

Effect of Lower Third Molar Status on Fracture of Mandibular Angle and Condyle

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Abstract

Background: To determine the correlation between impacted M3 and mandibular angle and condylar fractures considering the hypothesis that the presence of M3s increases the risk of mandibular angle and simultaneously decreases the risk of condylar fracture and vice versa..

Methods: In this cohort study seventy-five patients having ninety-two hemi-mandibles with fracture of condylar process or angle were included. Status of third molar on the fractured side of mandible was determined. Based on status of mandibular third molars patients were broadly classified into two groups i.e. erupted and impacted.

Results: Among the total 92 hemi-mandibles that were fractured, 56.5% had angle fractures while 43.5% had condylar fractures. Out of total 48 hemi-mandibles with impacted third molars, mandibular angle was fractured in 72.92%. While among 44 hemi-mandibles having erupted third molars, 61.36% had condylar fractures.

Conclusion: Mandibular angle fractures more readily as the result of facial trauma in the presence of an impacted M3, especially with Class B depth and class 2 ramus position. Absence of an impacted mandibular third molar increases the risk of condylar fractures while concomitantly decreasing the risk of mandibular angle fracture.

Key words: Mandibular impacted third molar, Condyle fracture, Angle fracture.

Introduction

The most common bone to fracture because of facial trauma is the mandible. The presence of an impacted mandibular third molar (M3) weakens the mandibular angle region thus predisposing it to fracture more commonly when compared with mandibular condyle which tend to fracture more in the absence of impacted M3. The facial bone commonly fractured as a result of trauma is the mandible, although it has been perceived to be a strong and inflexible bone of the facial skeleton.¹ In literature the frequency of mandibular

fractures is quite variable, alternating from 24.3% to 68.6%, of all maxillofacial fractures.^{2,3} This disparity may be due to variety of reasons such as the age of the patient and the etiology of trauma and socio economic status as well. The pattern of fracture of the mandible is again dependent upon a variety of factors. Primary reason is the force and direction of the injury but it is also dependent upon the type and amount of bone, and presence of certain anatomical structures. One such anatomical structure is the presence of impacted third molars (M3) which has been suggested as a strong contributing factor for mandibular angle fracture.^{4,5} As the presence of an impacted third molar affects the amount and quality of bone at the angle of mandible, a 2-3 fold increased risk for fracture of mandibular angle has been found in the presence of impacted M3s.^{6,7} Concurrently, it has been observed that the absence of an impacted M3 while decreasing the risk of mandibular angle fracture however increases the risk of mandibular condylar fracture.⁸ The calculation of this relative risk of mandibular condyle and angle fracture is significant because the treatment of condylar fracture is more challenging and associated with more surgical morbidity.⁹

The aim of this study was dual, firstly to determine whether the presence of impacted M3s affects the frequency of mandibular condylar and angle fracture and secondly to determine if this risk of fracture is also dependent on M3s position in the mandible. This position in the mandible was determined according to Pell and Gregory classification. It has been suggested theoretically that the impacted M3s decrease the bony volume in the angle region, so we wanted to investigate would it increase the risk of angle fracture while simultaneously decreasing the risk of condylar fracture and whether the degree of tooth impaction would be directly related to the risk of fracture.

Patients and Methods

This cohort study was carried out in department of Oral & Maxillofacial Surgery at Rawal Institute of Health Sciences Islamabad from Jan 2016 to Dec 2017. After taking verbal consent, all patients who reported with mandibular condyle or angle fractures as a result

of trauma were enrolled in the study. Exclusion criteria were patients younger than 18 years of age, patients with comminuted fractures, gunshot or blast injuries, and patients having pathological fractures. The demographic data and information regarding the type of fracture and status of mandibular third molar was noted on a Performa. Clinical and radiographic examination (Orthopantomogram and PA mandible), was performed to diagnose the type of mandibular fracture. Mandibular angle fracture was defined, according to Kelly and Harrigan, while condylar fracture was defined as a fracture above the base of sigmoid notch on the condylar process of mandible.¹⁰ By radiographic examination the status of third molar on the fractured side of mandible was determined according to Pell and Gregory classification.¹¹ The third molars were classified for angulation according to Sciller's classification.¹² Cases presenting with impacted third molars on the fractured side of mandible were divided into two groups i.e. impacted third molar "Present" and "Absent" group. In impacted third molar "absent" group, the hemi-mandible with fully erupted M3s, missing M3s or M3s having Pell and Gregory 1A classification were included. While all other M3s were regarded as impacted and were included in the impacted third molar "Present" group. Chi square test was applied to determine the relationship between status of mandibular third molar and type of fracture. P value < 0.05 was considered significant.

Results

The study comprised of seventy-five patients having ninety-two hemi-mandibles with fracture of mandibular angle or condyle. Majority (84%) were male while 13 (16%) were female having mean age 28.23±12.37 years (age range 18 to 75 years). In present study 35 (46.7%) patients had unilateral mandibular angle fractures while unilateral condylar fracture was present in 23 (30.7%) patients. Bilateral condylar and angle fractures were present in 12 (16%) patients whereas just 5 (6.7%) patients reported with bilateral condylar fractures and none of the patients had bilateral angle fractures. Road traffic accident (RTA) was the most common cause of fractures (n=56, 76.7%) followed by fall (n=10, 13.3%), assault (n=6, 8%), sports injury (n=2, 2.7%) and animal injury (n=1, 1.3%). Among the total 92 hemi-mandibles that were fractured, 52 (56.5%) had angle fractures while other 40 (43.5%) had condylar fractures. Status of mandibular third molar was analyzed (Table 1), Third

molars were categorized into impacted third molars "present" and "absent" groups according to the already mentioned criteria. It was found that in 52.17% hemi-mandibles third molars were considered impacted while in 47.83% cases teeth were either fully erupted or missing. It was further analyzed that out of total 48 hemi-mandibles with impacted third molars mandibular angle was fractured in 72.92% cases. While among 44 hemi-mandibles in impacted M3s "absent group", 27 (61.36%) had condylar fractures. Chi square test was applied to analyze the association of mandibular third molars with angle and condyle fractures and p value was found to be 0.001 (Table 2).

Table 1 :Third Molar Status

Status of third molars		Frequency	Percentage
Pell and Gregory Class	Class 1	46	50
	Class 2	37	40.2
	Class 3	6	6.5
	Absent	3	3.3
Pell and Gregory Position	Position A	44	47.8
	Position B	38	41.3
	Position C	7	7.6
	Absent	3	3.3
Angulation	Mesio-angular	32	34.8
	Horizontal	22	23.9
	Vertical	26	28.3
	Disto-angular	9	9.8
	Absent	3	3.3

When the association of mandibular fracture (condyle and angle) to the occlusal position of third molar was assessed, it was found that 28 (73.68%) hemi-mandibles having third molars at position B had angle fractures while just 10 (26.32%) hemi-mandibles had condylar fractures. The chi square test was applied, and P value of 0.047 was calculated (Table 03). Lastly upon evaluating the association of mandibular fracture (condyle and angle) with third molar ramal position, it was interestingly noted that at Class 2 position 27 (72.97%) hemi-mandibles had angle fractures while only 10 (27.03%) hemi-mandibles had condyle fractures. Chi square test was applied and P value of 0.059 was found which is considered non-significant (Table 4).

Table 2 : Relationship between impacted third molars and mandibular angle and condyle fracture

Impacted third molar	Condyle fracture		p-value	Angle fracture		p-value
	Present	Absent		Present	Absent	
Present (n=48)	13 (27.08%)	35 (72.92%)	0.001	35 (72.92%)	13 (27.08%)	0.001
Absent (n= 44)	27 (61.36%)	17 (38.64%)		17 (38.64%)	27 (61.36%)	
Total	40	52		52	40	

Table 3: Correlation of position of third molars to mandibular angle and condyle fracture

Position of third molars	Condyle fracture		p-value	Angle Fracture		p-value
	Present	Absent		Present	Absent	
Position A	24(54.55%)	20(45.45%)	0.047	20(45.45%)	24(54.55%)	0.047
Position B	10(26.32%)	28(73.68%)		28(73.68%)	10(26.32%)	
Position C	4(57.14%)	3(42.86%)		3(42.86%)	4(57.14%)	
Absent	2(66.67%)	1(33.33%)		1(33.33%)	2(66.67%)	
Total	40	52		52	40	

Table 4: Relationship between ramal classification of third molars and mandibular angle and condyle fracture

Ramal Classification of third molars	Condyle fracture		P value	Angle Fracture		P value
	Present	Absent		Present	Absent	
Class 1	24(52.17%)	22(47.83%)	0.059	20(45.45%)	24(54.55%)	0.059
Class 2	10(27.03%)	27(72.97%)		27(72.97%)	10(27.03%)	
Class 3	4(66.67%)	2(33.33%)		2(33.33%)	4(66.67%)	
Absent	2(66.67%)	1(33.33%)		1(33.33%)	2(66.67%)	
Total	40	52		52	40	

Discussion

Mandible is a rigid and strong facial bone but still it is to be commonly fractured as a result of trauma. It is the quantity and quality of bone at different sites of mandible which directly affects the incidence of mandibular fractures. Our hypothesis is based on the theory that presence of impacted third molars directly affects quantity of bone at the mandibular angle region, thus predisposing it to fracture as suggested by other researchers as well.¹³

In present study it was found that in 52.17% hemi-mandibles with impacted third molars, mandibular angle was fractured in 72.92%. As noted in our study that more mandibular angles were fractured in the presence of impacted M3, this was supported by various other studies as well.^{14,15} Moreover this risk is not only dependent on the presence of an impacted M3 but position of impacted M3 also has a significant

effect, as shown in a study by Fuselier et.al. and Duan et.al.^{16,17} In our study we also observed that 73.68% patients having class B impacted M3s, 72.9 % patients having class 2 ramus position of M3 reported with angle fractures. We know that fractures of mandibular angle present with an area of strain at the superior alveolar border and an area of compression at the lower border of mandible.¹⁸ The impacted M3s with Class II and Class B position thus interrupt the continuity of the upper border of mandible. This results in a characteristic weakness in the mandibular angle, thereby predisposing it to fracture more easily. This explains why the highest risk of angle fractures was observed for Class II and Class B positions of M3 when compared with the impacted M3 having Class III and Class C position, where the impactions are deep and do not interrupt the continuity of the upper border of mandible.

Another common fracture site in the mandible is the condylar process which due to its anatomy and location can be considered another weak area in the mandible. It has been hypothesized that the presence of impacted third molars while increasing the risk for angle fracture simultaneously reduces the incidence of condylar fractures.^{19,20} A study reports that mandibles in the absence of an impacted M3, show a 1.8 fold increased risk of condylar fracture.²¹ Our study also supported this because we found out that in the patients with absence of impacted third molars there was a higher incidence of condylar fracture. These findings were supported in some other studies as well which when determining the effect of the third molar on condylar fractures, demonstrated that in the presence of an impacted M3, the tension forces increase slightly in the angle region predisposing it to fracture more easily as compared to the condylar process. In the absence of an impacted M3, these forces are transmitted to the mandibular condyle thus predisposing it to fracture.^{19,20}

Not much research is done about the association of M3 position with the risk of condylar fractures, but the few studies which have been conducted show that the relative risk of fracture is more in mandibular sides with M3 in Class I and Class A position.^{21,24,25} Although these investigators found a statistically significant relationship, which our study could not validate because we did not find any significant risk.

The proponents of the debate of prophylactic removal of impacted M3 suggest that its early removal in young individuals can decrease the surgical morbidity associated with of M3 in later age. They suggest its removal especially in those young athletes who are

involved in competitive contact sports, recommending that this removal of M3 would further decrease the risk of mandibular angle fracture.^{15,26} But from our results we can conclude that while decreasing the risk of angle fracture it will predispose the mandible to condylar fractures, surgical management of which is comparatively more challenging.²⁷ Therefore we recommend that suggestion of prophylactic extraction of impacted M3s should be carefully reconsidered because its long term effects may not be beneficial.

Conclusion

Presence of an impacted mandibular third molar predisposes the mandibular angle to fracture, particularly at Pell and Gregory Class B depth and class 2 ramus position of impacted third molar whereas it reduces the risk of concomitant condylar fractures.

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