



ROLE OF MANDIBULAR 3RD MOLAR AND INTEGRITY OF EXTERNAL OBLIQUE LINE IN RELATION TO THE RESISTANCE OF ANGLE AND CONDYLE OF MANDIBLE TO FRACTURE – RETROSPECTIVE STUDY

Dental Science

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ABSTRACT

AIMS/OBJECTIVE: - The purpose of this study was to analyse the relationship between mandibular angle fracture and the status of eruption of the mandibular third molars. The study was done to investigate causal relationship between partially erupted or impacted mandibular 3rd molars and the subsequent risk of fracture of condyle and angle of mandible

METHOD: - A retrospective study was conducted for 2 years in government dental college Jammu. The sample consisted of 102 mandibular angle fracture case with or without the presence of mandibular third molars, inclusive of both sexes in the age group 18-45 years. The mandibular angle fractures were analysed by taking an orthopantomogram for each case after an informed consent was obtained. Classification followed was Pell Gregory and winters classification. Outcome variable was presence of condyle and angle fractures of mandible. Mandibular fractures classified as pathologic were excluded. The predictor variable was the presence or absence of mandibular third molar (M3). The confounding variables were the age, gender and cause of accident. The relationship between predictor and outcome variables is analyzed by using chi-square test. The patients were all medically fit and healthy. Exclusion criteria were edentulous patients as well as patients with any bony pathology. A p-value of less than 0.05 is considered as significant.

RESULTS: - the mean age was 31 years, male predominance and RTA was most common cause. Increased incidence of angle fractures in the presence of mandibular third molar, mandibular third molar was present in 90% of the cases with angle fracture. 73% of the teeth were impacted. Increased incidence of mandibular angle fracture was observed in position A, class II, and mesioangular impaction of third molar, which were statistically significant. No significant association was seen between condylar fracture and 3rd molars; also depth of 3rd molar has no significant relationship with angle fracture.

CONCLUSION: - The most important finding of our study was that mandibular third molars are one of the factors associated with a higher incidence (2.3-fold) of angle fracture. The presence of mandibular third molar was in strong association with mandibular angle fracture and there was an increased incidence of position A, class II, and mesioangular impaction, when compared with other positions. This study concludes that there is a direct relationship between the presence and status of impacted third molars with increased risk of mandibular angle fracture. Relationship with condylar fractures needs to be investigated with more sample size.

KEYWORDS

Mandibular angle fracture, Impaction, mandibular third molar, status of eruption.

INTRODUCTION

Mandibular fractures are among the most frequently encountered maxillofacial traumas in clinical practice. 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. Multiple studies report a 2 to 3-fold increased risk for mandibular angle fractures when M3s are present.^{5,6} Finite element analysis using micro-CT in cadaver mandibles has also shown that in a mandible with third molar (M3), stress is concentrated around the root apex of the third molar, which alters the concentration and propagation of stress in the mandible, which increases risk of an angle fracture.²

It has been hypothesized that M3 weakens the angle by decreasing the bone mass in the region making the mandibular angle more susceptible to fracture.³ So it can be argued that there may be advantages in removing third molars that are not deeply impacted.⁴

Fractures of the angle of mandible contributes to 40% of all fractures involving the mandible and often seen in the younger age group.⁵

Approximately 50% of fractures of the mandible involve areas with teeth and the presence of teeth is the most important factor in determining where the fracture occurs.⁶

Our study assesses the risk posed by mandibular third molars in causing an area of weakness in the mandibular angle region, making it

more susceptible to fracture. We made an additional query into the fact if there the risk of angle fracture varies with angulation, ramus relationship and depth of the M3. This study stresses the importance of prophylactic removal of impacted mandibular teeth.

METHODOLOGY

The study was a descriptive study which was carried out at the Department of Oral & Maxillofacial Surgery, IGGDC JAMMU AND Dental college Puducherry from 19th june 2017 to 27th july 2018. 87 patients with clinical and radiographic diagnosis of mandibular fracture were included using non-probability sampling technique. Cases of both genders and older than 18 years of age diagnosed as mandibular fractures were included. Pathologic fractures, edentulous mandibles, developmental disorders were excluded. The standard radiograph for assessment of mandibular fracture and status of third molar was OPG. After an informed consent from the patients, a proforma was filled in accordance with the acquired information containing demographics, cause of accident and clinical findings. Confounding variables were controlled through matching.

The predictor variable was the presence or absence of mandibular third molar (M3). An M3 was classified using the Pell and Gregory system and the modified winter's classification. The outcome variable was the presence or absence of angle fracture. The confounding variables were the age, gender and cause of accident. The qualitative variable like gender, in the demographic data are presented as percentages and proportions and quantitative data, like age, is presented as standard deviations. The relationship between predictor and outcome variables is verified and assessed by using chi-square test. A p-value of less than 0.05 is considered as significant.

RESULTS

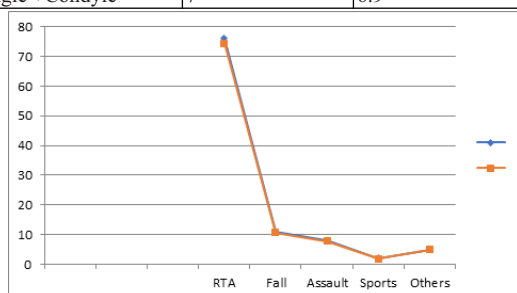
In the present study, we observed angle fracture in the age group ranging from 18 to 45 years and the mean age of the patients was 31 years. The study sample consisted of 77 (75.4%) males and 25 (24.6%) females. Mandibular angle fractures were observed more on the left side than on the right. The most likely cause of angle fracture [Table 1] was road traffic accident with 76 (74.5%) cases, followed by falls in 11 (10.7%) cases, assaults in 8 (7.8%) cases, sports in 2 (1.9%) cases, and others in 5 (4.9%) cases. In this study, we had 52 (51%) cases of isolated angle fracture and 50 (49%) cases were associated with other fracture sites of mandible, with 17 (16%) cases of parasymphysis fracture, 3 (2.9%) cases of symphysis fracture, 7 (6.9%) cases of condylar fracture. It was found that mandibular third molars were involved in 92 (90.2%) cases of angle fracture and were absent in 10 (9.8%) cases [Table 2]. In the sample of 92 cases, we observed 68 (74%) cases of angle fracture associated with impacted mandibular third molar and were erupted in 24 (26%) cases [Table 1]. In the present study, mesioangular impactions were more with 60 (59%) cases, which was statistically significant ($P < 0.05$), followed by vertical impaction in 31 (30%) cases, horizontal impaction in 6 (6%) cases, and distoangular impaction in 5 (5%) cases. Considering the distribution of sample according to the horizontal position of mandibular third molar (Pell and Gregory's classification) [Table 3], we found 45 (44%) cases of class II, 37 (36%) cases of class I, and 20 (20%) cases of class III impacted teeth, which were not statistically significant. Considering distribution of sample according to the vertical position of mandibular third molar (Pell and Gregory's classification) [Table 4], position A was seen in 63 (61%) cases which was highly significant ($P < 0.001$), position B in 25 (24%) cases, and position C in 14 (15%) cases of angle fracture.

TABLE 1

Tooth present	90.2 %
Tooth absent	9.8%
Impacted	74%
Erupted	26%

TABLE 2

Variables	N	Percentage
Male	77	75.4
Female	25	24.6
Cause of injury		
RTA	76	74.5
Fall	11	10.7
Assault	8	7.8
Sports	2	1.9
Others	5	4.9
Isolated angle fractures	52	51
Other fractures	50	49
Angle +Condyle	7	6.9



Total angle fractures out of 102	68	66.6 %
Isolated angle fractures	52	76.4%
Angle plus associated fractures other than condyle	9	13.3%
Angle plus condyle	7	10.3%

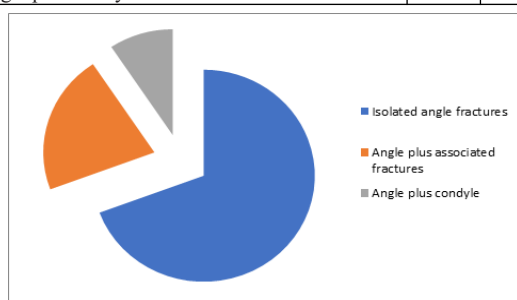


TABLE 3

Class I	36%
Class II	44%
Class III	20%

TABLE 4

Position A	61%
Position B	24%
Position C	15%
Mesioangular	59 %
Distoangular	5%
Horizontal	6%
Vertical	30%



DISCUSSION

Maxillofacial fractures are one of the most frequently occurring trauma to human Skeleton. Fracture of the mandible is more common occurrence owing to its comparative anatomic prominence. A multitude of factors including direction and amount of force, presence of soft tissue bulk, and biomechanical characteristics of the mandible such as bone density and mass or anatomic structures and presence or absence of tooth produce weak areas. Thus, the angle of the mandible is an area of lowered resistance to fracture. In mandible, the angle is the most frequent site when only one fracture is present.[7] Teeth in mandible and maxilla are the most important anatomical factor which makes fractures involving these bones entirely different from other fractures elsewhere.[7] The mandibular third molars are the most frequently impacted teeth seen, which may be either complete or partial.[12] When the impacted third molar is present, by virtue of it occupying space, there is a reduced cross-sectional area of the angle of mandible. This results in an area of weakness facilitating the occurrence of fracture following minor trauma. When third molar is absent, the resistance of mandibular angle increases causing the force to be transmitted to a more fragile region, namely, the condyle.[8] Metin et al[9] reported in their study that patients having mandibular fractures and impacted or unerupted teeth had nearly a 1.73-fold increased risk of a mandibular fracture comparing with patients not having unerupted or impacted teeth. While considering the age distribution in the present study, the mandibular angle fracture was observed in the age group ranging from 18 to 45 years and the mean age

was 31 years. The results showed almost immaculate consistence with the results of the study conducted by Olikarinen *et al.* and Sakr *et al.* who reported that a peak incidence of angle fracture was observed at 20-29 years,[9,10] this is due to the fact that this age group presents with mostly higher incidence of high placed mandibular impactions. Persons in this age group also indulge in violent incidents compared with other ages. As for as gender is concerned, in the present study, the study sample consisted of 77 males (75.4%) and 25 females (24.6%). This observation was consistent with the finding of the study by Dongas *et al.*[11]. Males have physiologically an aggressive behaviour, indulge in rash driving, are more involved in sports hence a higher incidence. With respect to the cause of injury In our study, most common cause is RTA [76 (74.5%) cases] as against assaults [8 (7.8%)] and falls [11 (10.7%)]. This was consistent with the study conducted by Ugboke *et al.* who found that road traffic accidents were the main cause of mandibular angle fractures.[This is mainly due to reasons like limited road safety awareness, speed limit violations, drunk driving, racing sports and complacent driving habits.

We found 62(60%) cases of mandibular angle fracture on the left side as compared to 40 (40%) on the right side. This was in consistence with the study finding of Inaoka *et al.* However, the side did not present any statistically significant relationship with angle fracture.[8] side of injury is on the side of fall. Moreover, with predominance of right handed people in society,victims during altercations are hit mostly on left side. In this study, 50(49%) cases were associated with other fracture sites of the mandible, with 17 (16%) cases of parasymphysis fracture, 3 (2.9%) cases of symphysis fracture, 7 (6.9%) cases of condylar fracture. This was in agreement with the study conducted by Zhu *et al.* who considered that location, site, direction, severity of force, and impact may influence the site of fracture.[12] Mechanism and severity of injury was the foremost factor resulting in multiple fractures and was not influenced by the presence or absence of mandibular third molar. In this study, we found 7 (6.9%) condylar fractures which was consistent with the study conducted by Inaoka *et al.* [8]. Inherent weakness of condyle could be one of the factors responsible whereas in cases of fully erupted teeth or missing mandibular third molars resistance of angle of mandible is comparatively higher. In this study, 52(51%) cases had isolated mandibular angle fracture. Impacted mandibular third molars pose a higher risk of angle fracture. Third molar eats up the bone space that makes the angle of mandible more vulnerable to fracture. In the total sample, mandibular third molars were involved in 91 (90%) cases, among which 75 (74%) cases had impacted third molar and in 27 (26%) cases, it was erupted. This finding was in consistence with Amaratunga *et al.*[13] who showed the mandibular third molars as a risk factor and found the higher risk of angle fractures with incompletely erupted mandibular third molars.[13] The reason for this increased incidence of fracture was that the impacted tooth within the angle region is a predisposing factor for it reduces the bony strength and overall resistance to fracture. The third molar was absent in 11 (10%) cases of mandibular angle fracture. The other reason could be a muscular imbalance of stress and strain between pterygomassetric and suprahyoid muscles. We observed mesioangular impactions in 59(60%) cases ($P < 0.005$), followed by vertical 31(30%), horizontal 6 (6%), and distoangular impaction in 5 (5%) cases. This was in agreement with the study conducted by Fuselier *et al.* and Thangavelu *et al.* who showed that mesioangular impactions were the most commonly associated with angle fracture.[19,20] The root of mesioangular impacted third molar has a wedging influence on angle of mandible thus splitting it and making it prone to fracture.] Superficially impacted third molars compromise the rigidity and integrity of external oblique ridge whereas the deep impactions eat up the bony space and make the angle more vulnerable to fractures. Deeply positioned impactions also reduce the mandibular height. In the present study, position A was seen in 63 (61%) cases ($P < 0.001$), position B in 25 (24%) cases, and position C in 15 (15%) cases. The findings of the present study were consistent with the findings of the study conducted by Elavenil *et al.* who confirmed that the most common type of impaction associated with angle fracture was class I, position A.[14]class I and Position A weakens the external oblique ridge hence increasing the susceptibility to fracture.We found 45(44%) cases of class II, 37 (36%) cases of class I, and 20 (20%) cases of class III impacted tooth in mandibular angle fracture cases. These findings were consistent with the study conducted by Thangavelu *et al.*[15] who found that the higher percentage of angle fracture cases related to class II position in angle fracture.[15] This may be due to the fact that class II reduces the mandibular height.

CONCLUSION

In the total sample, mandibular third molar was present in 90% out of which 74% were impacted. Position A, class II, and mesioangular impaction of third molars showed a higher incidence of angle fractures. No significant relationship of impacted mandibular third molars with condylar fractures was observed. This study concludes that there is a coherent relationship between the presence and status of third molars, with increased risk of mandibular angle fracture. Such valuable information might prove indispensable while evaluating the mandibular third molars and subsequently planning there prophylactic removal. If the association between the presence of mandibular third molar and the risk for angle fractures is causal, then this might be taken into account, along with other factors, in any decision regarding the removal of third molars.

FINANCIAL SUPPORT AND SPONSORSHIP

Nil.

Conflicts of interest

There are no conflicts of interest.