

Etiological changes of maxillofacial trauma admitted to the emergency department

Maxillofacial trauma in emergency medicine

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Abstract

Aim: Maxillofacial trauma (MFT) is one of the most common causes of trauma-related admissions to the emergency department (AS). The aim of this study is to determine the etiological, clinical and demographic characteristics, morbidity and mortality rates of MFT cases admitted to the emergency department.

Material and Methods: Patients aged 18 years and older who underwent maxillofacial (MF) imaging with computed tomography (CT) were included in this retrospective cross-sectional study. The aim of this study is to determine the most common injuries in MFT cases and their relationship with the trauma mechanism. In addition, surgical intervention, morbidity and mortality rates were calculated.

Results: Of the 458 cases included in the study, 72% were male. The most common trauma mechanisms are assault (41%) and fall (32%), respectively. The most frequently injured tissues and organs were soft tissues (42%) is nasal cartilage (21%). It was found that the risk of intracranial pathology increased 23.5 times in patients with frontal bone fractures compared to those without.

Discussion: MFT traumas are important both cosmetically and because surgical intervention cannot be performed everywhere. We should pay attention to the early diagnosis and treatment of frontal bone fractures, which are the most common causes of trauma depending on years and state policies. Future studies will provide clearer data on this subject.

Keywords

Maxillofacial Trauma, Emergency Department, Etiology

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Introduction

Maxillofacial trauma (MFT) is one of the most common causes of trauma-related admissions to the emergency department [1,2]. Traffic accidents, beatings, falls and contact sports are the most common causes of maxillofacial trauma [3–6], and the male population is more frequently exposed to MFT [7].

The head and neck region contains many structures necessary for life that perform complex functions such as speech, vision, swallowing and smell, and has a great aesthetic importance [8]. Emergency physicians should be careful in terms of other accompanying major traumas and complications that may occur in the management of patients with MFT. Deficiencies in the diagnosis and treatment of facial fractures can cause deformity, chewing difficulties, paresthesia, visual disturbances, and death [8–11]. The vascularization of the facial area is intense, and arterial bleeding can quickly result in massive blood loss. Segmented fractures may cause airway obstruction, orbital traumas may cause extraocular muscle squeezing, ischemia, and permanent vision loss [12]. Apart from the medical complications that may occur in acute and chronic periods, severe mental state disorders can also be observed [13,14]. Early evaluation and intervention in MFT can significantly reduce morbidity and mortality [6].

The aim of this study is to determine the etiological, clinical and demographic characteristics, morbidity and mortality rates of MFT cases admitted to the emergency department.

Material and Methods

Study design and settings

This retrospective cross-sectional study was carried out in the emergency clinic of a third-level hospital in the province of Izmir in western Turkey. After obtaining approval from the local ethics committee (Decision No: 0216 Date: 21/04/2022), patients who applied to the adult emergency service with 35-40 thousand trauma patients annually between 'June 1 - September 30, 2021' due to MFT were analyzed retrospectively.

Study population

Among the patients admitted to the emergency department due to trauma, patients aged 18 years and older who underwent maxillofacial (MF) imaging with computed tomography (CT) were included in the study. Non-traumatic cases and patients with missing data were excluded from the study. A total of 458 cases were included in the study.

Data collection and processing

Age, gender, type of trauma, injured tissues, organs and bones, need for surgical intervention, developing complications, accompanying intracranial or cervical injury, morbidity, hospitalization and patient outcomes were analyzed from the medical records of the cases. Trauma mechanisms included motor vehicle accidents, assaults, falls, gunshot injuries, and others. Injured tissues and organs included eye-eyelids, tear ducts, nasal cartilage, facial nerve and soft tissues, and bone structures, orbital, nasal, maxilla, mandible, zygoma and frontal bone. It was recorded whether airway obstruction, septal hematoma, bleeding, soft tissue infection and meningitis developed as complications.

Outcome measures

This study aims to determine the most common injuries in MFT

cases and their relationship with the trauma mechanism. In addition, surgical intervention, morbidity and mortality rates were calculated.

Data analysis

IBM SPSS Statistics 28 (SPSS Inc., Chicago, USA) program was used for data analysis. Descriptive statistics are presented with frequency, percentage, mean and standard deviation values. Whether the data conformed to the normal distribution was evaluated using the Shapiro-Wilk test, skewness- kurtosis values, and Q-Q plots. Univariate regression analysis was performed to determine the relationship between the type of bone fracture as a result of maxillofacial trauma and surgical intervention and intracranial pathology. All parameters found to be statistically significant in Univariate regression analysis were evaluated in multinomial logistic regression analysis. A p-value of <0.05 was considered significant. All statistics were done at a 95% confidence interval.

Ethical Approval

Ethics Committee approval for the study was obtained.

Results

Of the 458 cases included in the study, 72% (n=328) were male. The mean age of men (40 ± 17) was lower than women (48 ± 23), and there was a statistically significant difference between them ($p < 0.001$). The most common trauma mechanisms were assault (41%), falls (32%) and motor vehicle accidents (17%). Age and trauma mechanisms by gender are presented in Table 1. The most frequently injured tissues and organs were soft tissue (42%), nasal cartilage (21%), and eye-eyelid (13%), the most common fractures of the bones were nasal (50%), maxillary (25%), and orbital (24%). Surgical intervention was performed in 18% of the cases. In addition, 8.7% of the cases had intracranial pathology and 2.2% had cervical spine pathology. The most common complications were bleeding (19%) and septal hematoma (5.2%). Although soft tissue infection occurred in 2.2% of the cases, meningitis did not develop in any of them. Among other complications, airway obstruction was seen in 5 (1.1%) cases, and facial nerve damage was seen in 2 (0.4%) cases. Loss of function developed in 58 (13%) cases, and cosmetic damage remained in 167 (36%) cases. The hospitalization rate was 11%, the intensive care unit admission rate was 3.5%, and the mortality rate was 0.4%. Tissue, organ and bone types injured due to MFT, accompanying pathology, complications, treatment and morbidity rates are shown in Table 2.

The relationship between fractured bone type and surgical intervention and intracranial pathology was investigated. Univariate regression analysis revealed a statistically significant relationship between all bone fractures and surgical intervention. However, in the multinomial logistic regression analysis, frontal, zygoma, and maxilla fractures were found to be confounding factors. It was found that the surgical risk increased 3 times in those with mandibular fractures, 2.5 times in those with orbital fractures, and 1.9 times in those with nasal fractures. The results of the multinomial logistic regression analysis are presented in Table 3. When the relationship between intracranial pathology and bone fractures was examined, it was seen that there was a statistically significant relationship with

orbita, maxilla, zygoma and frontal bone fractures according to univariate regression analysis. No significant relationship was found with nasal and mandible fractures. Orbital, maxilla and zygoma fractures were found to be confounding factors in the multilogistic regression analysis. It was found that the risk of intracranial pathology increased 23.5 times in patients with frontal bone fractures compared to those without (Table 3).

Table 1. Distribution of demographic data and trauma mechanisms by gender.

	Female	Male	Total	P value	
Gender (n (%))	131 (%28)	328 (%72)	459 (%100)		
Age (Mean ± SS)	48 ± 23	40 ± 17	42 ± 19	<0.001*	
Mechanism of Trauma n (%)	Beating	57 (%30.5)	130 (%69.5)	187 (%100)	0.592**
	Fall	46 (%31)	102 (%69)	148 (%100)	
	Traffic Accident	16 (%21)	61 (%79)	77 (%100)	
	Firearm injury	4 (%31)	9 (%69)	13 (%100)	
	Sport	2 (%18)	9 (%82)	12 (%100)	
Others	6 (%27)	16 (%73)	22 (%100)		

SS: Standard deviation, *Obtained from independent samples T-test, **Obtained from chi-square test

Table 2. Number of injured tissues, organs and bones, complications, treatment and morbidity.

	Yes	No
Orbita	108 (%23.5)	351 (%76.5)
Nasal	228 (%49.7)	231 (%50.3)
Maxilla	113 (%24.6)	346 (%75.4)
Mandibula	38 (%8.3)	421 (%91.7)
Zygoma	73 (%15.9)	386 (%84.1)
Frontal	39 (%8.5)	420 (%91.5)
Soft tissue injury	193 (%42)	266 (%58)
Eye-Eyelids	63 (%13.7)	396 (%86.3)
Nasal cartilage	96 (%20.9)	363 (%79.1)
Septal hematoma	24 (%5.2)	435 (%94.8)
Soft tissue infection	10 (%2.2)	449 (%97.8)
Intracranial Pathology	40 (%8.7)	419 (%91.3)
Surgical intervention	84 (%18.3)	375 (%81.7)
Loss of function	58 (%12.6)	401 (%87.4)
Cosmetic damage	167 (%36.4)	292 (%63.6)

Table 3. Surgical intervention and intracranial pathology risk according to bone fractures.

Surgical intervention	p-value	Exp (B)
Orbita	0.003	2.5
Nasal	0.018	1.9
Maxilla	0.092	1.7
Mandibula	0.006	3
Zygoma	0.949	1
Frontal	0.166	1.7
Intracranial Pathology		
Orbita	0.711	1.2
Maxilla	0.334	0.6
Zygoma	0.253	1.9
Frontal	<0.001	23.6

Exp: Expected B, Obtained from multinomial logistic regression analysis

Discussion

As in the world, the most common cause of young deaths in our country is traffic accidents, assault, etc., judicial events. Since we are the only public institution in our city for emergency response related to maxillofacial trauma, patients in this category come to our hospital from all districts.

İrkören et al. [15] and studies in the literature [1,3,12] show parallelism with the gender analysis of patients who applied to the emergency department of our hospital with MFT. Applications of male patients were 2.5 times higher than those of females. In the evaluation made for the trauma mechanism for MFT, dominance is often observed in those who come with the complaint of beating. Although MFTs due to falling with the second frequency are common, the difference in the male-female ratio is preserved in all species.

Unlike the results of our study, Şimşek et al., in their study conducted in 2020, reported that the most common reason for patients presenting with MFT was falling, and the second most common cause was assault [16]. The most important reason why the data differed from our study may be that the geographical location of the province where the hospital is located is in a mountainous area. In support of this idea, the demographic data and trauma types of the nasal USG study performed by Çağlar et al. [17] in patients with maxillofacial trauma and the data of our study can be shown.

Bamjee et al. [18], Schaftenaar et al. [19], Erol et al. [20] reported in the data of their studies that the most common reason for application of patients with MFT was traffic accidents, followed by applications after assault. This situation differs from our study. Seasonally, this study also shows that the incidence of MFT cases is higher in summer remains statistically similar. The change in trauma types can be considered a result of the increase in the frequency of traffic controls in our country. This suggests that the socio-economic decline in the country is inversely proportional to the increase in battering incidents. In the evaluation made among the types of broken bones in MFT, in accordance with the literature [21], it was found that nasal bone fracture was most often observed. Secondly, maxilla fracture is frequently observed, and the third is the accompanying orbital fracture. As can be expected, bone fractures also change with the change in the frequency of trauma type. Although in previous studies, mandible fractures were most frequently detected in the 1st or 2nd row, which were most commonly seen in traffic accidents, more minor bone fractures were observed in our study.

Considering that 1 out of 5 maxillofacial trauma patients underwent surgical intervention, MFTs constitute an important workload for hospitals. The most surgically risky bone fractures are nasal, mandible and orbital bones. These results are similar to DeAngelis et al. [22]

Although frontal bone fractures are less common, they are the most risky condition for intracranial pathologies accompanying maxillofacial fractures. From an anatomical point of view, this is the expected result.

Conclusion

MFT traumas are important both cosmetically and because surgical intervention cannot be performed everywhere. We should pay attention to the early diagnosis and treatment of

frontal bone fractures, which are the most common causes of trauma depending on years and state policies. Future studies will provide clearer data on this subject.

Limitations

This study was retrospective and determined for the presence of cosmetic damage, and the data were taken from the patient file, consultation and surgery notes. No face-to-face interviews were conducted with the patients. In addition, the high number of patients were referred to our hospital from another center.

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Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

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Conflict of interest

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