

A retrospective study on the epidemiology and treatment of maxillofacial fractures

Maksillofasyal kırıkların epidemiyolojisi ve tedavisi üzerine retrospektif bir çalışma

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BACKGROUND

Maxillofacial injuries constitute a substantial proportion of cases of trauma. This descriptive analytical study assesses the cause, type, incidence, and demographic and treatment data of maxillofacial fractures.

METHODS

A retrospective study on maxillofacial traumas was carried out in the Department of Plastic and Reconstructive Surgery at Şişli Etfal Hospital (Istanbul, Turkey) between January 1, 2000 and December 31, 2005. The study included 216 patients with a mean age of 29.8 years. Sex and age distribution of patients, etiology of trauma, localization of the fractures, treatment modalities, time to treatment after the trauma, and postoperative complications were recorded.

RESULTS

The male predilection was 75.5%. Road traffic accident was the most common causative factor (67.1%), followed by interpersonal violence (19.4%), falls (12.5%), and work- and sport-related accidents (0.9%). A total of 50% of the patients suffered isolated mandibular fractures, 23.6% had isolated midface fractures, and 26.3% had combined midface and mandibular fractures. Regarding distribution of mandibular fractures, the majority (26.8%) occurred in the parasymphysis, 14.8% in the angulus, and 11.1% each in the symphysis and corpus. Complications occurred in 6% of patients, and the most common was malocclusion followed by infection and nonunion.

CONCLUSION

The causes and pattern of maxillofacial fractures reflect trauma patterns within the community and, as such, can provide a guide for the design of programs geared toward prevention and treatment.

Key Words: Maxillofacial fractures/epidemiology/etiology/incidence/treatment; mandible fractures; miniplate fixation; fracture fixation/methods.

AMAÇ

Maksillofasyal kırıklar akut travmalar içerisinde önemli bir yer tutar. Bu tanımlayıcı çalışmada, maksillofasyal kırıkların nedenleri, tipleri insidansı, demografik özellikleri ve tedavi seçenekleri değerlendirildi.

GEREÇ VE YÖNTEM

Retrospektif olarak planlanan çalışmaya Şişli Etfal Hastanesi Plastik ve Rekonstrüktif Cerrahi Kliniğinde 1 Ocak 2000 ile 31 Aralık 2005 yılları arasında, ortalama yaşı 29,8 olan maksillofasyal kırık nedeniyle farklı yöntemlerle tedavi edilen 216 hasta dahil edildi. Hastaların cinsiyeti, yaş dağılımları, travma etyolojisi, kırıkların yeri, tedavi yöntemleri, tedavi süresi ve ameliyat sonrası komplikasyonlar kaydedildi.

BULGULAR

Maksillofasyal kırık şikayeti ile başvuran hastaların en sık 20-30 yaş aralığında olduğu görüldü. Erkek oranı %75,5 olarak saptandı. Bu kırıklarda en sık görülen neden trafik kazalarıydı, bunu sırasıyla darp, düşme, iş kazası ve spor nedeniyle yaralanmaların takip ettiği gözlemlendi. Hastaların %50'sinde izole mandibula kırığı, %23,6'sında izole orta yüz kırığı ve %26,3'ünde orta yüz ve mandibula kırığının birlikte olduğu belirlendi. Mandibuler kırıklar kırık oluşum bölgelerine göre %14,8 angulus, %11,1 simfisiz ve %11,1 korpus olarak saptandı. Hastaların %6'sında komplikasyon gözlemlendi. Bu komplikasyonların sıklık sırasına göre maloklüzyon, enfeksiyon ve birleşme olduğu görüldü.

SONUÇ

Kliniğimizde tedavi olan hastaların epidemiyolojik bilgileri, tedavi yöntemleri, kırık oluşum nedenleri ve oluşan komplikasyonlar değerlendirilmiş, bulguların ülkemizin sosyoekonomik ve kültürel yapısıyla ilişkili olduğu düşünülmüştür.

Anahtar Sözcükler: Maksillofasyal kırıklar/epidemioloji/etyoloji/tedavi; mandibular kırıklar; mini plak ile fiksasyon; kırık fiksasyonu/yöntem.

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Many studies have reported about the anatomic localization, causes, age and gender distributions, treatments, treatment results, and incidences of maxillofacial fractures.^[1-18] The main cause of maxillofacial fractures as reported in the earlier studies was traffic accidents.^[19-26] Other causes are assaults, falls, sports-related injuries, and civilian warfare.^[26] More recent studies have shown assault as the most common cause of maxillofacial fractures in many developed countries, whereas traffic accidents remain the most frequent causes in many developing areas.^[27,28] The causes, types, and sites of these fractures seem to change according to geographic location.^[1]

Regimens for the treatment of maxillofacial fractures include fixation with miniplates, wire fixation, intermaxillary fixation, and conservative treatment with extraoral Barton bandage. Additionally, graft and Proplast applications for reconstruction of bone defects and elevation by Gillies method in the case of zygoma fracture are the most common regimens of treatment used in the world and also in our clinic. Nevertheless, the treatment protocol of the patient with maxillofacial fracture may change according to the type and location of the fracture as well as the surgeon's experience and preference.

Because of social, cultural, and environmental factors, both the incidence and etiology of maxillofacial fractures vary country to country.^[29] Turkey is geographically and culturally between Europe and the Middle East. However, there have been few detailed reports about the causes and incidence of maxillofacial fractures in Turkey. This article presents the age, sex, etiology, type, and site of fracture for 216 patients treated for maxillofacial fractures from January 2000 to December 2005 in a public hospital in Istanbul.

MATERIALS AND METHODS

We retrospectively investigated 216 patients with maxillofacial fractures who were treated in our clinic between January 2000 and December 2005. Various parameters including age, sex, etiology, and type and site of fracture were evaluated. The localization of fractures was classified into three main groups as mandibula, zygoma and combined fractures.

RESULTS

This retrospective study included 216 patients (53 male and 163 female) aged 2 to 88 (mean age: 29.8) years with facial bone fractures treated at Şişli

Etfal Hospital in Istanbul, Turkey from January 2000 to December 2005.

In addition to the epidemiologic separation and causes of maxillofacial fractures in Tables 1-3, the treatment protocols for each patient and the number of the patients treated with each protocol are shown in Table 4. Long-term follow-up treatment regimens and the complications were investigated and are presented in Table 5.

Fractures appeared to be most frequent in the 20-30-year-old group. The distribution of the patients according to age is presented in Table 6.

Table 1. Anatomical locations of mandible fractures

Anatomical location	No of patients	%
Symphysis	12	11.1
Parasymphysis	29	26.8
Angulus	16	14.8
Corpus	12	11.1
Parasymphysis and angulus	14	12.9
Parasymphysis and symphysis	6	5
Condyle and sub condyle	3	2.7
Parasymphysis and condyle	2	1.8
Parasymphysis and corpus	4	3.7
Angulus and corpus	6	5
Condyle and coronoid	1	0.9
Ramus and symphysis	1	0.9
Angulus and symphysis	2	1.8
Symphysis, parasymphysis and condyle	1	0.9
Total	108	100

Table 2. Anatomical location of midface fracture

Anatomical location	No of patients	%
Maxilla	2	3.9
Zygoma	17	33.3
Tripod	17	33.3
Nasal	7	13.7
Frontal	2	3.9
Alveolar	6	11.7
Total	51	100

Table 3. Causes of fractures

Etiology	No of patients	%
Traffic accidents	145	67.1
Assaults	42	19.4
Falls	27	12.5
Work and sports accidents	2	0.9
Total	216	100

Table 4. Treatment protocols

Treatment	No of patients	%
Intermaxillary fixation	22	10.1
Fixation with plates	166	76.8
Fixation with wire	9	4.1
Medpor	1	0.4
Iliac crest graft	3	1.3
Elevation and reduction	15	6.9
Total	216	100

Table 5. Complications

Complications	No of patients	%
Nonunion	3	1.3
Plate infections	3	1.3
Malocclusion	7	3.2
Total	13	6.0

Table 6. Age groups

Age group	No of patients	%
0-10	19	8.7
11-20	42	19.4
21-30	69	31.9
31-40	37	17.1
41-50	28	12.9
51-60	11	5.0
61-70	7	3.2
71-80	2	0.9
81-90	0	
91-100	1	0.4
Total	216	100

The most common cause of injury was traffic accidents (67.1%), followed by interpersonal violence (19.4%) and falls (12.5%). The least common cause was working accidents (industrial accidents).

The distribution of fractures according to the anatomical localization is shown in Table 1. One hundred and eight patients had isolated mandibular fractures and 57 had a combination of mandibular and midface fractures. The most common fracture location was the parasymphysis region in 26.8% of the patients and the angulus in 14.8% of the patients. There were 79 fractures that combined two locations, the most common of which was combination of parasymphysis and angulus region fractures in 12.9% of the patients, followed by combined corpus and angulus fractures.

There were 51 patients with midface fractures

and the most common locations were zygoma (66.6%), followed by nasal injuries (13.7%). There were 57 fractures that combined two and more facial bones. The most common combination was zygoma and orbital rim in 37 patients.

We performed many treatment protocols, as in the previous studies, according to the type and location of each fracture and our experience preference. The most common treatment was rigid fixation by plates. Other regimens included intermaxillary fixation, wire fixation, use of bone grafts or alloplastic materials for reconstruction of bone defects, and elevation with Gillies method in the case of zygomatic arch fractures.

There were some complications in the early and late follow-up periods. The most common was malocclusion (3.2%), followed by infection (1.3%).

DISCUSSION

In general, our results were concordant with previous studies from the region with a similar socio-ethnic and economic background.^[9,30,31] The male predominance (75.5%) is still overwhelming, although it was 3:1. This sex ratio was higher than previous reports from Jordan,^[1,5] Nigeria,^[3,11] Zimbabwe,^[3,2] Thailand,^[3,31] Sweden,^[7] Austria,^[3,41] Greece,^[3,5] Japan,^[3,6,37] and Canada.^[3,8,39] The greatest number of patients was found in the 20-30-year-old group (n=69, 31.9%). This was similar to percentages reported in previous studies.

The most common etiological factor for maxillofacial injuries in our study was traffic accidents (67.1%). A higher incidence of traffic accidents had been reported from Saudi Arabia,^[3,11] Japan,^[3,6] Austria,^[3,41] Greece,^[3,5] and Thailand,^[3,31] and from various countries.^[19-25] More recent studies have shown assault as the most common cause of maxillofacial fractures in many developed countries, whereas traffic accidents remain the most frequent cause in many developing areas.^[28,29] We found interpersonal violence was the second most frequent causative factor (19.4%) for maxillofacial injuries. This incidence was higher than in the United Arab Emirates (4.1%)^[3,7] and Nigeria (13%),^[4,0] but similar with the results from Brazil (22.5%)^[1,2] and Jordan (16%).^[1,5] In a study from Zimbabwe, 90% of the trauma patients were men and 90% of fractures resulted from assaults, predominantly in the 21 to 25 age group. The explanation given was that most Zimbabweans did not have motor vehicles.^[4,1] This

reflects the socioeconomic conditions affecting the causes of maxillofacial fractures. Our study showed traffic accidents as having the highest incidence and assaults the second highest, like in other Middle Eastern countries and developing countries like Brazil.^[12]

It is known that the most common mandibular fracture location was the condyle (36%) followed by the corpus.^[12,16,18,42] There are previous studies showing the corpus region as the most common location.^[1,2,5] Our findings are not similar to other studies in this regard, demonstrating the parasymphysis as the most common region.

There were 108 patients with midface fractures and the most common location was zygoma, at a rate of 66.6%. There were 57 patients with more than one facial bone fracture. The most common combination was orbital rim and zygoma fractures (47%). Most reports, like those from Abiose (1986) and Güven (1988), showed that the most common midface fracture was maxillary Le Fort I type fracture.^[1,2,18] However, there were also reports from Brazil, Iran, and Pakistan, which defined zygomatic fractures as the most common fractures of the midface.^[12,16,18]

There are many treatment regimens in maxillofacial fractures, but the selection may change according to the type and location of the fracture, patient characteristics, and the surgeon's experience and preference. Each patient and fracture has particular properties; therefore, standardization is not possible. Nevertheless, the common applications are internal fixation using mini-plates or wire inter-maxillary fixation using arch bars, extraoral bandage (Barton's bandage), elevation and reduction procedures for zygoma fractures,^[43] or a combination of these methods. We preferred rigid fixation using plates in most cases. The other regimens we used were intermaxillary fixation, fixation with wires, and -if there was any defect- bone graft or alloplastic materials for reconstruction, Gilles elevation and reduction for zygoma fractures, or a combination of these protocols.

The most frequent complications seen in the treatment of maxillofacial fractures are malocclusion, infection, and nonunion.^[42] In our study, the most common complication was malocclusion, in 53.8% of the patients, followed by infection and nonunion, with the same incidence (23.3%). Ten patients with malocclusion and nonunion underwent revision operations. Three patients with infection

were treated with local wound care and local antimicrobial application.

In conclusion, maxillofacial fractures are observed with different etiological factors and anatomic locations according to geographic location. Age and sex variations may also occur based on geographic locations. The treatment and principles are not the same in each case. Each patient and fracture has particular properties, and the surgeon should evaluate the patients and fractures individually.

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