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RETROSPECTIVE STUDY

Mandibular third molars as a risk factor for angle fractures: a retrospective study

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Introduction Anecdotal reports suggest that the presence of mandibular third molars predispose the mandible to angle fractures. The purpose of this study was to evaluate the presence of mandibular third molars as a risk factor for angle fractures in patients with fractured mandibles.
Materials and method A retrospective study was designed comprising of patients admitted for treatment of mandibular fractures between January 2006 and January 2009. Data sources were the patients' medical records and radiographs. The predictor variables were the presence and position of third molar. Third molar position was grouped into 9 categories based on the Winter's and Pell & Gregory classification. The outcome variable was the presence of an angle fracture. Other study variables included age, sex, race and mechanism of injury, associated fractures and fracture location.
Results Of the 136 patients with mandibular third molars, 49 cases had angle fractures. Of the 18 patients without mandibular third molars, 03 had angle fractures.
Conclusion The results of this study demonstrate that patients with fractured mandibles and mandibular third molars are nearly 2.2 times more likely to have an angle fracture than patients without mandibular third molars.

Keywords Mandibular third molars · Angle fractures

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Introduction

Mandible is a corticocancellous bone and constitutes the strongest and most rigid component of the facial skeleton, more commonly fractured than the other bones of the face, a fact directly related to its prominent and exposed situation [1]. The angle of mandible serves as the transition zone between dentate and edentate regions and is commonly associated with impacted teeth [2]. The mandibular angle and ramus are both suspended within the strong masticatory musculature. These qualities may be associated with an increased risk of fracture at the angle region. The teeth are the most important factor in determining where the fracture occurs [1] and approximately 50% of fractures of the mandible involve areas with teeth [3].

Fractures of the mandibular angle comprise approximately 30% of all mandibular fractures [4]. The increased frequency of mandibular angle fractures relative to other locations has been hypothesized to be attributable to the presence of the mandibular third molar [5–7].

The actual stress patterns that occur in the human mandible are influenced by several factors, including the osseous anatomy, the forces exerted by the muscles of mastication, the occlusal loading pattern, the exact point of application and the direction and severity of the impact force, which plays an important role in determining the site of fracture [8, 9].

Numerous experimental investigations have looked into the response of the mandible to applied forces [10–12] which showed that mandibles with unerupted mandibular third molars required 40% less force to be fractured than mandibles with fully erupted third molars as well as the fact that patients with fractured mandibles and third molars are 3.8 times more likely to have an angle fracture than patients without third molars [13].

Materials and method

This study was a three year retrospective analysis that used patients' clinical records and radiographs as data sources. The study group consisted of 154 patients who presented with mandibular fractures at the Division of Oral and Maxillofacial Surgery of a tertiary care centre between January 2006 and January 2009. The primary study variables were the presence or absence of third molars and mandibular angle fractures. Panoramic radiographs were used to determine the presence of third molar, their position and angle and their relation to the ramus.

Table 1 Sex predicliction (%)

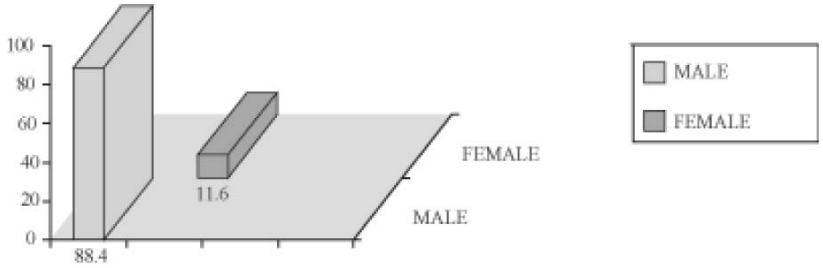
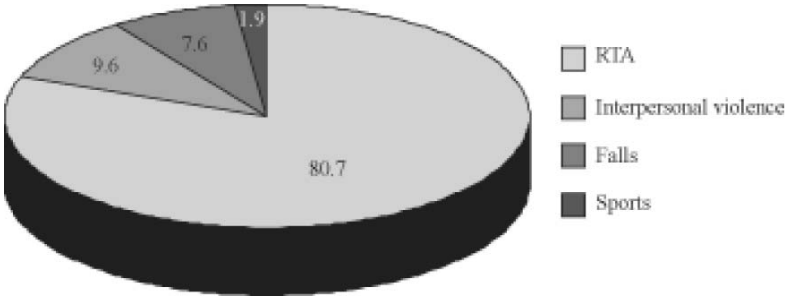


Table 2 Mode of injury (%)



The most common mode of injury was road traffic accidents (80.7%), followed by interpersonal violence (9.6%), falls (7.6%), sports injury and others (1.9%).

Impacted third molars were classified as per Winter's classification [14]. Angulation of a third molar was measured by using the method of Shiller [15]. The angles were classified as follows: vertical ± 10°, mesioangular and distoangular ± 11° to 70°, and horizontal more than ± 71°. Positions of third molars were assigned A, B or C depending on their relative eruption status and relation to the lower occlusal plane and the CEJ of second molar. Position A is defined as the highest portion of the mandibular third molar is level with or above the occlusal table of the mandibular second molar. Position B is defined as the highest portion of the mandibular third molar is between the cementoenamel junction and occlusal table of the mandibular second molar. Position C is defined as the highest portion of the mandibular third molar is below the cementoenamel junction of the mandibular second molar.

The relation of the third molar to the ramus and the second molar was estimated according to Pell and Gregory classification [16]. They were connoted Class I, II or III depending on their relative position. Class I is defined as a mandibular third molar with sufficient space between the ramus and the distal surface of the mandibular second molar. Class II is defined as the space between the ramus and the distal of the mandibular second molar is less than the mesio-distal diameter of the crown of the mandibular third molar. Class III is a mandibular third molar located all or mostly within the ramus.

A mandibular angle fracture was defined as a fracture located 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 [2].

Data were collected for the following variables: age, sex, mechanism of injury and mandibular fractures. Mode of injury was grouped into road traffic accidents, falls, interpersonal violence and sport injury and others. A chi-square test was used and P values less than 0.05 were considered statistically significant.

Results

The age of the patients ranged from 17 to 70 years, with a mean age of 33.2 years. 88.4% were males and 11.6% females (Table 1). The most common mode of injury (Table 2) was road traffic accidents (80.7%), followed by interpersonal violence (9.6%), falls (7.6%), sports injury and others (1.9%). Third molars were present in 136 patients (88.3%). Out of the 154 patients, 52(33.7%) patients had angle fractures. third molars were present in 49(94.2%) of these cases. Third molar were absent in 03 cases. Isolated angle fractures were present in 28(53.8%) of the 52 cases with the left sided angle fracture being more common than the right. Most common combination was a parasymphysis and opposite side angle fracture (22 cases, 42.3%). Angle fractures associated with subcondylar fractures were present in 02 cases (3.8 %). A total of 39 impacted teeth were associated with angle fractures. Angular position of the third molars in angle fractures revealed that 27(69.23%) of the teeth were mesially tilted, 09(23.07%) were in vertical position, 02(5.16%) were in horizontal position and 01 teeth (2.56%) was in distoangular position (Table 3). Of the 39 teeth, 27(69.23%) were positioned with their occlusal surfaces on the same level or above the occlusal plane of the adjacent M2 (Position A), 09(23.07%) were positioned with their occlusal surfaces below the occlusal plane but above the cervical line of the adjacent M2 (Position B) and 03(7.69%) were positioned beneath the cervical line of the M2 (Position C). The relation of the tooth to the ramus of the mandible revealed 25 teeth (64.1%) were in Class I, 11(28.2%) were in Class II and 03(7.69%) were in Class III positions (Table 4).

Of the 136 patients with third molars, 49 patients (36.02%) had angle fractures. Of the 18 patients without third molars, 03 patients (16.67%) had angle fractures (Table 5). Thus, patients with third molars were 2.16 times more with an angle fracture than patients without third molars (P=<0.172). The incidence of angle fractures was found to be significantly higher in the unerupted third molar group 75% (39 of 52 cases) compared with the erupted third molar group 25% (13 of 52 cases). Angle fractures were associated more commonly with mesioangular impaction (69.23%) and the most common position of the impacted teeth was in Class I position (64.1%) relative to the ramus.

A significant trend was established between the degree of impaction and the susceptibility of the angle region to fracture (P=<.089). Location of the fracture line were assessed in relation to third molars which showed fracture line ahead of third molars in 14(26.9%) cases, behind the third molars in 22(42.3%) cases and through the third molar in 16(30.7%) cases. Fracture of the third molar in the line of fracture occurred in 02 cases (3.8 %).

Discussion

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 [7]. Site, force and direction of impact are important determinants of fracture location. When large forces are applied to a small area of the mandible, as in RTA, the fracture generally occurs at the point of impact, regardless of the architecture of the mandible at that site. When the force is distributed to a wider area, as by a fist to face, the mandible will fracture at its weakest point. In our study of 52 angle fractures, there were 28 cases of isolated angle fractures which probably have resulted because of a direct impact to the angle region. The presence of the third molar in this region further weakens the area increasing its susceptibility for fracture. A proposed explanation for this relationship is that mandibular third molars weaken the mandible by decreasing the cross-sectional area of bone. Moore [17] has suggested that a change in the direction of the grain of bone, which occurs where the vertical ascending ramus and the horizontal body meet, tends to weaken the angle region of the mandible and increases its susceptibility to fracture.

Biomechanical and epidemiologic studies support the hypothesis that the presence of mandibular third molars (third molars) is associated with an increased risk for angle fractures. Reitzik et al. [11] showed that Vervet monkeys' mandible require 15.8 +/-2.5 kg of force to produce an angle fracture when the third molar is present and 26.4 +/-4.2 kg of force when the third molar is absent. In human clinical studies, the presence of the third molar has been repetitively shown to be associated with higher relative risk for angle fracture [18–21]. These studies demonstrated that when the third molar was present, the risk of angle fracture increased 2 to 3 fold compared with when the third molar was absent. Consistent with other studies, the results of this study showed a 2.16 times increased risk of angle fractures when third molars were present. Our results also imply that patients with unerupted lower third molars were more likely to sustain an angle fracture than those in whom they had erupted. 39(75%) of our 52 cases were associated with an impacted third molar. This is consistent with other studies reported in the literature.

Wolujewicz [22] addressed the issue of the impacted teeth within the angle region as a predisposing factor to their weakness but concluded that there was no relationship between the state of eruption of the respective third molar and the incidence of angle fractures. Contrary to this study, our results demonstrate that a variable risk exist for angle fractures depending on third molar position. Of the 39 impacted teeth, 27(69.23%) were in Level A, which was the most common, followed by 09 cases (23.07%) at Level B. Similarly the relation of the third molars to the ramus of the mandible revealed that in most cases the third molars were in Class I (25 teeth, 64.1%). Based on these results it can be implicated that a more superficial position of an impacted third molar was associated with an increased risk of angle fractures.

In the present study, it was also observed that mesioangular impactions were most commonly associated with angle fractures (69.23%). This is consistent with studies by Fuselier et al. [23] who studied 1214 cases of mandibular angle fractures and reported a similar result. As the root of third molar in this group is directed towards the angle of the mandible, the third molars may act as a wedge splitting the mandibular angle, by which the injury force is redirected toward the mandibular ramus and angle. Moreover analysis by Iida et al. [26] revealed that the highest incidence of angle fractures was observed in the group in which third molars decreased the amount of bone more than 20%, especially in cases with mesioangular impactions. Future biomechanical analyses concerning these forces and the effect of the angulation of third molar are needed.

Some studies, [13,25] recommend prophylactic removal of third molar to prevent the risk of the possible angle fracture especially for young persons. However, the extraction wound requires more than 6 months for obtaining enough strength [26] during which time patients should be particularly careful to avoid direct injury. Though we cannot show the correct suggestion concerning the earlier removal of third molar according to our results, the most important factor may be that the younger, especially those who have a high possibility of suffering an injury to the face such as persons involved in contact sports, should be aware of the presence of the third molar which has an increased risk for fracture, and pay special attention to preventing the injury forces such as use of a mouth guard or protectors.

Conclusion

This study documented the fact that the presence of an unerupted third molar,

Table 3

Type of impaction	Number
Mesioangular	27
Vertical	09
Horizontal	02
Distoangular	01

Table 4 Distribution of third molar position - Occlusal position

	A	B	C	Total
Class I	21	04	Nil	25
Class II	06	04	01	11
Class III	Nil	01	02	03
Total	27	09	03	39

Table 5 Angle fractures

Third molar	Angle fracture present	Angle fracture absent	Total
Present	49	87	136
Absent	03	15	18
Total	52	102	154

angulation of third molars, its relative position to the ramus of the mandible and the consequently reduced amount of bone are considerable risk factors for mandibular angle fractures. However it would be incorrect to conclude from this study that mandibular fractures are predisposed because of third molar presence. We know that each subject sustained a force that was sufficient to result in a mandible fracture. This study does suggest, however, that when sufficient force is applied to result in a mandible fracture and when an third molar is present, the fracture is more likely to occur in the angle region of the mandible. Further biomechanical studies, will be necessary to further clarify the risk depending on the various impact areas and the direction of the forces applied in addition to the incompletely erupted mandibular third molars on angle fractures to determine the fact whether prophylactic removal of third molars should be advocated.

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