Original Article

Effects of Mandibular Third Molar Angulation and Position on Crowding

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ABSTRACT

Objective: To test the hypothesis that there are no statistically significant differences between mandibular dental crowding and angulation and impaction depth of mandibular third molars.

Materials and Method: In this study, the lateral cephalograms, panoramic radiographs, and dental casts of 48 patients (11 boys, 37 girls, mean age 17.10 ± 3.20 years) were evaluated. All patients had class 1 molar relationship, mild and moderate dental crowding, and no tooth loss or size anomaly. Three groups were established according to the mandibular third molar impaction depth on a panoramic radiograph. Group 1 (8 patients, mean age 22.3 ± 2.13 years), the occlusal surface of the impacted tooth is level or nearly level with the second molar; group 2 (16 patients, mean age 17 ± 2.33 years), the occlusal surface is between the occlusal plane and the cervical line of the second molar; and group 3 (24 patients, mean age 15.4 ± 1.76 years), the occlusal surface is below the cervical line of the second molar. Third molar angulation was measured with reference to the anterior angle between the occlusal plane of the first and second premolars and a line drawn through the occlusal surface of the third molar. Angulation and impaction depth of all right and left molars were compared with the mandibular dental crowding. Pearson correlation and 1-way ANOVA statistical analyses were used.

Results: There were no statistically significant differences between impaction depth and total mandibular dental crowding ($p > 0.05$). In addition, no statistically significant differences were found between both left and right third molar angulation and left or right dental crowding in all groups ($p > 0.05$).

Conclusion: The present study indicated that mandibular third molar angulation and impaction depth have no effect on mandibular dental crowding. (*Turkish J Orthod* 2013;26:129–133)

KEY WORDS: Crowding, Third molar angulation

INTRODUCTION

Mandibular incisor crowding is described 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 solely a tooth-arch size discrepancy; there are many variables affecting this discrepancy problem.[1] The development of mandibular incisor crowding is a process that occurs throughout life, but more evidence is needed to understand how it changes. Many analysis and theories have tried to explain why mandibular incisor crowding increases with age. Maximum lip strength has been investigated as a theory to explain mandibular incisor crowding, and this factor could play an important role in developmental crowding. However, it is difficult to quantify lip pressure clearly.[2,3] Other studies have suggested that growth changes can contribute to mandibular incisor crowding.[4,5] A commonly accepted theory states that the third molars apply mesial pressure on the mandibular posterior teeth.[6] Southard *et al.*[7] suggested that interproximal forces help to determine crowding of the mandibular anterior teeth after the retention phase.

The impact of the third molars on incisor crowding has long been discussed in dental literature and has been a controversial subject for many years.[8] The third molars generally erupt between 16 and 24 years of age, and the position of the mandibular third molar changes during the eruption and development period.[9,10] Erupting third molars continually change

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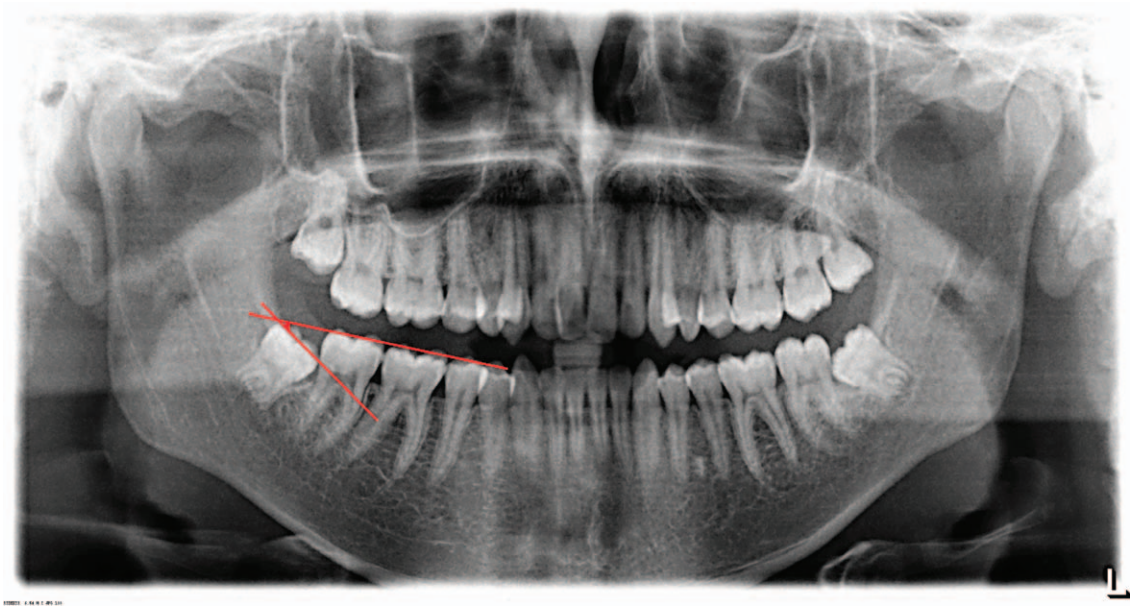

Figure 1. Measurement of the mandibular third molar angle.

their angular positions[11] and show important pre-eruptive rotational movements.[12] These movements continue when the third molar's bud contacts the second molar's body. Gaumond[13] found that after germectomy of second molars, 86% of third molars moved to a good position in the arch. Many orthodontists believe that extracting second molars will improve the angulation of the third molars. In this way, they will erupt into good positions.[13,14] In light of this, their impaction depth and position are important factors in their eruption period. Some studies were conducted to explain the incisor crowding etiology,[1,15] but a few of them interrelate with third molar position and angulation.[8,16] Therefore, the aim of this study was to investigate the relationship between mandibular dental crowding and the angulation and impaction depth of the mandibular third molar. For the purposes of this study, the hypothesis assumed that there are no statistically significant differences between mandibular dental crowding and the angulation and impaction depth of the mandibular third molar.

MATERIALS AND METHODS

The lateral cephalograms, panoramic radiographs, and dental cast records of 48 patients (11 boys, 37 girls, mean age 17.10 ± 3.20 years) who underwent orthodontic treatment were selected from the archive at the Department of Orthodontics of Gaziantep University. Patients were selected using the following criteria: all patients had a class 1 molar relationship, mild and moderate dental crowding (total lack of space in the arch <10 mm), and no tooth loss or size anomaly. Three groups were established according to mandibular third molar impaction depth on a panoramic radiograph. Impaction depth and the position of the third molar were classified according to the study of Ay *et al*.[17] Group 1 (8 patients, mean age 22.3 ± 2.13 years), the occlusal surface of the impacted tooth was level or nearly level with the second molar; group 2 (16 patients, mean age 17 ± 2.33 years), the occlusal surface was between the occlusal plane and the cervical line of the second molar; and group 3 (24 patients, mean age 15.4 ± 1.76years), the occlusal surface was below the cervical line of the second molar. The radiographs were taken with the same digital machine (Sirona; XG 3, München, Germany). The selected panoramic radiographs for the measurement of third molar angulation were traced with the DBSWIN tracing program (Dürr Dental AG, Bissingen, Germany) by the same investigator (R.O.). Third molar angulations were measured with reference to the anterior angle between the occlusal plane of the first and second premolars and a line drawn through the occlusal surface of the third molar (Fig. 1).[18] Additionally, Hayes-Nance analysis was applied to the dental casts to evaluate the crowding on the mandibular arch. Measurements were performed using an electronic caliper (Digimatic; Showa, Japan).

Table 1. Demographic, crowding, and third molar angulation data for the panoramic radiograph recording the third molar impaction depth and angulation

	No. of Subjects (n)	Sex (Girl/Boy)	Mean Age	Mean of Total Crowding, mm	p*
Group 1	8	7/1	22.3 ± 2.13	1.575	0.532
Group 2	16	8/8	17 ± 2.33	2.98	
Group 3	24	22/2	15,4 ± 1.76	2.26	

* $p < 0.05$ (statistically significant).

Statistical Analysis

The results were calculated with the software SPSS for Windows (release 10.0.0; SPSS, Inc, Chicago, IL, USA). The Kolmogorov-Smirnov test was performed to test the normality of the data. Descriptive statistics were evaluated for both males and females by calculating the means and standard deviations of crowding, angulation, and third molar position. Pearson correlation and 1-way ANOVA statistical analysis were used to define the differences.

RESULTS

The relationship between impaction depth and crowding was defined with 1-way ANOVA statistical analysis, and there were no statistically significant differences between the 3 different impaction depth groups and total mandibular dental crowding ($p > 0.05$; Table 1). According to the Pearson correlation analysis, no statistically significant differences were found between left mandibular third molar angulation and the results of Hayes Nance analysis performed to the left quadrants ($p > 0.05$; Table 2). No statistically significant differences were found between right mandibular third molar angulation and the results of Hayes Nance analysis performed to the right quadrants ($p > 0.05$).

DISCUSSION

In parallel with the highest rate of third molar impaction, some problems such as pain, swelling, and crowding are commonly detected. The effects of impacted third molar presence and position on mandibular crowding have been investigated for many years.[19,20] Generally, studies about the third molar have focused on evaluating the effects of the eruption period in both jaws and changing of the angulation and position of the third molar with or without extractions.[21,22] However, we pointed out the effects of angulation or position of third molars on mandibular incisor crowding without extraction or tooth loss.

Differences in angulation between the superimposed images might cause clinicians to perform inaccurate measurements of third molar angulation on lateral cephalograms, as seen in previous studies.[21,22] Thus, we decided to use panoramic

Table 2. Pearson correlation test results of differences between crowding and angulation according to group

	Group	Mean	SD	No. of Subjects (n)	p*
Third molar angulation (right)	1	7.2875	7.2700	8	0.472
Crowding (right)	1	0.8125	0.7735	8	
Third molar angulation (left)	1	7.9875	6.1770	8	0.471
Crowding (left)	1	0.7625	0.8193	8	
Third molar angulation (right)	2	33.3688	17.7740	16	0.574
Crowding (right)	2	1.5875	1.3681	16	
Third molar angulation (left)	2	32.6875	12.1910	16	0.615
Crowding (left)	2	1.4063	1.2963	16	
Third molar angulation (right)	3	30.6833	12.3670	24	0.869
Crowding (right)	3	1.2250	1.2922	24	
Third molar angulation (left)	3	28.0167	13,8398	24	0.527
Crowding (left)	3	1.0333	1.1720	24	

* $p < 0.05$ (statistically significant).

radiographs to determine the angulation without the negative effects of superimposition on lateral cephalograms.

Zachrisson[23] reported that a mesially directed force is an important factor in increased mandibular incisor crowding in early teenagers. Also, the combination of being a young adult and the presence of a developing mandibular third molar with the lack of space might be a reason for the late mandibular arch crowding.[23] The results of our study didn't agree with this previous study. We didn't find any statistically significant correlation between mandibular crowding and third molar angulation or impaction depth.

There are some studies in agreement with the results of our study. Ades *et al*.[24] conducted a study to determine the relationship between the presence of third molars and changes in lower dental arch parameters. According to the results of their study, based on the analysis of cephalograms and models, they stated that third molar removal didn't effect incisor crowding.[24] Similarly, Hasegawa *et al*.[16] found no significant correlation between the angulation of the lower third molar and the angulation of the other teeth in the lateral segment (i.e., canine, premolars, and first and second molars).

Furthermore, the relationship between premolar extraction and eruption of third molars and angulation has been investigated.[1,3] Elsey *et al*.[25] reported that first premolar extraction treatment improved third molar angulation by a mean of 7° as a result of evaluation of panoramic radiographs. Also, Haavikko *et al*.[26] claimed that extraction of mandibular premolars accelerated the eruption of the mandibular third molars. Additionally, in a study by Lindqvist and Thilander[27] involving 23 male and 29 female patients with bilateral impaction of the lower third molars and anterior crowding, one of the impacted third molars was extracted unilaterally, and study casts and cephalograms were evaluated annually for a period of 3 years postextraction; they concluded third molar extraction relieved anterior crowding in 70% of the patients.

Sandhu and Kaur[28] used panoramic radiographs in their study and found that mesiodistal space is an important variable to estimate the eruption of the third molar. Lack of space seems to be a major reason for an unsuccessful eruption. However, eruption cannot be guaranteed, despite adequate space available in the jaw.[28]

Another study provided information about crowding after orthodontic treatment. Kaplan[29] reported that the presence of third molars did not produce a greater degree of lower anterior crowding or relapse once retention had stopped after orthodontic treatment.

CONCLUSION

According to the results of our study, our hypothesis that there are no statistically significant differences between mandibular dental crowding and angulation and impaction depth of the mandibular third molar was accepted. 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. However, it can be concluded that mandibular third molar angulation and impaction depth might have no effect on the mandibular dental crowding. Further studies are necessary to investigate the relationship between incisor crowding and third molars.

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