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Evaluation of the relationship between wisdom teeth and mandibular fractures**✉Betul Tas Ozyurtseven, ✉Ebru Deniz Karsli, ✉Aykut Can Balkanlioglu, ✉Metin Gungormus***Gaziantep University, Faculty of Dentistry, Department of Oral and Maxillofacial Surgery, Gaziantep, Turkey*Received 07 January 2021; Accepted 02 February 2021
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**Abstract**

The aim of this study is to investigate the relationship of mandibular fractures with the presence and position of third molars. Patients who presented to our clinic due to mandible fractures between 2013 and 2020 were included in the study. Panoramic radiographs, computed tomography images and clinical records of the patients were examined as a data source. Locations of mandibular fractures, combined fracture sites, ipsilateral mandibular wisdom teeth were recorded. The Pell-Gregory classification was used to determine the degree of impaction of the wisdom teeth and according to the ramus and the depth, and the Winter classification to determine their position and angulations. The relationship of all data with fractures of the mandible was evaluated. The data obtained were analyzed with the SPSS program using chi-square and Fisher's exact tests. The study sample consisted of 65 patients (condyle fractures; 15.4%, angulus fractures 29.2%, body fractures 18.5% and symphysis fractures 36.9%). 18 of the patients had a combined fracture. It was observed that there was a significant relationship between mandible fractures and the presence of combined fractures ($\chi^2 = 11.182$, $p = 0.011$). While 76.9% of the patients with mandible fractures had mandibular wisdom teeth; 58% of them were found to be impacted. No significant relationship was found between the localization of the fracture and the presence of wisdom teeth and/or impacted teeth ($p < 0.05$). Our study showed that the presence of wisdom teeth in mandibular fracture cases is commonly seen, but wisdom teeth presence (erupted or impacted) did not show a statistically significant difference in the occurrence of mandibular fractures.

Keywords: Wisdom teeth, mandibular fractures, angulus fractures**Introduction**

Although the mandible is a strong bone, it is a sensitive bone due to its prominent position on the face and mechanically weak areas such as angulus, condyle, and both sides of the symphysis [1,2]. Mandibular fracture incidence is between 23.8% and 81.3% and mandible is the most common bone with maxillofacial fractures [2]. In the development of mandible fractures, many factors such as biomechanical properties, bone density of the mandible, presence of wisdom teeth, the direction and amount of force to the mandible, the region where the force comes from, and the characteristics and support of the soft tissue effect [3]. Studies examining mandibular third molars' effect on the mandibular fracture pattern report a higher risk of developing mandibular fractures in cases with mandibular wisdom teeth [4].

Angulus is vulnerable to fractures not only because it is the junction area between the body and the ramus but also the impacted wisdom teeth decrease the bone strength by reducing the amount of bone and adversely affects the absorption of forces to the bone [4,5].

It is thought that the risk of developing an angulus fracture decreases in cases where there is no wisdom tooth and the risk of developing condylar fractures increases due to the transmission of force to the condylar area [6]. Although Yaltrik et al. [7] investigated the effects of the presence of impacted wisdom teeth on the incidence of angulus fractures, to the best of our knowledge, no studies are evaluating the development of mandibular fractures with relation to wisdom teeth and their spatial classifications in Turkish society. Therefore, in our study, it was aimed to investigate the relationship between mandibular fractures and the presence of wisdom teeth, their impaction type, and spatial location.

Materials and Methods

Patients with mandibular fractures who applied to Gaziantep University, Faculty of Dentistry Department of Oral and Maxillofacial Surgery between 2013-2020 were included in our retrospectively designed study. Panoramic radiographs, cone-

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beam computed tomography images, and clinical records of the patients were examined as a data source. Patients with missing radiographic or clinical data, patients with concomitant maxillary and/or facial fractures, cases of pathological fractures, patients with incomplete wisdom tooth development, and cases of total edentulism were excluded from the study.

Our study was approved by Gaziantep University Clinical Research Ethics Committee (2020/434). Principles of the Declaration of Helsinki were followed, and the names and medical information of the patients were kept confidential during the study.

The topographic classification of Cornelius was used to define mandibular fractures [8]. This classification considering the topographic regions of the mandible; was prepared to include 5 regions: symphysis/parasymphysis, body, angulus/ramus, condylar process, and coronoid process [8]. The symphysis area is between the roots of the mandibular canine teeth; the body area is the bone region between the mandibular canine teeth and the mandibular angle; the angulus/ramus region is the bone between the mandibular third molar tooth and the outer mandibular edge excluding the condyle and coronoid processes; the coronoid region is the bone area in front of the mandibular notch, to which the temporal muscle adheres, and is called coronoid process; the condylar region is the bone behind the mandibular notch, limited by masseteric ridge inferiorly, and the area containing the condylar process [8].

It was evaluated as a single fracture or a combined fracture according to the number of fracture sites formed in the mandible. The areas where the combined fractures are localized were also determined.

The presence of ipsilateral mandibular wisdom teeth was determined based on the fracture site. The degrees of impaction of wisdom teeth were grouped as; impacted teeth (completely or partially covered with bone and/or soft tissue) and erupted teeth (completely erupted).

In cases where wisdom teeth were present, the Pell-Gregory classification was used to determine the depth and relationship of these teeth to the ramus, and the Winter classification to determine their position and angulation [9, 10].

The Pell-Gregory ramus classification is determined based on the distance between the mandibular second molar tooth and the anterior edge of the ramus. Classification is indicated as Class I; when the space is sufficient for the mesiodistal diameter of the wisdom tooth, Class II; when space is less than the mesiodistal diameter of the wisdom tooth and Class III; when most of the wisdom tooth is in the ramus [9].

The Pell-Gregory depth classification is based on the level of the occlusal plane of the wisdom tooth relative to the occlusal plane of the second molar tooth [10]. Classification is indicated as Class A; when the part of the wisdom tooth is above the occlusal plane, Class B; when the highest part of the wisdom tooth is between the occlusal plane and the cervical line of the adjacent second molar and Class C; when the higher part of the wisdom tooth is below the cervical line of the adjacent second molar [9].

Winter classification is determined as vertical, mesioangular, horizontal, and distoangular, based on the occlusal plane angle between impacted wisdom teeth and second molars [10].

Statistical Analysis

The age and gender data of the patients were recorded. The relationship of all data with fractures of the mandible was evaluated. The data obtained were analyzed with the SPSS 22 (IBM, NY, USA) program using chi-square and Fisher's exact tests.

Results

65 of the patients who applied to our clinic during the period covered by the study met the inclusion criteria. While 75.4% of these patients were male, it was observed that 76.6% were between the ages of 20-40 (Table 1).

Table 1. Distribution of patients by age and gender

Gender	Age					
	10-20 n (%)	20-30 n (%)	30-40 n (%)	40-50 n (%)	50-60 n (%)	60-70 n (%)
Female	1 (1.6%)	11 (17.2%)	3 (4.7%)	0 (0.0%)	1 (1.6%)	0 (0.0%)
Male	5 (7.8%)	18 (28.1%)	17 (26.6%)	3 (4.7%)	4 (6.3%)	1 (1.6%)
Total	6 (9.4%)	29 (45.3%)	20 (31.3%)	3 (4.7%)	5 (7.8%)	1 (1.6%)

Mandibular fractures are grouped as; condyle fractures (n=10, 15.4%), angulus fractures (n=19, 29.2%), body fractures (n=12, 18.5%), and symphysis fractures (n=24, 36.9%).

While 47 patients had a single fracture, 18 patients had more than one fracture. When the relationship between the localization of mandibular fractures and the presence of combined fractures was examined, it was seen that the location of the fracture was associated with the presence of combined fracture ($\chi^2 = 11.182$, $p=0.011$) (Table 2). While symphysis fractures were seen with each fracture localization, it was noticed that angulus and condyle fractures were not seen together (Table 3).

Table 2. Descriptive statistical results of combined fracture presence in different mandibular fracture locations

Mandibular fracture localization	Without combined fracture n (%)	With combined fracture n (%)
Condylar	10 (15.4%)	0 (0.0%)
Angulus	16 (24.6%)	3 (4.6%)
Body	9 (13.8%)	3 (4.6%)
Symphysis	12 (18.5%)	12 (18.5%)

Table 3. Distribution of mandibular fracture region and combined fracture regions anatomically

Mandibular fracture localization	Combined fracture localization			
	Condylar (n)	Angulus (n)	Body (n)	Symphysis (n)
Condylar	0	0	0	0
Angulus	0	0	0	3
Body	0	0	2	1
Symphysis	4	4	1	3

While 76.9% of 65 patients with a fracture of the mandible had wisdom teeth and 58% of them were found to be impacted. No significant relationship was found between the localization of the fracture and the presence of wisdom teeth and/or impacted teeth ($p > 0.05$).

No relationship was found between the occurrence of combined fractures and the presence of wisdom teeth and being impacted.

Mesioangular angulation, Class I, and Class C impaction types were the most common types of impaction observed in patients with condyle fractures. Vertical and mesioangular angulations,

Class I and Class B impaction types were the most common types of impaction observed in patients with angulus fracture. Mesioangular angulation, Class I, and Class C impaction were the most common types of impaction observed in patients with body fractures. Mesioangular angulation, Class I, Class B, and Class C impaction were the most common types of impaction observed in patients with symphysis fractures.

However, no significant relationship was found between the localization of the fracture and the spatial location of the wisdom teeth ($p < 0.05$) (Table 4).

Table 4. Classification of wisdom teeth with different fracture locations according to their positions

	Pell-Gregory Depth			Pell-Gregory Ramus				Winter		
	Class A (n)	Class B (n)	Class C (n)	Class I (n)	Class II (n)	Class III(n)	Vertical (n)	Mesioangular (n)	Distoangular (n)	Horizontal (n)
Condylar	1	0	2	2	1	0	1	2	0	0
Angulus	2	5	2	7	2	0	4	4	0	1
Body	2	0	4	5	1	0	2	3	1	0
Symphysis	3	4	4	11	0	0	4	6	0	1

Discussion

Our study aimed to investigate the relationship between wisdom teeth and mandibular fractures. Several studies have shown that the presence of wisdom teeth increases the tendency to mandibular fractures by weakening the mandible [1,3]. However our data revealed that neither erupted nor impacted wisdom teeth predisposed the mandibular fractures. Similar to our results Ugboke et al. also reported that the presence of the wisdom tooth does not necessarily predispose the mandibular fractures [11]. Mandibular angle was suggested to be an important factor, especially in angulus fractures. Also, biomechanics of the mandible, the forces exerted by the muscles, occlusion, and force properties can be effective in mandibular fractures [12,13].

Mandibular fractures are often seen in the third decade of life [14]. In our study, 44.6% of the mandibular fractures were observed to be composed of patients between the ages of 20-30. Different studies indicate that fracture incidence increases at similar ages [3,15]. It is thought that being socially active at this age might be the reason for this increase.

While 75.4% of fracture cases in our study are men, 24.6% of them are women. These rates were consistent with the publications of Lee et al. [3] and Güven et al. [16].

When the localization of mandibular fractures was examined, it was seen that 15.4% of the cases were condyle fractures, 29.2% angulus fractures, 18.5% body fractures, and 36.9% symphysis fractures. A study conducted in Australia was consistent with our results, the most common localizations of mandibular fractures were indicated as the angulus (43%) and symphysis (26%) regions [17]. However, combined fractures in a different part of the mandible were associated in 27.7% of our cases ($n = 18$). Similar to our study, the combined fracture rate in mandibular fractures was reported as 30% by Schön et al. [17] and 24.5% by Güven et al. [16].

When the relationship between the localization of mandibular fractures and the presence of combined fractures was examined, it was observed that they were related ($\chi^2 = 11.182$, $p = 0.011$). This relationship was thought to be due to the high rate of combined symphysis fractures. Schön et al. reported that combined fractures are the most common fractures of the body or parasymphysis accompanying angulus [17]. In our study, combined fractures were mostly seen in the angulus and symphysis region, followed by the condyle and symphysis region. Güven et al. stated that angulus and symphysis fractures (8.8%) took first place among combined fractures [16]. Unlike our results, in a study conducted in Venezuela, it was reported that the most common fracture combination was between the body and the parasymphysis [18].

The difference among the localization of the combined fractures is thought to be because of the direction of the force and the region it is exerted.

Considering the localization of mandibular fractures, no significant relationship was found between the localization of the fracture and the presence of wisdom teeth. It is suggested that wisdom teeth weaken the bone in the angulus region by reducing the amount of bone and cross-sectional bone area due to the osseous space they occupy in the bone [3]. Therefore, it is thought that the risk of angulus fracture increases in the presence of wisdom teeth[4]. Our data did not show that impacted or erupted wisdom teeth affect the risk of fracture in the mandible. In addition to the absence and eruption rates of wisdom teeth similar to those of impacted wisdom teeth, having a small sample size might be a plausible explanation.

In a meta-analysis study evaluating the relationship between wisdom teeth and mandibular fractures, it was shown that angulus fractures developed more frequently in Class III and Class C positions of wisdom teeth [4]. When we evaluated the spatial positions of wisdom teeth, no relationship was found between the localization of mandibular fractures and positions of the wisdom teeth.

Our study had several limitations. The sample of the study consisted of patients with mandibular fractures who applied to our clinic. Therefore data is extracted from a single-center resulting in a small sample size. Studies involving different centers can be planned to increase the number of cases. Also, mandibular fractures can develop depending on many factors. The effective rate of wisdom tooth presence and impaction state examined in our study on fracture development alone is not known. Conducting a study that examines the predisposing factors of fracture by including different parameters will be useful in improving the level of knowledge on the subject in the future.

Conclusion

In our study, it was observed that the presence of wisdom teeth and/or impacted teeth were frequently observed in fracture cases, but there was no significant relationship between wisdom teeth and fracture development in the mandible. In addition to this, the spatial positions of wisdom teeth were not found to be associated with fracture development. However, although it is not possible to make a definite judgment, taking into account the multifactorial development of fractures, a protective extraction of wisdom teeth can be planned on a case-by-case basis.

Conflict of interests

The authors declare that they have no competing interests.

Financial Disclosure

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Ethical approval

Ethical consent was received from Gaziantep University Clinical Ethics Committee(2020/434).

References

1. Sohal K, Moshy J, Owibingire S et al. Association between impacted mandibular third molar and occurrence of mandibular angle fracture: A radiological study. *J Oral Maxillofac Radiol.* 2019;7:25-9.
2. Zhou H, Lv K, Yang R et al. Mechanics in the production of mandibular fractures: A clinical, retrospective case-control study. *PLoS One.* 2016;11:e0149553.
3. Lee Y, Kim J, Lee M et al Relationship between mandible fractures and third molars. *Arch Craniofacial Surg.* 2019;20:376-81.
4. Ruela WS, de Almeida VL, Lima-Rivera LM et al. Does an Association Exist Between the Presence of Lower Third Molar and Mandibular Angle Fractures?: A Meta-Analysis. *Journal of Oral and Maxillofacial Surgery.* 2018;76:34-45.
5. Meisami T, Sojat A, Sándor GKB et al. Impacted third molars and risk of angle fracture. *Int. J. Oral Maxillofac. Surg.* 2002;31:140-4.
6. Sukegawa S, Saika M, Kanno T et al. Do the presence of mandibular third molar and the occlusal support affect the occurrence and the mode of mandibular condylar fractures? *J Hard Tissue Biol.* 2019;28:377-82.
7. Yaltirik M, Tanyel CR, Katiboğlu B. A comparative study of the clinical aspects and relationship between fractures of mandibular angle and the presence of a lower third molar. *Turkish J Med Sci.* 2002;32:391-5.
8. Cornelius CP, Audigé L, Kunz C et al. The comprehensive AOCMF classification system: Mandible fractures- level 2 tutorial. *Cranio-maxillofacial Trauma Reconstr.* 2014;7:S031-S043.
9. Pell GJ and Gregory GT. Impacted mandibular third molars: classification and modified technique for removal. *Dent Dig.* 1933;39:330-8.
10. M. Cına Aksoy, "Investigation of the effects of fatty calcium hydroxide on the prevention of postoperative complications after impacted lower third molar extraction" Suleyman Demirel University, 2008.
11. Ugboko VI, Oginni FO, Owotade FJ. An investigation into the relationships between mandibular third molars and angle fractures in Nigerians. *Br J Oral Maxillofac Surg.* 2000;38:427-9.
12. Ma'aita J and 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.
13. Mehra A, Anehosur V, Kumar N. Impacted Mandibular Third Molars and Their Influence on Mandibular Angle and Condyle Fractures. *Cranio-maxillofac Trauma Reconstr.* 2019;12:291-300.
14. Thapliyal GK, Sinha R, Menon PS et al. Management of mandibular fractures. *Med J Armed Forces India.* 2008;64:218-20.
15. Samieirad S, Eshghpour M, Dashti R et al. Correlation Between Lower Third Molar Impaction Types and Mandibular Angle and Condylar Fractures: A Retrospective Study. *J Oral Maxillofac Surg.* 2019;77:556-64.
16. Guven O, Erol B, Ozer M. A clinical study on jaw fractures in the Southeastern Anatolia. *Acta Odontol Turc.* 1985;2:65-73.
17. Schön R, Roveda SIL, Carter B. Mandibular fractures in Townsville, Australia: Incidence, aetiology and treatment using the 2.0 AO/ASIF miniplate system. *Br J Oral Maxillofac Surg.* 2001;39:145-8.
18. Amarista Rojas FJ, Bordoy Soto MA, Cachazo M et al. The epidemiology of mandibular fractures in Caracas, Venezuela: Incidence and its combination patterns. *Dent Traumatol.* 2017;33:427-432.