Pattern of Third Molar Impaction; Correlation with Malocclusion and Facial Growth

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Abstract

Background: The aim of the present study was to evaluate the type of mandibular and maxillary third molar impaction in different malocclusions and facial growth patterns.

Method and materials: In this descriptive cross sectional study, 364 impacted third molars of patients referring to the orthodontic department of Yazd University were assessed radio graphically. Also, the type of malocclusion and the facial growth pattern was determined by analyzing their lateral cephalograms. Collected data were entered to a computer and statistical tests (Chi-square) were carried out using SPSS16.

Results: Significant correlation was found between the type of mandibular third molar impaction (based on Pell Gregory classification) and different types of malocclusion. Also, the dominant form of impaction (based on winter classification) among different types of facial growth pattern was the vertical one.

Conclusion According to the results of this study, the vertical level of mandibular third molar impaction relative to the adjacent second molar impaction was statistically associated to the type of malocclusion. Also, we found no correlation between the M3s impaction and the type of facial growth pattern.

Key Words: Third molar Impaction, Malocclusion, Facial growth pattern

Introduction

The impacted tooth is one that fails to erupt into the dental arch within the specific time [1-2]. The time of M3 eruption is variable among different individuals. It could start at age of 16 or impede until 18 to 20 [3]. M3s are the most frequently impacted teeth [4-5]. The reason is probably that they are the last teeth erupting into the dental arch therefore the chance of space deficiency for their eruption is high [4]. Broadbent believed that when a third molar became impacted the mandible had failed to achieve its full growth potential.Bjork showed that M3 impaction was associated not only with a reduced amount of growth, but also with a more downward as opposed to forward growth direction. He found that backward direction of eruption and retarded maturation were associated factors [6].

There are several classifying systems for M3 impaction. As shown in *Table 1* and *Figure 1,* winter classifies M3s into 4 categories based on the inclination of the M3 longitudinal axis (Mesioangular, distoangular, vertical and horizontal). P&G classifies M3s into 9 different categories based on their vertical position (relative to the cemento enamel junction and the occlusal plane) and their horizontal position (relative to the ascending mandibular ramus) [7]. The etiology of M3s impaction has been extensively studied. There is a general consensus that the main factor is the mesial angulation of lower M3s to the mandibular plane which has not been reoriented to the vertical direction [8,9]. Another factor is the shortage of space from distal of M2 to the anterior border of ramus [3].

In addition to the mentioned factors, studies reported that malocclusion and facial growth pattern could have an important effect on eruption or impaction of the teeth [3,10]. Richardson (1977) reported higher incidence of M3s impaction in Malocclusion class II [9]. In contrast, Abu Alhaji (2010) found higher incidence of mandibular M3s impaction in malocclusion class III [3].

Impacted teeth and orthodontic treatments are reciprocally associated together. With the on time proper orthodontic treatment the complications of M3s impaction could be prevented [11]. Therefore the aim of the present study was to assess the pattern of M3s impaction in correlation with the facial growth pattern and malocclusion.

Methods and Materials

Sample selection

In this descriptive cross sectional study, 321 pretreatment

Table 1.*Winter classification.*

Impaction type	**The angle of M3's Long axis in relation to second molar**	
Vertical	10° to -10°	
Mesioangular	11° to 79°	
Horizontal	80° to 100°	
Distoangular	-11° to -79°	

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panoramic radiographs of the patients referred to dental school of Yazd University were assessed. Radiographs belong to the patients with congenital disorders, syndromic anomalies and those under the age of 18 were excluded. Also, any history of previous tooth extraction, presence of any pathologic lesion around the impacted tooth and uncompleted M3s roots were other exclusion criteria of this study. Of those pretreatment panoramic, 107 radiographs met our inclusion criteria which contain 364 impacted M3s.

Classification of M3s impaction

All OPG radiographs were evaluated to be classified. Based on the inclination of M3 longitudinal axis relative to M2 (winter classification), teeth were categorized to vertical (10 to -10 degree) mesioangular (10 to 80 degree), horizontal (80 to 100 degree) and distoangular (-10 to -80 degree) (*Table 1*).

For determining the level of impaction based on P & G classification, M3 were categorized to 3 groups (*Figure 2*);

1. In level A, the highest part of the mandibular third molar was on the same level or below the occlusal plane of the adjacent second molar.

2. In level B, the highest part of the mandibular third molar was below the occlusal plane but above the cervical line of the second molar.

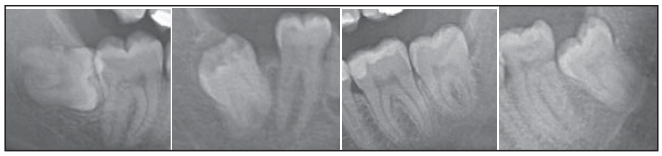
3. In level C, the highest part of the mandibular third molar was beneath the cervical line of the second molar

Also, the relationship of the impacted third molar to the ramus of the mandible and the second molar is classified as follows:

1. Class I. Sufficient space available between the anterior border of the ascending ramus and distal side of second molar for eruption of the third molar.

2. Class II. The space available between the anterior border of the ramus and the distal side of the second molar is less than 1/2 mesiodistal width of the crown of the third molar

3. Class III. The third molar is totally embedded in bone from the ascending ramus because of absolute lack of space.



X-rays belong to the impacted third molars classified as horizontal, distoangular, vertical and mesioangular respectively (from left to right).

Figure 1. *Winter Classification.*

Figure 2. *P&G classification .A: M3 is on the same level or below the occlusal plane. B: M3 is below the occlusal plane. C: M3 is beneath the cervical line of the second molar.*

Growth pattern and malocclusion

The samples were categorized to malocclusion class I, II or III based on the cephalometric indices like ANB, angle of convexity and wits. Also, Facial growth pattern of the patients was classified to normal, vertical and horizontal by Jaraback index and sum of posterior angles.

Statistical analysis

The data were entered into a computer using the Statistical Package for Social Science (SPSS 16) software and analyzed by "Chi-Square" test and statistical significance was considered to be P value ≤ 0.05.

Results

In this study, 364 impacted M3s (180 maixillary M3, 184 mandibular M3) were evaluated radio graphically. The distribution of M3s impaction, regardless of the classification type, in malocclusion class I, II and III and also in normal, vertical and horizontal facial growth are shown in *Table 2*.

Among 184 mandibular impacted M3s, 47 belong to the patients with malocclusion class I, 70 to malocclusion class II and 67 to malocclusion class III. *Tables 3 and 4* summarize data regarding the type of malocclusion and impaction classification based on Winter and P&G (1,2,3 and A,B,C) respectively. Results showed a significant correlation between the pattern of mandibular M3s impaction (based on P&G.A,B,C classification) and the type of malocclusion (P_v =0/049).

Among 180 maxillary impacted M3s, 69, 66 and 45 teeth belong to malocclusion class I, II and III respectively. The pattern distribution of maxillary M3s impaction is shown in *Table 5*. The most prevalent angular position of the mandibular impacted M3s against all kinds of facial growth pattern was vertical one followed by the mesioangular, distoangular and horizontal positions (*Table 6*). Also, 48.7 % of mandibular M3s erupted to level B in any facial growth pattern (*Table 6*).

Discussion

M3s are the last teeth erupting into the mouth and might be impacted completely or partially due to space deficiency, obstructions or ectopic position of the tooth [9]. Because of the increasing incidence of unerupted M3s and the association of numerous complications with these retained teeth [12,13], assessment of the M3s impaction and its etiology is necessary for better prediction and treatment. In this study the pattern of M3s impaction in different skeletal malocclusion were evaluated. Results showed no significant relationship between the angular positions of M3s (winter classification) and the type of malocclusion. However the level of M3s eruption relative to the occlusal surface of adjacent molars (P&G classification) was statistically correlated with the type of malocclusion. In malocclusion class I and II, most of the teeth were erupted to the level of B. In malocclusion class III, the level of most teeth was at the level of the occlusal surface of M2s which might be due to the more space available by mandibular prognathism compared to the malocclusion class I and II. These results are in consent with Richardson's study

Table 2. *Distribution of M3s impaction in malocclusion and facial growth pattern.*

	Growth pattern			Malocclusion		
	Normal	Vertical	Horizontal	I	II	III
%Impaction	42	41.8	16.2	25.3	37.4	37.4

Table 3. *Distribution of mandibular M3s impaction type (based on winter classification) against different malocclusions.*

Mandibular M3s Impaction / Malocclusion	Winter			
	Vertical	Mesioangular	Distoangular	Horizontal
I	40.4	48.9	8.5	2.1
II	58.6	34.3	4.3	2.9
III	64.2	28.4	3	4.5
P.value	0.198			

Table 4. *Distribution of mandibular M3s impaction type (based on Pell & Gregory classification) against different malocclusions.*

Mandibular M3s Impaction / Malocclusion	Pell & Gregory					
	A	B	C	1	2	3
I	23.4	57.4	19.1	36.2	57.4	6.4
II	28.6	51.4	20	48.6	42.9	8.6
III	47.8	41.8	10.4	56.7	37.3	6
P.value	0.049			0.252		

Table 5. *Distribution of maxillary M3s impaction type (based on Winter and Pell & Gregory classification) against different malocclusion.*

Maxillary M3s Impaction / Malocclusion	Winter			Pell & Gregory		
	Vertical	Mesioangular	Distoangular	A	B	C
I	84.4	4.4	11.1	20	28.9	51.1
II	74.2	7.6	18.2	33.3	13.6	53
III	75.4	8.7	15.9	40.6	18.8	40.6
P.value	0.739			0.092		
Maxillary M3s Impaction / Malocclusion	Winter			Pell & Gregory		
	Vertical	Mesioangular	Distoangular	A	B	C
I	84.4	4.4	11.1	20	28.9	51.1
II	74.2	7.6	18.2	33.3	13.6	53
III	75.4	8.7	15.9	40.6	18.8	40.6
P.value	0.739			0.092		

Table 6. *Distribution of mandibular M3s impaction type (based on winter and Pell & Gregory classification) against different facial growth patterns.*

Impaction / Growth Pattern	Winter				Pell & Gregory		
	Vertical	Mesioangular	Distoangular	Horizontal	A	B	C
Normal	56.4	35.9	7.7	0	32.1	48.7	19.2
Vertical	54.5	37.7	3.9	3.9	36.4	49.4	14.3
Horizontal	58.6	31.0	0	10.3	34.5	51.7	13.8
P.value	0.114				0.915		

who reported more incidence of M3s impaction in patients with short mandible (malocclusion class II) [9]. In contrary, Abu Alhaji, 2010, found that Class III subjects had increased mandibular third molar impaction with reduced retromolar space width [3]. An explanation for this opposite results could be the way in which the type of malocclusion had been determined in different studies. Abu Alhji used only ANB angle for malocclusion classification which could not specify which jaw has deficiency or excessive growth. While in the present study other analyses like wits and angle of convexity, in addition to the ANB angle, had been used. Also the class II and III malocclusions were categorized again based on the prognathism or retrognathism of each jaw [14].

Results showed that in malocclusion class I, most of the M3s were in class II of P&G classification (1/2 mesiodistal width of them were embedded in ramus bone). However in class II and III malocclusions, teeth were dominantly ahead of anterior border of ramus. Since there is always a tooth-jaw size discrepancy in class I malocclusion, the resulted space deficiency could causes more sever impaction (M3s embedded more in bone).

As mentioned earlier, insufficient development of the retromolar space could be an explanation for the high rate of mandibular third molar impaction [15-17]. When the remodeling resorption at the anterior aspect of the mandibular ramus is limited, the eruption of the mandibular third molars could be blocked [6]. Also, the direction of mandibular growth plays an important role in third molar

eruption. The molars tend to erupt more forward during the functional phase in patients with anterior growth rotation, partly compensating for the limited amount of resorption at the anterior border of the ramus [6]. Because morphologic parameters at adolescence might predict the remaining type of mandibular growth rotation, they could also be useful in predicting impaction of mandibular molars [18]. Therefore an important factor affecting the retromolar space is mandibular rotation which simultaneously determines the facial growth pattern [4,19]. In the present study no statistical differences were found between the prevalence of M3s impaction and different facial growth patterns. However Breik et al. reported that patients with short faces demonstrated an almost two times lower incidence of mandibular third molar impaction compared with long faces [4]. A reason for this disagreement might be the small sample size of Breik study as he mentioned within the limitation of his study.

Results of this study showed that the dominant angular position of impacted M3s in all kinds of facial growth pattern was vertical position. In contrary, Briek reported that 80% of the impacted teeth in all kinds of facial growth pattern were mesioangular [4]. However Legovic found no statistical differences between the angular position of mandibular impacted M3s and the type of facial growth pattern [11]. At the end we should mention that measuring the length of mandible (Go-Me in mm and its relations with S-N length) should have been done in order to detect any correlation between M3s impaction rate and mandibular length. Unfortunately in this study we had no data regarding the mandibular body length due to the limitation. We recommend further studies to consider this factor as an index for classifying malocclusions before assessing the impaction rate.

Conclusion

According to the results of this study, the vertical level of mandibular M3s impaction relative to the adjacent M2s were statistically associated to the type of malocclusion; In malocclusion class I and II, most of the teeth were erupted to the level of B. In malocclusion class III, the level of most teeth was at the level of the occlusal surface of M2s.Also, we found no correlation between the M3s impaction and the type of facial growth pattern.

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