

## Effect of Mandibular Third Molar Presence and Position on the Risk of Mandibular Angle Fracture

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### Abstract

**Background:** Mandibular third molar presence and position may have an effect on the risk of mandibular angle fracture. **Objective:** The purpose of the present study was to see the effect of mandibular third molar presence and position on the risk of mandibular angle fracture. **Methodology:** This cross-sectional study was conducted in four centers in Bangladesh from July 2009 to June 2010 for a period of one year. The mandibular angle fractured patients were selected for the study. The medical records and panoramic radiographs of patients with mandibular angle fracture were examined. The presence or absence and degree of impaction of the mandibular third molars were assessed for each patient and related to the occurrence of fracture of the mandibular angle. Data were also collected for age, sex, mechanism of injury, number and location of mandibular angle fractures. **Results:** A total number of 100 patients with mandibular angle fracture were analyzed. The mean age is  $44.36 \pm 21.9$  years. Among 100 cases, 75 cases had lower third molars and 25 cases had without lower third molars. Within the 75 patients, 64 cases had impacted third molars while 11 cases had erupted third molars. Among the impacted group, 64.1% cases were mesioangular, 15.6% cases were horizontal, 12.5% cases were distoangular and 7.8% cases were vertical. **Conclusion:** In conclusion mandibular angle that contains an impacted lower third molar is more susceptible to fracture when exposed to trauma than an angle without lower third molar. [Journal of National Institute of Neurosciences Bangladesh, July 2022;8(2):181-184]

**Keywords:** Effect; mandibular; third molar presence; risk; mandibular; angle fracture

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### Introduction

The angle is a unique anatomic subcomponent of the mandible. It serves as the transition zone between dentate and edentate regions and is commonly associated with impacted teeth<sup>1</sup>. This qualities may be associated with an increased risk of fracture at the angle region. The teeth are most important in determining the sites, where

fracture occurs. The long canine tooth and partially erupted third molar tooth both represent line of relative weakness<sup>2</sup>.

Mandibular fracture patterns depend on multiple factors, including direction and amount of force, presence of soft tissue bulk and bio-mechanical characteristics of the mandible such as bone density and mass or anatomic

structures creating weak areas<sup>3</sup>. Since mandibular fractures frequently occur at or near the angle, some investigator felt that this may be related to the presence of an unerupted mandibular third molar. Multiple studies report a 2- to 3-fold increased risk for mandibular angle fractures, when third molars (M3s) are present<sup>4</sup>. According to hypothesis, the impacted or unerupted third molar (M3) could weaken the mandible because the tooth occupies more osseous space<sup>5</sup>.

The deeply impacted third molar tooth would make an angle vulnerable to fracture as in physiological or pathological conditions such as cyst or tumour<sup>6</sup>. Safdar and Meechan<sup>7</sup> concluded through their research that deeply impacted lower third molar have the highest relative risk for angle fractures. This conclusion was later challenged by a secondary analysis<sup>8</sup>. However, it is not clear why impacted teeth are associated with an increased risk for angle fractures. The biomechanical argument is that impacted teeth occupy space in the mandible that would otherwise be occupied by bone, thereby reducing the total available bone mass and producing a relatively weaker jaw<sup>9</sup>. The purpose of the present study was to see the effect of mandibular third molar presence and position on the risk of mandibular angle fracture.

## Methodology

**Study Settings and Population:** This cross-sectional study was carried out from July 2009 to June 2010 for a period of one year. This study was conducted in the Department of Oral and Maxillofacial Surgery at Dhaka Dental College and Hospital, Bangabandhu Sheikh Mujib Medical University, Shaheed Suhrawardy Medical College and Hospital, Casualty Department of Dhaka Medical college Hospital, Dhaka, Bangladesh. Patients who were attended in the OPD or admitted to hospitals with angle of the mandible fracture and patients having with or without presence or absence of mandibular third molar irrespective of age and sex were included in this study. Study subjects were recruited on the basis of inclusion and exclusion criteria. Inclusion Criteria were patients having mandibular angle fracture with third molar, patients having mandibular angle fracture without third molar and age limit of the patients were 17 years to 65 years of both sex as well as cooperative patient. Exclusion criteria were patients who refused to be included in this study, patients having pathological angle fracture due to tumor, cyst, peri-apical pathoses, hyperparathyroidism, Pagets, osteoporosis and other metabolic conditions, age below 17years, edentulous patient or un-cooperative and

psychic patient.

**Study Procedure:** Data were collected by a preformed questionnaire containing History, Clinical examination, Radiographs like Orthopantomogram and Clinical records from hospital charts. Patients treated for mandibular angle fractures by the Maxillofacial Surgery Department in Dhaka Dental College and Hospital, Bangabandhu Sheikh Mujib Medical University, Saheed Suhrawardy Medical College and Hospital, Casualty Department in Dhaka Medical College and Hospital, Dhaka, Bangladesh were included. Data on age, sex and etiology of the fractures were collected from case records and radiographs. To assess the predictor variable like the presence or absence of lower third molar, impacted or not impacted teeth and outcome variables like the presence or absence of mandibular angle fracture, panoramic radiographs were used. In addition, with the help of patient's hospital charts and OPG, their age gender, type of fracture, radiographic evaluation and type of impaction were assessed. The mandibular angle fracture was defined based on given by Kelly and Harrigan<sup>10</sup> which was a fracture located posterior to the second molar extending from any point on the curve formed by the junction of the body and the ramus in the retromolar area to any point in the curve formed by the inferior border of the body and posterior border of the ramus of the mandible. The position of the impacted third molars were classified according to Pell and Gregory and Winter's classification. Pell and Gregory's classification<sup>11</sup> was done according to the relationship of the impacted lower third molar to the ramus of the mandible and the second molar (Based on the space available distal to the second molar). The amount of horizontal space was measured between the anterior border of the ascending ramus and the posterior border of lower 2<sup>nd</sup> molar. When adequate space available, Class 1 impaction; when inadequate space available, Class 2 impaction and when third molar located all or mostly within the ascending ramus, class 3 impaction. Winter's classification<sup>10</sup> was done according to vertical depth and angulation. Winter's classification suggested mesioangular, distoangular, horizontal, vertical and in this study the above mentioned classification is used.

**Statistical analysis:** Data were analyzed with the use of chi-square test. Statistical significance was considered when  $p < 0.05$ . Software used is SPSS 16 version for statistical analysis.

## Results

A total number of 100 patients were recruited for this

study. Among them most of the patients were within the age range between 30 to 39 years. Mean age of the subjects was  $44.36 \pm 21.9$  years (Table 1).

Table 1: Distribution of the Study Subjects by Age (n=100)

Age Group	Frequency	Percent
Less Than 30 Years	17	17.0
30 To 39 Years	43	43.0
40 To 49 Years	15	15.0
50 To 59 Years	13	13.0
≥ 60 years	12	12.0
<b>Total</b>	<b>100</b>	<b>100.0</b>

The distribution of the mandibular angle fracture patients by status of third molar teeth was recorded. Among 100 patients, 75.0% reported to have third molar teeth and 25.0% didn't have third molar teeth. The finding signifies that, presence of third molar teeth might precipitate the fracture in the angle of mandible (Table 2).

Table 2: Status of Third Molar among the Study Population (n=100)

Status of Third Molar	Frequency	Percent
Present	75	75.0
Absent	25	25.0
<b>Total</b>	<b>100</b>	<b>100.0</b>

The distribution of the study subjects by condition of third molar was recorded. Among the 75 patients with third molar teeth, 64 (85.3%) had the teeth impacted and in 11 (14.7%) cases the teeth was erupted (Table 3).

Table 3: Condition of Third Molar Teeth among the Study Population (n=75)

Condition of Teeth	Frequency	Percent
Impacted	64	85.3
Erupted	11	14.7
<b>Total</b>	<b>75</b>	<b>100.0</b>

The distribution of the patient by status of fracture was recorded. Among them 67.0% cases were favorable fracture and 33.0% cases were unfavorable fracture (Table 5).

Table shows the distribution of the mandibular angle fracture patient by position of teeth in the fracture line. Among them 76% had their tooth in fracture line and 24% had their tooth out of fracture line.

Table 4: Status of Angle Fracture among the Study Population (n=100)

Status of Fracture	Frequency	Percent
Favorable	67	67.0
Unfavorable	33	33.0
<b>Total</b>	<b>100</b>	<b>100.0</b>

Table 5: Position of Tooth according to Radiological Finding (n=75)

Position of Tooth	Frequency	Percent
Tooth in fracture	57	76.0
Tooth outside the fracture	18	24.0
<b>Total</b>	<b>75</b>	<b>100.0</b>

## Discussion

In the present study, the prevalence of mandibular angle fracture is seen on the basis of presence and position of the mandibular third molar. The issue is still controversial and many studies have been conducted in different countries to resolve the matter<sup>12-14</sup>. The present study is an attempt to enrich our knowledge in the matter which might help the maxillofacial surgeons in the decisions for prophylactic removal of mandibular third molar in vulnerable group of people.

This study evaluated 100 noted patients with mandibular angle fracture and compares the results of previous studies. Within 100 angle fractured patients 75.0% have mandibular third molar, maximum patients age was between 30 to 39 years, their mean age was  $44.36 \pm 21.9$  years and road traffic accidents was the main cause of fracture. Among 75 patients with third molar, 85.3% have impacted third molar.

Several factors have been proposed to influence the location of mandible fractures, including site, force and direction of impact, systemic disease, bony pathology, and the presence of impacted teeth<sup>14</sup>. Many reports have also implicated mandibular third molars as a risk factor for mandibular angle fractures<sup>15</sup>. The purpose of the current study was to evaluate mandibular third molars as a risk factor for angle fracture in collected patients. In human clinical studies, the presence of the M3 has been repetitively shown to be associated with higher relative risk for angle fracture<sup>16</sup>.

Data of the current study shows that, within 100 patients with mandibular angle fracture 75.0% have lower third molar teeth and 25.0% have no third molar. Similar result was found by Lee and Dodson<sup>1</sup>, in their study, among 99 angle fracture patients, 79 had lower third molar teeth. According to Ugboko et al<sup>15</sup>, they found

within 76 patients with mandibular angle fracture, 65 had lower third molar. An explanation for this relationship is that mandible third molars may weaken the mandible by decreasing the cross-sectional area of bone.

Further exploration of status of the 3<sup>rd</sup> molar teeth reveals that among the 75 patients with third molar teeth, 64 (85.3%) had the teeth impacted and in 11 (14.7%) cases teeth was erupted. According to study by Safdar and Meechan<sup>7</sup> they showed that within total angle fractured patients 68.8% had impacted third molar, the remaining were either erupted or absent. In angle fracture patients as maximum patients contain impacted third molar, it may suggests an increased chance of fracture among subjects with impacted 3<sup>rd</sup> molar. Possible explanation is that impacted teeth may be associated with an increased risk for angle fractures and their report showed that impacted teeth occupy space in the mandible that would otherwise be occupied by bone, thereby reducing the total available bone mass and producing a relatively weaker jaw<sup>16</sup>.

Of the patients with impacted teeth, 64.1% were of mesio-angular type, 12.5% were of disto-angular type, 7.8% were of vertical type and 15.6% were of horizontal type. In present study, mesioangular impaction is more (64.1%). One study conducted by Meisami et al<sup>17</sup>, percentage of mesio-angular impaction was more in their study. As the similar study conducted by Ma'aita and Alwrikat<sup>18</sup>, their result shows that vertical impaction is more (59.0%) in their study, they have demonstrated that increased type of vertical impaction causes mandible more susceptible to fracture. This result differs from their study and it may be due to the small sample size and short duration of time. So another study taking the control group can be carried out further.

The major limitation of the current study is its smaller sample size and absence of control group. However the evidence suggests a significant role of 3<sup>rd</sup> molar teeth in increasing the risk of fracture in the angle and specially mesioangular type of impaction mostly influence angle fracture. The fact has also been supported by structural phenomenon and biomechanics of the region. Our finding is in line with several other studies done in the field.

### Conclusion

In conclusion, the presence of 3<sup>rd</sup> molar teeth significantly increases the risk of fracture at the angle of mandible irrespective of the nature of impact leading to fracture. In angle fracture more patients presented with an impacted teeth, suggesting an increasing

likelihood of fracture with the presence of an impacted tooth. Large scale study should be conducted to get the real scenario.

### References

1. Lee JT, Dodson TB. The effect of mandibular third molar presence and position on the risk of an angle fracture. *Journal of oral and maxillofacial surgery*. 2000;58(4):394-8.
2. Ma'aita J, Alwrikat A. Is the mandibular third molar a risk factor for mandibular angle fracture?. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology*. 2000;89(2):143-6.
3. Fuselier JC, Ellis III EE, Dodson TB. Do mandibular third molars alter the risk of angle fracture?. *Journal of oral and maxillofacial surgery*. 2002;60(5):514-8.
4. Tevepaugh DB, Dodson TB. Are mandibular third molars a risk factor for angle fractures?: A retrospective cohort study. *Journal of oral and maxillofacial surgery*. 1995;53(6):646-9
5. Duan DH, Zhang Y. Does the presence of mandibular third molars increase the risk of angle fracture and simultaneously decrease the risk of condylar fracture? *International journal of oral and maxillofacial surgery*. 2008;37(1):25-8
6. Iida S, Hassfeld S, Reuther T, Nomura K, Mühling J. Relationship between the risk of mandibular angle fractures and the status of incompletely erupted mandibular third molars. *Journal of Cranio-Maxillofacial Surgery*. 2005;33(3):158-63
7. Safdar N, Meechan JG. Relationship between fractures of the mandibular angle and the presence and state of eruption of the lower third molar. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology*. 1995;79(6):680-4
8. Naghipur S, Shah A, Elgazzar RF. Does the presence or position of lower third molars alter the risk of mandibular angle or condylar fractures? *Journal of Oral and Maxillofacial Surgery*. 2014;72(9):1766-72
9. Meisami T, Sojat A, Sandor GK, Lawrence HP, Clokie CM. Impacted third molars and risk of angle fracture. *International journal of oral and maxillofacial surgery*. 2002;31(2):140-4
10. Patil PM. Unerupted lower third molars and their influence on fractures of the mandibular angle and condyle. *British Journal of Oral and Maxillofacial Surgery*. 2012;50(5):443-6
11. Leal J, Porto GG. Relationship between mandibular fracture and impacted lower third molar. *Med Oral Patol Oral Cir Bucal*. 2009;14(7):E349-54
12. Thangavelu A, Yoganandha R, Vaidhyanathan A. Impact of impacted mandibular third molars in mandibular angle and condylar fractures. *International journal of oral and maxillofacial surgery*. 2010;39(2):136-9
13. Iida S, Nomura K, Okura M, Kogo M. Influence of the incompletely erupted lower third molar on mandibular angle and condylar fractures. *Journal of Trauma and Acute Care Surgery*. 2004;57(3):613-7
14. Hanson BP, Cummings P, Rivara FP, John MT. The association of third molars with mandibular angle fractures: a meta-analysis. *Journal-Canadian Dental Association*. 2004;70(1):39-43
15. Ugboko VI, Oginni FO, Owotade FJ. An investigation into the relationship between mandibular third molars and angle fractures in Nigerians. *British Journal of Oral and Maxillofacial Surgery*. 2000;38(5):427-9
16. Hanson BP, Cummings P, Rivara FP, John MT. The association of third molars with mandibular angle fractures: a meta-analysis. *Journal-Canadian Dental Association*. 2004;70(1):39-43.
17. Meisami T, Sojat A, Sandor GK, Lawrence HP, Clokie CM. Impacted third molars and risk of angle fracture. *International journal of oral and maxillofacial surgery*. 2002;31(2):140-4
18. Ma'aita J, Alwrikat A. Is the mandibular third molar a risk factor for mandibular angle fracture?. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology*. 2000;89(2):143-6