Have the causes of maxillofacial fractures changed over the last 16 years in Finland? An epidemiological study of 725 fractures

Kontio R, Suuronen R, Ponkkonen H, Lindqvist C, Laine P. Have the causes of maxillofacial fractures changed over the last 16 years in Finland? An epidemiological study of 725 fractures. Dent Traumatol 2005; 21: 14–19. © Blackwell Munksgaard, 2005.

Abstract - A retrospective study was undertaken to assess causes of maxillofacial fractures in Helsinki in 1981 and 1997. Hospital records of 725 patients were analyzed according to several factors including age, sex, cause of fracture and time of the injury. The time intervals between the accident and hospital examination were also evaluated. Number of maxillofacial fractures was 318 in 1981 and 407 in 1997 (27.9% increase) and most patients were men. The male to female ratio was 2.8:1 in 1981, 3:1 in 1997. In 1981, most affected patients were in the age group of 31-40 years (33.2%) of men, 28.9% of women). Sixteen years later the most affected age group was 41-50 years (23.3% of men, 30.4% of women). Assault was the cause of the injury in 42% of patients followed by traffic accidents (26%) and fall (17%). During the study period violence had become more severe in nature. Kicking as the cause of maxillofacial fracture increased by 7.3% and use of a weapon by 5.7% between the years studied. Bicycle accidents increased by 19.3% but motor vehicle accidents decreased by 31.6% between the years. Falls, and bicycle and pedestrian accidents were the causes that accounted for most of the increase in maxillofacial fracture. In 1997, maxillofacial fractures were slightly more common from June to August and from Friday to Sunday than at other times (45.2 and 50%, respectively).

Numerous reports relating to causes of fracture of the facial bones have been published. Only a few have concerned maxillofacial fracture in Finland in recent years (1-4). National statistics regarding fractures of facial bones reflect standards of living and culture and after laws concerning the wearing of safety belts have been introduced numbers of traffic accidents have decreased in many countries (3, 5-8). Assault, road traffic accidents and falls have been reported to be the most common causes of maxillofacial fracture (6, 9, 10). However, as leisure time has increased it has also become more important in the etiology of maxillofacial fractures.

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Unemployment and economic recession may have resulted in increased alcohol abuse and related risk of injury, as high alcohol consumption has been shown to increase risk of assaults and road traffic accidents (11). Lamberg concluded that most maxillofacial fractures in the 1970s were sustained during weekends, because of Finnish drinking habits (1, 2).

The aim of the study was to examine the causes of maxillofacial fractures as well as age and sex distributions of the patients in 1981 and 1997. Another aim was to study the occurrence of the injuries in regards to weekdays and holidays.

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Material and methods

The Maxillofacial Unit in Helsinki University Central Hospital provides services to the 1.3 million or so inhabitants of Helsinki and neighboring administrative areas. Patients covered by the study had sustained a maxillofacial fracture in 1981 or 1997. Names were collected from databases relating to outpatient clinics, operating theatres and wards in the Helsinki University Central Hospital Department of Oral and Maxillofacial Surgery and in the Töölö Hospital Trauma Centre. Data were obtained retrospectively from the case history of each patient. Patients who had suffered only nasal, tooth or alveolar fractures were excluded.

Patients' age and sex, and cause of injury were recorded. The day and month of the accident, and the time that had elapsed between the occurrence of injury and examination were noted. All data were entered into a Paradox database. Data were analyzed using a customized statistical program.

Results

A total of 725 patients were examined clinically and radiographically during 1981 and 1997. In 1981, 5% of the case data was incomplete and therefore it was not used.

In 1981, 318 (235 males) and in 1997 407 (305 males) patients were examined. The corresponding male to female ratios were 2.8:1 and 3.0:1. In 1981, the average ages of the men and women concerned were 32.9 and 35.3 years, respectively. For 1997,

the corresponding statistics were 36.7 and 42.4 years (Fig. 1a,b).

Assault was the commonest cause of maxillofacial fracture in both men and women in both years, accounting for 42% of cases in both instances (Fig. 2a,b). In 1981, the most common form of assault was a blow from a fist (60.0% of the 131 patients) followed by kicking (28.2%). In 1997, 54.4% of the 169 patients had been hit with a fist and 37.5% were kicked (Fig. 3a,b). The male to female ratio in patients who had been assaulted was 3.4:1 in 1981 and 5.5:1 in 1997. The male to female ratio was higher in those who had suffered assault than in the other groups.

A road traffic accident resulted in maxillofacial fracture in 84 patients (26.4%) in 1981 and in 107 patients (26.3%) in 1997. Of these, 51.2% in 1981 and 19.6% in 1997 were the driver or a passenger in a car. The corresponding percentages for bicycle accidents were 31 and 46.7%, and for pedestrian accidents were 9.5 and 20.6% (Fig. 4a,b). The gender difference was widest among car drivers and motorcyclists and lowest among cyclists (Fig. 4). In 1981, the male to female ratio was 2.0:1 and in 1997 2.3:1 (Fig. 5).

Of the other etiological factors related to maxillofacial trauma, falling was most commonly seen (12.3% of cases in 1981) and (13.9% of cases in 1997). The male to female ratio in relation to falls as a cause of maxillofacial injury was 1:1 in both 1981 and 1997 (Fig. 6a,b).

An accident related to sport accounted for only 6.6% of maxillofacial injuries in 1981 and 4.2% in 1997 (Fig. 2a,b).



Fig. 1. Age distribution in maxillofacial fractures in (a) men and (b) women.

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Fig. 2. Etiology of maxillofacial fractures in (a) in 1981 and (b) in 1997.

In this study, 21 patients were treated in 1981 for maxillofacial injury resulting from 10 different kinds of sport. In 1997, 17 patients were treated for maxillofacial injury resulting from seven kinds of sport. The sport that had most often resulted in maxillofacial fracture in the patient data, we reviewed was ice hockey followed by soccer.

Over half of all maxillofacial fractures (55.7 and 57.7% of male patients in 1981 and 1997, respectively) were sustained during the weekend (Friday, Saturday or Sunday). The corresponding percentages for women were 53.0 and 55.9. Mondays and Tuesdays were the days on which fewest maxillofacial injuries were sustained, in both 1981 and 1997 (Fig. 7).

In 1981, occurrence of maxillofacial fracture was fairly similar from month-to-month. In 1997, over 45% of the maxillofacial fractures (44.6% in the case of men, 47.1% in the case of women) were sustained in summer (between May and August). Incidences of maxillofacial fractures during the other months did not vary greatly.

Discussion

The number of maxillofacial fractures increased 27.9% over a 16-year period (1997 and 1981; 407 vs. 318). In the 1970s, in the same geographical area as the present study, the number of maxillofacial fractures was found to have increased by about 50% over an 8-year period in the same geographical area (1, 2). On the contrary, in the United Kingdom, only a 20% increase in the number of patients sustaining maxillofacial fracture was found between 1977 and 1987 (12). The results of the study reported here suggest that the incidence of maxillofacial fracture resulting from motor vehicle accidents or assault is unlikely to increase.

The overall causes of maxillofacial trauma were found to have changed very little over 16 years in Finland. Young men were three times more prone to maxillofacial injury than women; however, the male to female ratio depended on whether the injury was assault-, traffic- or fall-related and varied among these categories from 5.5:1 (assault) to 1:1 (falls).

The male to female ratio also varied between age groups. For those in the third and fourth decades of life the male to female ratio ranged from 2.5 to 4.5:1. For elderly people (aged 60 or over), it was



Fig. 3. Incidence of maxillofacial fractures according to interpersonal violence in (a) men and (b) women.



Fig. 4. Incidence of maxillofacial fractures according to traffic accidents in (a) men and (b) women.



Fig. 5. Gender distribution of maxillofacial fractures caused by traffic.

almost 1:1. The average ratio, approximately 3.0:1, is similar to male to female ratios reported in other studies (3, 7, 11).

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In this study, the mean age of patients increased by approximately 4 years between 1981 and 1997. The high-risk age groups were 31-40 years in 1981 and 41-50 years in 1997. In the United Kingdom, Hutchinson et al. found the mean age of patients with maxillofacial fracture to be only 25 years (largest group was from 15 to 25 years of age) (11). In a study of hospitalized maxillofacial trauma patients in the 1970s, the mean age was 32 years, and 33% of patients were 21-30 years of age (1, 2). In a study relating to the 1980s and the Oulu region of northern Finland the mean age was similar, 31.3 years (range 4-78 years). An explanation of our findings may be the general aging of the population. It also might be that maxillofacial injuries in elderly people are now becoming more frequently diagnosed.

Studies relating to causes of maxillofacial fractures in several other countries have been published. Cultural and economical differences appear to have affected to etiological factors of maxillofacial fractures (3, 5, 6, 8, 11, 12). Violence between individuals has been found to be the main cause of maxillofacial fracture in Africa, Scotland and Finland's neighbors Sweden and Norway (6, 7, 9, 10). In Japan and France the most common causes of maxillofacial fracture have been traffic accidents and falls (8, 10).

In the study reported here maxillofacial fractures mostly resulted from violence between young men. The incidence of maxillofacial fracture caused by falls, particularly in women, in 1997 was twice that in 1981. Some violence, especially domestic, may have been incorrectly reported as a fall. If so, numbers of cases of maxillofacial fracture resulting from assault would be higher in women.



Fig. 6. Other etiological factors of maxillofacial fractures in (a) men and (b) women.



Fig. 7. Maxillofacial fracture incidence according to weekdays.

Violence between individuals increased in severity from 1981 to 1997. Kicking and use of weapons became more common in relation to maxillofacial injuries sustained by both sexes between 1981 and 1997. However, fists remained the most common 'weapon' in fights. Lamberg et al. found that only 3–10% of assaults had involved kicking (13). In our study, we found that almost 30% of assaults leading to maxillofacial fracture in 1981 and almost 40% in 1997 had involved kicking.

While the percentage of maxillofacial fractures resulting from bicycle accidents was twice as great in 1997 as in 1981, and that of pedestrian accidents was three times as high, the percentage of maxillofacial fractures caused by car accidents fell from 50– 20. Bicycle accidents in 1997 accounted for over 50% of the road traffic accidents that resulted in maxillofacial fracture. The reduction in percentage of road traffic accidents resulting in maxillofacial injury to car occupants most likely due to reductions in speed limits, increased road safety awareness, improvements in vehicle safety features, e.g. seat belts and airbags, and improvements in road conditions.

Cycling has become a popular way of getting around cities. The middle-aged are unaccustomed to wearing a helmet when cycling. This may partly explain the higher incidence of maxillofacial fracture found in this study in 1997 than in 1981. Because the incidence of bicycle and pedestrian accidents between 1981 and 1997 was increasing, the percentage of road-traffic accidents resulting in maxillofacial injury remained at 25. The percentage is similar reported in other western European countries (5, 10, 11).

Sport injuries accounted for maxillofacial fractures in only 21 patients (6.6%) in 1981 and 17 patients (4.2%) in 1997. Other colleagues have found 5-6% of maxillofacial fractures to have been related to sport (5, 7, 14). Our results were similar to results relating to the 1970s and 1980s in Finland, when Lamberg (1, 2) and Sane et al. (15)reported ice hockey and soccer to be the sports in which maxillofacial fracture occurred most often. As sports reflect national cultures, the incidences of sport-related maxillofacial fractures differ greatly between countries. Ice hockey, rugby, skiing and cycling have been found to be most hazardous sports (16-18). Boxing is not very dangerous as far as maxillofacial injury is concerned. Use of helmets, mouth and face guards and other protective equipment in sports should decrease numbers of maxillofacial fractures.

Most fractures in this study in 1997 had occurred in June, July and August. In 1981, July and August were particularly bad months for maxillofacial injury. Findings relating to Finland in the 1970s were similar (1, 2). Our findings relating to 1997 are similar to those of Fridrich et al. (19) and Oikarinen et al. (3).

The results of this study indicate that interpersonal violence was the most common cause of maxillofacial fracture in both years. Men sustained over 70% of the maxillofacial injuries recorded. Over 80% of those who suffered maxillofacial injury as a result of violence between individuals were male. The number of those sustaining maxillofacial injury might not have increased from 1981 to 1997 had there not been an increase in road traffic accidents involving cyclists and pedestrians, and in falls. The results of the study reported here suggest that the incidence of maxillofacial fracture resulting from motor vehicle accidents or assault is unlikely to increase.

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