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Maxillofacial fractures in a Swedish population – incidence and etiology

VERSION 3

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Abstract

Background. The incidence and etiology of maxillofacial fractures varies among populations. The purpose of this study was to review and analyse the incidence and etiology of maxillofacial fractures in the county of Örebro, Sweden.

Methods. 158 patients who were attended to at Department of Otolaryngology at the Örebro University Hospital, Örebro, Sweden during 2012 were included in a retrospective study.

Results. A total of 214 fractures from 158 patients were analysed. Males (113) and patients in the age group 20-39 (66) years were the most frequently affected (mean age (standard deviation, SD) 38.2 (22.5)). The male:female ratio was 2.4:1 and the incidence was 80.3 per 100 000 inhabitants and year for males and 31.6 per 100 000 inhabitants and year for females in Örebro county. Fall was the most common cause of trauma (36.1%) followed by assault (28.5%) and sports (21.5%). The majority of the patients presented with fractures of the nasal bone (56.5%) followed by orbital fractures (13.1%).

Conclusion. In Örebro county, the largest group of maxillofacial fractures consists of falls which mostly afflicts the elder population. The second largest group is assault, often in combination with alcohol, which mostly afflicts people in the age group 20-39 years.

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Background

Maxillofacial fractures most commonly affect males [1-6] with a peak incidence during 20-30 years of age [2-4]. The cause of maxillofacial fractures varies among populations. Road traffic accidents remain the most frequent cause of maxillofacial fractures in developing countries such as India [4] and Brazil [7]. Road traffic accidents have also been reported as the most frequent cause of maxillofacial fractures in industrialized countries like Greece [1,5], Italy [6] and Japan [8].

In other countries and regions such as Australia [2], Southern Bulgaria [9], Turkey [10] and New Zealand [11] assault is the most common cause of maxillofacial fractures.

Maxillofacial fractures can be divided into fractures with and without occlusal derangement. Maxillofacial fractures which disturb the occlusal relationship are dento-alveolar fractures in the maxilla and mandible, midface fractures – Le Fort I, II, III and mandible fractures [12].

Fractures without occlusal derangement are fractures to the zygomatic complex, nasal bones fractures, naso-ethmoidal-orbital fractures, orbital fractures and frontal bone fractures [13].

The fracture site distribution varies among studies, Lee et al. found that mandible fractures are the most common maxillofacial fractures on a global basis [11] while others have reported fractures to the zygomatic complex [14] and orbita [2,15] as the most common.

In Japan [3] and India [4,16] the majority of maxillofacial fractures are treated using open reduction. This is in contrast with Iran where the majority of maxillofacial fractures are treated using closed reduction [17]. Complications seen after maxillofacial fractures are postoperative infections [11,14,18], suboptimal reposition [11,14] and paraesthesia [14]. The purpose of this study was to review and analyse the incidence and etiology of maxillofacial fractures in the county of Örebro, Sweden.

Methods

This was a one-year retrospective review of all patients with maxillofacial fractures who were attended to at the Department of Otolaryngology at the Örebro University Hospital, Örebro, Sweden during 2012. Data from 169 patients was reviewed. Of these 169 patients 7 patients were excluded because they had sustained a trauma before 2012, 2 patients were excluded because the cause of trauma was uncertain and 2 patients were excluded because no fractures were found during examination.

The following data was obtained for each patient: age, gender, cause, airbag deployment, alcohol consumption, fractures, treatment and complications.

The patients were divided into four age groups; 0-19 years, 20-39 years, 40-59 years and 60+ years.

The causes of trauma were grouped into six categories; road traffic accidents, assault, falls, sports, occupational and others. The cause of trauma was based on the information left by the patients at the time they arrived at the hospital or by studying the ambulance report in the cases when such a report existed. In the case of road traffic accidents, information about airbag deployment was also registered. Bicycle accidents were registered as road traffic accidents. 2 horsing accidents were registered as falls together with 1 skiing accident and 1 accident involving a skateboard.

If the patient was under influence of alcohol during the time of the trauma or, in the case of assault, if the offender was under influence of alcohol this was also registered.

Fractures were classified as mandible fractures, maxillary fractures, zygomatic fractures, orbital fractures, nasal bone fractures and others. Patients with isolated dentoalveolar fractures were not included in this study because at the Örebro University Hospital these patients are treated by dentists.

Treatments were divided into open, closed and open/closed reductions.

Complications observed within three months from the date of injury were also registered.

Pearson's Chi-Squared test was used to test for independence. A p-value less than 0.05 was considered significant. Statistics from Statistics Sweden was used to calculate the incidence [19].

None of the 169 patients in this study have been asked if they wanted to participate in the study but as the results are presented on a group basis no ethical conflicts were considered.

The head of the Department of Otolaryngology-Head and Neck Surgery at the Örebro University Hospital approved of the study including the analysis of medical records.

Results

Table 1 Demographics

Gender	
Male	113
Female	45
Age	
Min age	4 years
Max age	96 years
Mean age	38.2 years

113 males and 45 females suffered maxillofacial fractures and were attended to at the Department of Otolaryngology at the Örebro University Hospital, Örebro, Sweden during 2012. This calculates to an incidence of 80.3 per 100 000 inhabitants and year for males and 31.6 per 100 000 inhabitants and year for females in Örebro county.

The age of the patients ranged between 4 and 96 years with a mean (standard deviation, SD) age of 38.2 (22.5) as seen in Table 1. Patients aged 20-39 years were the most frequently affected. Males were affected more than females with a ratio of 2.4:1 (113 males and 45 females).

Table 2 Distribution of maxillofacial fractures according to gender and age.

Gender	Age				Total
	0-19	20-39	40-59	60+	
Male	16	54	24	19	113
Female	9	12	8	16	45
Total	25	66	32	35	158

Chi-squared test ($p < 0.05$).

Table 3 Distribution of maxillofacial fractures according to etiology and age.

Etiology	Age				Total
	0-19	20-39	40-59	60+	
Assault	5	26	14	0	45
Fall	6	7	13	31	57
Other	14	33	5	4	56
Total	25	66	32	35	158

Chi-squared test ($p < 0.05$).

Table 2 shows a statistically significant association between age and gender. 47.8% of all males were in the age group 20-39 years compared to 26.6% of all females. 35.6% of all females were in the age group 60+ years compared to 16.8% of all males.

The most frequent cause of injury was fall (36.1%) followed by assault (28.5%). A statistically significant association between age and cause of trauma was found (Table 3). Of all patients subjected to violence 57.8% were aged 20-39 years compared to 0% aged 60+ years. Of all patients who suffered a fall-related trauma 54.3% were aged 60+ years compared to 12.3% aged 20-39 years.

A statistically significant association between gender and cause of trauma was also found (Table 4). 86.7% of all patients subjected to violence were males compared to fall-related

trauma where 59.6% were males. Assault was the most frequent cause of trauma for males (34.5%) and fall was the most frequent cause of trauma for females (51.1%).

10 road traffic accidents were found; 1 motor vehicle accident and 9 bicycle accidents. No report of airbag deployment was found.

A statistically significant association between alcohol and cause of trauma was found (Table 5). 31 patients suffered an alcohol-related trauma. In this group 53.3% were subjected to violence compared to 22.8% in the non-alcohol group.

Table 4 Distribution of maxillofacial fractures according to etiology and gender.

Gender	Etiology				Total
	Assault	Fall	Sports	Other	
Male	39	34	27	13	113
Female	6	23	7	9	45
Total	45	57	34	22	158

Chi-squared test ($p < 0.05$).

Table 5 Distribution of maxillofacial fractures according to etiology and alcohol-consumption.

Alcohol	Etiology			Total
	Assault	Fall	Other	
Yes	16	13	2	31
No	29	44	54	127
Total	45	56	56	158

Chi-squared test ($p > 0.05$).

214 fractures were registered. The largest group of fractures was nasal bone fractures (56.5%) with 121 patients. 5 mandible fractures were found. No statistically significant association between site of fracture and cause of trauma or between site of fracture and gender was found.

78 patients received treatments for maxillofacial fractures at the Department of Otolaryngology during 2012. The most common treatment was closed reduction of nasal bone fracture with 67 patients receiving 69 closed reductions. No statistically significant association between treatment (open, closed, open/closed) and cause of trauma was found.

20 patients suffered from 29 complications within 3 months from the date of trauma. Among these complications deviation (25%) was the most frequent followed by infection (10%) and nasal obstruction (10%).

Discussion

In this study the male:female ratio was 2.4:1 for the whole population 4-96 years while in the age group 60+ years it was 1.2:1. In the age group 20-39 years females represented 18.1% while in the age group 60+ years females represented 45.7%. During the years 2008-2012 women in Örebro county at the age of 65 had a life expectancy of 20.79 years compared to 17.87 years for men [20]. The difference in life expectancy could possibly explain the lower male:female ratio in the age group 60+ years.

Fall was the most common cause (36.1%) of all maxillofacial trauma registered in Örebro county during 2012. A similar result was found in a 10 year review of maxillofacial injuries made by Gassner et al. in Austria [15]. In Gassners review activities of daily life was the largest group with 38%.

In the age group 60+ years fall represented 88.6% of all maxillofacial trauma. This result is in agreement with a British study of 757 patients in the age group 60+ years in which 83% of the patients suffered a maxillofacial trauma from a fall [21], and a German study of 67 patients in the age group 60+ years made by Iida et al. where 70% of the patients suffered maxillofacial fractures from a fall [22].

Werning et al. suggested that there is a relationship between maxillofacial fractures and osteoporosis. In their study of 59 patients in the age group 60+ years who suffered from maxillofacial fractures they found an association between the number of maxillofacial fractures and the severity of osteoporosis and they concluded that “elderly patients with osteoporosis are more likely to develop maxillofacial fractures following low-impact trauma” [23]. Osteoporosis is a common condition in Sweden. One third of the females in the age group 70-79 years are diagnosed with osteoporosis upon measurements of bone mineral density [24]. If the mean age of the population continues to rise [25] it could possibly affect the incidence of maxillofacial fractures as a result of falls.

Assault was the second most common cause of trauma in this study. For males 34.5% of all maxillofacial trauma was due to assault and the male:female ratio was 6.5:1 during 2012.

In a study of 65 patients with assault-related maxillofacial fractures in Switzerland, Eggenesperger et al. found preceding alcohol and drug abuse in 23% of the patients [26]. In this study 35.5% of the patients subjected to violence were under the influence of alcohol or offended by a person who was under the influence of alcohol.

In the group of patients suffering an alcohol-related trauma 53.3% were subjected to assault. This result corroborates an earlier Dutch study by van den Bergh et al. from 2010 where they found that assault was the most frequent cause of trauma among patients with prior alcohol consumption [27].

Female victims of assault-related violence are more likely injured to the head than women presenting for treatment of unintentional injuries [28-30]. Furthermore, Perciaccante et al. suggest that young females with head, neck and facial injuries are more likely victims of intimate partner violence than older females with head, neck and facial injuries [28]. In a retrospective study of maxillofacial fractures in Northern Greece Kyrgidis et al. found that assault was the cause of maxillofacial fractures for 14.8% of the females treated [5]. This result is congruent with a Japanese study by Sasaki et al., who found that 12.2% of the females suffered assault-related maxillofacial fractures [3]. The corresponding result in this study was 13.3%. It is possible that the numbers found are a result of intimate partner violence.

Road traffic accidents were the cause of trauma for 10 (6.3%) of the 158 patients reviewed. A decline in maxillofacial fractures as caused by road traffic accidents is seen in Australia [2] and the Netherlands [27,31]. A possible explanation for this decline is the combination of seat belt use together with airbag equipped cars. Hitosugi et al. found that the combination of seat belt use and airbag deployment reduced the incidence of maxillofacial injuries in frontal motor vehicle accidents in Japan [32]. Simoni et al. have come to the same conclusion in a study of motor vehicle accidents in Alabama, USA [33]. The incidence of maxillofacial fractures caused by road traffic accidents was lower in this study than in other countries such as Brazil [7], India [4] and Greece [1]. A high compliance with traffic regulations in combination with airbag equipped cars in the Örebro population could possibly explain the low number of road traffic accidents found in this study.

The incidence of mandible fractures was much lower in this study than in several other studies [3,6,9,18,34]. Only 5 mandible fractures were found. This difference may indicate that isolated mandibular fractures are mainly managed by other departments at the Örebro University Hospital.

Weaknesses of this study are the small selection of patients and the short period of time studied. Also, the maxillofacial radiographs were not re-evaluated by a radiologist in this study.

Having radiologists examine the maxillofacial radiographs and counting the number of fractures could possibly strengthen the result. A prospective study where details around the

trauma are documented could possibly find an association between cause of trauma and site of fracture.

A deeper understanding of maxillofacial fractures and the behavior pattern of the people afflicted with maxillofacial fractures can be helpful when deciding which preventive measures should be taken in order to reduce the incidence of this type of injuries. Cabalag et al. reported the cost of maxillofacial injuries to 28% of the total cost of treating trauma patients in Australia [2]. Prevention of maxillofacial fractures in a population can possibly reduce this cost.

In Örebro county, the largest group of maxillofacial fractures consists of falls which mostly afflicts the elder population. Reducing the risk of falling can possibly reduce the number of maxillofacial fractures in this group. The second largest group is assault, often in combination with alcohol, which mostly afflicts people in the age group 20-39 years.

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