

## Effect of Lower Third Molar -Presence and Position on the Occurrence Mandibular Angle and Condyle Fractures: A Prospective Clinical Study

Research Article

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### Abstract

**Objectives:** This study was conducted to evaluate the effect of the presence and angulation of mandibular third molars on the occurrence of mandibular angle and condylar fractures.

**Materials And Methods:** A clinical study was carried out on patients with mandibular angle and /or condylar fractures attended the governmental hospitals in Erbil City from June 2015 to June 2016. Data sources were patients' hospital charts and panoramic radiographs. Predictor variables were the presence and orientation of mandibular third molars according to Pell and Gregory and Winter Classifications. Outcome variables were the presence of angle and condylar fractures. Other study variables included age, gender, and fracture aetiology. Data were analyzed using the  $\chi^2$  test and Student t test.

**Results:** The study sample consisted of 29 patients (22 males and 7 females) with 32 fractures sites with an average age of 26.5 years (range 17-50 years). The results revealed that the risk of mandibular angle fracture was significantly higher in patients with impacted mandibular third molars ( $P < .001$ ) and the risk of mandibular condylar fracture was significantly higher in patients lacking mandibular third molars ( $P < .001$ ). The highest risk for mandibular angle fracture was associated with mesio-angular angulation (58.8%) followed by vertical (35.3%) ones. Impacted mandibular third molars with Pell and Gregory class IIB orientation were most associated with mandibular angle fractures.

**Conclusion:** The presences of impacted mandibular third molars increase the risk of mandibular angle fracture and simultaneously decreased the risk of mandibular condylar fracture.

**Keywords:** Angle; Condyle; Fracture; Impacted; Third Molar.

### Introduction

The mandible presents a greater number of fractures in comparison to the other facial bones, even though it is considered the strongest and most rigid bone in the facial skeleton. This could be explained by its prominent location, which may increase its exposure to risk factors [1]. The mandible includes mechanically fragile regions, such as the mandibular angle, the mandibular condyle, and the symphysis [2]. Multiple factors such as the size, direction, nature, and surface area of the impacting force are known to influence the pattern of mandibular fractures. Other factors that are thought to be responsible include the presence of soft tissue bulk and biomechanical characteristics of the mandible, such as bone density, mass, and normal or pathologic anatomic structures

creating weak areas within the bone [3].

Many investigators have reported that patients with unerupted mandibular third molars were more likely to have an angle fracture than those patients without unerupted once. This has been attributed to the decreased cross-sectional area of bone at the mandibular angle that contains the unerupted third molars [4-6]. An inverse relationship was seen for condylar fractures. Patients with impacted mandibular third molars were less likely to have a condylar fracture than those without impacted ones [7-9]. Whether incompletely erupted lower third molars without clinical symptoms should be surgically removed remain controversial [3]. So, several authors recommended extraction of them in adolescents and young adults who often play contact sports because of the

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associated high incidence of mandibular angle fractures [4, 10].

As the mandible is fractured more often at the condyle rather than at the angle, it may not be helpful to extract the unerupted third molars as a protective measure against mandibular condyle fracture, because the treatment of condylar fractures is more difficult and challenging than that of angle fractures [11, 12].

The aim of this study is to determine whether a relation exists between the presence of mandibular third molars and mandibular angle and condylar fractures and whether the risk of these fractures varies with third molar position and angulation.

## Materials And Methods

A prospective clinical study was conducted on patients with mandibular angle and /or condylar fractures attended the governmental hospitals in Erbil City. A total of 29 patients (22 males and 7 females) with 32 fractures were included. Their mean age was 26.5 years (range of 17 - 50 years). The study was approved by the Ethical Committee of the Kurdistan board for medical specialties, and the patients gave an informed consent to the study. The following data were collected: patient's age, gender, cause of the fracture, site of the fracture, and presence and position of mandibular third molars.

Clinical and radiographical examination, using panoramic radiography, was conducted to determine the presence and position of mandibular third molars and the presence of angle and condylar fractures (Fig. 1). Mandibular angle fractures were defined according to Kelly and Harrigan [13] as fractures found posterior to the second molar tooth, extending from any point on the curve formed by the junction of the body and the ramus in the retromolar area to any point on the curve formed by the inferior border of the body and posterior border of the ramus of the mandible. Condylar fracture was defined as a fracture with the fracture line occurring above the sigmoid notch.

By examination of panoramic radiographs, the horizontal and vertical positions of mandibular third molars were categorized according to Pell and Gregory classification. The horizontal positions include three classes based on the position of the crown between the anterior border of the vertical ramus and the second molar. Class I: the crown of third molar is completely anterior to the ramus, Class II: Part of the third molar crown is covered by ramus, Class III: the third molar is completely embedded in ramus. The vertical position was categorized into three levels based on the relative position of mandibular third molars to the crown of the adjacent second molar. Class A: The third molar occlusal plane is the same as the second molar occlusal plane. Class B: The third molar occlusal plane is between the second molar occlusal

plane and the cervical line. Class C: Third molar occlusal plane is below the second molar cervical line.

The angulation of the mandibular third molars compared to the adjacent second molar was divided into four groups, according to winter's classification, as follows: Horizontal, mesio-angular, vertical and disto-angular.

The database was analyzed using Statistical Package for Social Sciences (SPSS) version 21 and the results were compared between patients with different variables, with a statistical significance level of <0.05. The results were presented as rates, ratio, frequencies, percentages in tables and figures and analyzed using Chi square test and student t test.

## Results

The mean age of patients was 26.5 years (range 17-50 years). The largest percentage (41.5%) was in the 20-29 years age group. Twenty-two patients (76%) were male and only 7 were female (24%) with a female to male ratio of 3.1:1. The most common cause of trauma was road traffic accidents (41.3%), followed by fall from height (FFH) (20.6%), while sport injury comprised only (3.40%).

Mandibular angle fracture was observed in 16 patients, with two patients having bilateral angle fractures (56.25%). Mandibular condylar fractures were observed in 14 patients (43.75%). One patient has mandibular angle and condylar fractures simultaneously. A detailed analysis of the demographic variables is presented in Table 1.

The risk of mandibular angle fracture was statistically higher in younger patients ( $P < .001$ ), with the mean age (20.4) years old. While the condylar fractures present with the mean age (33.4) years old. Fractures on the left side of the mandible (56.25%) were slightly more than those on the right (43.75%). In the 18 sites of angle fracture, the number of the fracture sites on the left side were twice those on the right side, while in the condylar fractures were half than those on the right. However, the side did not present a significant relationship with both mandibular angle and condyle fractures.

The risk of angle fractures was significantly higher in patients with impacted mandibular third molars as compared with those of non-impacted third molars (94.4% vs 5.6%;  $P < .001$ ). Conversely, the risk of condylar fracture was lower in patients with impacted mandibular third molars compared with those without impacted once (28.6% vs 71.4%;  $P < .001$ ). The Influence of impacted mandibular third molars on mandibular angle and condylar fracture is presented in Table 2.

**Figure 1. Fracture of right mandibular angle.**



The relation between mandibular third molar- position and mandibular angle and condylar fractures is presented in Table 4. The teeth most associated with angle fractures are Class II (88.2%) and position B (41.2%). The mesioangular impactions was the most common angulation associated with angle fractures (58.8%), followed by vertical impactions (35.3%). However, statistical significance was not reached for any of the 3 positioning groups (horizontal position, vertical position, and angulation) in relation to angle fracture ( $P > .05$ ). while in the 4 mandibular condyle fractures that occurred in the patients with present of mandibular third molars are in the level A 4(100%) and equally in both CI I and CI II. Based on the angulation of the mandibular third molars, the mandibular condyle fractures were most frequent with

vertical angulation 3 (75%), followed by distal angulation 1 (25%).

### Discussion

The purpose of this study was to determine whether the presence or position of mandibular third molars alter the risk of mandibular angle or condylar fracture. In agreement with Halmos et al.[14] the results of this study confirm the greater risk of angle fractures when the third molar is present, as well as a variable greater risk depending on the position of the third molar. The reason for the higher risk of angle fractures in the presence of impacted mandibular third molars is believed to be caused by weakening of the mandibular angle because the tooth occupies more osse-

**Table 1. Demographic variables according to angle and condylar fracture status.**

Variable	Angle Fracture	Condylar Fracture	Total	P-value
Age (yrs.), mean	20.4	33.4	26.5	0.001
<b>Gender No. (%)</b>				
Male	13 (72%)	11 (78.5) %	24 (75%)	0.03
Female	5 (28%)	3 (21.5%)	8 (25%)	
<b>Fracture etiology N (%)</b>				
Road traffic accident	7 (39%)	6 (43%)	13 (40.6)	0.77
Fall from height	3 (16.7%)	4 (28.6%)	7 (22%)	
Fall on ground	3 (16.7%)	3 (21.4%)	6 (18.8%)	
Interpersonal violence	4 (22.2%)	1 (7.1%)	5 (15.6)	
Sport injuries	1 (5.6%)	0 (0.0%)	1 (3.1%)	
<b>Side of fracture</b>				
Right	6 (33.3%)	9 (64.3%)	15 (47%)	0.08
Left	12 (66.7%)	5 (35.7%)	17 (53%)	

**Table 2. Influence of impacted mandibular third molars on mandibular angle and condylar fractures.**

	Angle fracture	Condyle fracture	Total	P-Value
Present	17 (94.44%)	4 (28.57%)	21 (65.625%)	0.001
Absent	1 (5.56%)	10 (71.43%)	11 (34.375%)	
Total	18 (100%)	14 (100%)	32 (100%)	

**Table 3. Risk of angle and condylar fractures in relation to mandibular third molar patten.**

Impacted third molar	No. (%)	No. (%)	P-Value
<b>Horizontal position</b>			
Class I	2 (11.8%)	2 (50%)	0.08
Class II	15 (88.2%)	2 (50%)	
Class III	0 (0.0%)	0 (0.0%)	
<b>Vertical position</b>			
Class A	5 (29.4%)	4 (100%)	0.03
Class B	7 (41.2%)	0 (0.0%)	
Class C	5 (29.4%)	0 (0.0%)	
<b>Angulation</b>			
Vertical	6 (35.3%)	3 (75%)	0.04
Mesioangular	10 (58.8%)	0 (0.0%)	
Horizontal	1 (5.9%)	0 (0.0%)	
Distoangular	0 (0.0%)	1 (25%)	

ous space in the jaw, thereby decreasing the quantity of bone in this region. This hypothesis was supported by Reitzik et al. [15] whose work with monkey mandibles showed that mandible sides with impacted mandibular third molars fractured with 60% of the force required to fracture mandible sides containing normally erupted mandibular third molars.

After measuring the degree of mandibular third molars impaction by horizontal and vertical positions according to the Pell and Gregory system, the highest risk was seen in patients with mandibular third molars position of Class II and Class B. This finding is consistent with studies from Choi et al. [16] and Duan and Zhang [17] who also observed higher risk in these two groups. This finding has been explained by pointing out that mandibular angle fractures have an area of tension at the superior border and an area of compression at the inferior border, according to muscle insertion, muscle force, and bite force positioned on the proximal and distal segments of the fracture [18] mandibular third molars that disrupt the continuity of the cortical bridge of the superior border can cause an inherent weakness in the angle, thereby requiring less force and muscle tension to cause an angle fracture. This might explain why the highest risk of fracture has been seen in Class II and Class B positions of mandibular third molars, in which the superior border is interrupted, rather than Class III and Class C, where the superior border is intact. However, evidence from other studies, including Kandel et al. [5] found that third molars present at occlusal position C and ramus position level 3 had a higher risk of angle fracture in comparison with other categories. Therefore, the relation between the position of mandibular third molars and angle fractures are still controversial. According to Winter's classification, the mesioangular angulation was more frequent, followed by vertical angulation, which agrees with the study conducted by Fuselier et al. [19] and Thangavelu et al. [20] who proved that mesioangular impactions were the most associated with angle fracture. As the root of mesioangular impacted third molar is directed toward the angle of mandible, stress is concentrated around the root apex, which may act as a wedge splitting the mandibular angle, by which the injury forces are redirected toward the mandibular angle and decreases the amount of bone by more than 20%, which increases the risk of angle fracture.

Earlier authors also discovered that the presence of mandibular third molars decreased the risk of condylar fractures, [21, 22] as confirmed by the present study. In this study the percentage of condylar fractures was larger in the patients who did not have an impacted third molar (absent or erupted in Class I and Class A). The present findings could be explained by the reduction of the absorption capacity of the mandibular angle. According to Kober et al. [23] when the third molar is erupted or absent, the resistance of the mandibular angle increases, causing the force to be transmitted to a more fragile region, namely the condyle. The resultant fracture of the condylar neck also is considered a protective mechanism to prevent traumatic dislocation of the condyle into the middle cranial fossa. Less is known about the relation between mandibular third molar position and risk of condylar fractures.

Although the rate of postoperative complications is higher in the treatment of angle fractures, according to Ellis [24], the difficulties of reduction and fixation are more frequent in the treatment of condylar fractures, due to less visibility in the operative field, a difficult hemostasia and the possibility of facial nerve injury [17, 22]. From this viewpoint the prophylactic removal of asympto-

matic impacted inferior third molars in patients with greater risk of facial trauma is not to be recommended as it could increase the risk of a mandibular fracture due to the greater vulnerability of the mandible to a condylar fracture, the treatment of which could be more challenging than that of an angle fracture.

Most of patients involved in mandibular angle fractures were male as compared to female with the male to female ratio of 4.3:1. This is in accordance with the studies of Abbasi et al. [25] and Abbas et al. [26]. The high percentage of male gender for all types of traumas can be due to the fact that males have more freedom to go outdoor and involve in various activities which make them more prone to accidents [27]. Fractures of the mandibular angle and condyle were observed most due to road traffic accidents (41.3%), followed by fall from height (20.6%), This is attributed to multiple reasons like increase in number of vehicles and bad roads in the areas of study, violation of speed limit, traffic laws and neglecting seatbelt, and motorcycle and bicycle riders (the majority does not use the helmet).

The highest incidence of mandibular angle and condyle fractures occurred between 20 to 29 years old with the mean age 26.3 years, this is contributed to the fact that it is the most active period of life and may probably tend to be involved in violent conduct making them more susceptible to trauma.

## Conclusion

The presence of mandibular third molars increased the risk of angle fracture and simultaneously decreased the risk of condylar fracture. The highest risk for mandibular angle fracture is found to be associated with mesioangular angulations, position B and class II.

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