

The Epidemiology of Mandibular Fractures Treated at the Toronto General Hospital: A Review of 246 Cases

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A b s t r a c t

Background: Mandibular fractures constitute a substantial proportion of cases of maxillofacial trauma. This study investigated the incidence, causes and treatment of mandibular fractures at a hospital in Toronto.

Methods: The medical records and radiographs for 246 patients treated for mandibular fracture at the Toronto General Hospital over a 5½-year period (from 1995 to 2000) were reviewed. Data on the patients' age, sex, smoking status, alcohol and drug use, mechanism of injury, treatment modality, and post-operative complications were recorded and assessed.

Results: Men 21 to 30 years of age sustained the most mandibular fractures. The ratio of males to females was 5:1. Most fractures were caused by violent assault (53.5%), followed by falls (21.5%) and sports activities (12.2%). Alcohol was a contributing factor at the time of injury in 20.6% of fractures for which this information was available. Nearly half of all cases were treated by open reduction (49.1%). Complications occurred in 5.3% of patients.

Conclusion: The incidence and causes of mandibular fracture reflect trauma patterns within the community and, as such, can provide a guide to the design of programs geared toward prevention and treatment.

MeSH Key Words: mandibular fractures/epidemiology; mandibular fractures/etiology; retrospective studies

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The management of fractures to the maxillofacial complex remains a challenge for oral and maxillofacial surgeons, demanding both skill and a high level of expertise. It has been reported that fractures of the mandible account for 36% to 59% of all maxillofacial fractures.¹⁻³ The large variability in reported prevalence is due to a variety of contributing factors, such as the sex, age, environment and socio-economic status of the patient, as well as the mechanism of injury. For each patient, the combination of these factors determines the likelihood of a mandibular fracture. A clearer understanding of the demographic patterns of mandibular fractures will assist health care providers as they plan and manage the treatment of traumatic maxillofacial injuries. Such epidemiological

information can also be used to guide the future funding of public health programs geared toward prevention. To this end, independent investigators have conducted numerous studies on population groups from every continent, all with the common goal of elucidating the nature of mandibular fractures.

The reported findings of certain aspects of mandibular trauma have been widely substantiated, for example, a higher frequency of such fractures among males,⁴⁻⁸ whereas the results for other aspects have differed. Investigators in countries such as Jordan,⁴ Singapore,⁹ Nigeria,^{5,10} New Zealand,¹¹ Denmark¹² and Japan⁶ have found that motor vehicle accidents represent the most common cause of mandibular fractures in those countries, while others, in

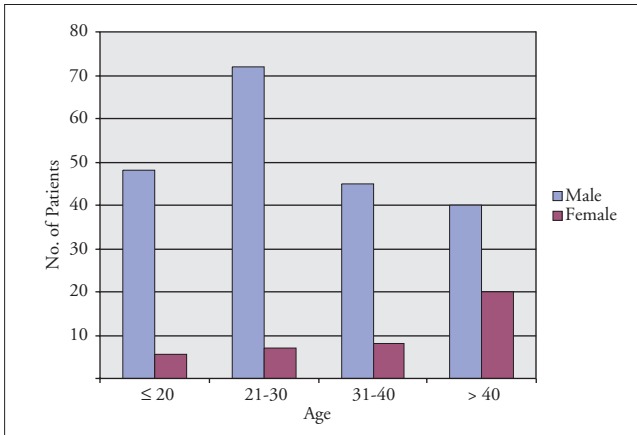


Figure 1: Age and sex distribution.

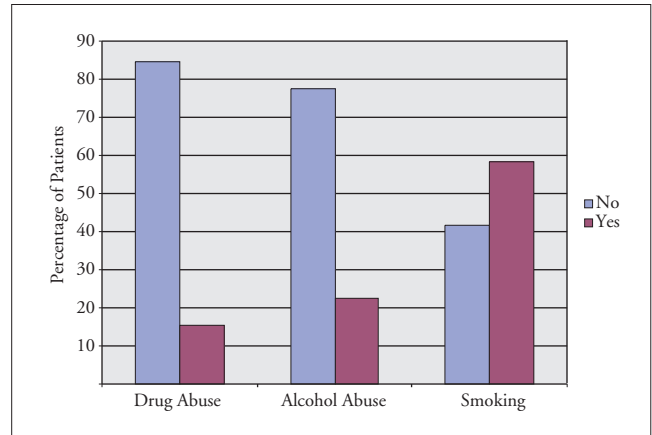


Figure 2: Rates of smoking and of alcohol and drug abuse among patients with mandibular fracture.

Finland,¹³ Scotland¹⁴ and Sweden¹⁵ have reported assault as the most common etiological circumstance. The present study was a retrospective analysis of all mandibular fractures treated at the Toronto General Hospital over a 5½-year period (1995 to 2000). Its aims were to determine the frequency of mandibular fractures among males and females; to determine the age group in which injury occurred most often; to examine the mechanisms of injury; to investigate the possible contributory role of alcohol, smoking and other drug use; to report on the modalities of treatment rendered; and to examine the frequency of post-operative complications.

Methods

The records and radiographs of all patients presenting with mandibular fracture to the dental department, Toronto General Hospital, from January 1995 to June 2000 were reviewed. The Toronto General Hospital is a leading downtown health care centre serving Toronto's demographically diverse population. Patient information was collected by means of a medical data form specifically designed for this study. Data regarding age, sex, cause of injury, alcohol abuse, involvement of alcohol in the trauma, need for delirium tremens prophylaxis, smoking status, drug abuse, treatment modality, and postoperative complications were gathered from pertinent hospital inpatient and outpatient records, as were orthopantomographic radiographs. All patients treated for mandibular fracture, whether admitted to hospital and treated in the operating room or seen as outpatients, were included in this investigation. Collected data were compiled and examined for relevance with the SPSS version 8.0 (SPSS Inc., Chicago, IL) statistical program.

Results

A total of 246 patients aged 14 to 90 years were treated for mandibular fracture during the study period. Most of

the patients were male (83.3%), with females accounting for only one-sixth of the cases (16.7%) (Fig. 1). Indeed, the prevalence of mandibular fracture was higher in males of all age groups, with an overall male-to-female ratio of approximately 5:1. Among males, the highest prevalence of fractures occurred in the third decade, whereas among women, significantly more mandibular fractures occurred after the age of 40.

The causes of mandibular fracture were varied (Table 1); however, the primary causative factor was assault (131 cases [53.3%]). Falls were the second most frequent cause of fracture (53 cases [21.5%]), followed by sports injuries (30 cases [12.2%]). Trauma resulting from motor vehicle accidents accounted for only 15 cases (6.1%).

On closer examination, obvious differences between the sexes in the causes of fracture are readily apparent (Table 1). Males most frequently sustained fractures as the result of violent assaults (124 cases [60.5% of male population]), with falls (30 cases [14.6%]) and sports-related injuries (28 cases [13.7%]) causing most of the remaining fractures. In contrast, more than half of the women reported falls (23 cases [56.1% of the female population]). Only a few reported assault as the reason for their fractures (7 cases [17.1%]), and fewer still had been involved in a motor vehicle accident (4 cases [9.8%]).

More than half of the 220 patients for whom data on substance abuse were available were smokers (128 patients [58.2%]), and nearly a quarter reported an alcohol abuse problem (49 patients [22.3%]) (Fig. 2). Those currently using other drugs composed the smallest group of substance abusers (34 patients [15.5%]).

The percentage of males who smoked (108 of 182 males for whom substance abuse data were available [59.3%]) was only slightly higher than the percentage of females who smoked (20 of 38 patients [52.6%]) (Fig. 3). However, the rates of drug and alcohol abuse among male patients were

Table 1 Causes of mandibular fracture

| Cause | No. of females (%) | No. of males (%) | Total no. of patients (%) |
|------------------------|--------------------|------------------|---------------------------|
| Assault | 7 (17.1) | 124 (60.5) | 131 (53.3) |
| Fall | 23 (56.1) | 30 (14.6) | 53 (21.5) |
| Sports injury | 2 (4.9) | 28 (13.7) | 30 (12.2) |
| Motor vehicle accident | 4 (9.8) | 11 (5.4) | 15 (6.1) |
| Pathologic condition | 3 (7.3) | 3 (1.5) | 6 (2.4) |
| Other | 0 (0) | 4 (2.0) | 4 (1.6) |
| Cause not available | 2 (4.9) | 5 (2.4) | 7 (2.8) |
| Total for column | 41 (100) | 205 (100) | 246 (100) |
| Overall ratio | 41/246 (16.7) | 205/246 (83.3) | 246 (100) |

Table 2 Alcohol involvement and DT prophylaxis treatment in jaw fracture cases

| | No. of females (%) | No. of males (%) | Total no. of patients (%) |
|--|--------------------|------------------|---------------------------|
| Alcohol involvement^a | | | |
| No | 38 (92.7) | 155 (76.7) | 193 (79.4) |
| Yes | 3 (7.3) | 47 (23.3) | 50 (20.6) |
| Total | 41 (16.9) | 202 (83.1) | 243 (100)* |
| DT prophylaxis^b | | | |
| No | 36 (94.7) | 165 (90.7) | 201 (91.4) |
| Yes | 2 (5.3) | 17 (9.3) | 19 (8.6) |
| Total | 38 (17.3) | 182 (82.7) | 220 (100)** |

DT = delirium tremens

^aPercentages of females and males with and without alcohol involvement were calculated from the total number of females and males for which information on this factor were available (i.e., 41 and 202, respectively). Percentages for the "total" column and row for alcohol involvement were calculated from the total number of patients for which information on this factor were available (i.e., 243). Data on alcohol involvement were unavailable for 3 of the 246 patients in the study.

^bPercentages of females and males with and without DT prophylaxis were calculated from the total number of females and males for which information on this factor were available (i.e., 38 and 182, respectively). Percentages for the "total" column and row for DT prophylaxis were calculated from the total number of patients for which information on this factor was available (i.e., 220). Data were unavailable for 26 of the 246 patients in the study.

* Values unavailable for 3 patients.

** Values unavailable for 26 patients.

roughly double those of the female patients: 44 males (24.2%) and 5 females (13.2%) with alcohol abuse and 31 males (17%) and 3 females (7.9%) with drug abuse (**Fig. 3**).

Of the 243 cases for which alcohol involvement was known, drinking was a factor in 50 (20.6%) (**Table 2**). Again, the proportion of males for which the fracture was associated with drunkenness was more than twice the proportion of females (23.3% and 7.3%, respectively). Of the 220 patients for which information was available about delirium tremens prophylaxis, nearly one-tenth (19 patients [8.6%]) required such management (**Table 2**).

The surgeons at the Toronto General Hospital used several different approaches for reduction and fixation of mandible fractures. In approximately half of the 242 fractures for which information was available about management (119 cases [49.1%]), an open approach involving plates, screws or transosseous wiring (or some combination

of these) was used (**Table 3**). For the remaining 123 patients (50.8%), treatment was more conservative. Management in these cases involved closed reduction of the fracture usually with arch bars or ivy loops and intermaxillary fixation (**Table 3**).

Patients treated at this institution over the period of the evaluation were followed post-operatively for an average of 6 months. The frequency of post-operative complications was relatively low (**Fig. 4**). Of the 246 study patients, only 13 (5.3%) experienced any complication. Infection was the most common complication, affecting 7 patients (2.8%). There were also 3 cases (1.2%) of malunion. In only 1 case (0.4%) was malocclusion requiring reoperation documented.

Discussion

The results of this investigation of patients with mandibular fractures who were treated at the Toronto

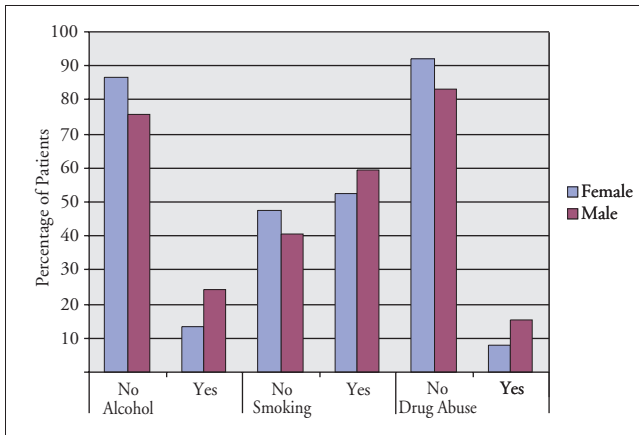


Figure 3: Rates of smoking and of alcohol and drug abuse among females and males with mandibular fracture. Percentages are calculated separately for females and males. Note: Values for 26 patients were unavailable.

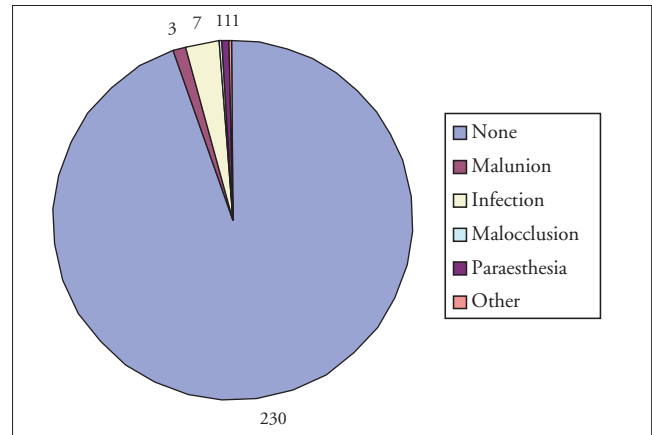


Figure 4: Number and type of postoperative complications.

Table 3 Treatment modalities for mandibular fractures

| Treatment | No. of procedures (%) |
|---|-----------------------|
| Open reduction | |
| Plates and intermaxillary fixation | 59 (24.0) |
| Plates without intermaxillary fixation | 54 (22.0) |
| Wire and intermaxillary fixation | 9 (3.7) |
| Intraosseous wiring | 1 (0.4) |
| Screws and intermaxillary fixation | 4 (1.6) |
| Plate, wire and intermaxillary fixation | 1 (0.4) |
| Closed reduction | |
| Arch bars | 46 (18.7) |
| Ivy loops | 39 (15.9) |
| No fixation | 24 (9.8) |
| Orthodontic brackets | 5 (2.0) |
| Data unavailable | 4 (1.6) |

General Hospital are largely in agreement with those of previous reports, particularly with regard to age and sex of the patients. The finding that men aged 21 to 30 constituted the group with the highest frequency of jaw fracture is consistent with previously published reviews.^{4-8,14,16} It has also been consistently shown that the frequency of mandibular fracture among males is far greater than that for females. Reported overall ratios of males to females have ranged from 3:1 to 5.4:1,^{2-4,12} similar to the ratio observed here (5:1).

Many authors have reported motor vehicle accidents as a major cause of mandibular fracture,^{4-6,8-11} whereas others have reported assault as the main causative factor.^{2,13-15} Consistent with the findings of the latter investigations, violent assault was the single most frequent cause of jaw fracture in this study (53.5%). Those suffering trauma as a result of violence were mainly males; females reported assault as the second most frequent reason for their injuries,

after falls. In all too many cases, however, the clinical findings do not agree with the report of a fall, and practitioners often suspect spousal abuse. It follows, then, that a certain number of females might have received their injuries as a result of assault but reported a fall as the cause.

In Sweden, alcohol or narcotic involvement in mandibular fracture has been reported to be as high as 56%, and most of the cases associated with violence (79%) are linked to alcohol abuse.⁷ In a study conducted in Finland, 44% of mandibular fractures were associated with alcohol abuse.¹⁷ Investigators in Nigeria have suggested that in their region of the world, observed increases in the prevalence of mandibular fractures may be directly related to increased consumption of alcohol after annual periods of fasting.⁵ In the study reported here, alcohol was associated with about 20% of jaw fractures, a proportion significantly lower than figures reported elsewhere. This discrepancy may be explained by underreporting by hospital staff. It may also suggest that the relatively strict laws governing the sale and consumption of alcohol in the province of Ontario may be effective in preventing alcohol-related violence. The proportion of males who reported abuse of alcohol and illegal narcotics was roughly twice the proportion of females (**Fig. 3**).

For these 246 patients treated for mandibular fracture, the postoperative complication rate was 5.3%. This rate is lower than those reported by groups in Nigeria⁵ and Denmark.⁸ Infection was the most frequent complication, followed by malunion and malocclusion (**Fig. 4**). This low rate of complications, particularly of postoperative infection, considered in relation to the large number of open reduction procedures performed by surgeons in this setting, is particularly encouraging and challenges previously reported high rates of infection after open reduction.^{5,8}

Mandibular fractures occur in people of all ages and races, in a wide range of social settings. Their causes often

reflect shifts in trauma patterns over time. It is hoped that assessments such as the one presented here will be valuable to government agencies and health care professionals involved in planning future programs of prevention and treatment. ♦

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C D A R E S O U R C E C E N T R E

CDA members can obtain additional information on mandibular fractures by borrowing *Oral and maxillofacial trauma*, 2nd ed., edited by Raymond J. Fonesca and Robert V. Walker, W.B. Saunders, 1997. For more information, contact the Resource Centre at tel.: 1-800-267-6354 or (613) 523-1770, ext. 2223; fax: (613) 523-6574; e-mail: info@cda-adc.ca.
