Journal section: Oral Surgery
Publication Types: Research

Relationship between mandibular fracture and impacted lower third molar

Sirius-Dan Inaoka [1], Suzana-Célia-de Aguiar-Soares Carneiro [2], Belmiro-Cavalcanti-do Egito Vasconcelos [3], Jefferson Leal [4], Gabriela-Granja Porto [2]

[1] Senior resident in Oral and Maxillofacial Surgery, Restauração Hospital, Recife, Brazil
[2] Postgraduate Student of the PhD program in Oral and Maxillofacial Surgery, University of Pernambuco, Recife, Brazil
[3] Senior Lecturer in Oral and Maxillofacial Surgery. Director of the Master and PhD programs in Oral and Maxillofacial Surgery, University of Pernambuco, Recife, Brazil
[4] Specialist in in Oral and Maxillofacial Surgery, University of Pernambuco, Recife, Brazil

Correspondence:
Faculdade de Odontologia de Pernambuco
Departamento de Cirurgia e Traumatologia BMF
Av. General Newton Cavalcanti, 1650 Camaragibe - PE
54753-220 Brazil
belmiro@pesquisador.cnpq.br

Inaoka SD, Carneiro SCAS, Vasconcelos BCE, Leal J, Porto GG. Relationship between mandibular fracture and impacted lower third molar. Med Oral Patol Oral Cir Bucal. 2009 Jul 1;14 (7):E349-54.
http://www.medicinaoral.com/medoralfree01/v14i7/medoralv14i7p349.pdf

Received: 06/09/2008
Accepted: 16/11/2008

Article Number: 5123658894 http://www.medicinaoral.com/

eMail: medicina@medicinaoral.com
Indexed in:
-SCI EXPANDED
-JOURNAL CITATION REPORTS
-Index Medicus / MEDLINE / PubMed
-EMBASE, Excerpta Medica
-SCOPUS
-Indice Médico Español

Abstract

Many studies have shown that the greatest risk of fracture of the mandibular angle is related to the presence of an unerupted lower third molar, based on the hypothesis that there is a decrease in the area of bone and absorption of the impact in this area, leading some surgeons to indicate its prophylactic removal in patients most exposed to the risk factors of facial trauma. On the other hand, other authors have observed a greater frequency of condylar fractures in patients without an impacted lower third molar.

Purpose: The aim of this study was to relate the condylar and angle fracture with an unerupted lower third molar, taking into account the position of the tooth.

Material and Methods: Panoramic radiographs were used to determine if the presence or absence of the third molar is related to the occurrence of mandibular fractures, such as angle and condylar fractures.

Results: In a total of 43 patients with angle fractures, the greatest percentage had erupted teeth, and 41.9% had impacted teeth; however there was no significant difference between the fractured side and the tooth condition (p=0.350). There were 91 condylar fractures and in 42.9% the third molar was absent and in 40.7% the tooth was erupted . There was no significant difference between the fractured side and the tooth condition (p=0.852).

Conclusion: The absence of an impacted third molar may increase the risk of condylar fractures and decrease the prevalence of mandibular angle fractures.

Keywords: *Mandibular condyle, mandibular fractures, tooth, unerupted, molar, third.*

Introduction

The mandible presents a greater number of fractures in comparison to the other facial bones, even though it is considered the strongest and most rigid bone in the facial skeleton. This could be explained by its prominent location, which may increase its exposure to risk factors (1).

It is common to find the impacted third molars resulting from modern alimentary habits, with a decrease in masticatory loading and from hereditary, embryological reasons or other etiologic factors (2-4).

Many studies have shown a direct relation between the presence of impacted inferior third molars and a greater likelihood of mandibular angle fractures, with 2- to 3-fold increase in risk (5,6). In approximately 50% of mandibular fractures teeth are involved (7).

Impacted teeth in the mandibular angle area may be considered a risk factor for fractures in this region (8). On this basis some authors have advocated an earlier removal of impacted inferior third molars in order to prevent fractures of the mandibular angle (9-11).

However, other authors have observed a greater frequency of condylar fractures in patients without an impacted lower third molar (12,13).

Very little evidence of the influence of an impacted lower third molar on the increase in mandibular fractures is to be found in the literature. Thus the aim of this study was to ascertain whether an impacted lower third molar influences the frequency of condylar and angle mandibular fractures.

Material and Methods

This retrospective study used panoramic radiographs of patients, which were used to collect relevant data and evaluate whether the presence of an impacted inferior third molar is related to angle and condylar mandibular fractures.

The study was conducted at the Division of Oral and Maxillofacial Surgery of Restauração Hospital, in Recife-PE, Brazil. It was approved by the Ethics Committee of the institution. The sample comprised all patients with angle or condylar fractures attended in the hospital between 2000 and 2005.

The condylar fractures were classified as high or low (Fig.1-A) and the mandibular angle ones according to location: anterior or posterior (Fig.1-B).

Patients with condylar fractures caused by a gunshot wound were excluded, as were patients less than 16 years old; those with a pathological fracture and those whose data were incomplete.

The variables studied were the characteristics of the mandibular fractures (angle and condylar fracture whether associated or not with another mandibular fracture) and those of the third molars according to Pell and Gregory´s classification in the vertical and horizontal plane (Fig.1-C) and to Winter´s classification in relation to the angulation (Fig.1-D).

A descriptive statistics was made using means and percentages. The inferential statistical analysis was made using Fisher´s Exact Test and Pearson´s Cui-squared Test.

Results

Mandibular angle fracture

The mean age of the 43 patients in this study was 26.35 years (range, 16-55 years). The largest percentage (46.5%) was in the 21-30 years age group. Thirty-eight patients (88.4%) were male and only 5 were female (11.6%).

Of the 43 patients with angle fracture, in 24 (55.8%) it was on the right side and 19 (44.2%) on the left. More than half the patients (55.8%) had only angle fractures and in the others the angle fracture was associated with another mandibular fracture such as the mandibular body on the opposite side (9 cases), parasymphysis on the opposite side (5 cases), condyle (3 cases, 1 on the opposite side and 2 on both sides) and symphysis (2 cases).

The majority of the cases with angle fracture had the third molar erupted followed by 41.9% of the patients with an impacted third molar (Table 1). As regards to the side, the left side had more impacted teeth than the right (52.6% x 33.3%). No significant difference was found between the side of the fractures and the condition of the tooth (absent, erupted or impacted) (p=0.350).

In relation to the classification of Pell and Gregory, out of the 38 teeth, the largest percentages corresponded to Class I (52.6%) and Class II (44.7%). The majority of the teeth were classified as Class A (63.2%), followed by 23.7% classified as Class B.

According to the classification of Winter, 65.8% of the teeth had a vertical angulation, followed by 28.9% with mesioangular angulation and 11.1% in the horizontal position.

Condylar fracture

The mean age of the 68 patients in this study was 33.07 years (range, 16-74 years). The largest percentage (47.1%) corresponded to the ≥ 31 years age group. Forty-nine patients (72.1%) were male and 19 were female (27.9%). More than half the cases (55.9%) had only a condylar fracture, the others also having a fracture in another region. Of the 68 patients a with condylar fracture with or without a fracture in another region, 23 were bilateral condylar fractures (8 without associated fractures, 9 with a fracture in the symphysis/parasymphysis and 6 with one in the mandibular body).

Table 1 shows that of the 91 condylar fractures the largest percentage (42.9%) had the third molar absent, followed by 40.7% with an erupted tooth. No significant difference was found between the side of the fractures

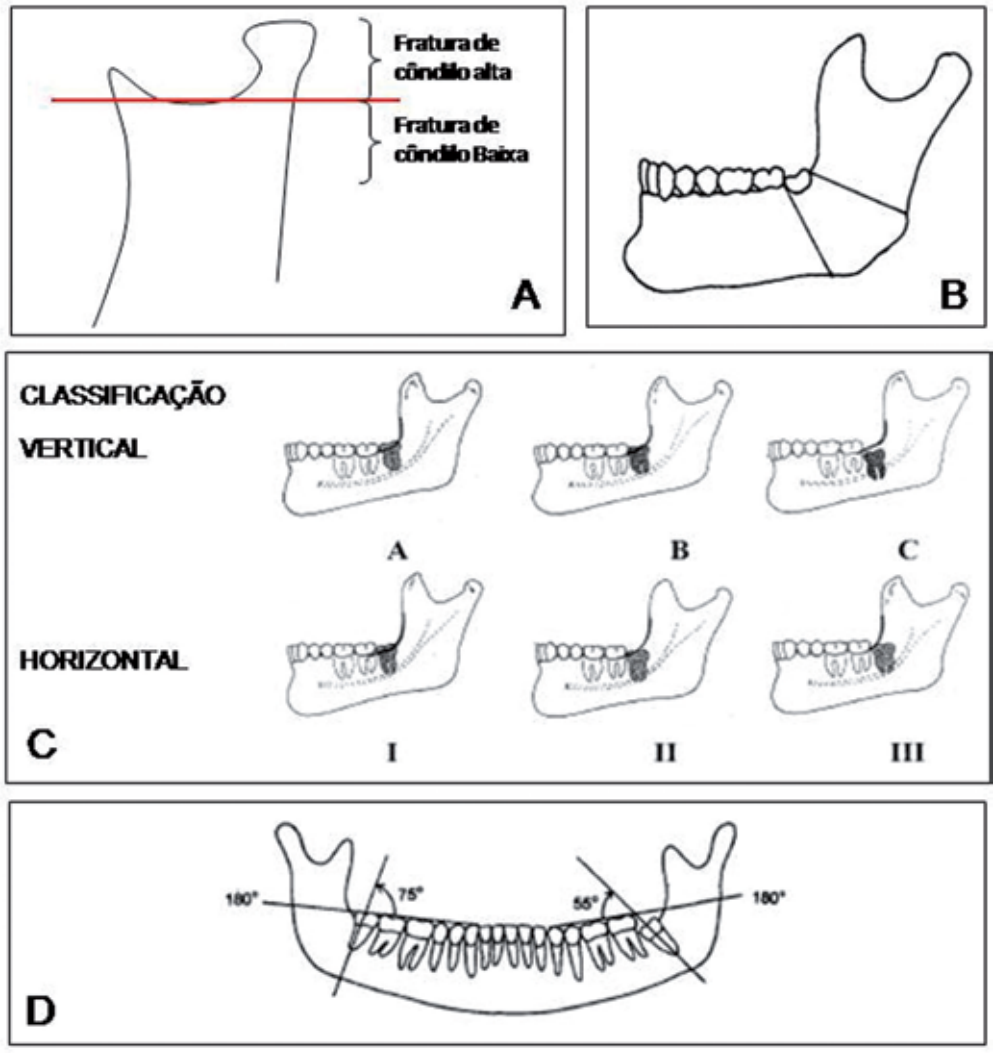

Fig. 1. (A)–Classification of condylar fractures; (B)–The region between the lines represents the area defined as an angle fracture; (C)–Tooth positon according to the Pell and Gregory classification; (D)–Illustration of the measurement of the angulation of the tooth according to Winter´s classification.

Table 1. Evaluation of the position of the third molar according to the side of the angle and condylar fractures.

Angle Fracture	Position of the third molar								
Side	**Absent**		**Erupted**		**Impacted**		**TOTAL**		**p Value**
	N	%	N	%	N	%	n	%	
Right	4	16.7	12	50.0	8	33.3	24	100.0	$p^{(1)} = 0.350$
Left	1	5.3	8	42.1	10	52.6	19	100.0	
Total group	**5**	**11.6**	**20**	**46.5**	**18**	**41.9**	**43**	**100.0**	
Condylar fracture	Position of the third molar								
Side	**Absent**		**Erupted**		**Impacted**		**TOTAL**		**p Value**
	N	%	N	%	N	%	n	%	
Right	18	42.9	18	42.9	6	14.3	42	100.0	$p^{(2)} = 0.852$
Left	21	42.9	19	38.8	9	18.4	49	100.0	
Total group	**39**	**42.9**	**37**	**40.7**	**15**	**16.5**	**91**	**100.0**	

(1): Using Fisher´s Exact Test.
(2): Using Pearson´s Cui-squared Test.

Table 2. Evaluation of the condition of the third molar (impacted or erupted) (present or absent) according to the type of fracture.

	Type of fracture						
Condition of the third molar	**Angle**		**Condyle**		**Total group**		**p Value**
	N	%	N	%	N	%	
Impacted	18	41.9	15	16.5	33	24.6	$p^{(1)} = 0.001$*
Erupted	25	58.1	76	83.5	101	75.4	
TOTAL	**43**	**100.0**	**91**	**100.0**	**134**	**100.0**	
Absent	5	11.6	39	42.9	44	32.8	$p^{(1)} < 0.001$*
Present	38	88.4	52	57.1	90	67.2	
TOTAL	**43**	**100.0**	**91**	**100.0**	**134**	**100.0**	

(1): Using Pearson´s Cui-squared Test

and the condition of the tooth (absent, erupted or impacted) (p=0.852).

More than half of the condylar fractures (58.2%) were classified as low and 41.8% as high. Of the 52 teeth present, 73.1% were classified as Class I. Also in relation to the classification of Pell and Gregory, the largest percentages corresponded to Class A (65.4%) and Class B (30.8%).

According to the classification of Winter, 75% of the teeth had a vertical angulation, followed by 21.1% with mesioangular angulation.

There are no significant differences between low and high condylar fractures and the classification of Pell and Gregory. According to the Winter classification, the largest percentage corresponded to the vertical classification among the condylar fractures classified as low and the mesioangular classification among the fractures classified as high, albeit with no significant difference (p=0.193).

The percentage of impacted third molar was greater in angle fractures than in condylar fractures (41.9% x 16.5%), the difference being significant (p=0.001) (Table 2).

The absence of third molar was greater among the cases with condylar fractures than with angle fractures (42.9% x 11.6%), with significant difference (p=0.001) (Table 2).

Discussion

This study sets out to evaluate the relation between third molars and angle and condyle fractures. In agreement with Halmos et al. (14), the results of this study confirm the greater risk of angle fractures when the third molar is present, as well as a variable greater risk depending on the position of the third molar, the risk being greater in Pell and Gregory´s classification class I and II and A and B (10). According to Winter´s classification, the vertical angulation was more frequent, followed by mesioangular angulation, which is in agreement with Ma'aita et al. (15). However, Iida et al. (13) did not observe any significant difference between the position of the third molar and the risk of angle fractures.

In the group of condylar fractures, the results of this study agree with Duan et al. (16) in relation to the prevalence of an older population, but in relation to the predominant gender, which was male in this study. The greater predisposition of males was probably due to the fact that they are more exposed to the risk factors for facial trauma, such as road accidents and physical aggression.

With regards to the localization of the associated fractures in the angle fractures, there was a predominance, in this study, of the mandibular body region, followed by the symphysis/parasymphysis, which were on the opposite side of the angle fracture. However, Zhu et al. (12) found the mandibular body to be the most commonly fractured area.

In the fractures associated with condylar ones, about 61% of them were in the symphysis and parasymphysis, which is in agreement with Zhu et al. (12).

This study confirms that of Lee et al. (17), which states that the presence of a third molar (erupted or impacted) increases the risk of angle fractures. However, Ugboko et al. (18) state that the presence of a third molar does not predispose to angle fractures.

The hypothesis proposed by Reitzik et al. (19) tries to explain the third molar as risk factor, reporting that the bone space occupied by the tooth makes the mandibular angle more fragile. Thus, according to this theory, the deeper localization of the tooth would increase this risk. However, the results of this study are at odds with this. Nonetheless, they do agree with a biomechanical study conducted by Meisami et al. (20), which suggests that mandibular resistance is maintained by the integrity of the cortical bone, not the medullary bone, which means that the superficial position of the third molar breaks the integrity of external oblique line, creating a fragile point in the mandible. Fuselier et al. (21) also made a study with a sample of 1210 patients, which concluded that the deeper localization of the third molar is not related to an increase in the risk of angle fracture, which is in agreement with Meisami et al. (20).

Some findings of this study are in agreement with Duan et al. (16), who observed a relation between the risk of condylar fracture and the presence and position of the third molar. In their results, the group with condylar fracture was larger when the third molar was present. However, in this study the percentage of condylar fractures was larger in the patients who did not have an impacted third molar (absent or erupted – 83.6%). These findings are in agreement with recent studies by Duan et al. (16), Zhu et al. (12) and Iida et al. (13). The present findings could be explained by the reduction of the absorption capacity of the mandibular angle. According to Kober et al. (22), when the third molar is erupted or absent, the resistance of the mandibular angle increases, causing the force to be transmitted to a more fragile region, namely the condyle.

In this study the classification of the condylar fractures (low or high) was related to the position of the third molar, a relationship that was not found in the literature. The results showed that when the tooth was in a vertical position the condylar fracture was classified as low and when in a mesioangular position it was classified as high.

Although the rate of postoperative complications is higher in the treatment of angle fractures, according to Ellis (23), the difficulties of reduction and fixation are more frequent in the treatment of condylar fractures, due to less visibility in the operative field, a difficult hemostasia and the possibility of facial nerve injury (24-26). From this viewpoint the prophylactic removal of asymptomatic impacted inferior third molars in patients with greater risk of facial trauma is not to be recommended as it could increase the risk of a mandibular fracture due to the greater vulnerability of the mandible to a condylar fracture, the treatment of which could be more challenging than that of an angle fracture.

Conclusion

The absence of an impacted third molar may increase the risk of condylar fractures and decrease the prevalence of mandibular angle fractures.

References

1. Banks P. Killey's fractures of the mandible. 4th ed. London: Wright; 1991.
2. Rounds FW, Rounds CE. Principles and technique of exodontia. 1th ed. St.Louis: Mosby; 1953.
3. Woldenberg Y, Gatot I, Bodner L. Iatrogenic mandibular fracture associated with third molar removal. Can it be prevented? Med Oral Patol Oral Cir Bucal. 2007;12:E70-2.
4. Marzola C. Retenção dental. 2ª. ed. São Paulo: Pancast; 1995.
5. Tevepaugh DB, Dodson TB. Are mandibular third molars a risk factor for angle fractures? A retrospective cohort study. J Oral Maxillofac Surg. 1995;53:646-9.
6. Safdar N, Meechan JG. Relationship between fractures of the mandibular angle and the presence and state of eruption of the lower third molar. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 1995;79:680-4.
7. Neal DC, Wagner WF, Alpert B. Morbidity associated with teeth in the line of mandibular fractures. J Oral Surg. 1978;36:859-62.

Wagner WF, Neal DC, Alpert B. Morbidity associated with extraoral open reduction of mandibular fractures. J Oral Surg. 1979;37:97-100.
8. Wolujewicz MA. Fractures of the mandible involving the impacted third molar tooth: an analysis of 47 cases. Br J Oral Surg. 1980;18:125-31.
9. Hanson BP, Cummings P, Rivara FP, John MT. The association of third molars with mandibular angle fractures: a meta-analysis. J Can Dent Assoc. 2004;70:39-43.
10. Peterson LJ, Ellis E, Hupp JR, Tucker MR. Cirurgia oral e maxillofacial contemporânea. 3a ed. Rio de Janeiro: Guanabara Koogan; 2000.
11. Schwimmer A, Stern R, Kritchman D. Impacted third molars: a contributing factor in mandibular fractures in contact sports. Am J Sports Med. 1983;11:262-6.
12. Zhu SJ, Choi BH, Kim HJ, Park WS, Huh JY, Jung JH, et al. Relationship between the presence of unerupted mandibular third molars and fractures of the mandibular condyle. Int J Oral Maxillofac Surg. 2005;34:382-5.
13. Iida S, Nomura K, Okura M, Kogo M. Influence of the incompletely erupted lower third molar on mandibular angle and condylar fractures. J Trauma. 2004;57:613-7.
14. Halmos DR, Ellis E 3rd, Dodson TB. Mandibular third molars and angle fractures. J Oral Maxillofac Surg. 2004;62:1076-81.
15. Ma'aita J, Alwrikat A. Is the mandibular third molar a risk factor for mandibular angle fracture? Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2000;89:143-6.
16. 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?. Int J Oral Maxillofac Surg. 2008;37:25-8.
17. Lee JT, Dodson TB. The effect of mandibular third molar presence and position on the risk of an angle fracture. J Oral Maxillofac Surg. 2000;58:394-8.
18. Ugboko VI, Oginni FO, Owotade FJ. An investigation into the relationship between mandibular third molars and angle fractures in Nigerians. Br J Oral Maxillofac Surg. 2000;38:427-9.
19. Reitzik M, Lownie JF, Cleaton-jones P, Austin J. Experimental fractures of monkey mandibles. Int J Oral Surg. 1978;7:100-3.
20. Meisami T, Sojat A, Sàndor GK, Lawrence HP, Clokie CM. Impacted third molars and risk of angle fracture. Int J Oral Maxillofac Surg. 2002;31:140-4.
21. Fuselier JC, Ellis EE 3rd, Dodson TB. Do mandibular third molars alter the risk of angle fracture? J Oral Maxillofac Surg. 2002;60:514-8.
22. Kober C, Sader R, Thiele H, Bauer HJ, Zeilhofer HF, Hoffmann KH, et al. Stress analysis of the human mandible in standard trauma situations with numerical simulation. Mund Kiefer Gesichtschir. 2001;5:114-9.
23. Ellis E 3rd. Complications of mandibular condyle fractures. Int J Oral Maxillofac Surg. 1998;27:255-7.
24. Hendrix JH Jr, Sanders SG, Green B. Open reduction of mandibular condyle; a clinical and experimental study. Plast Reconstr Surg Transplant Bull. 1959;23:283-7.
25. Peters RA, Caldwell JB, Olsen TW. A technique for open reduction of subcondylar fractures. Oral Surg Oral Med Oral Pathol. 1976;41:273-80.
26. Brown AE, Obeid G. A simplified method for the internal fixation of fractures of the mandibular condyle. Br J Oral Maxillofac Surg. 1984;22:145-50.