

ORIGINAL ARTICLE

MANDIBULAR THIRD MOLAR ANGULATION IN EXTRACTION AND NON EXTRACTION ORTHODONTIC CASES

Imtiaz Ahmed, Gul-e-Erum, Naresh Kumar

Department of Orthodontics, Dr. Irshat-Ul -Ebad Khan Institute of Oral Health Sciences, DOW University of Health Sciences, Karachi, Pakistan

Background: The purpose of this study is to determine the angulation of mandibular third molar in orthodontic cases which are planned for extraction and non extraction. **Methods:** This is a cross-sectional descriptive study in which pre-treatment panoramic radiographs of 49 patients, age range 11–26 years were taken from the OPD of Department of Orthodontics, Dr. Ishtat- ul -Ebad Khan Institute of Oral and Health Sciences (DIKIOHS), Dow University of Health Sciences. The angles between the long axis of the second and third molars were measured. Descriptive statistics were applied. Mann-Whitney *U*-test was used for intergroup comparison extraction and non extraction cases. **Results:** This study consists of 49 patients with mean age of 17.94 years. Over all result concluded that mandibular third molar angulations were from 8–94° in extraction cases and 10–73° in non extraction cases. However, the pre-treatment 3rd molar angulation differences in extraction and non extraction cases were statistically insignificant with *p*-value >0.05. **Conclusions:** This study evaluates third molar angulations in pre-treatment cases, the differences in angulation were like other morphological differences but changes in angulation after treatment may or may not be related to extractions.

Keywords: Third molar angulation, extraction and non extraction orthodontic cases

INTRODUCTION

The development of third molars and their influence on the dental arches has long been of concern to the dental profession. The developmental path of third molars in human being is very irregular and the formation, calcification timing, position and course of eruption of these teeth show great variability. Frequently, third molars are impacted or congenitally missing.¹ The eruption space for mandibular third molars is also affected by the direction of tooth eruption during the functional phase of eruption. Third molar will erupt if space is available and that its impaction is a manifestation of a tooth/tissue disharmony or crowding. The third molar buds are angulated mesially in the mandible and approximately 43% of third molar impaction may be classified as mesioangular in mandible.²

The third molar often becomes impacted because of lack of space for their eruption. It may be possible to demonstrate differences in the relative size and shape of the mandible and the teeth between subjects with impacted third molars. Impacted third molars may commonly be observed in patients referred for orthodontic treatment.³ The orthodontist should be aware of the relationship of mandibular third molars to the remaining teeth in the dental arch. Developing third molars continually change their position and undergo pre-eruptive rotational movements. These rotational movements take place when third molar bud comes into close proximity to second molar.⁴ The initial angulations of third molars may also influence their subsequent eruption.⁵

The purpose of this study was to determine the angulation of mandibular third molar in orthodontic cases which are planned for extraction and non extraction, and to assess the molar angulation with other reasons on which extraction decision based like: tooth size arch length discrepancy, crowding, teeth inclination etc. International large number of studies had investigated the post treatment mandibular third molar angulation changes in extraction, non extraction cases while none of study is available for pre-treatment mandibular third molar angulation in orthodontic cases. Therefore this research conducted to collect local data for pre-treatment mandibular third molar angulation and this will help to clarify the decision of extraction and non extraction in orthodontic cases.

MATERIAL AND METHODS

This is a cross-sectional descriptive type study in which pre-treatment panoramic radiographs of 49 patients, age range 11–26 years, were taken from the OPD of Department of Orthodontics, Dr. Ishtat-ul-Ebad Khan Institute of Oral and Health Sciences (DIKIOHS), Dow University of Health Sciences.

The inclusion criteria were an Angle Class I, II and III skeletal and dental relationship, bilaterally un-erupted and erupted (angulated) mandibular third molar could be seen on panoramic radiographs.

The exclusion criteria were presence of mandibular third molar unilaterally, missing or supernumerary tooth/teeth in the dental arch, microdontia, macrodontia, tooth shape anomalies, systematic diseases and cleft lip or palate etc.

Panoramic radiographs which are routinely taken for Orthodontic patients at DIKIOHS, DUHS were selected according to inclusion criteria, traced second and third molar on overlying acetate paper and analysed by two observers. The long axis of the third molar and second molar were traced from the midocclusal point through the midpoint of the root bifurcation and the midpoint between the mesial and distal root tips. The angles between the long axis of the second and third molars were measured (Figure-1). The measurements were repeated on 30 randomly selected panoramic radiographs.

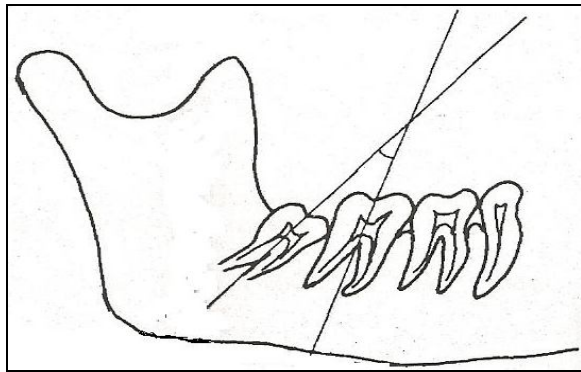


Figure-1: Lines and angle of mandibular third molar

Descriptive statistics were applied, mean age with its minimum and maximum limits were computed. Frequencies of 3rd molar angulation on right and left side were evaluated. Mann-Whitney *U* test was used for intergroup comparison to see statistically significant angulation differences in pre-treatment 3rd molar values of extraction and non extraction cases; $p \leq 0.05$ was considered significant.

RESULTS

Out of 49 patients 36 were female and 13 were male, with age range from 11–26 years, mean age 17.94 years. Over all results concluded that mandibular third molar angulations were from 8–94° in extraction cases and 10–73° in non extraction cases, which shows third molar angulation, was more in extraction cases (Table-1). However, the pre-treatment 3rd molar angulation differences in extraction and non extraction cases were statistically insignificant ($p > 0.05$) (Table-2). The severity of third molar angulation was more 94° on the right side than 87° on the left side. The mean third molar angulation on the right side was 39.52° in extraction cases and 31.13° in non extraction cases. The mean third molar angulation on the left side was 40.67° in extraction cases and 29.50° in non extraction cases (Table-1).

Table-1: Mandibular Third Molar Angulation in Extraction and Non Extraction Cases

Right Mandibular Third Molar				Left Mandibular Third Molar			
Non Extraction		Extraction		Non Extraction		Extraction	
Angle	Frequency	Angle	Frequency	Angle	Frequency	Angle	Frequency
10	2	9	1	12	1	8	1
15	1	16	1	15	2	10	2
21	1	18	1	18	1	14	1
23	1	20	1	19	1	15	2
27	2	21	1	23	1	16	1
30	1	23	1	24	2	18	1
34	2	24	1	25	2	23	1
35	2	25	2	26	1	25	1
36	1	26	2	31	1	27	1
39	1	27	4	45	1	28	1
61	2	28	2	47	1	34	2
Total	16	29	1	50	1	37	1
		30	1	73	1	38	1
		31	1	Total	16	40	1
		35	1			41	1
		37	1			42	3
		38	1			47	2
		40	1			49	1
		52	1			55	1
		56	2			69	1
		68	1			74	2
		73	1			79	1
		81	1			80	1
		93	1			83	1
		94	2			87	1
		Total	33			Total	33

Table-2: Mean, median values and Mann-Whitney *U* test for intergroup comparison

Measurement	Extraction		Non extraction		<i>p</i>
	Min-Max (Median)	Mean (SE)	Min-Max (Median)	Mean (SE)	
Right mandibular third molar	9–94 (28)	39.52 (4.16)	10–61 (32)	31.13 (3.69)	0.557
Left mandibular third molar	8–87 (39)	40.67 (4.06)	12–73 (24.50)	29.50 (4.07)	0.130

DISCUSSION

This study is directed to determine the angulation of mandibular third molar by using measurement on conventional panoramic radiograph. Measurements of the third molar angulation on lateral cephalogram, as seen in previous studies⁶⁻¹⁰ may be biased because of difference in angulation between the superimposed images. Similar problems are present in any cephalogram study of change in posterior tooth position, and can only be overcome if measurements are made on 60° head film of the left and right sides. However, studies by Olive¹¹, and Larheim¹² have shown that panoramic radiographs are a reliable indicator in evaluating third molar angulations, so they are used in the present study.

In our study pretreatment mandibular third molar angulation in extraction cases was between 8–94° and in non extraction cases was between 10–73°. In a previous study¹ pre-treatment mandibular third molar angulation with reference to second molar in extraction cases was between 3–56° and in non extraction cases was between 8–50° which are not significantly different. The statistically significant difference in molar angulation after treatment is 9° and 3.5° in extraction and non extraction cases respectively.

Jain *et al*⁴ took the horizontal plane as a reference to evaluate the 3rd molar and second molar angulations. Mean difference in third molar angulation changes is 7.25° in extraction and 1.5° in non extraction cases; while in second molar 5.7° in extraction and 2.8° in non extraction cases. However, the differences in pre-treatment third molar angulations in extraction and non extraction cases were statistically insignificant.

Staggers *et al*⁵ compare the pre-treatment third molar-occlusal plane angles revealed no differences in ext and non extraction groups and also showed no statistically significant differences after orthodontic treatment in both groups. While the third molars in both groups showed an improvement in angulation. Similarly results in our study showed the differences in pre-treatment third molar angulations in extraction and non extraction cases were statistically insignificant which suggest that factors other than extractions could influence the inclination and subsequent eruption of third molars.

The average age of third molar eruption ranges from 17–25 years, but the roots are not fully formed until 18–25 years of age.^{13,14} The subjects of this study ranged in age from 11–26 years with mean age of about 18 years; (majority of orthodontic patients age group) during this time third molar bud is developing and is undergoing rotational pre-eruptive movements.

Teeth most favourable for eruption are those which initially have angulation of less than 50° to occlusal plane.¹⁵ In our study those teeth was favourable which have initially angulation below 30° according to long axis of second molar and third molar. The smaller the initial angulation of this tooth, the greater was the chance that the tooth would develop a small angulation favourable for eruption. When the initial angulation of third molar is less than 10°, than development of the erupting path is favourable; between 10°–20° the tooth is equally likely to remain at the same angle as to develop a smaller or larger angulation. The larger the initial angle the greater were changes toward a smaller angulation but only seldom did the angle become sufficiently small for eruption of the tooth to be possible.¹⁵

This study showed that mandibular third molar angulation is less in non extraction and more in extraction cases, but these differences are statistically insignificant which are also similar to the results of other studies. The pre-treatment angulation differences were part of the morphological differences which affect extraction/non-extraction decision like tooth size arch length discrepancy, mandibular growth pattern, corpus length, curve of spee and incisors inclination etc., while the changes in angulation after treatment may occur due to extractions of teeth but factors other than extractions could have affect like rotational pre eruptive tooth movements. Previous studies^{1,4,5} have used the occlusal plane and mandibular plane as a horizontal plane of reference however changes in occlusal plane with treatment and remodelling of lower border of the mandible during growth may cause misinterpretation of third molar angle calculations.

CONCLUSION

This study evaluated third molar angulations in pre-treatment cases, the differences in angulation were like other morphological differences but changes in angulation after treatment may or may not be related to extractions.

REFERENCES

1. Saisel MY, Meral GD, Kocadereli I, Tasar F. The effects of first premolar extractions on third molar angulation. *Angle Orthod* 2005;75:719–22.
2. Khawaja N, Asmari DA, Qahtani NA, Mashyakh MA. A survey of radiographic position of impacted third molars among patients attending a university oral surgery clinic. *J Pak Dent Assoc* 2008;17:26–30.
3. Ahmed N, Fida M. The frequency of impacted teeth in orthodontic patients: A study at the Aga Khan University Hospital, Karachi. *J Pak Dent Assoc* 2008;17:12–6.
4. Jain S, Valiathan A. Influence of first premolar extractions on third molar angulation. *Angle Orthod* 2009;79:1143–8.

5. Stagers JA, Germane N, Fortson WM. A comparison of the effects of first premolar extractions on third molar angulation. *Angle Orthod* 1992;2:135–8.
6. Capelli J Jr. Mandibular growth and third molar impaction in extraction cases. *Angle Orthod* 1991;61:223–9.
7. Erdem, D, Ozdiler E, Memikoglu UT, Baspinar E. Third molar impaction in extraction cases treated with the Begg technique. *Eur J Orthod* 1998;20:263–70.
8. Kim TW, Årtun J, Behbehani F, Artese F. Prevalence of third molar impaction in orthodontic patients treated nonextraction and with extraction of 4 premolars. *Am J Orthod Dentofacial Orthop* 2003;123:138–45.
9. Årtun J, Thalib L, Little RM. Third molar angulations during and after treatment of adolescent orthodontic patients. *Eur J Orthod* 2005;27:590–6.
10. Behbehani F, Årtun J, Thalib L. Prediction of mandibular third molar impaction in adolescent orthodontic patients. *Am J Orthod Dentofacial Orthop* 2006;130:47–55.
11. Olive RJ, Basford KE. Transverse dentoskeletal relationships and third molar impaction. *Angle Orthod* 1981;51:41–7.
12. Larheim TA, Svanaes DB. Reproducibility of rotational panoramic radiography: mandibular linear dimensions and angles. *Am J Orthod Dentofacial Orthop* 1986;90:45–51.
13. Richardson M. Pre-eruptive movements of the mandibular third molar. *Angle Orthod* 1978;48:187–93.
14. Silling, G. Development and eruption of the mandibular third molar and its response to orthodontic therapy. *Angle Orthod* 1973;43:271–8.
15. Haavikko K, Altonen M, Mattila K. Predicting angulation development and eruption of the lower third molar. *Angle Orthod* 1978;48:39–48.

Address for Correspondence:

Dr. Imtiaz Ahmed, A-227, Block-D North Nazimabad, Karachi, Pakistan. **Cell:** +92-321-2201021.

Email: drimtiaaz75@hotmail.com, drimtiaaz76@yahoo.com