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Normative Data of Variables Determining Eruption of Third Molars in Orthodontic Patients – A Retrospective Study

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Abstract

Objectives: 1) To Formulate a normative data of variables affecting the eruption of third molar. 2) To help format a research data to compare variable changes occurring during formative and eruption stage (11-16 years)of third molar. **Materials and Methods:** The sample comprised of Orthodontic patients at CMCH from 2012-2019, within an age group of 11years -16 years, which was approved by the ethical committee. 40 Male and 40 Female Patient's Orthopentogram with complete set of teeth were considered in the study. The measurements analysed were: 1) Retromolar space:is distal contact of PMM2(Permanent mandibular second molar) and junction of occlusal plane to the anterior border of the mandible. 2) Gonial Angle: angle between the tangent from inferior border of the mandible and posterior border of the mandible. 3) Mesiodistal width of second molar : greatest distance between mesial and distal portion of the crown. 4) Mesiodistal width of third molar: greatest distance between mesial and distal extension of the crown. 5) Angulation of first and second Molar : the angle formed between the long axis of PMM1 (Permanent mandibular first molar) and PMM2 (Angulation m1m2). 6) Angulation of second molar to base of Mandible: the angle formed between the long long axis of PMM2 and the tangent drawn to the inferior border of the mandible (Angulation m2bm). 7) Nolla's classification of third Molar. Trophy Dicom; carestream LS 8000c machine programmed with Kodak software was used to record the digital OPG with standard protocol and head position. The 7 Variables were analysed with the Kodak software and the measurements were recorded on excel worksheet. **Results:** The Data was used for comparison of all variables to explore gender specific differences, only the mesiodistal width was significantly different between the gender. A descriptive table was formulated with a range of measurements for all variables. A correlation between Retromolar space and all other variables was analysed ,there is a positive correlation with formation of third molar(Nolla's grading) and retromolar space in females and it is statistically significant. Though a weak ,correlation exists between other variable and retromolar space ,it was not statistically significant. **Conclusion:** 1) A normative data and Data for future research, of variables affecting the eruption of third molar in their formative and eruptive stage was Formulated. 2) Though a weak correlation exists between other variable and retromolar space during the formative and eruption stage of third molars.

Keywords: Retrospective Study, Third Molars, Variables

1. Introduction

Physiological eruption of teeth is chronology age and gender dependent. Impaction of teeth has been a concern in Dentistry. Impacted third molars are very common to encounter, as they are the last teeth in the arch to erupt. "Third molars account for 98% of all impacted teeth and lower third molars are the second most frequently impacted teeth after upper third molars"[1].

"Oral surgeons and Orthodontist recommend prophylactic removal of third molars before roots are fully formed and further indicate that this procedure will prevent the eruption of the teeth in a malposition"[2].The debate still prevails as to whether one must prophylactically extract the

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wisdom tooth to prevent the future complications that arise if they get impacted. Many variables are pivotal in predicting the eruption of a third molar. All studies so far were carried out in post eruption phase to analyze a predictor for third molar eruption. So, far no study has been carried out to formulate a Normative Data in Orthodontic Patients, which relate to variables that determine the eruption of third molars during their formative and eruption stage between 11-16 years. This article is an attempt to formulate a normative data of variables to predict the degree of third molar eruption or impaction for patients requiring Orthodontic treatment. Hence, 40 Male and 40 Female Patient's Orthopentogram (OPG) who reported to Christian Medical College and Hospital for orthodontic treatment were selected and studied retrospectively. The OPG were studied to emphasize the role of each corelating variable which determine the eruption of third molars during formation and eruptive stages.

2. Objectives

1. To Formulate a normative data of variables affecting the eruption of third molar.
2. To help format a research data to compare variable changes occurring during formative and eruption stage (11–16 years) of third molar.

3. Methodology

The sample comprised of Orthodontic patients at CMCH from 2012-2019, within an age group of 11–16 years, which was approved by the ethical committee. 40 Male and 40 Female Patient's Orthopentogram with complete set of teeth were considered in the study.

The measurements analysed were:

1. **Retromolar space:** is distal contact of PMM2 (Permanent mandibular second molar) and junction of occlusal plane to the anterior border of the mandible (Figure 1).
2. **Gonial Angle:** angle between the tangent from inferior border of the mandible and posterior border of the mandible (Figure 2).
3. **Mesiodistal width of second molar:** greatest distance between mesial and distal portion of the crown (Figure 3).
4. **Mesiodistal width of third molar:** greatest distance between mesial and distal extension of the crown (Figure 4).

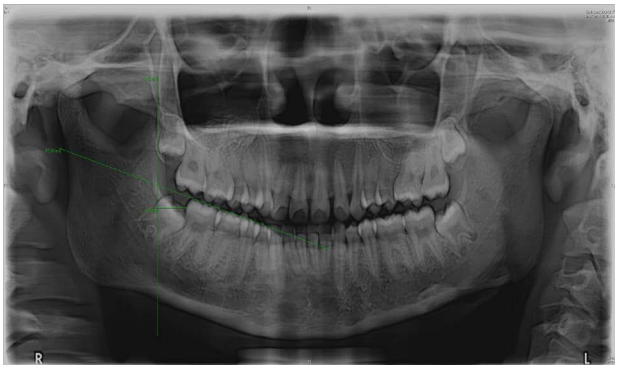


Figure 1. Retromolar Space.

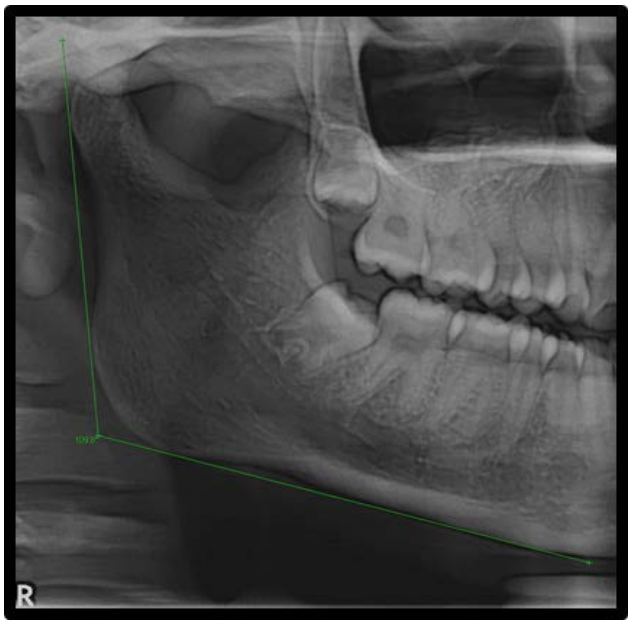


Figure 2. Gonial Angle.



Figure 3. Mesiodistal width of second molar.



Figure 4. Mesiodistal width of third molar.



Figure 5. Angulation of first and second molar.

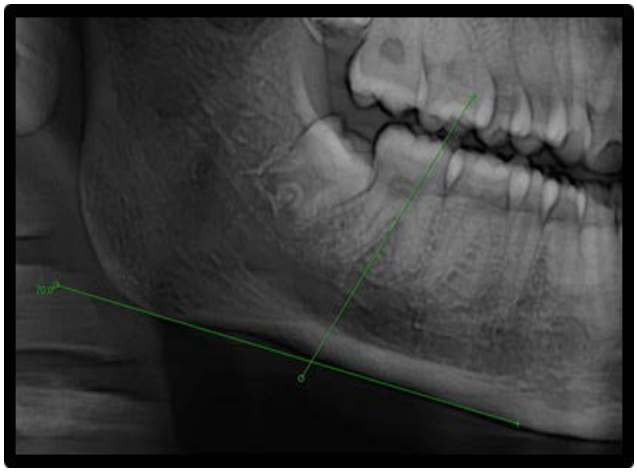


Figure 6. Angulation of second molar to base of Mandible.

5. **Angulation of first and second molar:** the angle formed between the long axis of PMM1 (Permanent mandibular first molar) and PMM2 (Angulation m1m2) (Figure 5).
6. **Angulation of second molar to base of Mandible:** the angle formed between the long long axis of PMM2 and the tangent drawn to the inferior border of the mandible (Angulation m2bm) (Figure 6).
7. Nolla's classification of third Molar.

Exclusion criteria for sample selection were:

1. Missing third molar or second molar or any tooth in the arch.
2. Impacted second molar.
3. Early extraction of first molar or any tooth in arch due to caries or any other cause.
4. Fractured tooth or crown in one or many teeth which may affect the arch length were excluded from the study.
5. Patients with severe skeletal abnormalites or previously treated for any malocclusion were excluded.

Trophy Dicom; care stream LS 8000c machine programmed with Kodak software was used to record the digital OPG with standard protocol and head position.

The 7 Variables were analysed with the Kodak software and the measurements were recorded on excel worksheet.

4. Statistic Analysis

Data was summarized with mean and standard deviation. The gender differences of the variables were compared using Independent-t-test and the reference range using 95% confidence limits were presented stratified for the gender. The pearson correlation was used to quantify the degree of relation between the variables. All the data were analysed using STATA IC/15.

5. Results

Table 1 presents the comparison of all variables to explore gender specific differences. Only the mesiodistal width was significantly different between the gender.

Table 2 presents the confidence limits that is the reference range of each variable, this is a descriptive table.

Table 3 presents correlation between Retromolar space and all other variables.

Table 1. Comparison of characteristics among male and female

Variables	Overall (n=80)	Female (n=40)	Male (n=40)	p-value
Age	13.5±1.5	13.7±1.4	13.2±1.5	0.166
Retromolar space	9.1±2.9	9.1±2.9	9.1±3.0	0.938
Gonial angle	121.5±22.3	117.0±30.6	125.9±5.8	0.072
mdw2	13.0±1.7	12.3±1.4	13.8±1.7	<0.001
mdw3	12.7±1.5	11.9±1.2	13.4±1.4	<0.001
Angulation m1m2	5.3±5.2	4.9±4.3	5.7±5.9	0.507
Angulation m2bm	76.9±10.4	76.6±12.4	77.2±8.0	0.771
nolla	5.5±1.4	5.5±1.5	5.5±1.3	>0.99

Table 2. The refrence range for the varibles (mean±1.96*sd)

Variables	Female (n=40)	Male (n=40)
Retromolar space	3.5,14.8	3.2,15.0
Gonial angle	105.1,176.9	114.5,137.4
mdw2	9.4,15.1	10.5,17.1
mdw3	9.5,14.2	10.7,16.2
Angulation m1m2	-3.5,13.4	-5.9,17.3
Angulation m2bm	52.3,100.8	61.5,93.0
nolla	2.5,8.5	3,8.1

Table 3. Correlation between retero molar space and other variables

Variables	Female (n=40)	Male (n=40)
	r-value(p-value)	r-value(p-value)
Age	0.129 (0.428)	0.296 (0.064)
Gonial angle	0.009 (0.957)	-0.222 (0.168)
mdw2	0.051 (0.757)	-0.066 (0.685)
mdw3	0.107 (0.510)	0.109 (0.503)
Angulation m1m2	0.158 (0.329)	-0.126 (0.439)
Angulation m2bm	-0.253 (0.116)	-0.038 (0.818)
nolla	0.474 (0.002)	0.302 (0.058)

There is a positive correlation with formation of third molar (Nolla's grading) and retromolar space in females and it is statistically significant.

Though a weak, correlation exists between other variable and retromolar space, it was not statistically significant.

6. Discussion

Third molar impaction is a concern as it may cause Pericoronitis, Caries, Cysts and Tumors associated with tooth, Periodontitis, Root resortion, late crowding in lower anteriors and other pathologies. "More than one third of the population faces a decision about how best to manage impacted teeth,this places a significant burden on the healthcare sector"[3]. "The lower third molar eruption is a complex process that depends on several factors, for a long time insufficient development of retro molar space has been considered to be the most important factor contributing to the high impaction rate of lower third molar"[4–7]. Research has evidence wherin cases with adequate retro molar space the lower third molars have failed to erupt into occlusion[5,8] giving evidence, there are other factors contributing to eruption of third molars. Impacted third molars also risk caries to second molar[9] which affects the entire occlusion and quality of patient's wellbeing. Skeletal growth pattern is one of the factors governing eruption of third molar"[10–12]. Hence, this study was undertaken to evaluate and formulate a normative data of the variables affecting the eruption of third molars and retromolar space as they form and erupt into the oral cavity. The Nolla's classification was used to define the stage of third molar development and Gonial angle to determine the skeletal pattern.

The purpose of this investigation was to test the null hypotheses that the variables had no influence on the lower third molar eruption and on the retromolar space during their eruptive and formative stages.

7. Conclusion

1. A normative data and Data for future research, of variables affecting the eruption of third molar in their formative and eruptive stage was Formulated.
2. Though a weak correlation exists between other variable and retromolar space during the formative and eruption stage of third molars.

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