Eruption Status of Third Molar and Its Possible Influence on the Location of Mandibular Angle Fracture: A Retrospective Analysis

Praveen Satish Kumar · Vikas Dhupar ·
Francis Akkara · G. B. Ananth Kumar

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Abstract

Introduction This study was designed to evaluate the influence of eruption status of mandibular third molars on the location of mandibular angle fracture. We also aimed to evaluate the incidence of damage to mandibular third molar teeth (M3) and its roots.

Materials and Methods Medical records and panoramic radiographs of 142 patient cohorts with mandibular angle fractures with third molars present were retrospectively reviewed.

Results Revealed that incidence of angle fracture were high in patients with fully erupted M3 when compared to unerupted group. Out of 142 patients, 108 fractures were found involving the M3 socket and 14.1 % had damage to M3.

Conclusion The presence of erupted mandibular third molar increases the chances of angle fracture when compared to impacted M3. Involvement of the M3 socket often resulted in increased operative time and complexity of the surgical procedure with possible removal of the damaged M3.

Keywords Angle fracture · M3 injury · Classification of angle fracture · Third molar root injury

Introduction

Fractures of the mandibular angle represent the largest percentage of mandibular fractures in many studies [1, 2]. Approximately 25–33 % of all mandibular fractures are angle fractures and several proposed reasons include the presence of third molars; a thinner cross-sectional area than the tooth-bearing region and also biomechanically the angle can be considered a “lever” area. Multiple studies report a twofold to threefold increased risk of mandibular angle fracture when mandibular third molars (M3) are present [3–5]. Based on this hypothesis we designed a study to examine the exact location of the fracture line in relation to the M3 socket and the incidence of damage to its roots.

Materials and Methods

A retrospective cohort study was used to address the hypothetical evaluation. The study sample consisted of patients with fractured mandible admitted to our service between January 2005 and February 2010. Data sources were medical records and panoramic radiographs. The primary study variables were presence of mandibular third molars and mandibular angle fracture. Patients with absent third molars were excluded from the study group.

Panoramic radiographs were used to determine whether mandibular third molars were present. If they were present, their position and angle were assessed. A normally erupted lower third molar was defined as follows: vertical eruption (80°–100°), the occlusal surface reaching the mandibular occlusal plane and the posterior part of the crown not covered by the anterior border of the ascending mandibular ramus. We considered any third molar partially or completely covered by bone tissue as unerupted. With the use

P. S. Kumar (✉) · V. Dhupar · F. Akkara
Department of OMFS, Goa Dental College and Hospital,
Bambolim 403002, Goa, India
e-mail: praveen1931@gmail.com

G. B. A. Kumar
Department of OMFS, K.M. Shah Dental College, Baroda, India

Table 1 Classification of Angle fracture in relation to M3

Zone I	Fracture line passes through the socket of the third molar tooth
Zone II	Fracture line passes posteriorly not involving the third molar socket
Zone III	Fracture line that passes anterior to third molar socket
Abbreviation used the presence of damage to third molar teeth in zone I	FR-fracture of teeth INT-Intact teeth e.g.: Zone I FR or Zone I INT

Table 2 Study variables stratified for presence of third molar and angle fracture

	Frequency	Percent
<i>Age</i>		
A	13	9.2
B	98	69.0
C	31	21.8
Total	142	100.0
<i>Gender</i>		
Male	123	86.6
Female	19	13.4
Total	142	100.0
<i>Side of involvement</i>		
Left	74	52.1
Right	64	45.1
Bilateral	4	2.8
Total	142	100.0

of a modification of Winter's classification [6], impacted third molars were classified as mesioangular, distoangular, vertical and horizontal. Angulation of a third molar was measured by using the method of Sciller [7]. The angles were classified as follows: vertical $\pm 10^\circ$, mesioangular and distoangular $\pm 11^\circ$ – 70° , and horizontal more than $\pm 71^\circ$.

In this study the mandible was divided into five anatomic regions; condyloid process, ramus, angle, body and parasymphysis. A mandibular angle fracture was defined as a fracture located posterior to the second molar extending from any point on the curve formed by the junction of the body and 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. The present study utilized the classification given in Table 1 to evaluate the location of the fracture pattern in the angle region.

Data collected for the potential confounding variables were age, sex, side of angle fracture, zone of fracture, status of M3 eruption, and incidence of root fracture and also the frequency of removal of involved M3. Descriptive statistics were computed for each variable and a correlation matrix was used to identify potential confounding variables

Table 3 Analysis of angular position

Position of teeth	Frequency	Percentage
Erupted	93	65.5
Vertical impaction	12	9.2
Mesio angular impaction	16	11.3
Disto angular impaction	5	3.5
Horizontal impaction	3	2.1
Bud with incomplete roots	9	6.3
Bilateral fractures excluded	4	2.8

Table 4 Incidence of M3 damage

Status of teeth	Frequency	Percentage
Intact teeth	109	76.8
Fractured	20	14.1
Roots incompletely formed	9	6.3
Exclusion—Bilateral # cases	4	2.8
Total	142	100.0

Table 5 M3 eruption status and zone of angle fracture

	Erupted	Impacted	Bud	Total
Zone I	73 (67.6 %)	29 (26.9 %)	6 (5.6 %)	108
Zone II	14 (66.7 %)	6 (28.6 %)	1 (4.8 %)	21
Zone III	6 (66.7 %)	1 (11.1 %)	2 (22.2 %)	9

to assess the relationship between M3 and the location of fracture line. The data obtained was analyzed using SPSS (statistical package for social sciences) version 20.

Results

One hundred and forty-two patients met the criteria to be included in the study. One hundred and twenty-three patients were males (86.6 %), and nineteen were females (13.4 %). Data summarized in Table 2 depicts the incidence of age and gender distribution of the sample. Analysis for side of involvement revealed seventy-four left sided fractures (52.1 %), sixty-four right sided fractures (45.1 %) and four bilateral angle fractures (2.8 %). Table 3 summarizes the angular position of M3.

In the study sample, analysis of zone of fracture revealed that the involvement of zone I i.e. fracture line passing through the socket were seen in 108 cases (76.1 %), zone II involvement were seen in 21 cases (14.8 %) and zone III in 9 cases (6.3 %). Four bilateral (2.8 %) cases were excluded for simplifying data analysis.

Incidence of damage to M3 tooth is summarized in Table 4 and correlation between eruption status and zone of fracture is summarized in Table 5. Out of twenty cases with damaged M3, 13 cases required removal of the M3 at the time of surgery and 7 cases required removal at a later date.

Discussion

The purpose of this study was to determine the exact location of the fractures involving the mandibular angle in the presence of third molar teeth. Consistent with other studies, our results confirmed an increased risk of angle fractures when M3s were present as well as a variable risk for angle fractures depending on M3 position [1, 2, 4, 8–11]. We found higher incidence of angle fracture in the age group B (19–39 years) which is similar to Halmos et al. [12] study. The greater predisposition of men could be explained by the fact that they are more exposed to the risk factors for facial trauma, such as motor vehicle accidents and physical aggression. Huelke et al.'s [13–15] studies reported that fractures occur more frequently in dentate rather than edentulous regions of the mandible. Their findings were confirmed by Amaratunga [16] and Halazonetis [17].

Huelke et al. further identified the angle region to be most susceptible to fractures in dentate mandibles and hypothesized that presence of M3 increases the risk of angle fracture by occupying osseous space and thereby weakening the angle region. If the hypothesis were true, there should be a variable risk of angle fractures depending on M3 position. Specifically, we would expect to observe that deeper impactions might have a higher risk of fracture. The results of our study, however, were contrary. The analysis of the position of the third molar teeth revealed that the most superficial M3 position (mesioangular and vertical impactions), were associated with an increased risk for fractures when compared to the deeply impacted M3 (horizontal and distoangular impactions). These findings are consistent with study conducted by Seiji Iida et al. [18] who suggested that highest incidence of angle fractures were observed in the group in which M3 decreased the amount of bone more than 20 %, especially in cases with a mesioangular M3. Thangavelu and Yoganandha [2] also suggested that higher proportions of angle fracture were found in those with unerupted mandibular third molars with Class-II ramus and position B mesioangular impactions.

The most important factor to indicate the presence of M3 is the reduced amount of bone at the angle, and this hypothesis is supported by the study of Reitzik et al. [19]. They showed that the mandibles containing incompletely erupted M3 fractured at approximately 60 % of the force required to fracture the mandibles containing fully erupted M3 by using the dry isolated vervet monkey mandible.

Meisami et al. [20] also suggested that mandibular strength is derived from maintenance of cortical, not medullary bone integrity. As such, superficially positioned M3 disrupts the cortical integrity of the external oblique ridge, producing a point of weakness in the mandible and making it susceptible to fracture.

Fractures of mandibular angle region have been a subject of special interest because for their close or direct relationship with the lower third molar tooth. Most studies do not mention the actual location of fracture line in relation to the third molar socket when present and none have mentioned about the incidence of teeth damage. We studied the location of fracture line to determine the most common site when M3s were present and the incidence of teeth damage. The results obtained have shown an increased incidence of fracture line passing through the M3 socket. It was also evident that presence of a damaged M3 led to its removal either during the initial surgery or at a later date. It was found that damaged M3 in line of fracture often led to increased operating time and complexity of surgery. But this study did not evaluate the exact operative time required to treat such cases, hence we recommend further studies to evaluate this fact.

Based on the results obtained a possible sub classification of the mandibular angle fracture with M3 can be used for better communication between surgeons and treatment planning. Many studies have tried to delineate the fact that teeth involved in the fracture line have increased complication rates [21–24]. The classification used in this study may be useful to segregate the fractures in mandibular angle region according to their incidence and involvement of teeth for better surgical planning and clinical reporting.

In conclusion fractures of the angle region are more commonly seen in individuals with erupted and superficially impacted third molars when compared to individuals with deep M3. Presence of third molar teeth may also increase the complexity of surgery involving the treatment of such fractures.

Conflict of interest None declared.

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