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Compare The Anchoring Loss and Total Treatment Duration Between The Passive Self Ligating Bracket and Traditional Pre-Adjusted Edgewise Bracket Systems

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ABSTRACT

Aim: To compare and contrast the anchoring loss and total treatment duration between the passive SLB (Smart Clip) and traditional pre-adjusted edgewise bracket systems.

Methods and Materials: The conventional preadjusted edgewise (M.B.T.) bracket system was used on 20 patients, whereas the Smart Clip self-ligating bracket system was used on 20 patients. Patients in the conventional pre-adjusted edgewise (M.B.T.) bracket group and the Smart Clip self-ligating bracket group had mean ages of 17.8±2.1 years and 17.6±2.1 years, respectively. Before and after the retraction was finished, each patient had two lateral cephalometric radiographs taken. The amount of anchoring loss that has been seen is the result of initial levelling and alignment, followed by sliding mechanics to close the space.

Results: The difference in mean values (anchorage loss) regarding U6 (sagittal) between category A and category B was non significant statistically. The difference in mean values (anchorage loss) regarding L6 (sagittal) between category A and category B was non significant statistically. The difference in mean values (anchorage loss) regarding U6 (verticall) between category A and category B was non significant statistically. The difference in mean values (anchorage loss) regarding L6 (vertical) between category A and category B was non significant statistically. The anchorage loss was greater in conventional M.B.T appliance, however the difference was not significant statistically.

Conclusion: The anchorage loss was greater in conventional M.B.T appliance, however the difference was not significant statistically.

Keywords: Anchorage loss; Self ligating bracket; Edgewise bracket

INTRODUCTION

One of the main reasons for less-than-ideal outcomes in orthodontic treatment is anchor loss, which is a potential adverse effect of orthodontic mechanotherapy. Multiple factors, including the site of extraction, appliance design, aging, overcrowding, and overjet, have been identified as its causes [1]. In order to manage anchoring, physicians have worked hard throughout the years to identify biomechanical solutions.[2] Orthodontists may now treat patients effectively and consistently thanks to Andrews' discovery of the Straight-wire appliance, a novel technique with spartan mechanics.[3]

The frictional forces created here between archwire as well as bracket, which may prevent tooth movement, necessitate greater retraction pressures, and result in anchoring taxation, have drawn significant study interest as moving mechanics in orthodontics become more widely used. . Most of these frictional resistance's size, control, and clinical importance are unknown.[4] A sufficient translational force must be given in order to counteract the frictional force because up to 60 percent of total of the force applied can be lost through friction, reducing the force accessible for tooth movement. Higher forces would be needed as the frictional resistance increased.[5] In order to seal off the edgewise slot, self-ligating brackets feature a mechanical system, an active clip, or a passive slide incorporated into the bracket. These bracket systems do not require ligatures.[6,7]

In order to provide improved sliding mechanics and reduce friction, the self-ligating bracket was developed. As the teeth move more quickly, treatment time is reduced. The frictional resistance is drastically decreased and tooth movement happens more quickly in the lack of wire or elastomeric links.[8,9] Sliding mechanics were used in this study to compare and contrast the anchoring loss and total treatment duration between the passive SLB (Smart Clip) and traditional pre-adjusted edgewise bracket systems.

METHODS AND MATERIALS

From the department O.P.D.40 prospectively enrolled who met the eligibility requirements were chosen for the study.

Sample selection

The following criteria were used to choose the study category sample that qualified for this investigation:

Inclusion standards

1) A thorough dental and medical history excluding any underlying disease.

2) Patients who need to have their first molars extracted for medicinal purposes.

3) In the sample situations, the decision to extract was made mostly for retraction after levelling and aligning.

The conventional preadjusted edgewise (M.B.T.) bracket system was used on 20 patients, whereas the Smart Clip self-ligating bracket system was used on 20 patients. Patients in the conventional pre-adjusted edgewise (M.B.T.) bracket group and the Smart Clip self-ligating bracket group had mean ages of 17.8±2.1 years and 17.6±2.1 years, respectively.

After initial alignment in all categories, a 0.019 x 0.025- in SS archwire with a hook positioned mesially to the canines was implanted and remained in situ for 5 weeks. The archwire finished flush with the distal part of the first

molar bracket on each side, and the six anterior teeth were secured with elastic chain. Following alignment, active tie-backs were attached to the archwire hook mesial to the canine and put across the extraction sites from the bracket hook on the first molar. The amount of movement in millimetres that occurred in the direction opposite of the applied resistance was measured as "anchorage loss."

Before and after the retraction was finished, each patient had two lateral cephalometric radiographs taken. The amount of anchoring loss that has been seen is the result of initial levelling and alignment, followed by sliding mechanics to close the space. Landmarks were located on radiographs, and bilateral structures were divided before being taken into consideration as mid-sagittal points. By creating the Cartesian Coordinate System, linear measurements of distinct locations' spatial positions were ascertained.[6] A line drawn from the SN line on the pretreatment cephalometric radiograph and transferred to the posttreatment cephalometric radiograph served as the X axis of the Cartesian coordinate. By dropping a line from Sella parallel to the X axis, the Y axis was created.[7]

These measurements were used to describe shifts in the placement of the permanent first molars in the mandible and maxilla. During orthodontic mechanotherapy, horizontal measurements along the Y axis revealed forward movement of the molars and vertical measures along the X axis revealed extrusion of the molars. A digital calliper (150 mm ECP-015D digiMax calliper, Moore and Wright, Buchs, Switzerland) was used to measure the difference between the initial and final measurements and determine the total amount of anchor loss to the nearest 0.1 mm. Every patient in both groups had the same amount of treatment time, measured in months, from the initial installation of fixed appliances until their removal.

All radiographs were examined twice by the same researcher, with a 2-week gap between recordings, in order to minimise technique error in defining the various measuring locations and reference structures. The final measuring value was the average of the two records.

Statistical Analysis

For descriptive statistics, arithmetic means and SD were employed. Utilizing MINITAB version 13.1, all the data were examined. The results are shown as mean SD. Unpaired t-tests were used to compare changes between the study and control groups, while paired t-tests were used for intragroup contrasts (i.e., PreePost changes). The results were deemed statistically significant at a p-value of 0.05 or below.

RESULTS

Intragroup changes in pretreatment and post treatment in category A (Smart Clip)

The mean pretreatment values regarding U6 (sagittal) was 46.61 ±7.01mm and mean post treatment values were 49.51 ±8.11. The mean difference (anchorage loss) was 1.90 and the difference was significant statistically. ($p < 0.01$). The mean pretreatment values regarding L6 (sagittal) was 47.11± 9.63 mm and mean post treatment values were 50.01 ± 9.79 mm. The mean difference (anchorage loss) was 2.90 and the difference was significant statistically. ($p < 0.01$). The mean pretreatment values regarding U6 (vertical) was 66.74±4.58 mm and mean post treatment values were 68.26 ±4.61 mm. The mean difference (anchorage loss) was 1.52 and the difference was

significant statistically. ($p < 0.05$). The mean pretreatment values regarding L6 (vertical) was 65.96 ±4.53 mm and mean post treatment values were 67.66± 4.75 mm. The mean difference (anchorage loss) was 1.72 and the difference was significant statistically. ($p < 0.05$). (Table 1).

Intragroup changes in pretreatment and post treatment in category B (M.B.T)

The mean pretreatment values regarding U6 (sagittal) was 46.46 ±7.98 mm and mean post treatment values were 49.54± 8.20 mm. The mean difference (anchorage loss) was 3.08 mm and the difference was significant statistically. ($p < 0.01$). The mean pretreatment values regarding L6 (sagittal) was 48.41± 7.13 mm and mean post treatment values were 51.36± 7.12 mm. The mean difference (anchorage loss) was 2.95 and the difference was significant statistically. ($p < 0.01$). The mean pretreatment values regarding U6 (vertical) was 65.61± 4.46 mm and mean post treatment values were 67.11± 4.45 mm. The mean difference (anchorage loss) was 1.50 and the difference was significant statistically. ($p < 0.05$). The mean pretreatment values regarding L6 (vertical) was 65.41± 4.42 mm and mean post treatment values were 67.09 ±4.44 mm. The mean difference (anchorage loss) was 1.68mm and the difference was significant statistically. ($p < 0.05$). (Table 2).

Comparison between values in category A and category B. (Smart clip vs M.B.T)

The difference in mean values (anchorage loss) regarding U6 (sagittal) between category A and category B was non significant statistically. The difference in mean values (anchorage loss) regarding L6 (sagittal) between category A and category B was non significant statistically. The difference in mean values (anchorage loss) regarding U6 (verticall) between category A and category B was non significant statistically. The difference in mean values (anchorage loss) regarding L6 (vertical) between category A and category B was non significant statistically. (Table 3). The anchorage loss was greater in conventional M.B.T appliance, however the difference was not significant statistically.

Table 1: Pretreatment and post treatment changes in category A

	Linear measurements (mean ± SD) in category A			
	U6 (sagittal)	L6 (sagittal)	U6 (vertical)	L6 (vertical)
Pre	46.61 ±7.01	47.11± 9.63	66.74±4.58	65.96 ±4.53
Post	49.51 ±8.11	50.01 ± 9.79	68.26 ±4.61	67.66± 4.75
Mean diff.	2.9	2.9	1.52	1.7
t^a	9.96	15.14	4.23	4.41
p	< 0.01	<0.01	< 0.05	< 0.05

Table 2: Pre treatment and post treatment changes in category B

	Linear measurements (mean ± SD) in category B			
	U6 (sagittal)	L6 (sagittal)	U6 (vertical)	L6 (vertical)
Pre	46.46 ±7.98	48.41± 7.13	65.61± 4.46	65.41± 4.42
Post	49.54± 8.20	51.36± 7.12	67.11± 4.45	67.09 ±4.44
Mean diff.	3.08	2.95	1.5	1.68
t^a	16.51	15.21	4.36	5.15
p	< 0.001	< 0.001	< 0.05	< 0.01

Table 3: Comparison between category A and category B

	U6 (sagittal)	L6 (sagittal)	U6 (vertical)	L6 (vertical)
Category A	2.9	2.9	1.52	1.7
Category B	3.08	2.95	1.5	1.68
t^a	0.7	0.37	0.22	0.1
p	0.61	0.91	0.82	0.72
Significance	Ns	Ns	Ns	Ns

DISCUSSION AND CONCLUSION

In order to seal off the edgewise slot, self-ligating brackets feature a mechanical system, an active clip, or a passive slide incorporated into the bracket. These bracket systems do not require ligatures. In order to provide improved sliding mechanics and reduce friction, the self-ligating bracket was developed.[8-12] As the teeth move more quickly, treatment time is reduced. The frictional resistance is drastically decreased and tooth movement happens more quickly in the lack of wire or elastomeric links. 4Sliding mechanics were used in this study to compare and contrast the anchoring loss and total treatment duration between the passive SLB (Smart Clip) and traditional pre-adjusted edgewise bracket systems.[13-17]

Numerous studies have shown that SLBs have far less friction than traditional bracket designs.[11] Particularly in extraction situations in which tooth translation is accomplished by sliding mechanics, such a decrease in friction can considerably reduce overall treatment duration and anchorage considerations. Numerous studies have also demonstrated that some self-ligating brackets are more clinically effective and efficient than traditional brackets, while others have demonstrated that there is no distinction among the two bracket systems.[12-15] When employed to retract a canine, an anchor unit composed comprising the first molar and second premolar can occupy between 5% and 50% of the overall extraction space, according to research by [16]

In smart clip category the mean pretreatment values regarding U6 (sagittal) was 46.61 ±7.01mm and mean post treatment values were 49.51 ±8.11. The mean difference (anchorage loss) was 1.90 and the difference was

significant statistically. ($p < 0.01$). The mean pretreatment values regarding L6 (sagittal) was 47.11± 9.63 mm and mean post treatment values were 50.01 ± 9.79 mm. The mean difference (anchorage loss) was 2.90 and the difference was significant statistically. ($p < 0.01$). The mean pretreatment values regarding U6 (vertical) was 66.74±4.58 mm and mean post treatment values were 68.26 ±4.61 mm. The mean difference (anchorage loss) was 1.52 and the difference was significant statistically. ($p < 0.05$). The mean pretreatment values regarding L6 (vertical) was 65.96 ±4.53 mm and mean post treatment values were 67.66± 4.75 mm. The mean difference (anchorage loss) was 1.72 and the difference was significant statistically. ($p < 0.05$). .

An in vivo research by Hixon et al[18] demonstrated that the resistance to sliding was lower than that seen in the lab. Masticational forces inside the mouth may have loosened any regions where the wire was stuck, allowing it to slide freely. In a further experiment, the archwire was dragged through the bracket while being subjected to an oscillating force of 25e400 g at 90 Hz by Liew et al.[19] With wire displacement, the resistance to sliding was lowered by 60% to 85%. He came to the conclusion that the masticatory forces and other oral processes significantly decreased the effective frictional resistance between the orthodontic brackets and archwires. The mouth exerts little stresses that are well within the range needed to create this action.

In M.B.D category the mean pretreatment values regarding U6 (sagittal) was 46.46 ±7.98 mm and mean post treatment values were 49.54± 8.20 mm. The mean difference (anchorage loss) was 3.08 mm and the difference was significant statistically. ($p < 0.01$). The mean pretreatment values regarding L6 (sagittal) was 48.41± 7.13 mm and mean post treatment values were 51.36± 7.12 mm. The mean difference (anchorage loss) was 2.95 and the difference was significant statistically. ($p < 0.01$). The mean pretreatment values regarding U6 (vertical) was 65.61± 4.46 mm and mean post treatment values were 67.11± 4.45 mm. The mean difference (anchorage loss) was 1.50 and the difference was significant statistically. ($p < 0.05$). The mean pretreatment values regarding L6 (vertical) was 65.41± 4.42 mm and mean post treatment values were 67.09 ±4.44 mm. The mean difference (anchorage loss) was 1.68mm and the difference was significant statistically. ($p < 0.05$)

The difference in mean values (anchorage loss) regarding U6 (sagittal) between category A and category B was non significant statistically. The difference in mean values (anchorage loss) regarding L6 (sagittal) between category A and category B was non significant statistically. The difference in mean values (anchorage loss) regarding U6 (verticall) between category A and category B was non significant statistically. The difference in mean values (anchorage loss) regarding L6 (vertical) between category A and category B was non significant statistically. (table 3).The anchorage loss was greater in conventional M.B.T appliance, however the difference was not significant statistically.

[20]examined frictional resistance in a related lab experiment. The finger (20e200 g) was tapped randomly in all directions and at all frequencies while the wire was being dragged through the bracket. They observed that regardless of the method of ligation, wire size, substance, etc., resistance to sliding was always lowered to zero when displacement was applied. [21] measured sliding resistance while oscillating the test bracket. Researchers discovered that repeatedly moving the bracket can minimise sliding resistance by up to 85% with as little as 0.16 mm of mesiodistal crown movement.

It can be concluded that the anchorage loss was greater in conventional M.B.T appliance, however the difference was not significant statistically.

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