Research Article

Assessment of role of mandibular third molar in lower anterior crowding among orthodontic patients of Kathmandu Nepal

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ABSTRACT

Introduction: Crowding in mandibular arch increases with increasing age and etiology of crowding is multifactorial in nature. Role of mandibular third molar in lower anterior crowding remains a topic of controvery over a period of century. The objective of this study was to assess whether there is any correlation between presence of mandibular third molar position and lower anterior crowding.

Materials and Method: On the basis of third molar position one hundred and six sample of pretreatment orthodontic patients aged between 17 to 38 years were divided into erupted, erupting and agenesis group. The study was conducted in Peoples Dental College and Hospital from January 2020 to March 2020 after obtaining ethical approval from the institutional review committee. This cross-sectional study was done on dental casts and orthopantomogram; brass wire was used for measuring arch length and digital vernier caliper for measuring tooth material with modified segmental arch analysis method.

Result: Among 106 samples collected 55 (51.88%) were female and 51(48.11%) were male and the mean age was 21.53 ± 3.91 years, Chi square and ANOVA test was used for Statistical analysis. This study showed no statistically significant differences between third molar position and lower anterior crowding on right (P= 0.68) and left side (P = 0.45).The study also showed that association between the third molar position and lower anterior crowding is more on left side compared to right side.

Conclusion: Mandibular third molars have not statistically significant difference in lower anterior crowding so, extraction of third molars for relieving the anterior crowding is not justifiable.

KEYWORDS: Agenesis, Lower anterior crowding, Mandibular third molars.

INTRODUCTION

Third molars are the last tooth to erupt and most commonly impacted tooth as well. It exhibits greatest variations of any tooth in the oral cavity from its formation and calcification, its course of eruption to final position and its crown and root morphology.[1] Lower anterior crowding is a well known problem and the cause involves not a single factor but it has combination of multiple factors which includes: tooth size and arch form, facial growth pattern, late mandibular growth and its rotation, effects of resting, functional and parafunctional soft tissue pressures, lack of compensating attrition in the modern diet, mesially directed force from the erupting third molars and maturation and contraction of periodontal soft tissues.[2]

In Orthodontics, role of third molar in the development of lower anterior crowding has been a topic of considerable debate and controversy over the years and it remains unsolved till now[3]. It has been said that, during the eruption of third molar it transmits an anterior component of force in the mandibular arch mainly in the areas of canines and incisors, which results in tooth

rotation and displacement in anterior direction.

Bergstrom and Jensen[4] studied sixty subjects with unilateral molar agenesis and they found greater crowding in the quadrants in which third molars were present than in those in which third molars were missing. Robinson[5] claimed that late lower incisor crowding is caused by the erupting third permanent molar in the lower jaw.

Richardson[6] who had performed several studies on crowding and third molars and she concluded in review of relevant article that pressure from the back of the arch and presence of a third molar was the cause of late lower arch crowding but she does not exclude the role of other causative factors.

On the other hand Bishara et al[7,8] studied the changes in the lower incisors from 12 to 45 years of age and they found that there was an increasing tooth size-arch length discrepancy as age progresses which leads to decrease in arch length and causes lower anterior crowding. According to Siatkowski[9] lower anterior crowding occurs due to: changes in anterior arch width and depth during late growth period result in a decrease of anterior arch circumference, which is greater in the mandibular arch than in the maxillary arch, retroclination of incisors with increasing age and the forces of tongue and lip musculature.

Also a number of studies found no correlation between mandibular third molars and lower incisor crowding.[3,10,11,12] Because of these contrasting findings, this study was started to re-evaluate the relationship between presence of mandibular third molars and lower anterior crowding.

MATERIALS AND METHODS

A sample of one hundred and six patients aged between 17 to 38 years, pretreatment OPG and casts were taken from the department of Orthodontics, Peoples Dental College and Hospital Kathmandu, Nepal for assessing the position of third molars and measuring the lower anterior crowding. The duration of the study was from January 2020 to March 2020 after obtaining ethical approval from the Institutional Review Committee of Institute of Medicine, Tribhuvan University (Ref No- 296/(6-11) E2 076/077). The sample size was determined by using the formula.

$$n1 = \frac{NZ^2P(1-P)}{d^2(N-1)+Z^2P(1-P)}$$

Where N = Population size (90), Z = Level of confidence (1.96), if prevalence is 20%, (P = 0.2), d = Precision (0.05), n1 is required sample size and the minimum sample size needed is 67.

Inclusion criteria of this study were age at least 17 years, complete lower dental arch (except third molars), no history of previous orthodontic treatment, no artificial dental crowns and bridges, good quality of orthopantomogram and cast.

The exclusion criteria were orthodontic, orthopedic and surgical treatment, spacing in lower anterior region, systemic disease, developmental anomalies or syndromes and extraction of third molar.

Third molar was assessed on the OPG and cast to decide their position i.e agenesis, erupted and erupting on the right and left side respectively. Arch length of lower anterior segment was measured in two segments: canine to central incisor on each side, with the help of brass wire on the cast by modified segmental arch analysis method proposed by Lundstrom.[3,13]

Crowding was measured in the mandibular arch from canine to canine with the help of digital vernier caliper (Louisware brand with 0.02 mm measurement accuracy) and calculation was done separately for the right and left anterior segments (central incisor to canine) based on the difference between the tooth size and arch length discrepancy. To determine the reliability, 25 dental casts were randomly selected and re-measured by the same investigator at different time. The repeated measurement errors did not occur systematically and within range of ± 0.5 mm per side, they were considered negligible with respect to the present study.

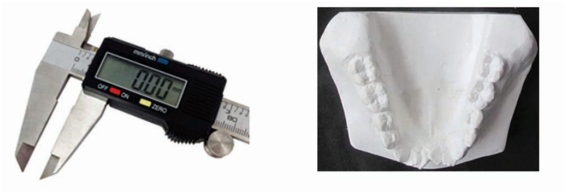

Figure 1: Materials used for the study

The data were collected and descriptive statistics were drawn from the quantitative data using SPSS version 25.00, Chicago, Inc. Chi square test was used to assess the relationship between third molar position and lower anterior crowding and one way ANOVA test was used to compare the mean crowding. Statistically significance was considered if P value is ≤ 0.05.

RESULT

A total of 106 samples were collected among them 55 (51.88%) were female and 51(48.11%) were male (Figure 2) and the mean age was 21.53 ± 3.91 years.

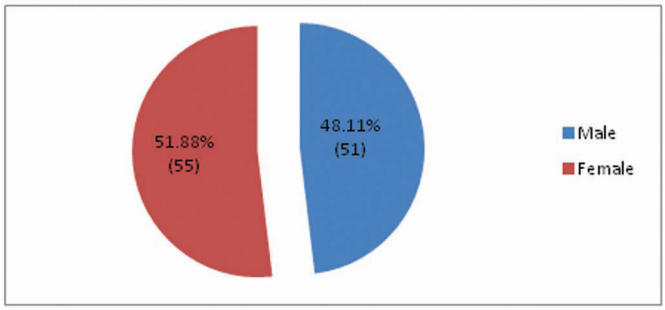

Figure 2: Frequency of gender distribution

Table 1 shows pattern of third molar position i.e agenesis, erupted and erupting and lower anterior crowding in mm on right side of the arch. There were 36 samples with erupted third molar, 48 samples with erupting third molar and 22 samples with agenesis of third molars.

Table 2 shows the distribution of samples according to the severity of crowding in the agenesis, erupting and erupted third molar groups in mm on left side of the lower arch. There were 32 samples with erupted third molar, 52 samples with erupting third molar and 22 samples with agenesis of third molars.

Table 3 shows Likelihood ratio Chi square test in right and left side of lower arch for comparision between lower anterior crowding and third molar position and it shows that there was no statistically significant difference between them on the right (P= 0.68) and left side (P = 0.45).

Table 4 and 5 shows that the mean crowding in the erupted group on the right side is 2.17 and 1.94 on the left side of the erupting group. However the ANOVA test shows there was no statistically significant difference between the mean lower anterior crowding and third molar position in all the three groups in right (P = 0.29) and left sides (P = 0.64).

Table 1: Comparison between crowding (Right side) and third molar position

Third molar position R	Crowding R						
	<1	1–2	2–3	3–4	4–5	≥5	Total
Agenesis (%)	6(27.27%)	8(36.36%)	5(22.72%)	2(9.09%)	1(4.54%)	0	22
Erupted (%)	10(27.77%)	13(36.11%)	4(11.11%)	3(8.33%)	3(8.33%)	3(8.33%)	36
Erupting (%)	14(29.16%)	18(37.5%)	9(18.75%)	4(8.33%)	3(6.25%)	0	48
Total (%)	30(28.3%)	39(36.79%)	18(16.98%)	9(8.49%)	7(6.60%)	3(2.83%)	106

Table 2: Comparison between crowding (Left side) and third molar position

Third molar position L	Crowding L						
	<1	1–2	2–3	3–4	4–5	≥5	Total
Agenesis (%)	5(22.72%)	8(36.36%)	6(27.27%)	2(9.09%)	1(4.54%)	0	22
Erupted (%)	9(28.13%)	11(34.38%)	5(15.63%)	3(9.38%)	2(6.25%)	2(6.25%)	32
Erupting (%)	15(28.84%)	15(28.84%)	13(25%)	5(9.62%)	2(3.85%)	2(3.85%)	52
Total (%)	29(27.36%)	34(32.08%)	24(22.64%)	10(9.43%)	5(4.72%)	4(3.77%)	106

Table 3: Chi square tests for comparision between crowding and third molar position on right and left side

Chi square test	Value		df		Exact P	
	R	L	R	L	R	L
Likelihood Ratio	7.46	9.87	10	10	0.68	0.45

Statistically insignificant (P > 0.05)

Table 4: Comparisions of means using ANOVA

Third molar position	Lower anterior crowding					
	Mean		SD		N	
	R	L	R	L	R	L
Agenesis (%)	1.72	1.62	1.15	1.12	22	22
Erupted (%)	2.17	1.91	1.81	1.48	36	32
Erupting (%)	1.70	1.94	1.15	1.43	48	52
Total (%)	1.86	1.87	1.41	1.38	106	106

Table 5: ANOVA Table for right and left side

Lower anterior crowding X third molar position	Sum of Squares		df		Mean Square		F		P	
	R	L	R	L	R	L	R	L	R	L
Between Groups	5.02	1.73	2	2	2.51	0.87	1.26	0.45	0.29	0.64
Within Groups	206.03	198.75	103	103	2	1.93				
Total	211.05	200.48	105	105						

Statistically insignificant (P > 0.05)

DISCUSSION

The lower anterior crowding is an essential feature of the completed permanent dentition over the age of 17 years.[14] The etiology behind the late incisor crowding phenomenon is multifactorial in nature. It involves reduced arch length, jaw/tooth size discrepency, decreased intercanine width with ageing, retroclination of the lower incisors, mesial movement of the posterior teeth and skeletal and soft tissue changes during growth as well as ageing.

The influence of the third molar on lower incisor crowding is evaluated in the dental research and has been a challenging subject for many years. Therefore, In this study untreated sample of 106 patients with mean age of 21.53 ± 3.91 years were selected to determine whether the third molar position has any influence on lower incisor crowding or not.

The present study shows that there is no statistically significant association between third molar position and lower anterior crowding in all three groups on right and left sides. These findings are in accordance with the study done by Shah et al.[3] who found similar relationship between mandibular third molar and lower anterior crowding in pretreatment orthodontic patients. Also other literatures which supports this finding are studies done by Zawawi,[15] Harradine,[16] Sidlauskas,[17] Kaplan,[18] Shanley,[19] Ades,[20] Little,[21] Buschang and Shulman,[22] Van Der Schoot,[23] Richardson,[24] Vego,[25] Lindqvist and Thilander,[26] Antanas,[14] Karasawa,[27] and Jain et al.[28]

But, these finding are not in agreement with the study done by Niedzielska,[29] and Abdulla.[30] The reason for this might be as suggested by Niedzielska[29] who said that when there is sufficient space for the eruption

of the third molars, they erupts in normal position in the arch and does not cause displacement of the other teeth; but, when the space is deficient, third molars may causes dental crowding.

According to one of the review article published in 2018 by Beucher et al., showed that there is not any significant relationship between mandibular third molar and lower anterior crowding in 83% of included articles.[31] So, removal of third molars just for prevention of lower incisor crowding is not justifiable and it needs more strong scientific reason or pathology for its removal.

The association between the third molar position and lower anterior crowding is more on left side compared to right side, which is not similar to the study done by Shah et al.,[3] it may be due to geographic variation, genetic differences and the differences in the sample size selection play a fundamental role in the varied result of studies.

The study also shows there is increase in the mean crowding in the erupted group on right side and erupting group on left side compared to agenesis group this might be due to mesial pressure exerted by impacted, erupted or erupting third molars which may alter mandibular eruption patterns and cause decreases in arch length but this value is not statistically significant.

CONCLUSION

Third molars do not create statistically significant difference on lower anterior crowding. Therefore extraction of third molars for preventing/ relieving the lower anterior crowding is not justifiable.

Conflict of interest: None

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