

Crown Inclination Achieved With A Pre Adjusted Edgewise Appliance Using A Roth Or Mbt Prescription: A Comparative Study

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ABSTRACT: *Aim: Purpose of our research was to match the quantity of crown inclination achieved with a pre-adjusted edgewise appliance utilizing Roth versus MBT prescription.*

Methodology: Forty sets of posttreatment study models from patients treated employing a preadjusted edgewise appliance (20 Roth and 20 MBT) were selected using predetermined inclusion and exclusion criteria. The models were masked and laser-scanned, and therefore the final crown inclinations were assessed from the digital images. A two-way analysis of variance was undertaken with the variable quantity of ultimate crown inclination and independent variables of bracket prescription (Roth or MBT) and tooth type.

Results: There were no statistically significant differences in terms of the ultimate inclination of the anterior teeth between the 2 bracket prescriptions ($P < .132$). Statistically significant differences were found between the ultimate inclinations of various tooth types investigated ($P < .001$).

Conclusion: In this group of selected patient records, the differences in torque values between the 2 bracket prescriptions failed to cause any real clinically detectable differences within the final inclination of teeth.

Keywords: *Aligning, anchorage loss, levelling, MBT, ROTH*

1. INTRODUCTION

The preadjusted edgewise Straight Wire Appliance was familiarized within the 1970s.¹ Since then, there are various suggested modifications to the bracket prescriptions considering torque and tip values, frequently differing by just some degrees. Differences within the torque prescription of the various preadjusted edgewise appliance systems are often the reason given

for choosing one prescription over another. It's known that torque expression is affected by the amount of play between the archwire and thus the bracket slot² and by variations in tooth anatomy,³⁻⁵ variations in bracket placement,³ inaccuracies within the bracket slot and archwire dimensions,⁶⁻⁸ mode of ligation of an archwire,^{7,9} and stiffness of the archwire.¹⁰ In spite of varied devices to manage anchorage, anchor loss still appears to be a possible side effect of preadjusted edgewise appliance system. Although anchor loss is attributed to be multifactorial, it's essential to idealize the biomechanical advantages of the prescriptions that are employed within the day-to-day practice. The MBT and Roth bracket prescriptions are one amongst the two frequently used preadjusted edgewise appliance systems round the world especially within the UK. Within the orthodontic literature, one preceding study has compared the subjective outcome of the two prescriptions (MBT and Roth); the results of that study showed that the bracket prescription had no effect on the subjective esthetic judgments of posttreatment study models made by nine experienced orthodontists.¹¹ Traditionally, incisor inclination has been assessed by lateral cephalometric radiograph; however, this method is known to be but ideal¹² and has the disadvantage of subjecting the participant to radiation. A more modern method is using three-dimensional (3D) digital dental models obtained from laser scanning, which has been shown to be as reliable as cephalometric superimpositions for assessing orthodontic tooth movement.^{13,14} The MBT prescription was introduced in 1997 and quickly established itself together of the foremost popular bracket prescriptions on the market. The foremost differences with other bracket prescriptions are:

- Increased palatal root torque within the upper central incisor brackets (Andrews: 7°; Roth: 12°; MBT: 17°)
- Increased palatal root torque within the upper lateral incisor brackets (Andrews: 3°; Roth: 8°; MBT: 10°)
- Increased lingual crown torque within the lower incisor brackets (Andrews: -1; Roth: -1°; MBT: -6°)
- Decreased shot the upper canine brackets (Andrews: 11°; Roth: 13°; MBT: 8°).

Selection of an appropriate bracket prescription for any particular individual or population facilitates the quality of finish and also the obligatory time to understand the objectives. Over 30 prescriptions are commercially available. Choosing an appropriate appliance for a given population necessitates methodical research. Although craniofacial and dental features of well-balanced faces of two racially diverse groups are fundamentally different, similarity is evidenced within races.¹⁵ Hence choosing prescriptions which can suit the bulk of 1 particular race becomes prudent for consistently achieving good results. Therefore, in orthodontics an individualization of treatment leads to simpler outcome by working within patient's natural teeth angulation and inclination instead of making patients acceptable single standard.

2. AIM OF THE STUDY

Purpose of our research was to test amount of crown inclination achieved with a pre-adjusted edgewise appliance utilizing Roth versus MBT prescription.

3. METHODOLOGY

Forty sets of posttreatment study models from patients treated employing a preadjusted edgewise appliance (20 Roth and 20 MBT) were selected using predetermined inclusion and exclusion criteria.

The following inclusion criteria were applied:

- Treated with upper and lower preadjusted edgewise appliances with a Roth or an MBT prescription
- Younger than 20 years old at the beginning of treatment

- Bilateral upper arch premolar extractions
- A Peer Assessment Rating Index score of 5 or less from the posttreatment study models
- N A 0.019 3 0.025-inch chrome steel working archwire in a very 0.022 3 0.028-inch bracket slot
- An ANB angle between 1° and 5° inclusive.

The following exclusion criteria were applied:

- A nonextraction approach
- Extractions aside from premolars
- Functional appliance treatment
- Headgear treatment
- Orthognathic surgery

The torque values of MBT bracket prescription used were +17° for maxillary central incisors, 27° for maxillary canines, and 26° for mandibular incisors. The torque values of Roth bracket prescription used were +12° for maxillary central incisors, 22° for maxillary canines, and 21° for mandibular incisors. To conduct the laser scanning of dental study models and to research the crown inclination of the labial segment teeth, the subsequent method was developed: The study models were placed at an angle of 45° to the horizontal on the rotating stage in order that the shaft of light hit the horizontal a part of the surface at right angles. The model was then scanned and therefore the surface was converted to a lattice of 300,000 connected points. The 3D image was captured by a computer then viewed and manipulated using Rapidform 2006 software. The software then calculated the angle formed between the sheet and a plane perpendicular to the maxillary occlusal plane. This angle signifies the faciolingual crown inclination of the tooth. For the most study, all the study models were masked, and therefore the investigator was blinded to the prescription used for treating each patient. Two-way analysis of variance (ANOVA) test was conducted. The variable quantity was the inclination of the teeth measured using the 3D laser technique and therefore the two independent variables were bracket prescription and tooth type. the importance level was set at P <.05.

4. RESULTS

Table 1 shows the descriptive statistics for the three teeth by bracket prescription. The results of the two-way ANOVA tests (Table 2) showed that there was no statistically significant interaction between the bracket prescription and tooth type on the ultimate crown inclination (P <.330) and no statistically significant difference within the final inclination of the teeth between the patients treated using MBT or Roth bracket prescriptions (P< .130); however, there was a statistically significant difference within the final inclination between different tooth types (P < .001).

Table 1- Descriptive Statistics for the Three Tooth Type by Bracket Prescription

Tooth	Roth			MBT		
	Mean Degrees	SD	95% Confidence Intervals range	Mean Degrees	SD	95% Confidence Intervals range
Upper Left Central Incisor	3.9	6.3	22.6	7.5	4.8	16.3
Upper	-5.6	5.7	19.5	-3.1	7.7	32.9

Right Permanent Canine						
Lower Right Central Incisor	-1.4	7.3	22.3	-2.0	6.8	25.5

*SD- Standard Deviation

Table 2-Two-Way Analysis of Variance Results

Source	Mean Square	F	P Value
Bracket	97.04	2.29	0.130
Tooth	1093.53	25.87	0.001
Bracket*Tooth	47.69	1.13	0.330

* $p < 0.05$ - significant

5. DISCUSSION

The preadjusted edgewise appliance system adopted few control measures like bonding brackets on the middle of clinical crown, lacebacks, bendbacks, curve of spee, and full sized arch wire regardless of the mechanics employed. the matter of conserving anchorage remains universal irrespective of orthodontic technique used. Hence differing types of anchorage control devices like TPA, implants, InstaNance, and holding arches were introduced to regulate the anchorage.¹⁶ This study found no significant difference between the MBT and Roth bracket prescriptions in terms of the ultimate crown inclination of labial segment teeth of patients treated using these appliances. With relation to the faciolingual inclination of labial segment teeth, therefore, it appears that for treating patients with skeletal Class I and a minimum of two premolar extractions, it doesn't matter whether a patient is treated with the MBT or Roth prescription because the stated difference in torque between the 2 bracket prescriptions doesn't seem to exist clinically. This study is in agreement with the findings of Moesi et al.,¹⁷ who allotted a retrospective observational assessment to work out if using the MBT or Roth prescription has any effect on the subjective outcome of treatment, as judged by professionals. They showed that the power to see which bracket prescription has been used was no better than chance for many clinicians. additionally, Moesi et al. found that the selection of bracket prescription had no effect on the subjective esthetic judgments of posttreatment study models made by nine experienced orthodontists. Germane et al. examined the facial surface contours of teeth and also the effects of variations in facial surface on the faciolingual tooth angulation. These authors reported that the facial surface contours aren't consistent among teeth of the identical type between different persons, and this variability increases progressively between teeth from anterior to posterior in both arches.¹⁸ Additionally, van Loenan et al. reported that placing a bracket between 2 and 4.5 mm from the incisal fringe of the maxillary central incisor and canine may end in a median torque expression difference of 10° at the top of treatment within the same patient using one style of bracket system. This was thanks to the variable labial crown morphology. These factors may need contributed to the wide selection of normal deviations in expressed torque values noticed within the present study. Torque expression is additionally littered with the stiffness of the archwire; chrome steel is thought to possess the most important torque expression, followed by TMA (titanium molybdenum alloy) then nickel-titanium wire.¹⁹

6. CONCLUSION

There is no difference within the final crown inclinations of the upper central incisor, lower central incisor, and upper canine in patients treated with either the MBT or Roth prescription preadjusted edgewise appliances.

7. REFERENCES

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