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Do third molars weaken the mandibular angle?

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Abstract

Objective: The purpose of this study is to estimate how is the magnitude of the impact of a mandibular third molar on the mandibular angle stiffness.

Study Design: It was performed a literature search on whole MEDLINE and LILACS data base to find articles that match the following inclusion criteria: cohort studies presenting data on patients with mandibular fractures and third molars; that had a similar angle fracture definition; and that present data available to be cross-classified in a statistic analysis.

Results: The sample was composed by 4 studies, involving 2533 patients from USA, Nigeria, Germany and Jordan, evaluated between 1976 and 2001. The analysis of the sample shows a relative risk for a mandibula to fracture, comparing patients with and without third molars, ranging from 1,18 to 2,25. The data of the sample was grouped because of the homogeneity of the articles methods. The estimated relative risk across the 4 studies was 1,94 (95% CI 1,6 – 2,35).

Conclusions: The presence of a third molar may double the risk of an angle fracture of the mandible to occur. Even with this data, the present study cannot support conditions related to the third molar that may affect this impact. Further studies are necessary to discuss the true indication of removal of these teeth as a prophylactic measure in population groups more predisposed to fracture.

Key words: *Third molar, mandibular angle fracture, relative risk.*

Introduction

The mandible is the bone most susceptible to trauma in the facial region because of its more projected position in the facial skeleton (1-3), with an estimated frequency of 11.5 cases per 100,000 individuals/year. Individuals aged 16 to 30 years account for 50.2% of these fractures and mandibular angle fractures correspond to 40% of these cases. This prevalence is influenced by a series of factors such as sex, age, socioeconomic condition and the characteristics of trauma (4). The mandibular angle has been described as a fragile area and the presence of the third molar in this region is supposed to increases the risk of an angle fracture (5,6). An experimental study on monkeys has shown that mandibles containing unerupted third molars fractured at approximately 60% of the force required to fracture mandibles with erupted third molars (7). Various studies have reported a 2- to 3-fold higher risk of mandibular angle fractures when the third molar is present (4, 8-10). In contrast, a study carried out in Nigeria reported a 1.2-fold higher risk of mandibular fractures when the third molars were present, but the authors did not defend an impact of the third molar on susceptibility of the mandible to fracture, emphasizing interference from a traumatic etiological agent (6).

The reason for the increased prevalence of mandibular angle fractures is not well established (1). The presence of the third molar has been suggested to contribute to increased mandibular fragility because the mandible loses parts of its bone structure to harbor an organ that does not contribute to its strength (4). In addition, completely unerupted teeth are more associated with mandibular fragility because they compromise more extensively the bone structure. In a retrospective study, Inaoka et al. (1) reported that the percentage of impacted third molar was greater in angle fractures than in condylar fractures. However, the effect of partially erupted teeth on the support structures of the mandibular framework (external oblique line) should be taken into account (3-5, 9).

A similar subject has been approached in a meta-analysis, but the methodological aspects of the study questioned the validity of its results (11). There are divergences between the data and the source articles and repetitive samples published at distinct times were included in the studies analyzed (8,10). For obvious ethical reasons, there is no human study design that would permit the elucidation of this interference, since it would be impossible to submit experimental and control groups to injury likely to fracture the mandible in order to evaluate the resistance of this bone and the effect of the third molar on mandibular fractures. Thus, the aim of the present study was to perform a systematized review of the scientific literature in order to determine a representative value of how much the third molar lowers the resistance of the mandibular angle to fracture based on retrospective cohort studies.

Materials and Methods

A strategic search of the Medline/Pubmed and Lilacs/Scielo databases was conducted using the following keywords: "mandibular fractures" and "third molars". The term "mandibular angle" was not recognized as a keyword of this subject. The search resulted in an initial sample of 80 articles. After refinement, 59 articles of the "Journal Article" type published in English or Portuguese remained for analysis. This screening excluded articles such as Comments, Case reports and Editorials. The titles and abstracts of only 21 of these articles were adequate for the review and these articles were selected for reading. The articles needed to fulfill the following criteria to be included in the study:

- Type of study: cohort studies reporting data regarding mandibular and angle fractures and third molars; case-control studies reporting data regarding the proportion of patients with third molars and mandibular angle fractures compared to subjects without fractures; epidemiological surveys reporting data regarding difference in the incidence of mandibular fractures associated with the presence or absence of third molars.
- Definition of angle fracture: the studies should define an angle fracture as a fracture occurring in a region posteriorly to the second molar and extending from a point between the curve connecting the alveolar surface and anterior border of the ramus in the retromolar region and the curve connecting the basilar bone of the mandible and posterior border of the ramus (5,12,13).

After a reading of the articles had been performed for verification of the inclusion criteria, 11 articles were selected for the present review (Table 1). No literature reviews (14), mechanical assays with computer simulation (15), or metaanalyses (11) presenting a type of study or approach different from that evaluated in the present study (2, 16-20) and that did not define angle fracture (21) were selected. Among the articles selected, those presenting some type of sample limitation, for example, including a specific group of individuals (22,23), those not differentiating between erupted and absent third molars (24), and those including samples previously used in other studies (9,10,25) were excluded, with only studies remaining that clearly reported the data of the sample (8). After exclusion, five articles (3-6, 8), which possessed a similar methodology that permitted the comparison of their data, continued in the study.

In order to evaluate the quality of the methods and of the results obtained in each study, a modified classification was used since the articles were cohort studies to which conventional classifications did not apply (26). The study was classified as "good" when the authors had performed and reported the statistical calculations necessary to determine whether the data obtained were representative of the population. The study was classified as "moderate" when only the results were reported

Table 1. Articles included in the review.

Article	Author	Type of study	Journal
Impacted third molars: a contributing factor in mandibular fractures in contact sports.	Schwimmer et al. (22)	Retrospective cohort	Am J Sports Med
Are mandibular third molars a risk factor for angle fractures? a retrospective cohort study.	Tevepaugh et al. (25)	Retrospective cohort	J Oral Maxillofac Surg
Relationship between fractures of the mandibular angle and the presence and state of eruption of the lower third molar.	Safdar et al. (24)	Retrospective cohort	Oral Surg Oral Med Oral Pathol Oral Radiol Endod
A study of sports-related mandibular angle fracture: relation to the position of the third molars.	Yamada et al. (23)	Retrospective cohort	Scand J Med Sci Sports
The effect of mandibular third molar presence and position on the risk of an angle fracture.	Lee et al. (10)	Retrospective cohort	J Oral Maxillofac Surg
Is the mandibular third molar a risk factor for mandibular angle fracture.	Ma´aita et al. (3)	Retrospective cohort	Oral Surg Oral Med Oral Pathol Oral Radiol Endod
An investigation into the relationship between mandibular third molars and angle fractures.	Ugboko et al. (6)	Retrospective cohort	Br J Oral Maxillofac Surg
Do mandibular third molars alter the risk of angle fracture?	Fuselier et al. (8)	Retrospective cohort - multicenter	J Oral Maxillofac Surg
Impacted third molars and risk of angle fracture.	Meisami et al. (4)	Retrospective cohort	Int J Oral Maxillofac Surg
Mandibular third molars and angle fracture.	Halmos et al. (9)	Retrospective cohort – multicenter	J Oral Maxillofac Surg
Relationship between the risk of mandibular angle fractures and the status of incompletely erupted mandibular third molar.	Iida et al. (5)	Retrospective cohort	J Craniomaxillofac Surg

but without showing how they were obtained. The study was classified as "poor" when no calculations had been performed. Since correlation studies aimed at establishing a relationship between the presence of the third molar and angle fractures were analyzed, the study was classified as "good" when the authors had evaluated other variables that might be related to the fracture, with these variables presenting a positive or negative association. The study was classified as "moderate" when these aspects were considered but no results were obtained, and as "poor" when no such analysis was performed.

In order to obtain data for a meta-analysis and to statistically calculate the overall relative risk (within a 95% confidence interval) of the third molar on mandibular angle fractures, the articles were classified as "good" when these data were clearly reported, as "moderate" when no such data were reported but analysis of the results permitted this calculation, and as "poor" when no information was provided. After this classification, a score was attributed to each article, with the classification "good' being scored as 2, "moderate" as 1, and "poor" as 0. Within the possible range of 6 to 0, articles with scores of 5 or 6 were classified as having a high methodological level, scores of 3 or 4 as medium level, and a score of less than 3 as low level. Articles receiving a score of low quality were excluded from the sample. The data of the tests were manually extracted and analyzed using the statistical software Stata version 7.0 and Excel software version 98. Thus were calculated the prevalence and incidences of each variable, and also the relative risks (RR) and their confidence intervals (CI) with confidence level of 95%, initially for each study and then for all studies as a whole.

Results

The sample of selected articles consisted exclusively of retrospective cohort studies whose data were based on the review of hospital records and radiographic files. Classification of the articles showed that none of the studies performed statistical calculations to determine whether their samples were representative of the population.

With respect to the correlation criterion, all studies provided some information to defend their position regarding the relationship between the presence of third molars and angle fracture. Ma´aita et al. (3) and Iida et al. (5) related this fragility to the type of dental impac-

tion and stage of eruption. In addition, Meisami et al. (4) and Fuselier et al. (8) also reported age to be a possible interfering factor. Ugboko et al. (6) associated a low frequency of these fractures with the mechanism of injury.

With respect to data suitable for a meta-analysis, the study of Ma´aita et al. (3) did not contain the desired complete data but statistical calculations could be performed. However, no data could be obtained from Meisami et al. (4) study which was classified as being of poor quality and was excluded from the sample. The remaining studies were classified as being of regular quality.

The four articles thus included in the present study showed a homogeneous pattern regarding methods and presentation of the results (3,5,6,8). The four articles selected comprised a total sample of 2533 patients. The studies were conducted in different countries (United States, Nigeria, Germany and Jordan) and the samples were collected during distinct periods ranging from January 1976 to June 2001.

Results of descriptive statistics of all studies are shown in (Table 2). The mean age of the sample was 30.9 years and there was a predominance of males (79.23%). Among all patients studied, 632 (24.95%) had mandibular angle fractures and 72.33% presented third molars.

(Table 3) illustrates the impact of gender on the prevalence of angle fractures. A significant difference between genders was only reported in the study of Ma´aita et al. (3) with female gender being a protective factor

Table 2. Distribution of patients according to sex, angle fracture, third molar, and mean age.

	Ma´aita et al. (3)	Ugboko et al. (6)	Fuselier et al. (8)	Iida et al. (5)	TOTAL
Variable	N (%)	N (%)	N (%)	N (%)	N (%)
Number of patients	615 (24.28)	490 (19.34)	1210 (47.77)	218 (8.61)	2533 (100)
Sex					
Male	488 (79.35)	369 (75.31)	981(81.07)	169 (77.52)	2.007 (79.23)
Female	127 (20.65)	121 (24.69)	229 (18.93)	49 (22.48)	526 (20.77)
Angle fracture*					
Present	152 (24.72)	76 (15.51)	326 (26.94)	78 (35.78)	632 (24.95)
Absent	463 (75.28)	414 (84.49)	884 (73.06)	140 (64.22)	1.901 (75.05)
Third molar*					
Present	426 (69.27)	408 (83.27)	837 (69.17)	161 (73.85)	1.832 (72.33)
Absent	189 (30.73)	82 (16.73)	373 (30.83)	57 (26.15)	701 (27.67)
Mean age (years)	33.2	30.6 $\pm$10.4	30.8$\pm$10.4	26.4$\pm$9.3	30.9

Table 3. Incidence of angle fracture according to sex.

Authors	**Sex**	**Total**	**Prevalence (%)**	**Relative risk**		**p**
				Point	95% CI	
Ma´aita et al. (3)	Female	49	38.38	1	-	0.000
	Male	103	21.11	0.54	0.41 – 0.72	
Ugboko et al. (6)	Female	13	10.47	1	-	0.095
	Male	63	17.07	1.58	0.90 – 2.78	
Fuselier et al. (8)	Female	65	28.38	1	-	0.584
	Male	261	26.61	0.93	0.74 – 1.18	
Total	Female	127	26.62	1	-	0.127
	Male	427	23.23	0.87	0.73 – 1.03	

Table 4. Incidence of angle fractures according to presence or absence of third molars.

Authors	Third molars	Total	Prevalence (%)	Relative risk		p
				Point	95% CI	
Ma´aita et al. (3)	Absent	25	13.23	1	-	0.000
	Present	127	29.81	2.25	1.52 – 3.33	
Ugboko et al. (6)	Absent	11	13.41	1	-	0.565
	Present	65	15.93	1.18	0.65 – 2.14	
Fuselier et al. (8)	Absent	57	15.28	1	-	0.000
	Present	269	32.14	2.10	1.62 – 2.72	
Iida et al. (5)	Absent	11	19.30	1	-	0.002
	Present	67	41.61	2.15	1.22 – 3.78	
Total	Absent	104	14.84	1	-	0.000
	Present	528	28.82	1.94	1.60 – 2.35	

against these fractures. Analysis of the sample as a whole showed that males were less susceptible to fractures but this finding was not statistically significant.

With respect to the presence of third molars, (Table 4) clearly shows a significant 1.94-fold increase in the predisposition to mandibular angle fractures when the third molar was present. A lower relative risk was only reported in the study of Ugboko et al. (6) who suggested a structural strengthening of the mandibular angle due to the presence of the third molar, although this result was not statistically significant.

Discussion

The classification elaborated for ranking the articles was useful to determine their methodological quality, with none of the studies presenting a satisfactory methodological level. This fact indicates the difficulty in elaborating an adequate scientific method for the evaluation of the association between mandibular angle fractures and the presence of third molars.

Approximately 25-30% of mandibular fractures occur in the region of the mandibular angle (3,4). This rate agrees with the prevalence found in the studies evaluated (24.5%). This information is important since it demonstrates similar fracture prevalence in different countries where the studies were conducted (United States, Germany, Jordan, Nigeria) despite marked geographic and cultural differences.

According to Tevepaugh et al. (25) the mean age of patients with mandibular angle fractures is 32.2 years. A slightly lower age (30.9 years) was observed in the sample of articles analyzed. In this respect, age may have a possible impact on the prevalence of these fractures. Although some studies does not show statistically significant data regarding this effect of age (3,8), Halmos et al. (9) and Meisami et al. (4) found a higher prevalence of the variables "angle fractures" and "third molars" in subjects of a specific age range (26-30 years). This prevalence was also noted in an increased relative risk for the same age group. This finding suggests a confounding factor, with the possibility that fractures in this region might be related to some specific behavior of young subjects, irrespective of the lower resistance to fracture caused by a third molar.

Statistical analysis performed in the present study showed that the third molar lowers the resistance of the mandibular angle to fracture as demonstrated by a 1.94 times higher relative risk of the occurrence of fractures in patients with third molars compared to those without these teeth. This finding agrees with the studies evaluated, in which the relative risk ranged from 1.2 to 3.8. (3-6, 8,9). Analyzing the confidence intervals, only the study of Ugboko et al. (6) defended the fact that the presence of third molars does not contribute to mandibular fragility.

In a meta-analysis, Hanson et al. (11) reported that the presence of third molars results in a 2.4 times higher relative risk of mandibular angle fractures. However, detailed analysis of the articles analyzed by these authors showed failures in the reported data, in addition

to the inclusion of two articles (8,10) that referred to the same sample.

Several studies have attempted to find an explanation for the lower resistance of the mandible to fracture. The possible etiology and characteristic of trauma (4), type of dental impaction (3, 8-10), and the characteristics of the patient (4,9) have been suggested as possible predisposing factors. However, no conclusion regarding the contribution of each factor can be drawn from the present review because of the variation in the assessment method of these factors and the lack of individual data for each patient.

According to Fuselier et al. (8) angle fractures are more common in subjects with mesioangular third molars (p=0.035). In contrast, Ma´aita et al. (3) found a higher prevalence for vertical and distoangular third molars. Regarding the vertical position, these authors suggested that deeply impacted third molars are the main responsible for the higher risk of angle fractures. In contrast, Lee et al. (10) did not observe that completely impacted teeth increase the relative risk of fracture compared to erupted third molars. Halmos et al. (9) confirmed this observation and added that superficial impactions (positions II-A and II-B of the Pell and Gregory system) may be more frequently associated with an increased risk of these fractures.

These data support the theory that the third molar has a higher impact on the susceptibility of the mandible to fracture when it compromises the pillars of strengthening and sustaining of the retromolar trigone region. Thus, semi-impacted teeth whose greater crown diameter is found at the level of the external oblique ridge compromise the bone structure more than completely unerupted teeth and thus favor mandibular fracture (3-5 ,9,25). This structural involvement has also been demonstrated by Iida et al. (5), who obtained statistically significant data showing that the closer the tooth is to the mandibular basilar bone, the higher the prevalence of angular fractures.

Lee et al. (10) provided data showing an increase in the frequency of mandibular angle fractures associated with the position of the impacted third molar. The authors found that compared to the erupted third molar (position 1A of the Pell and Gregory system) all positions presented an increased risk, except for completely impacted teeth (position 3C of the Pell and Gregory system). This information is important for the analysis of the article of Ugboko et al. (6) since 331 of the 408 patients with third molars had erupted teeth. These findings suggest that erupted third molars have a lower impact on the susceptibility of the mandibular angle to fracture and therefore support the opinion of the authors that the presence of the third molar does not reduce the resistance of the mandibular angle to fracture.

Fuselier et al. (8) emphasized that it is incorrect to state that the mandible undergoes fracture because of the presence of the third molar. The authors suggested that, when the mandible is submitted to a force sufficient to cause a fracture, which is specific for each individual, and contains a third molar, the fracture probably occurs in the region of the angle. This analysis should also consider factors inherent to the injury that are directly related to the pattern of fracture, such as intensity, direction, nature and point of impact of the force (4). If there is a large impact on a small area, the fracture will occur at this point; however, if the injury is of low intensity or distributed over a large surface, the fracture will occur in the area of lowest resistance (3,25).

The pattern of force transmission is directly related to the etiological agent of the fracture. Traumatic impacts of low intensity resulting in energy distribution along the lesioned body are suggested to be more frequently associated with mandibular angle fractures, especially when a third molar is involved. Physical aggressions and sportsrelated injuries are the main examples of this type of etiological agent (4,5, 21-23).

The study of Ugboko et al. (6) reports findings that support this hypothesis since it demonstrated a low prevalence of mandibular angle fractures (16%) compared to the other studies and is the only one defending the lack of interference of the third molar with mandibular angle fractures. One possible explanation for this difference is the fact that in 62% of the cases the etiological factor was an automobile accident, in which the fractures probably had occurred as a consequence of the direct transmission of a high amount of energy to the site of contact.

The articles analyzed are retrospective studies performing point analyses of a situation. Thus, for obvious ethical reasons it is not possible to obtain data either in the present study or through a specific scientific method for humans regarding the impact of the third molar on the prevalence of mandibular fractures other than angle fractures (11). On the basis of the present systematized literature review, we conclude that the third molar is a factor increasing the susceptibility of the mandibular angle to fracture. However, the present study did not determine which individual conditions and type of impaction are more frequently associated with this susceptibility. Further studies are necessary to discuss the true indication of removal of these teeth as a prophylactic measure in population groups more predisposed to fracture.

References with links to Crossref - DOI

References

1. Inaoka SD, Carneiro SC, Vasconcelos BC, Leal J, Porto GG. Relationship between mandibular fracture and impacted lower third molar. Med Oral Patol Oral Cir Bucal. 2009;14:E349-54.

2. Libersa P, Roze D, Cachart T, Libersa JC. Immediate and late mandibular fractures after third molar removal. J Oral Maxillofac Surg. 2002;60:163-5.

3. 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.
4. 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.
5. 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. J Craniomaxillofac Surg. 2005;33:158-63.
6. 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.
7. Reitzik M, Lownie JF, Cleaton-jones P, Austin J. Experimental fractures of monkey mandibles. Int J Oral Surg. 1978;7:100-3.
8. 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.
9. Halmos DR, Ellis E 3rd, Dodson TB. Mandibular third molars and angle fractures. J Oral Maxillofac Surg. 2004;62:1076-81.
10. 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.
11. 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.
12. Kelly DE, Harrigan WF. A survey of facial fractures: Bellevue Hospital, 1948-1974. J Oral Surg. 1975;33:146-9.
13. 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.
14. Adeyemo WL. Do pathologies associated with impacted lower third molars justify prophylactic removal? A critical review of the literature. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2006;102:448-52.
15. Takada H, Abe S, Tamatsu Y, Mitarashi S, Saka H, Ide Y. Three-dimensional bone microstructures of the mandibular angle using micro-CT and finite element analysis: relationship between partially impacted mandibular third molars and angle fractures. Dent Traumatol. 2006;22:18-24.
16. Atanasov DT, Vuvakis VM. Mandibular fracture complications associated with the third molar lying in the fracture line. Folia Med (Plovdiv). 2000;42:41-6.
17. Krimmel M, Reinert S. Mandibular fracture after third molar removal. J Oral Maxillofac Surg. 2000;58:1110-2.
18. Marker P, Eckerdal A, Smith-Sivertsen C. Incompletely erupted third molars in the line of mandibular fractures. A retrospective analysis of 57 cases. Oral Surg Oral Med Oral Pathol. 1994;78:426-31.
19. Wagner KW, Otten JE, Schoen R, Schmelzeisen R. Pathological mandibular fractures following third molar removal. Int J Oral Maxillofac Surg. 2005;34:722-6.
20. Werkmeister R, Fillies T, Joos U, Smolka K. Relationship between lower wisdom tooth position and cyst development, deep abscess formation and mandibular angle fracture. J Craniomaxillofac Surg. 2005;33:164-8.
21. 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.
22. 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.
23. Yamada T, Sawaki Y, Tohnai I, Takeuchi M, Ueda M. A study of sports-related mandibular angle fracture: relation to the position of the third molars. Scand J Med Sci Sports. 1998;8:116-9.
24. 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.
25. 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.
26. Jadad AR, Moore RA, Carroll D, Jenkinson C, Reynolds DJ, Gavaghan DJ, et al. Assessing the quality of reports of randomized clinical trials: is blinding necessary? Control Clin Trials. 1996;17:1-12.

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