



A Comparative Clinical Study of Mandibular Incisor Decrowding Using Different Pre-Adjusted Edgewise Brackets with Different Interbracket Span

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ABSTRACT

Introduction: Aim of the present was to determine and compare the efficiency of different pre-adjusted edgewise brackets with different Inter-bracket span in mandibular incisor decrowding and to determine and compare the amount of incisor proclination during decrowding if any.

Material and Method: 20 patients were selected and divided into two groups, group I with Double width brackets (3M Unitek Gemini Series) 0.018" slot with Roth prescription and group II with Mini Uni-Twin Bracket. (3M Unitek) 0.018" slot with Roth prescription. Pretreatment records were taken included lateral cephalogram, study models, and photographs. Little's irregularity index was calculated for both groups also IMPA was calculated for both at regular intervals and finally compared with post-treatment records.

Result: Little's irregularity index in group II was having a slightly higher ratio. Both Group I and Group II cases demonstrated an increase in the proclination of the lower anterior during decrowding.

Conclusion: The Mini Uni Twin brackets were found to align the lower anterior faster. Mini Uni Twin brackets are comparatively efficient in the lower anterior decrowding.

Keywords: Decrowding, Mandibular, Incisor, Interbracket Span.

Introduction

The importance of aligning has received a great deal of attention from the orthodontist. Newer wires and innovations in the bracket systems have simplified and reduced the time span of the aligning stage.¹ Angle mentioned the importance of a wide Interbracket distance to decrease the wire's stiffness. Essentially, wire stiffness depends upon at least three factors and the first one is the material itself, the second one includes the cross-section of the wire, and lastly the length of wire between brackets; the Interbracket Span.² Though the

new wires certainly represent a step forward, they are only a partial step towards total efficiency. The basic change needs to be more in the appliance than in the wires. Minimum attention along with the chairside, minimum discomfort to the patient, more rapid a better-controlled alignment was observed with Mini Uni-twin brackets.³ The current study was undertaken to determine and compare the efficiency of different pre-adjusted edgewise brackets with different Inter-bracket span in mandibular incisor decrowding and to determine and compare the amount of incisor proclination during decrowding if any.⁴ Table 1 discusses the advantages and disadvantages of single-width brackets and double-width bracket.

Type of Brackets	Advantages	Disadvantages
Single width bracket ⁵	<ul style="list-style-type: none"> • Increased interbracket distance – aligning and leveling forces within the physiologic limits. • Bracket placement on smaller and crowded teeth more convenient. • Difficulty to get full bracket engagement is considerable reduced. • Size of the first rectangular wire- not necessarily the smallest wire light torquing forces—reduced root resorption 	<ul style="list-style-type: none"> • Inadequate tipping and rotational control • The presence of wings made bonding difficult • Reduced torquing efficiency • Friction between the bracket slot and the arch wire increased – contact angle • Debonding forces strained the enamel wall above the acceptable limits
Double width bracket ⁶	<ul style="list-style-type: none"> • Control of root position • Rotational and tipping control • Torquing efficiency 	<ul style="list-style-type: none"> • Bracket placement and full bracket engagement in crowded lower anterior was less convenient • Greater friction

Table 1: The Advantages and Disadvantages of Single Width Brackets and Double Width Bracket.

Material and Method

Criteria for patient selection:

- Number: 20 patients, 10 from each group.
- Malocclusion: Class I / Class II
- Age: 14 – 20 years.
- Lower incisor discrepancy: 4 - 9mm according to Little's Irregularity score.
- Favorable inclination of the canine
- Absence of any oral habit
- Good oral hygiene
- Without any malformation in the anterior teeth
- Patients that had their bands and / or attachments broken were not included the study. The selected samples were grouped as follows. (TABLE: 2)

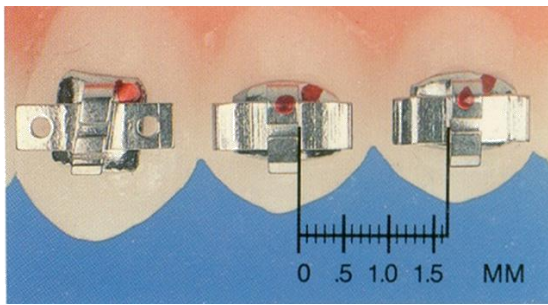


Figure 1: The Single Width Bracket

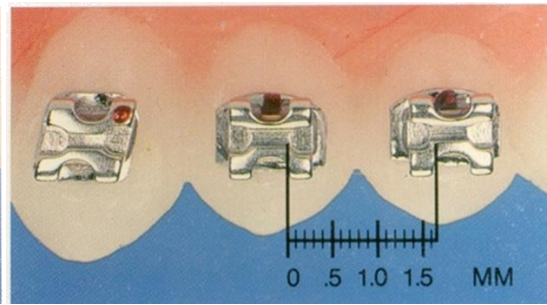


Figure 2: The Mini Uni Twin Bracket

Group I (Figure1)	Group II (Figure2)
Double width brackets (3M Unitek Gemini Series) 0.018" slot with Roth prescription	Mini Uni-Twin Bracket. (3M Unitek) 0.018" slot with Roth prescription
2.4mm (Actual width of the bracket)	2.5mm (Precision part was 1mm)

Table: 2 Grouping of Selected Samples

Clinical Procedure

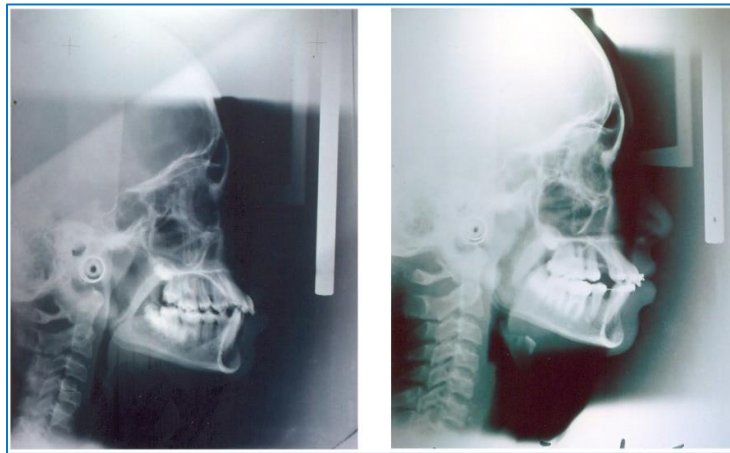
The clinical procedure started with the taking of pretreatment records of the selected patients who fulfil our inclusion criteria, here study models, lateral cephalogram, and intra-oral photographs of the patients were taken. After taking all the pretreatment records conventional bonding procedures were undertaken, followed by placing Laceyback using 0.009" SS wire. Heat-activated 0.016" NiTi (37°), Ortho form III. (3M Unitek).⁶ Once the wire was ligated the participants of the study were asked to visit for a follow-up visit every 14 days and were advised to consult the concerned doctor immediately if there were any loose brackets or bands.

Next step was an evaluation of the study cast, in this Little's Irregularity Score was first measured. A Digital Vernier Caliper measuring to 0.02mm was used for this purpose. This method involved measuring the linear displacement of the anatomic contact point as distinguished from the clinical contact point. A perfectly aligned arch from the mesial aspect of the left canine to the mesial aspect of the right canine theoretically would have had a score of 0, and a score higher than this would indicate the greatest displacement and more crowding.⁷ The measurements were obtained directly from the mandibular cast rather than intra-orally since proper positioning of the caliper was essential for consistent accuracy. The mandibular cast was viewed from above sighting down on to the edge of the anterior teeth (Fig 3). The caliper was held parallel to the occlusal plane while the beaks were lined up with contact points to be measured. The mesiodistal spacing was disregarded, provided the teeth in question was in proper arch form; if spacing, as well as displacement or rotations, was noted only the labiolingual displacement from the proper arch form was recorded. The patients were recalled every 14 days and impressions were made for study casts evaluation as per the Little's irregularity index and were tabulated, till the Little's irregularity score was "0" indicating a well-aligned arch.

After evaluating the study cast, Evaluation of the Incisor proclination during decrowding was taken up. The pre-treatment and post-treatment lateral cephalograms were traced in the usual manner for the incisor mandibular plane angle (IMPA) (Fig4). The difference between the pre-treatment and post-treatment lateral cephalogram was calculated for the change in the axial inclination of the lower incisor during decrowding. Fisher's Exact test was applied to compare a proportion of cases decrowded at different intervals between Group I and Group II.



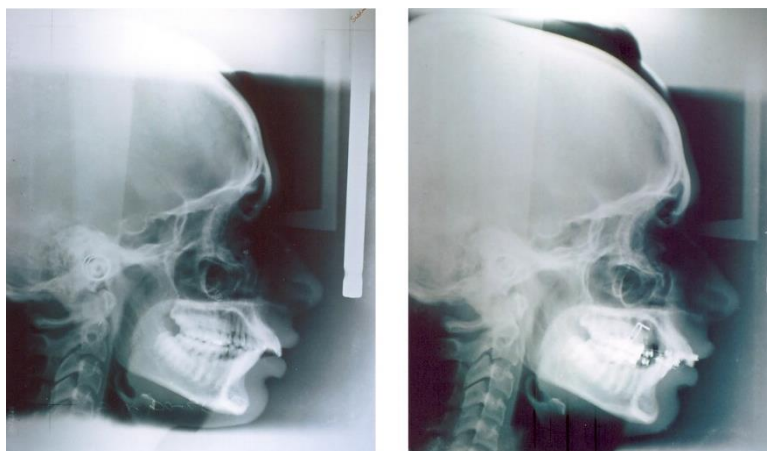
Figure 3: The Mandibular Cast was Viewed from Above Sighting Down on to the Edge of the Anterior Teeth.



Pre-treatment

Post-treatment

Figure 4A: Group I Gemini Series Bracket



Pre-treatment

Post-treatment

Figure 4B: Group II Mini Uni Twin Bracket

Results

The mean age of the patient for Group I was 17.1 ± 2.6 years and for Group II was 16.7 ± 2.0 years hence there was no significant difference in the mean ages between Group I and Group II ($P = 0.70$). Similarly the proportion of the male patients in both groups was similar ($P = 0.58$). Little's Irregularity Score for a group I was 6.55 ± 0.91 mm Mean \pm S.D. and for a group, II was 6.55 ± 1.02 mm Mean \pm S.D. so the p-value came out to 1.00 (Table 3). Fisher's Exact test was applied to compare the proportion of cases decrowded at different intervals between Group I and Group II (Table 4) Amount of de crowding between two groups were also compared (Table 5). From Day 1 to Day 14 for a group, I Mean \pm S.D was 0.68 ± 0.09 mm while for group II Mean \pm S.D was reported to be 0.94 ± 0.15 mm. From Day 14-Day 28 Mean \pm S.D for a group I (2.02 ± 0.15 mm) and Mean \pm S.D for group II (2.37 ± 0.26 mm). From Day 28-Day 42 (4.85 ± 0.34 mm) and Mean \pm S.D for group II (4.85 ± 0.34 mm) From Day 42-Day 56 for a group I Mean \pm S.D was 6.11 ± 0.44 mm while for group II Mean \pm S.D was reported to be 6.38 ± 0.75 mm. From Day 56-Day 70 Mean \pm S.D for a group I (6.55 ± 0.91 mm) and Mean \pm S.D for group II (6.55 ± 1.02 mm) While Evaluating the Incisor Mandibular Plane Angle (IMPA) The Pearson's Chi-square Test was applied and Pretreatment and post-treatment decrowding IMPA was compared. IMPA for pre-treatment for a group I (Mean \pm S.D, $94.3^\circ \pm 2.1^\circ$) and for group II (Mean \pm S.D, $94.0^\circ \pm 2.0^\circ$). For post-treatment for a group I (Mean \pm S.D, $95.1^\circ \pm 2.0^\circ$) and for group II (Mean \pm S.D, $95.8^\circ \pm 1.9^\circ$). The change between pre and post IMPA for a group I (Mean \pm S.D, $0.8^\circ \pm 0.6^\circ$) and for group II (Mean \pm S.D, $1.8^\circ \pm 0.9^\circ$) (Table 6)

Variable	Group I	Group II	P-value *
	Mean \pm S.D.	Mean \pm S.D.	
Little's Irregularity score.	6.55 ± 0.91 mm	6.55 ± 1.02 mm	1

Table: 3 Comparison of Mean Ratio of Little's Irregularity Score.

Intervals	Decrowding	Group I		Group II		P-value*
		No	%	No	%	
1 st Day	Yes	0	0%	0	0%	1.00
	NO	10	100%	10	100%	
14 th Day	YES	0	0%	0	0%	1.00
	NO	10	100%	10	100%	
28 th Day	YES	0	0%	0	0%	1.00
	NO	10	100%	10	100%	

42 nd Day	YES	0	0%	0	0%	1.00
	NO	10	100%	10	100%	
56 th Day	YES	1	10%	3	30%	0.65
	NO	9	90%	7	70%	
70 th Day	YES	5	50%	10	100%	0.03
	NO	5	50%	0	0%	

Table: 4 Comparison of Proportion of Cases Decrowded at Different Intervals Between Group I and Group II.

Variable	Group I	Group II	P-value *
	Mean \pm S.D.	Mean \pm S.D.	
Day 1-Day 14	0.68 \pm 0.09 mm	0.94 \pm 0.15 mm	<0.0001
Day 14-Day28	2.02 \pm 0.15 mm	2.37 \pm 0.26 mm	0.002
Day 28-Day42	4.85 \pm 0.34 mm	5.38 \pm 0.30 mm	0.005
Day 42-Day 56	6.11 \pm 0.44 mm	6.38 \pm 0.75 mm	0.35
Day 56-Day 70	6.55 \pm 0.91 mm	6.55 \pm 1.02 mm	1.00

Table: 5 Comparison of Amount of Decrowding at Different Intervals Between Group I and Group II.

Variable	Group I	Group II	P-value*
	Mean \pm S.D	Mean \pm S.D	
IMPA- Pre	94.3 $^{\circ}$ \pm 2.1 $^{\circ}$	94.0 $^{\circ}$ \pm 2.0 $^{\circ}$	0.75
IMPA- Post	95.1 $^{\circ}$ \pm 2.0 $^{\circ}$	95.8 $^{\circ}$ \pm 1.9 $^{\circ}$	0.44
IMPA- Change	0.8 $^{\circ}$ \pm 0.6 $^{\circ}$	1.8 $^{\circ}$ \pm 0.9 $^{\circ}$	0.01

Table: 6 Comparison of Pretreatment and Post Decrowding IMPA

Discussion

Little (1975) developed an index for assessing the degree of crowding in the mandibular arch.⁷ This method involved measuring the linear displacement of the anatomic contact point as distinguished from the clinical contact point. Single brackets increase interbracket distance about 50% and reduce wire stiffness (roughly the difference in stiffness between stainless steel and nickel-titanium).⁸ All the calculated values were recalculated 3 times and a mean was taken out to avoid any measurement errors. It was clear from table 3 that the Little' irregularity index in group II was having a slightly higher ratio.

The number of cases decrowded on the 70th day of the study was statistically significant in favor of Group II. This was most probably because of the increased interbracket span and was in correlation to Schudy and Schudy.⁹

Hocevar¹⁰ stated that alignment of crowded incisor whether accomplished by looped or plain arch wire, had a reciprocal action between the canines and incisors, tipping the former distally and the latter anteriorly, thus having the same effect as the anchor bends on the incisor. Both Group I and Group II cases demonstrated an increase in the proclination of the lower anterior during decrowding.

Conclusion

The Mini Uni Twin brackets were found to align the lower anteriors faster - statistically significant. The amount of decrowding occurring was faster at various intervals in cases with the Mini Uni Twin brackets- a statistically significant at interval 1, 2, 3 and 4. Cases with Mini Uni twin brackets had statistically significant amount of proclination of the lower anteriors ($0.8^{\circ} \pm 0.3^{\circ}$) after decrowding - clinical significance could be questionable (lesser than 1°)

Mini Uni Twin brackets are comparatively efficient in the lower anterior decrowding but further comparative clinical studies need to be performed, with an increase in the sample size and also the number of parameters to prove its total clinical efficiency.¹¹ Since we will never find a completely ideal appliance we must rely on the one that has the maximum advantages and the one that is the best accord with the biologic requirements.

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