

Influence of first premolar extraction on second and third molar angulation - A clinical study

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Received: 15-07-2014

Revised: 25-10-2014

Accepted: 23-11-2014

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ABSTRACT

Background: In modern populations, the impaction rate is higher for third molars than for any other tooth. Due to the speculation of third molar role on late incisor crowding, many orthodontists prescribe removal of third molars before, during or just after orthodontic treatment.

Objectives: The aim of this study was to compare whether orthodontic extraction of first premolar lead to any angular changes in second and third molars.

Material and method: Orthopantograms of 20 patients undergoing orthodontic treatment were collected pre and post treatment. The patients were divided into two groups – nonextraction and extraction group. Each group consisted of 10 patients. The angles were measured between the long axis of 2nd molar and 3rd molar with horizontal plane. Changes in 2nd and 3rd molar angulation from pre-treatment to post treatment for two groups were compared by Mann- Whitney u-test.

Results: Statistical analysis revealed that maxillary and mandibular 2nd and 3rd molar showed an improvement in angulation but it was statistically non-significant.

Conclusion: The findings of the present investigation suggest that premolar extraction therapy has a favourable effect on maxillary second & third molar angulation, while no changes in mandibular second & third molar angulation during treatment were found in patients treated with and without premolar extractions.

Keywords: Extraction, 2nd molar, 3rd molar angulation, orthodontic treatment, 1st premolar

Introduction

The development of third molars and their influence on the dental arches has long been of concern to the dental profession. [1] Ironically called the “wisdom teeth,” third molars are commonly blamed for a variety of complications, although their role in such complications has not necessarily been established. The effect of mandibular third molars on the relapse of mandibular incisor crowding following the cessation of retention in orthodontically treated patients has been a subject of much speculation. [2] In modern populations, the impaction rate is higher for third molars

than for any other tooth. [3-6] One explanation could be that the retromolar space frequently is inadequate. If the remodeling resorption at the anterior aspect of the mandibular ramus is limited, the eruption of the mandibular third molars might be blocked. [7-10] Similarly the lack of compensatory periosteal apposition at the posterior outline of the maxillary tuberosity could prevent eruption of the maxillary third molar. [3] The third molar buds are angulated mesially in the mandible and distally in the maxilla at the time of calcification. [11] Approximately 43 per cent of third molar impactions may be classified

as mesial in the mandible, while about 25 per cent may be classified as distal in the maxilla. [12] Unsatisfactory uprighting during completion of root formation may therefore be a common cause of third molar impaction, and occur more frequently in the mandible than in the maxilla. Due to the speculation of third molar role on late incisor crowding, many orthodontist prescribes removal of third molars before, during or just after orthodontic treatment.

The aim of this study was to compare whether orthodontic extraction of first premolar lead to any angular changes in second and third molars and comparing these with non-extraction cases.

Material and methods

A sample of 20 orthodontic patients who had undergone fixed orthodontic treatment at the Department of Orthodontics and Dentofacial Orthopedics, C.S.M.S.S. Dental College, Kanchanwadi, Aurangabad, Maharashtra, were selected for the study. These 20 patients were divided in two groups. Group 1 consists of 10 subjects who had been treated with the non extraction therapy and group 2 consists of 10 subjects who had been treated with extraction of all 1st premolars. Pretreatment (T1) and post-treatment (T2) panoramic radiographs (pantographs) of both group were taken. 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 horizontal plane was constructed by drawing a line passing through inferior most point of right and left orbit. This constructed plane was termed

the horizontal reference plane. The outlines of the maxillary & mandibular second and third molars and their long axes were drawn on the tracing sheet. The long axis of the second molar was traced from the mid-occlusal point through the midpoint of the root bifurcation and the midpoint between the mesial and distal root tips. The long axes of the third molar buds were drawn by the line bisecting a line connecting the mesial and distal outlines of the cervical areas.

The following measurements were made, (shown in Fig no.1) the outer angles formed by the third molar axes to the horizontal reference plane on both the right and left sides, the outer angles formed by the second molar axes to the horizontal reference plane on both the right and left sides and the last measurement made was an increase in the angle of the third molar to the horizontal reference plane, which would indicate an improvement in the position of the third molar.

The post-treatment values were subtracted from pre-treatment values to calculate the degree of changes in the angulation of third molar & second molars relative to the constructed horizontal plane. The data were analysed by Wilcoxon signed rank test and Mann Whitney U test. A p value ≤ 0.05 was considered as significant.

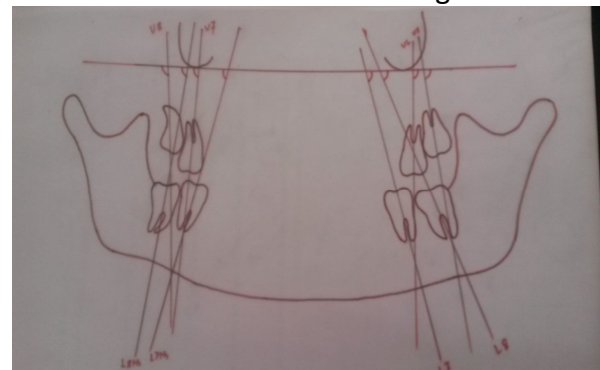


Fig.1 Figure showing angular measurements of 2nd and 3rd molar drawn between long axis and FH plane

Result

Table 1: Pretreatment and post-treatment changes in Non-extraction group

		Pre treatment	Post treatment	Difference	Significance
		Mean ± SD	Mean ± SD	Mean ± SD	P value
2nd molar	Right upper	82.44 ± 4.79	77.22 ± 6.99	-5.22 ± 6.16	0.36*
	Right lower	66.78 ± 8.88	73.44 ± 7.45	6.66 ± 5.40	0.02*
	Left upper	78.44 ± 6.61	76.56 ± 6.93	-1.88 ± 9.53	0.398
	Left lower	67.56 ± 7.51	71.89 ± 3.48	4.33 ± 7.58	0.12
3rd molar	Right upper	66.89 ± 11.67	65.44 ± 18.34	-1.44 ± 13.43	0.32
	Right lower	47.22 ± 12.89	49.33 ± 14.26	2.11 ± 8.28	0.95
	Left upper	65.78 ± 12.55	68.11 ± 22.13	2.33 ± 12.77	0.76
	Left lower	50.11 ± 14.60	48.22 ± 11.41	-1.88 ± 8.57	0.39

The mean difference (T2-T1) in maxillary right second molar angulation to the HRP in the non-extraction group was -5.22±6.15 degrees and for the extraction group, the mean difference was 5.66±7.68 degrees. This difference was statistically significant. (P< 0.001)

The mean difference (T2-T1) in maxillary left second molar angulation with respect to the HRP in the non extraction group was -1.88±9.53 degrees and for the extraction group, the mean difference was 4.00± 5.54 degrees. This was a statistically non-significant difference. (p = 0.10)

The mean difference (T2-T1) in mandibular right second molar angulation to the HRP in the non extraction group was 6.66±5.40 degrees and for the extraction

group the mean difference was 3.11±8.60 degrees. This difference was statistically non-significant (P = 0.26).

The mean difference (T2-T1) in mandibular left second molar angulation with respect to the HRP in the non extraction group was 4.33±7.58 degrees and for the extraction group the mean difference was -1.00±8.07 degrees. This was a statistically non-significant difference. (P = 0.25)

The mean difference (T2-T1) in maxillary right third molar angulation to the HRP in the non extraction group was -1.44 ± 13.43 degrees and for the extraction group the mean difference was 7.88 ± 4.07 degrees. This difference was statistically significant(P=0.01).

Table 2: Pretreatment and post-treatment changes seen in extraction group

		Pre treatment	Post treatment	Difference	Significance
		Mean (±) SD	Mean (±) SD	Mean (±) SD	P value
2nd molar	Right upper	81.00 ± 9.56	86.67 ± 7.26	5.66 ± 7.68	0.06
	Right lower	68.22 ± 8.10	71.33 ± 7.59	3.11±8.60	0.09
	Left upper	82.22 ± 7.54	86.22 ± 6.47	4.00 ±5.54	0.08
	Left lower	72.33 ± 6.48	71.33 ± 5.70	-1.00 ± 8.07	0.76
3rd molar	Right upper	74.44 ± 12.95	82.33 ± 13.00	7.88 ± 4.07	0.00*
	Right lower	53.33 ± 12.69	55.89 ± 15.35	2.55 ± 9.59	0.39
	Left upper	84.11 ± 18.48	85.56 ± 16.58	1.44 ± 11.31	0.49
	Left lower	55.00 ± 11.96	56.89 ± 13.87	1.88 ± 5.71	0.39

Table 3 Differences of angulation of 2nd and 3rd molars compared between extraction group and non-extraction group

		EXTRACTION	NON EXTRACTION	P value
		MEAN (±) SD	MEAN (±) SD	
	Right upper	5.66 ± 7.68	-5.22 ± 6.15	0.007*
	Right lower	3.11 ± 8.60	6.66 ± 5.40	.267
	Left upper	4.00 ± 5.54	-1.88 ± 9.53	0.101
	Left lower	-1.00 ± 8.07	4.33 ± 7.58	0.250
Third molar	Right upper	7.88 ± 4.07	-1.44 ± 13.43	0.010*
	Right lower	2.55 ± 9.59	2.11 ± 8.28	0.79
	Left upper	1.44 ± 11.31	2.33 ± 12.77	0.69
	Left lower	13.00 ± 1.88	-1.88 ± 8.57	0.47

The mean difference (T2-T1) in maxillary left third molar angulation with respect to the HRP in the non extraction group was 2.33 ± 12.77 degrees and for the extraction group the mean difference was 1.44 ± 11.34 degrees. This was a statistically non-significant difference. ($P=0.69$) The mean difference (T2-T1) in mandibular right third molar angulation to the HRP in the non extraction group was 2.11 ± 8.28 degrees and for the extraction group the mean difference was 2.55 ± 9.59 degrees. This difference was statistically non-significant. ($P = 0.79$) The mean difference (T2-T1) in mandibular left third molar angulation with respect to the HRP in the non extraction group was -1.88 ± 8.57 degrees and for the extraction group the mean difference was 13.00 ± 1.88 degrees. This was a statistically non-significant difference ($P=0.47$) (Table 1, 2, 3)

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%.^[21] This difference may be due to sampling variations, racial characteristics, and/or the clinician's 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.^[22] 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 four 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.^[1] The aim of this study was to compare whether orthodontic extraction of first premolar lead to any angular changes in second and third molars.

Changes with Nonextraction Treatment

Second & Third molar angulation increased minimally on right side & left side in lower arch. The increases were not statistically significant. On other hand, second and third molar angulations on right & left side in upper arch decreased minimally, but the decrease were not statistically significant. Hence, the second & third molar angulations were more or less maintained in all cases and showed very minimal improvement when treatment was done with the non-extraction technique. The present findings corroborate those of previous studies^[23, 24] in which improvements in some of the third molar angulations occurred, but they were significantly less than those seen in extraction cases. The present results are in contrast to the findings of Yigit et al,^[25] who showed a worsening of mandibular third molar angulations with non-extraction

treatment. The result in our study may be due to the fact that no reinforcement of anchorage was done. Silling^[10] stated that non-extraction therapy, by holding back or distally tipping the mandibular first and second molars, increased the chances of third molar impaction. The slight changes taking place in the absence of extractions could be attributed to the growth taking place in the retromolar area.

Changes with Extraction Treatment

A significant improvement in angulation following extraction treatment was seen on the upper right third molar ($p < 0.05$) while upper left third molar does not show any improvement. All second molar as well as mandibular third molar showed improvement in angulation but were found to be statistically non-significant. Similar uprighting or improvements in third molar angulations with extraction of premolars were also reported in previous studies.^[18, 21–27] Elsey and Rock^[22] using the MRP on panoramic radiographs, showed an improvement in third molar angulation by a mean of 7 degrees. However, these authors did not compare the changes on the right and left sides, and no comparisons were made with a representative group of non-extraction patients.

Extraction vs Non-extraction

The results of this study corroborate those of previous studies^[25–31] in which definite improvements were seen with extraction treatment vs non-extraction therapy with upper right second and third molar. The

results showed similarity with those of Stagers et al,^[3] who showed that orthodontic treatment involving premolar extractions did not improve third molar angulation any more than non-extraction treatment. Stagers et al found that third molar angulations improved regardless of the method of orthodontic treatment. The uprighting of the second molars in this study can be attributed to the effects of the treatment mechanics used. This improvement and maintenance of the axial inclinations of the second molars indicate an effective use of treatment mechanics. The sample size of this study was very less, also long term results of extraction of 1st premolars on the changes in angulation were not done. Taking into consideration these factors extensive studies with larger sample size as well as long term results should be done to determine the role of orthodontic treatment with or without extraction on 2nd and 3rd molars. The findings of the present investigation suggest that premolar extraction therapy has a favourable effect on maxillary second & third molar angulation, while no changes in mandibular second & third molar angulation during treatment were found in patients treated with and without premolar extractions.

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Cite this article as: Tarvade SM, Biday S. Influence of first premolar extraction on second and third molar angulation - A clinical study. *Int J Med and Dent Sci* 2015; 4(1):560-567.

**Source of Support: Nil
Conflict of Interest: No**