**Journal of Advanced Medical and Dental Sciences Research**
@Society of Scientific Research and Studies ***NLM ID:*** *101716117*

Journal home page: www.jamdsr.com doi: 10.21276/jamdsr Indian Citation Index (ICI) Index Copernicus value = 100

(e) ISSN Online: 2321-9599; (p) ISSN Print: 2348-6805

# Original Research

## Assessment of Angular changes of impacted mandibular third molars and developing mandibular third molars in premolar extraction cases

[1]Nidhi Patel, [2]Heena Shaikh, [3]Arifa Bakerywala, [4]Amarvir Kaur, [5]Bansari Patel, [6]Rakshit Dalal

[1]BDS, Avi Dental Clinic, Anand, Gujarat India;
[2]General Dentist BDS, Post Graduate Diploma in Hospital & Healthcare Management, Masters in Healthcare Leadership, Canada;
[3]DMD, Assistant Professor, Department of Pediatric Dentistry, Tufts University School of Dental Medicine, India;
[4]BDS, Dental Assistant, Aster Dental centre Edmonton, Canada;
[5]Shadowing, Salud Dental, West Chicago, United Stated of America;
[6]Private Practitioner, Dalal Dental Clinic, Mumbai, India

***ABSTRACT:***
**Background and Aim:** Impaction of the lower third molars is due to the lack of space in the retromolar pad. Extraction of premolars in orthodontic treatment helps the uprighting of mesioangular impacted third molars so that they can erupt normally. The aim of the study was to evaluate the angular changes of impacted mandibular third molars and developing mandibular third molars in first premolar extraction cases and if first premolar extraction promotes the eruption of impacted third molar. **Material and Methods:** This study was conducted using panoramic radiographs of patients reported for the correction of malocclusion. A total of 60 samples were selected based on inclusion and exclusion criteria. Patients were divided into 2 categories. Category I - Radiographs of patients undergone orthodontic treatment with third molar roots formation completed and category II - Radiographs of patients undergone orthodontic treatment with third molar roots formation uncompleted. On pre operative and post operative OPGs linear and angular measurements were measured. **Results:** There was statistically significant difference in the space between the anterior border of the ramus and the second molar. But there was no significant difference in the angulation of the third molars. So even if there is a gain of space for the third molars to erupt, the changes in the angulations of third molar does not favour the spontaneous eruption after the orthodontic treatment with extraction of 1s t premolar. **Conclusion:** There were no significant angular changes of impacted mandibular third molars and developing third molars in first premolar extraction cases with maximum anchorage consideration. Premolar extractions had a positive effect on the available space for the third molar to erupt.

Received: 14 November, 2023 Accepted: 19 December, 2023

**Corresponding author:** Nidhi Patel, BDS, Avi Dental Clinic, Anand, Gujarat India

**This article may be cited as**: Patel N, Shaikh H, Bakerywala A, Kaur A, Patel B, Dalal R. Assessment of Angular changes of impacted mandibular third molars and developing mandibular third molars in premolar extraction cases. J Adv Med Dent Scie Res 2024;12(1):51-54.

## 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]For most of the correction of malocclusion space is required and extraction of premolar is the most recommended method of space gaining. This in turn, can affect the angulations and space available for the third molar eruption.[6] Posterior available space is a significant factor for the eruption of mandibular impacted third molars and high rates of third molar eruption have been reported after the mandibular first molar extraction.[7,8] In this study we have considered, patients who have impacted third molars and have undergone extraction of first premolars for the correction of malocclusion. The aim of the study was to evaluate the angular changes of impacted mandibular third molars and developing mandibular third molars in first premolar extraction cases and if first premolar extraction promotes the eruption of impacted third molar.

## MATERIAL AND METHODS

This study was conducted using panoramic radiographs of patients reported for the correction of malocclusion. Ethical clearance was obtained prior to the study. A total of 60 samples were selected based on inclusion and exclusion criteria. The sample was divided into two categories. Category I - Radiographs of patient's undergone orthodontic treatment with third molar root formation completed and Category II - Radiographs of patient's undergone orthodontic treatment with third molar roots formation is incomplete.Inclusion criteria used in category I were patients of age 18 to 25 years, impacted mandibular third molars should be seen on a panoramic radiograph, the root development of the third molars is complete, treatment of the first premolar extraction cases included full closure of the extraction spaces, the total treatment time in the extraction cases should have been not less than 24 months and high quality pre-treatment and post-treatment orthopantamogram without any magnification and distortion errors and in which a clear, well defined anterior nasal spine (ANS), nasal septum, and the projected shadow of the palatal plane.In category II, inclusion criteria used was patients of age 14 to 17 years, impacted mandibular third molars should be seen on a panoramic radiograph, incomplete root development of the third molars, treatment of the extraction cases included full closure of the extraction spaces, the total treatment time in the extraction cases should have been not less than 24 months and high-quality pre-treatment and post-treatment orthopantamographs. Exclusion criteria were orthopantamographs with missing third molar, poor quality panoramic radiographs, cases where space closure is not completed.The OPGs of patients treated in; from the past two years were taken for the study. Sixty mandibular third molars are considered for the study, out of which roots of 30 third molars have completed and the other 30 have incomplete root formation. All the patients have undergone orthodontic treatment. The subjects included in study, were treated with premolar extraction. At the end of the space closure, all lower third molars were examined on the final orthopantomograph (OPG) as well. The tracing of pre-treatment and post treatment OPGs were done. The parameters were measured in the photocopy of the traced sheets. The following measurements were done in molars with incomplete root the long axis is marked by drawing a bisector of the mesio distal width of third molar.The values got from OPG of pre-treatment and post treatment OPGs were compared and were used for statistical analysis.

## STATISTICAL ANALYSIS

The recorded data was compiled and entered in a spreadsheet computer program (Microsoft Excel 2007) and then exported to data editor page of SPSS version 15 (SPSS Inc., Chicago, Illinois, USA). Quantitative variables were described as means and standard deviations or median and interquartile range based on their distribution. Qualitative variables were presented as count and percentages. For all tests, confidence level and level of significance were set at 95% and 5% respectively.

## RESULTS

In category, I Mean preoperative mesio-distal width of 3rd molar was 11.86 mm and postoperative was 11.92 mm. The parameters J to D7, J to R7 and ratio of available space to the mesio-distal width of third molar signifies the space available for the third molar to erupt. Mean J to D7 preoperative distance was 8.74 mm and postoperative distance was 10.3 mm. Mean J to R7 preoperative distance was 10.41 mm and postoperative distance was 11.31 mm. Mean pre ratio of available space to the width of the third molar (J-D7/8MD) was 0.71 and post-operative ratio was 0.84. Result shows a significant increase in available space for the third molar to erupt. Angular measurement signifies the inclination of the third molar. Mean pre operative OP to 8 angle was 52.10 degree and postoperative angle was 53.42 degree. Mean pre operative MP to 8 angle was 68.06 degree and postoperative angle was 69.94 degree. Result shows there is no significant change in the inclination of third molar. (Table 1).In category II Mean preoperative mesio-distal width of third molar was 11.63 mm and postoperative was 11.54 mm. Mean J to D7 preoperative distance was 6.46 mm and postoperative distance was 9.25 mm. Mean J to R7 preoperative distance was 8.50 mm and postoperative distance was 11.28 mm. Mean pre ratio of available

space to the width of the third molar (J-D7/8MD) was 0.64and post-operative ratio was 0.92. Results show a significant increase in available space for the third molar to erupt. Mean Preoperative OP to 8 angle was 57.90 degree and postoperative angle was 56.97 degree. Mean preoperative MP to 8 angle was 69.10 degree and post- operative angle was 73.97 degree. Result shows there is no significant change in the inclination of third molar. (Table 2)

**Table 1: Measurements considered in category I; the following table depicts the pre and post values of the category I**

| Time Interval | Mesio-distal width of 3rd molar(mm) | | J to D7(mm) | | J to R7(mm) | | Ratio (J-D7/8MD) | | OP to 8 (Angle in Degree) | | MP to 8 (Angle in Degree) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pre | Post | Pre | Post | Pre | Post | Pre | Post | Pre | Post | Pre | Post |
| Mean | 11.86 ±2.01 | 11.92 ±2.13 | 8.74 ±3.2 | 10.3 ±3.1 | 10.41 ±2.32 | 11.31 ±2.01 | 0.71 ±0.1 | 0.84 ±0.6 | 52.10 ±2.7 | 53.42 ±3.4 | 68.06 ±5.3 | 69.94 ±6.9 |
| P value | 0.09 | | 0.02* | | 0.03* | | 0.001* | | 0.7 | | 0.4 | |

*** indicate statistically significance at p≤0.05**

**Table 2: Measurement in category II; the following table depicts the pre and post values of the category II**

| Time Interval | Mesio-distal width of 3rd molar(mm) | | J to D7(mm) | | J to R7(mm) | | Ratio (J-D7/8MD) | | OP to 8 (Angle in Degree) | | MP to 8 (Angle in Degree) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Pre** | **Post** | **Pre** | **Post** | **Pre** | **Post** | **Pre** | **Post** | **Pre** | **Post** | **Pre** | **Post** |
| **Mean** | 11.63 ±3.01 | 11.54 ±2.20 | 6.46 ±1.1 | 09.25 ±4.2 | 08.50 ±4.25 | 11.28 ±2.10 | 0.64 ±0.12 | 0.92 ±0.29 | 57.90 ±6.5 | 56.97 ±5.10 | 69.10 ±5.2 | 73.97 ±6.25 |
| **P value** | 0.10 | | 0.001* | | 0.001* | | 0.001* | | 0.14 | | 0.08 | |

*** indicate statistically significance at p≤0.05**

## DISCUSSION

In orthodontic treatment, reducing crowding to add space occurs through extraction and nonextraction methods. First and second premolars are commonly extracted.[9] Mandibular third molar impaction is one of the major problems facing the dental profession, with evolutionary changes being cited as a significant culprit. 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 confirmed.[10]The role 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. The orthodontist should be aware of the relationship of the mandibular third molars to the remaining teeth in the mandibular arch. The main points to be decided are either these teeth will erupt or get impacted, whether they will cause crowding of the lower anterior teeth, and whether the extraction of other teeth will prevent crowding and influence their eruption.[11] The implementation of the correct position depends on numerous factors: the development of facial structures, the sagittal growth of the skeletal bases, the resorption on the anterior border of the ramus, the mesial movement of the posterior teeth, the increase in retromolar space, the vertical uprighting, and the mesiodistal dimension of the tooth. [12,13]The aim of the study was to evaluate the angular changes of impacted mandibular third molars and developing mandibular third molars in first premolar extraction cases. The study shows there is no significant changes in the angular measurements of the third molar with respect to the occlusal plane (OP) and mandibular plane (MP) in both of this category. Capelli using a sample of 60 patients, who had received orthodontic treatment, including the extraction of four premolars, found that, the impaction of third molars is associated high mesial inclination of the lower third molar in the ascending ramus. Jain et al.[14] compared the angular changes in the developing lower third molars in both first premolar extraction and non-extraction cases. They found that premolar extractions had a positive influence on the developing third molar angulations and non-extraction therapy did not have any adverse effects. Jain et al[14] took the horizontal plane as a reference to evaluate the 3rd molar and second molar angulations. Mean difference in third molar angulation changes is 7.25º in extraction and 1.5º in non extraction cases; while in second molar 5.7º in extraction and 2.8º in non extraction cases. However, the differences in pre-treatment third molar angulations in extraction and non extraction cases were statistically insignificant.All linear measurements and ratios represent the space available for the third molars to erupt. The results clearly stated that after the orthodontic treatment with first premolar extraction the available space for the eruption of third molar increases. Our results are in agreement with Jain et al.[14] But this can also be due to two other factors such as anchorage and mandibular growth. In a study, Un-Bong Baik et al.[15] they estimated factors associated with spontaneous angular changes of impacted mandibular third molars due to second molar protraction. They concluded that space

available for third molar eruption before and after second molar protraction are not associated with the uprighting of erupting lower third molars. So the increase in space can be caused by anchor loss. Staggers et al[10] 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.Another factor that can cause an increase in the available space for third molars is mandibular growth. The age groups that have been considered in this study have the chances of showing late mandibular growth. This can cause increase in space between the body and ramus of the mandible for the eruption lower third molar.[16] According to Kaplan[17] an insignificant resorption of the anterior border of the ramus is apparently responsible for impaction of third molar. Even if the study does not involve a control group to assess this influence, there are various studies that compare extraction and non-extraction cases. In these studies it has been observed that space available for the third molar has increased in both of the cases, with greater space in extraction case. So in spite of the remodelling happening in the ascending ramus as a part of growth of mandible, extraction has an influence on creating space for the eruption of third molars.Limitations of this study are that anchorage and growth of the mandible have not been considered and another limitation was insufficient number of samples due to the limited samples available in the dental clinic.

## CONCLUSION

There were no significant angular changes of impacted mandibular third molars and developing third molars in first premolar extraction cases with maximum anchorage consideration. Premolar extractions had a positive effect on the available space for the third molar to erupt.

## REFERENCES


1. Saysel 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, Mashyakhy 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. Türköz Ç, Ulusoy Ç. Effect of premolar extraction on mandibular third molar impaction in young adults. Angle Orthodontist. 2013;83:572–7. doi:10.2319/101712-814.1.
6. Bishara SE. Third molars: A dilemma! Or is it? Am J OrthodDentofacOrthop. 1999;115(6):628–33. doi:10.1016/s0889-5406(99)70287-8.
7. 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 OrthodDentofacOrthop. 2003;123:138–45. doi:10.1067/mod.2003.13
8. Alhaija E, AlBhairan HM, AlKhateeb SN. Mandibular third molar space in different antero-posterior skeletal patterns. Eur J Orthod. 2011;33:570–6. doi:10.1093/ejo/cjq125.
9. Ay S, Agar U, Bicakci A and Kosger H H 2006 Changes in mandibular third molar angle and position after unilateral mandibular first molar extraction Am. J. Orthod. DentofacialOrthop. 129 36.
10. Staggers JA, Germane N, Fortson WM. A comparison of the effects of first premolar extractions on third molar angulation. Angle Orthod 1992;2:135–8
11. Björk A, Jensen E, Palling M. Mandibular growth and third molar impaction. ActaOdontol Scand. 1956;14(3):231–72. doi:10.3109/00016355609019762.
12. Tarazona B, Paredes V, Llamas JM, Cibrian R, Gandía JL. Influence of first and second premolar extraction or non-extraction treatments on mandibular third molar angulation and position. A comparative study. Med Oral Patol Oral Cir Bucal 2010 Sep 1;15(5):e760-6. 2010;15(5):e760–6.
13. Kaplan RG. Some factors related to mandibular third molar impaction. Angle Orthod. 1975;45(3):153–8.
14. Jain S, Valiathan A. Influence of First Premolar Extraction on Mandibular Third Molar Angulation. Angle Orthod. 2009;79:1143– 8. doi:10.2319/100708-525r.1.
15. Baik UB, Bayome M, Abbas NH, Park JH, Lee UL, Kim YJ. Factors associated with spontaneous angular changes of impacted mandibular third molars as a result of second molar protraction. Am J OrthodDentofacOrthop. 2019;156(2):178–85.
16. Premkumar S. Textbook of craniofacial growth. JP Medical Ltd; 2011.
17. Kaplan RG. Some factors related to mandibular third molar impaction. Angle Orthod. 1975;45(3):153–8.