon 2 brackets are no more effective at reducing irregularity than the conventional twin bracket with elastomeric ligation.[16] However most advantage of self ligation remain largely presumptive. For example, enamel decalcification rates around self ligation appliances are unknown. In the past, there have been many studies on SLBs and CLBs separately and also comparison between them. But our extensive literature review did not find any studies which evaluated this type of brackets. Thus, a study was undertaken to evaluate this type of new SLB.The present study was aimed at evaluating and comparing the appliance efficiency during leveling and aligning, chairside time saving and bond failure, between Self Ligating Brackets and Conventional Ligating Brackets.

A total of 14 patients were examined in both the groups (7 with SLBs and 7 with CLBs). All the cases were operated by single operator. The various parameters were compared in both the groups.Literature reveals only a few of these studies that have actually evaluated the efficiency of the self ligating system in terms of their ability in decrowding the lower anterior teeth, the main drawback of the earlier studies are that some are retrospective in nature or they are a split mouth design. Prospective studies fail to make proper standardization.When both the SLB & CLB groups were compared for appliance efficiency, (during leveling and aligning) statistically significant reduction in the number of days observed when both the groups were compared.Our findings are in disagreement with Peter G .Miles et al[16] who has shown that Damon 2 bracket was no more effective at reducing irregularity than the conventional brackets. But in concurrence with the studies by Damon[19], Eberting, Straja and Tuncay[14] and Harradine[5]. However, these studies compared different type of SLBs and CLBs and evaluated the treatment changes at the end of complete treatment. The SLBs have a distinct advantage over CLBs considering the chairside time saving for archwire changes. The time needed to place a 0.016'' x0.022" archwire into SLB was nearly 3.16 times less when compared to the CLBs. SLBs required only half the time taken by CLBs for the removal of archwire. While the time taken for the whole procedure (i.e., for removal and placement) was 2.76 times less with SLBs. These findings are in agreement with studies done by Hanson[20], Damon[19], Maijer R Smith[6], Shivapuja and Berge[21], Berger and Byloff [4], and Harradine[5].

They permit the use of light force and also significantly reduces the risk of percutaneous injury. As more orthodontic practices embraces the concept of self ligation, it is becoming apparent that stainless steel and elastomeric ligatures will eventually be outdated as full banding is today. Considering the advantages of self ligating brackets for clinicians, staff, and patient they may well become the conventional appliance system in future.[1]

V. Conclusion

The study was performed over a period of 4-5 months to evaluate appliance efficiency during leveling and aligning Self ligating brackets were more effective during leveling and aligning than Conventional ligating brackets.This study found that SLBs were better than CLBs on appliance efficiency during

leveling and aligning, chairside time, but a major disadvantage was the experience of pain on engagement and removal of archwire especially during rectangular arch wires.Therefore, the smart clip Self ligating brackets can be considered more advantageous than the conventional ligating brackets.As this was a short term study, further research is warranted on a long term basis so as to be more clinically relevant.

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