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Changes in Third Molar Angulations After First Premolar Extractions During Fixed Orthodontic Treatment

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Abstract

To evaluate the effects of first premolar extraction on third molar angulation during fixed orthodontic treatment.

Panoramic radiographs of 40 patients treated orthodontically by fixed appliances were evaluated for change in third molar angulation. Twenty patients were treated by extraction of first premolars, whereas the other 20 patients were treated nonextraction. The change in upper and lower third molars angulation, relative to the occlusal plane and adjacent second molars, were obtained by subtracting post- treatment from pre-treatment values.

Statistically significant change in the angulation of both upper and lower third molars, relative to the occlusal plane and second molars, were found in the extraction group as compared to nonextraction group.

The extraction of first premolars during orthodontic treatment significantly improved the angulation of third molars toward uprightening.

Key words: fixed orthodontics, first premolar extraction, third molar angulation

Introduction

The third molars are the teeth that are most often congenitally missing. If present, they might follow an abortive eruption path and become impacted. [1] Impacted third molars are developmental pathological deformities characteristic of modern civilization. In modern populations; the impaction rate is higher for third molars than for any other tooth, accounting for 98% of all impacted teeth.[2] Impaction of the third molar is a high incident problem occurring in up to 73% of young adults in Europe.[3]

The explanation for the high impaction rate of third molars is the inadequacy of the retromolar space. If the remodeling resorption at the anterior aspect of the mandibular ramus is limited, the eruption of the mandibular third molars might be blocked. [4] Similarly the lack of compensatory periosteal apposition at the posterior outline of the maxillary tuberosity could prevent eruption of maxillary third molars.[5]

The eruption space for the mandibular third molars is also affected by the direction of tooth eruption during the functional phase of eruption. If the posterior teeth erupt more anteriorly, the retromolar space will increase.[6, 7] Rickets[8], using his racial method of growth prediction, felt that space for the lower third molar became available more through mesially-directed eruption of the

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dentition than remodeling at the anterior border of the ramus.

Most of the previous third molar studies have concentrated on the influence that third molars have on the rest of the dentition rather than on the control that the dentition has on the third molars. The impact of third molar eruption on mandibular incisor crowding has been extensively studied, and the results vary.[9-11]

A few investigators have studied the influence of premolar extractions on third molars. Faubion [12] examined the mandibular third molars of 40 orthodontically treated patients, 20 of them had been treated with extraction of four premolars and the other 20 were treated non-extraction. He found that 55% of the extraction group retained the mandibular third molars in good position as compared to 15% in the non-extraction group. Richardson [13] found that 28% of patients treated orthodontically, with extraction of premolars, had third molar impactions, while 38% of the nonextraction patients had impactions. A study of Stagger et al [14] concluded that orthodontic treatment involving premolar extractions did not improve third molar angulation any differently than non-extraction. Saysel et al [15] found that orthodontic treatment involving premolar extractions improved mandibular third molar angulation.Janson et al [16] demonstrated that the number of erupted and functioning maxillary third molars was statistically greater in 27 class II subjects treated with extraction of maxillary premolars, when compared with 28 subjects treated without extraction. Salehi and Danaie [17] found that successful eruption of lower third molars is significantly greater in those treated orthodontically with extraction of first premolars.

The purpose of this study was to investigate the change in mandibular and maxillary third molars angulation, relative to the occlusal plane and second molars, in cases treated orthodontically with extraction of first premolars and to compare these changes with non-extraction cases.

Materials and methods

The sample of this study included pre-treatment and post-treatment orthopantomographs (OPG) of 40 patients treated by fixed orthodontic appliances at the department of orthodontics, college of dentistry, Mosul, University. In 20 patients (13 girls and 7 boys), the four first premolars were extracted, whereas the other 20 patients (11 girls and 9 boys) were treated without premolar extraction. All of the patients had class I skeletal and dental relationships, full eruption of second premolars and second molars and bilateral unerupted third molars prior to orthodontic treatment.

Pre-treatment mean age of the extraction group was 13.18 years (±1.63), and 12.97 years (±1.76) for the nonextraction group. The mean duration of treatment was 2.47 years (±1.12) in the extraction group and 2.5 years (±1.00) in the nonextraction group (table 1). All the patients in extraction and nonextraction groups were treated with fixed orthodontic appliances using edgewise technique by the same clinician. The second molars were not included in the appliance.

All patients were radiographed by OPG. Pretreatment radiographs were taken within one month prior to commencing orthodontic treatment. All the post-treatment radiographs were taken on the day of debonding. Both pre- and post-treatment radiographs were traced on matte acetate paper. The angulation of the long axis of the third molars relative to the long axis of

second molar and the occlusal plane were measured in the pre-and post-treatment radiographs. A line passing through the cusp tips of second premolar and first molar determined the occlusal plane (figure 1).

The post-treatment values were subtracted from pre-treatment values to calculate the degree of changes in the angulation of third molar relative to the occlusal plane and second molars. The data were analysed by t-test. A p value ≤ 0.05 was considered as significant.

Results

Table 2 shows the changes in right and left mandibular third molar angulations relative to the occlusal plane and second molar. There was a statistically significant difference between the extraction and nonextraction groups in the mandibular third molar angulation related to both occlusal plane and second molar.

Table 3 shows the changes in right and left maxillary third molar angulations relative to the occlusal plane and second molar. There was a statistically significant difference between the extraction and nonextraction groups in the maxillary third molar angulation related to both occlusal plane and second molar.

Discussion

It's generally agreed that the mandibular third molar becomes impacted more than any other tooth. The prevalence of mandibular third molar impaction is variable in different populations, ranging from 9.5% to 39% [18]. This difference may be due to sampling variations, racial characteristics, and/ or the clinicians' own definition of impaction. Modern populations had more impaction of third molars than primitive ones, because they usually eat soft and sophisticated diets that require minimal chewing forces. The end result will be minimal interproximal attrition and mesial shift of posterior teeth, therefore; the retromolar space will not be adequate to occupy the third molar [19].

Patients treated orthodontically by extraction of premolars are often very concern to know if extraction of third molars will be necessary. Patients usually tolerate the loss of for premolars, yet they may not be as receptive to the loss of four additional teeth. Patients often complain that premolar extractions didn't prevent the need for third molar extractions and, as a result, eight "perfectly good teeth" were lost [14].

This study shoed that extraction of bilateral first premolars during fixed orthodontic treatment significantly improves the angulation of third molars toward uprighting, as compared to non-extraction cases. This improvement in angulation could be explained, in part, by bone apposition on the retromolar area during growth and mesial movement of the molars during closure of the extraction site that create a space for the erupting third molars.

The observation of this study comes in accordance with those of Faubion [12], Richardson [13], and Saysel et al [19], who all found a more uprighting of third molars after premolar extraction. The findings of this study disagree with those of Staggers et al [14], who claimed that first premolar extraction didn't improve the inclination of third molars, and they suggest that factors other than extractions could influence the inclination and subsequent eruption of third molars.

All the patients in this study were dentally and skeletally class I. Therefore there was no need to protract mandibular molars or retract maxillary

molars to obtain a class I molar relationship. If the patients had been class II dentally and skeletally, and mandibular molar protraction had been used to correct the molar relationship, an even more favourable change in mandibular third molar angulations may have occurred. Conversely, if maxillary molar distalization had been used to correct a molar relationship, an unfavourable change in maxillary third molar angulations may have occurred.

This study didn't reveal any basis to predict the eruption of third molars, because third molar angulation improved whether or not teeth were extracted. Also, even with this uprightening of third molars, teeth may still become impacted. Therefore, patients treated orthodontically and had premolars extracted to create a space showed not be guaranteed that their third molars will erupt perfectly.

Conclusion

The extraction of first premolars during orthodontic treatment significantly improved the angulation of third molars toward uprightening.

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Table (1): pretreatment age and treatment time of the sample.

Group	Pretreatment age(years)			Treatment time(years)	
	No.	Mean ±SD	P	Mean ±SD	P
extraction	20	13.18±1.63	ns	2.47±1.12	ns
Nonextraction	20	12.97±1.76		2.50±1.00	

Table (2): Changes in mandibular third molar angulation during fixed orthodontic treatment.

Changes in mandibular third molar angulation (degrees)			Mean	±SD	t-value	P-value
Relative to occlusal plane	Right side	Extraction	13.20	10.54	2.68	0.01
		Nonextraction	5.35	7.82		
	Left side	Extraction	12.85	11.03	2.46	0.02
		Nonextraction	5.69	7.16		
Relative to second molar	Right side	Extraction	6.95	5.14	2.15	0.05
		Nonextraction	4.15	2.70		
	Left side	Extraction	7.15	5.85	2.20	0.05
		Nonextraction	3.90	3.15		

Table (3): Changes in maxillary third molar angulation during fixed orthodontic treatment.

Changes in maxillary third molar angulation (degrees)			Mean	±SD	t-value	P-value
Relative to occlusal plane	Right side	Extraction	16.72	12.14	2.22	0.05
		Nonextraction	9.65	7.46		
	Left side	Extraction	17.22	11.95	2.29	0.05
		Nonextraction	10.13	6.98		
Relative to second molar	Right side	Extraction	11.30	9.42	2.76	0.01
		Nonextraction	4.88	4.50		
	Left side	Extraction	10.76	8.69	3.13	0.005
		Nonextraction	4.10	3.92		

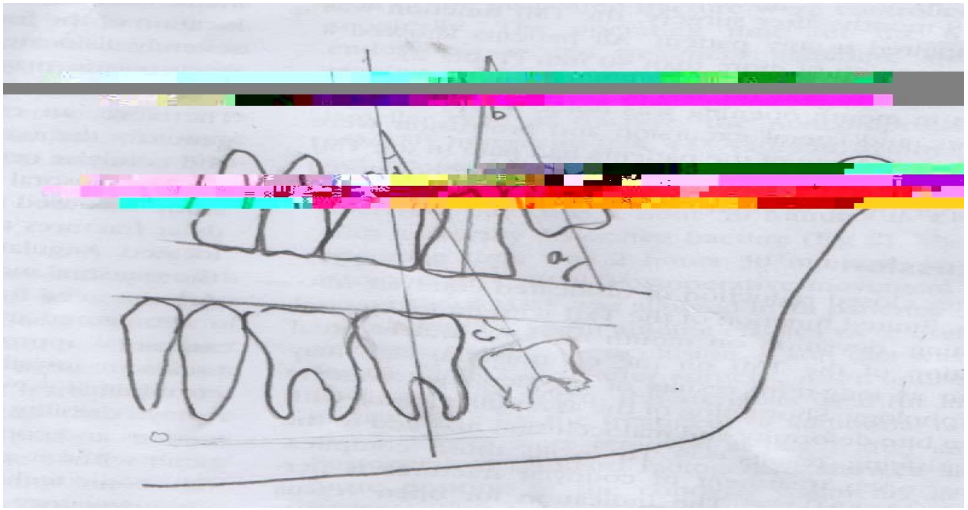

Figure (1):Angulation of upper third molar relative to the occlusal plane (a) and second molar (b).Angulation of lower third molar relative to the occlusal plane (c) and second molar (d).