Relationship Between Lower Third Molar and Anterior Dental Crowding

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Abstract

The influence of the third molars on mandibular incisor crowding has been discussed for more than a century this topic continues to be controversial among clinicians. Where Significant disagreement exists among practitioners including both orthodontists and oral and maxillofacial surgeons whether the third molar the main reason for mandibular anterior crowding.

Objective: The purpose of this study was to test the hypothesis that there are no statistically significant differences between lower third molars and mandibular dental crowding and to evaluate and compare the condition of third molars in the case of an eruption, impaction, and agenesis in individuals with dental crowding.

Materials and methods: The samples of this study consisted of 107 cases (45 males and 62 females) from Anwajed Clinic of North of Al- Zawia city, Libya with aged ≥ 18years with the Mean age was calculated as 20.5% were included in the current study, the sample was divided into three main groups consisted subjects who had mandibular third molars that were either impacted, erupted into function or agenesis.

Results: The result of study showed that there are no statistically significant differences between lower third molars and mandibular dental crowding and also showed that 54.2% (n=58) volunteers out of the 107 have erupted lower 3rd molar, 35.5% (n= 38) volunteers have impacted lower 3rd molar, while 10.3% (n=11) volunteer have agenesis of the 3rd molar.

Keywords: lower third molars, anterior dental crowding**,** Mandibular third molar impaction.

Introduction

The third molars generally erupted between 16 and 24 years of age, and the position and anatomy of the mandibular third molar changes during the eruption and development period [1]. The eruption and position of mandibular third molars differences from person to person. In some it has erupted, in some, it is missing and in some, it remains impacted. Impaction is defined as completely or partially unerupted and positioned against another tooth, bone, or soft tissue so that its further eruption would be unlikely. These third molars also serve as anchorage in the case of orthodontics, provide root anatomy for root canal treatment in case of endodontics, and help in abutment in case of prosthodontics [2].

Mandibular incisor crowding is defined as the discrepancy between the mesiodistal tooth widths of 4 permanent incisors and the available space in the alveolar process. However, incisor crowding is not just a tooth-arch size discrepancy; many variables are affecting this discrepancy problem for instance eruption of the lower third molar [3]. Anterior crowding is one of the common problems

encountered in the orthodontic practice, the relapse of anterior crowding following the completion of retention in orthodontically treated patients has been induced much speculation in the dental literature[4]. The influence of third molars on anterior crowding has two opinions: Some studies found that there was no relationship between erupting third molars and late anterior arch crowding, A randomized controlled trial was introduced by Harradine et al [5] on 77 patients. They have evaluated Little's index of irregularity, intercanine width, and arch length in patients after completion of orthodontic treatment randomly submitted to third molar extraction. The difference in crowding between the group with an extracted third molar and the group with retained third molar was not clinically significant, and therefore, the removal of third molars to reduce or prevent late incisor crowding could not be justified. Antanas S and Giedre T [6] did the study to re-evaluate the correlation between third molars presence and lower dental arch crowding. The results were not statistically significant with a third molar presence. Specific differences were recorded in the lower dental arch crowding between the groups with erupted, un-erupted, and agenesis of third molars. Although there was no significant co-relation, some tendency for crowding in the anterior part of the lower dental arch was expressed more in the groups with the presence of third molars, than with agenesis. Another group of authors believes that lower third molars are not the main reason for lower incisor crowding. Ades AG et al [7] tried to investigate the influence of third molars on mandibular dental arch and compared different groups of patients: with erupted third molars, loss of third molars, and after or without removal of premolars in the mandibular dental arch. In many cases crowding of mandibular incisors was observed but there were no recommendations to remove third molars to reduce anterior crowding.

However, another group of authors believe that lower third molars are the main reason for lower incisor crowding: Mochizuki M et al [8] reported that more than 58 % of dental crowding was observed in the lower anterior region at the period of third molars eruption. Additionally, Richardson ME [9] examined the changes in crowding during five years following the eruption of all permanent teeth anterior to the third molars and found a tendency toward increased crowding. Conversely, Bjo A and Skieller V [10] found no clear evidence that crowding was caused by the eruption of the third molar. Tüfekçi E et al [11] compared the opinions of Swedish orthodontists and American orthodontists regarding the association between third molar eruption and dental crowding. A survey was carried out on Swedish orthodontists asking their views on the force exerted by erupting third molars, its relationship to crowding, and their recommendations for prophylactic removal. Survey results were compared with those from a similar study conducted in the United States. The slight differences in responses to questions between Swedish and American orthodontists were observed. The results showed that both Swedish and American orthodontists believed that lower third molars were more likely than upper third molars to cause force (65% and 58% for Swedish and American orthodontists, respectively) and crowding (42% and 40%, respectively). Although only 18% of Swedish orthodontists generally or sometimes recommended prophylactic removal of mandibular third molars, 36% of American orthodontists generally or sometimes recommended removal. The purpose of this study was to test the hypothesis that there are no statistically significant differences between lower third molars and mandibular dental crowding and to evaluate and compare the condition of third molars in the case of an eruption, impaction, and agenesis in individuals with dental crowding.

Materials and methods

The samples of this study consisted of 107 cases (45 males and 62 females) from Anwajed Clinic of north of Al-Zawia city.

The data were collected according to the following inclusion criteria:

- Age ≥ 18 years.
- Complete lower dental arch "full set of permanent teeth .
- Good state of care of the lower teeth and Good quality orthopantomograms (opg).
- Good alginate impression with good stone casts available.

The exclusion criteria :

-Age ≤ 18 years.
- No orthodontic treatment before records were collected.
- no artificial dental crowns.

The sample was divided into groups according to the condition of the third molar in the sample:

- ***Group 1*** (third molar eruption):

Include dental arch with unilateral or bilateral third molar erupted to the occlusal plane, in good alignment buccolingually and of normal, size and form as shows in Figure 1.

Figure1:- Third molar eruption

- ***Group 2*** (third molar impaction):

Include dental arch with unilateral or bilateral third molar impaction. Impaction was defined as a tooth that has failed to erupt and remains completely or partially covered by bone, soft tissue, or both as shows in Figure 2.

Figure2:- Third molar impaction

- ***Groups 3*** (third molar agenesis):

Include dental arch with unilateral or bilateral third molar agenesis.

The diagnosis of third molar agenesis was based on the examination of periodical radio-graph taken after clinical examination and a negative history of previous third molar extractions. The radiographical examination was carried out for the subject who was suspected to have impacted or congenital missing third molar by using intra-oral periodical view and diagnosed by the dental radiologist as shows in Figure 3.

Figure3:- Third molar agenesis

The scoring method, applied to the stone caste, involved measuring the horizontal linear displacement of the anatomic contact point of each mandibular incisor from the adjacent teeth and the sum of these three measurements represents the severity of lower anterior dentition irregularity and as follow:

i. 1– 3 = mild irregularity
ii. 4 – 6 = moderate irregularity
iii. 7 – 9 = severe irregularity

In this study, measurements were obtained by using the same vernier caliper (dental vernier calibrated to tenths of a millimeter).

The cast was viewed from above and the Vernier was held parallel to the occlusal plane while the beaks were lined up with the displaced contact points to be measured. All measurements were repeated twice and if mismatched, a third measurement was adopted.

Statistical Analysis

Data were statistically analyzed by using IBM Statistical Package for Social Science (SPSS), Version 21.0 (SPSS, Chicago, IL, USA). Descriptive statistics includes tables and graphs. The relationship of the lower third molar to the anterior dental crowding was calculated by one-way ANOVA test and the Pearson chi-square test was used for multiple comparisons between the groups. A *p*-value of <0.05 was considered statistically significant.

Results

The study included 107 cases, (45 males, and 62 females), 15% of them (n= 16) was showed anterior arch crowding with mild irregularity, 38.3% (n= 41) was showed moderate irregularity, while 46.7% (n= 50) from the cases was showed severe irregularity as shown in Table 1.

Table 1- Severity of lower anterior dentition irregularity

Characteristics / Irregularity valid	**Frequency**	**Percent**	**Valid Percent**	**Cumulative Percent**
Mild	16	15.0	15.0	**15.0**
Moderate	41	38.3	38.3	**53.3**
Sever	50	46.7	46.7	**100.0**
Total	107	100.0	100.0	

The results of the study showed that the percentage of majority of the cases of anterior crowding have impacted lower wisdom tooth was about 35.5 % (n=38) cases (male and female), and 54.2% (n= 58) cases (male and female) have erupted lower wisdom tooth , while the lowest incidence of anterior crowding was with agenesis of lower wisdom tooth only about 10.2% (n= 11) cases (male and female) as shown in table 2.

Table (2): The distribution of the third molar among the group

Gander		Frequency	Percent	Valid Percent	Cumulative Percent
Male Valid	Eruption	22	48.9	48.9	48.9
	Impaction	19	42.2	42.2	91.1
	Agenesis	4	8.9	8.9	100.0
	Total	45	100.0	100.0	
Female Valid	Eruption	36	58.1	58.1	58.1
	Impaction	19	30.6	30.6	88.7
	Agenesis	7	11.3	11.3	100.0
	Total	62	100.0	100.0	

Otherwise, the result of study showed that 8.4% (n=9) of eruption cases, 2.8% (n=3) of impaction cases, and 3.7% (n= 4) of agenesis cases have mild irregularity. Also, 22.4% (n=24) cases of eruption, 12.1% (n= 13) of impaction cases ,and 3.7% (n= 13) of agenesis cases have moderate irregularity. While, 23.4% (n=25) of eruption cases, 20.6% (n=22) of impaction cases, and 2.8% (n=3) of agenesis cases have severe irregularity as shown in table 3.

Table 3:-Condition of the third molar , Severity of lower anterior dentition irregularity Cross tabulation

			Severity of lower anterior dentition irregularity			Total
			Mild irregularity	Moderate irregularity	Sever irregularity	
Condition of the third molar	Eruption	Count	9	24	25	58
		% of Total	8.4%	22.4%	23.4%	54.2%
	Impaction	Count	3	13	22	38
		% of Total	2.8%	12.1%	20.6%	35.5%
	Agenesis	Count	4	4	3	11
		% of Total	3.7%	3.7%	2.8%	10.3%
Total		Count	16	41	50	107
		% of Total	15.0%	38.3%	46.7%	100.0%

Additionally, the result of the study showed that the relationship of the lower third molar in the case of eruption teeth to the anterior dental crowding was calculated by one-way ANOVA test were used for multiple comparisons between the groups and showed that A *p*-value of >0.05 (p= 0.91) was considered no statistically significant and the relationship of the lower third molar in the case of impaction teeth to the anterior dental crowding was calculated by one-way ANOVA test were used for multiple comparisons between the groups and showed that A *p*-value of >0.05 (p=0.889) was considered no statistically significant as shown in table 4.

Table 4:- ONEWAY Crowding BY Eruption and Impaction

	Value	Df	Mean Square	Sig. P-value
Between Group 1 (Eruption)	.125	2	.063	.889**
Between Group 2 (Impaction)	2.489	2	1.245	.091**

** *p* value> 0.05 is no significant

Also, the result showed that the relationship of the lower third molar to the anterior dental crowding were calculated by the Pearson chi-square test and one way ANOVA test was used for multiple comparisons between the groups and showed that A *p*-value of >0.05 in one way ANOVA test (p= 0.134) and p-value of >0.05 in Pearson Chi-Square (p=0.683) were considered no statistically significant as shown in table 5.

Table 5:- a. 2 cells (22.2%) have expected count less than 5. The minimum expected count is 1.64.

	Value	Df	Asymp. Sig. P-value
Pearson Chi-Square	7.039[a]	4	**.134****
ANOVA test	0.354	2	**.683****

** *p* value> 0.05 is no significant.

Discussion

Anterior crowding is one of the common problem encountered in the orthodontic practice, where mandibular incisor crowding is presented as the discrepancy between the mesiodistal tooth widths of 4 permanent incisors and the available space in the alveolar process, Which is the relationship between the size of the teeth and the size of the jaw which results in imbrications and rotation of teeth. Three conditions that may make liable the dental arches to the crowd are excessively large teeth, excessively small bony bases of the jaws, and a combination of large teeth and small jaws [12].

The study demonstrated that 54.2% (n=58 out of 107) of the patients had an anterior lower arch crowding with erupted lower third molar while 35.5 % (n=38 out of 107) had anterior arch crowding with impacted lower third molar. This value demonstrates that the erupted 3rd molar has a slight effect on anterior lower dental arch crowding. On the other hand, the patients with agenesis of the lower 3rd molar demonstrate that lower dental arch crowding occurs in just 10.3% (n=11 out of 107 patients) this may mean that absence of a molar may provide adequate space for the

remaining dentition to erupt in a normal way. This finding agrees with the studies which confirm the relation between lower third molar and anterior arch crowding. Hicks EP [13] in his article argues against prophylactic removal of third molars and offers 2 statements representing opposing viewpoints: The presence of erupted third molars can cause late crowding. Although some investigators have shown a statistical association of erupted third molars and late anterior crowding, the association was not strong enough to allow the prediction of patients at risk. Also, the finding of this study that lower third molars are not the main reason for lower incisor crowding and that agrees with some authors who believe that lower third molars are not the main reason for lower incisor crowding, Ades AG et al [7] found that with time mandibular incisor irregularity increases whereas arch length and intercanine width decrease, no significant differences in mandibular growth patterns between the various third molar groups whether erupted, impacted, or congenitally missing, also with and without premolar extractions, and in the majority of cases, there was incisor crowding. This suggested that there is no basis for recommending third molar extractions to alleviate or prevent mandibular incisor crowding. Additionally, Pirttiniemi et al [14] evaluated the effect of removal of impacted third molars on 24 individuals in their third decade of life. Dental casts were evaluated before and 1 year after extractions. They found that the extractions allowed for slight distal drift of the second molar but had no significant change in the lower anterior area. Furthermore, Richardson ME [15] observed that not only the forces from an eruption of third molars are associated with crowding of lower incisors but also buccal and lingual angulations of lower first molars.

Conversely, another group of authors believed that lower third molars was the main reason for lower incisor crowding: Mochizuki M et al [8] found that more than 58 % of dental crowding was observed in the lower anterior region at the period of third molars eruption. Additionally, Richardson ME [9] examined the changes in crowding during five years following the eruption of all permanent teeth anterior to the third molars and found a tendency toward increased crowding. Also, Vego L [16] longitudinally investigated 40 individuals with lower third molars present and 25 patients with lower third molars congenitally absent. None of the selected patients had undergone orthodontic treatment. Each individual arch was measured for the amount of crowding at two-time intervals: after the eruption of the second molars at 13 years of age, and later at an average age of 19 years. In Vego's study, crowding was defined as loss of arch perimeter manifested either as the closure of space or the slipping of contacts and resulting in rotation or adverse movement of teeth. Vego found that in all 65 cases, the arch perimeter showed a decrease from the first to the second casts. This was expressed as an increase in the severity of rotated or misaligned teeth. The decrease in arch perimeter was less noticeable in persons without lower third molars. Vego concluded that the erupting lower third molars can exert a force on the neighboring teeth. He also indicated, that there are multiple factors involved in the crowding of the arch because arch perimeter loss was seen in patients with congenital absence of 3rd molars. Bergstrom and Jensen and Vego are the two most widely quoted studies that relate third molars to the crowding of the incisors. Finally, according to the result of the study that discussed some of the major considerations and the present controversy surrounding third molars related to orthodontics and it was supported the recommendation of Bishara SE [17] who has been reviewed various articles and concluded that: 1. The influence of the third molars on the alignment of the anterior dentition may be controversial, but there is no evidence to incriminate these teeth as being the only or even the major etiologic factor in the post-treatment changes in incisor alignment. The evidence suggested

that the only relationship between these two phenomena was that they occur at approximately the same stage of development, i.e. in adolescence and early adulthood. 2. The clinician has to have a justifiable reason to recommend the extraction of any tooth. 3. The clinician has to consider the impact of the extraction decision on any future treatment plan from an orthodontic, surgical, periodontal, or prosthodontic aspect. 4. If extraction is indicated, third molars should be removed in young adulthood rather than at an older age.

Conclusion

The results are quite contradictory: some authors support the opinion that lower third molars cause teeth crowding, the others confirm converse. Whereas, according to the hypothesis of the results of the study that there was no statistically significant differences between lower third molars and mandibular dental crowding was accepted. Also, the results of the present study do not supply enough evidence to assert that third molars are a major etiologic factor for mandibular dental crowding. while, the result of the study shows that the eruption lower third molar seems to play a role in anterior arch crowding.

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