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Alcohol and interpersonal violence may increase the severity of facial fracture

Connor O'Meara [a,*], Robert Witherspoon [b], Narada Hapangama [b], Dylan M Hyam [b]

[a] *Academic Department of Surgery, The Canberra Hospital, Garran, ACT, 2605, Australia*
[b] *Department of Oral-Maxillofacial Surgery, The Canberra Hospital, Garran, ACT, 2605, Australia*

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Abstract

The association between alcohol and interpersonal violence has been established in studies from a number of countries. We aimed to determine whether alcohol was a contributing factor in the incidence or severity of facial trauma. For 15 months we prospectively studied patients with facial fractures who presented for oral and maxillofacial review. Severity of injury was assessed using the maxillofacial injury severity score (MFISS). Of the 255 patients with facial trauma who presented to our tertiary referral centre, 202 had fractures of the facial skeleton. Most presentations were secondary to interpersonal violence ($n = 105$, 52%), and 91 (87%) of these involved alcohol. Overall, alcohol was involved in 53% of cases ($n = 107$). The relative risk of requiring surgical intervention when alcohol was involved was 1.61 (CI = 1.12–2.32). Alcohol significantly increased the severity of facial fracture for both MFISS: alcohol ($n = 107$) mean (SD) 11.43 (7.63); no alcohol ($n = 95$) mean (SD) 6.87 (6.22) ($p < 0.05$). Interpersonal violence also increased the severity of facial fracture: interpersonal violence ($n = 105$) mean (SD) 11.06 (6.68), no interpersonal violence ($n = 97$) mean (SD) 7.37 (7.59) ($p < 0.05$). Patients whose facial fractures are the result of interpersonal violence have more severe injuries and are more likely to require surgery if alcohol is involved. This results in a heavier surgical workload, and is an economic and social burden to the community. Primary prevention strategies will have an important role in reducing such injuries.

Keywords: Facial trauma; Alcohol

Introduction

When alcohol consumption commences at a young age,[1,2] consumers may develop a propensity for binge drinking because of limited access and social conventions.[3] Binge drinking has been linked to violence and other harm-related behaviour.[4,5] These characteristics of alcohol consumption seem to continue into early adulthood[6,7] and could be associated with an increased risk of alcohol-associated injury, namely interpersonal violence and motor vehicle crashes, with associated facial trauma.[8–10]

Patients with facial trauma have serious emotional, physical, social, and behavioural problems as a consequence of their injuries,[11] and are more likely to suffer from depression, anxiety, and post-traumatic stress disorder. Research has shown that psychological problems increase with the severity of the injury and the scar. This same group of patients have been reported to have problems with alcohol consumption, have high rates of legal problems, and have difficulty obtaining and continuing in employment as a consequence of disfigurement or psychological problems.[12–14]

We think that the severity of facial fracture increases in incidents that involve alcohol and interpersonal violence. The objective of this study was to find out the cause of injury, and the characteristics of patients with facial fractures secondary to trauma who presented to an Australian tertiary referral centre, and whether alcohol or interpersonal violence increased the severity of injury and the risk of surgical intervention.

* Corresponding author at: Department of Oral-Maxillofacial Surgery, Building 6, The Canberra Hospital, Garran, ACT, 2605, Australia. Tel.: +61 02 62443821; fax: +61 02 62052157.
E-mail address: connor.omeara@anu.edu.au (C. O'Meara).

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Table 1
Maxillofacial injury severity score.

AIS-90*	Description of injury
1	Contusion, laceration, and avulsions less than 25 cm^2 of skin, subcutaneous and muscle (including lip, lid, auricle, and forehead). Rupture of external carotid artery branches. Superficial injuries of the oral mucosa and tongue. Fracture of ramus, nose, and teeth. Displacement of teeth, luxation of teeth, TMJ joint contusion.
2	Lacerations more than 10 cm^2 and avulsions more than 25 cm^2 of skin, subcutaneous and muscle (including lip, lid, auricle, and forehead). Deeper and extensive tongue laceration. Alveolar fracture, condylar fracture, mandibular body fracture, maxillary fracture (Le Fort I, II). Open, displaced, comminuted nasal fracture. Closed orbital fracture, TMJ joint luxation, zygomatic fracture, facial nerve injury.
3	Maxillary fracture with loss of less than 20% blood. Open, displaced, comminuted orbital fracture.
4	Maxillary fracture with loss of more than 20% blood.

* AIS-90 Abbreviated injury scale 1990.

Table 2
Maxillofacial functional injury scale.

Index	Score	Description of injury
LMO	1	Mouth opening range 2–3.7 cm
	2	Mouth opening range less than 2 cm
MO	1	Malocclusion of fewer than 6 teeth in single jaw
	2	Malocclusion of more than 6 teeth in single jaw
	3	Malocclusion in both jaws
FD	1	Open soft tissue injury (less than 4 cm long) without tissue defect. Fracture without displacement.
	2	Open soft tissue injury (more than 4 cm long), tissue defect less than 2 cm^2. Facial nerve branch injury. Fracture with displacement, fracture with bony defect less than half side single jaw.
	3	Open soft tissue injury (more than 4 cm long) and tissue defect more than 2 cm^2. Facial nerve trunk injury. Bony defect more than half side of single jaw, bony defect in both jaws.

LMO, limited mouth opening; MO, malocclusion; FD, functional deformity.

Method

We prospectively studied 255 patients who presented to the Canberra Hospital (Australian Capital Territory, Australia) for assessment of oral and maxillofacial (OMF) trauma over 15 months (207 men (81%), 48 women (19%), mean (SD) age 31 (18.5) years, median age 25, range 1–95).

Australian adolescents begin hazardous alcohol consumption that is associated with a variety of injuries in their early to mid-teens,[5] so inclusion in the study was set at 15 years of age. Cases where the primary presenting injury was soft tissue trauma were excluded. In total 53 cases (20.78%) were excluded from 255 patients.

On presentation an alcohol history was taken. Patients were asked whether they had consumed alcohol within the 8 h before the incident, and the volume and pattern of consumption were recorded. Any patient who had drunk alcohol in the 8 h before the incident was allocated to the alcohol group. All those who had not were allocated to the no alcohol group.

The causes of injury were identified, the most common being interpersonal violence, followed by motor vehicle crashes, falls, and sports. In this study, presentations were allocated to these causes or labelled as other if the mechanism differed.

Two methods were used to measure the severity of injury. The first was the need for primary surgical intervention, and the second was the maxillofacial trauma injury severity score (MFISS) described by Zhang et al.[15] This combines the abbreviated injury scale 1990 (AIS-90) for facial injury with a maxillofacial functional injury scale where the three highest AIS-90 scores are multiplied by functional injury: MFISS = (A1 + A2 + A3) (Table 1) × (MO + LMO + FD) (Table 2).

Calculation of the MFISS for clinical presentations

The 202 facial fracture cases were numbered 1–202 and anonymised. Details including physical examination and imaging results were collated with relevant imaging for each case in a power point presentation with no indication whether alcohol was involved or whether interpersonal violence was the mechanism. These anonymised data were randomly examined three times by a medical officer (trained in advance in the use of the severity scoring technique, and scored according to the descriptions of severity of injury and scoring criteria shown in Tables 1 and 2) not involved in the patients' care. The results were corroborated by a panel of three OMF, and two dental surgeons. The final score for analysis was derived from the mean of these scores.

The severity of bony injury was decided by review of plain radiographs or computed tomograms. If imaging was not available, medical records were reviewed to obtain records of the injury. Identification of the severity of injury to soft tissue, the presence of infection, malocclusion, and displacement were based on medical records of physical examinations. All medical team reviews (emergency, OMF, or surgical subspecialty) of a presentation were analysed, but measurements of malocclusion, displacement, and type of injury were obtained from OMF review if opinions differed. If limited mouth opening (including amount) was not stated, this index was given a zero score.

Statistical analysis

To find out whether alcohol contributed to the severity of injury, all OMF trauma presentations that involved alcohol

Table 3
Cause of oral and maxillofacial injury and number of presentations that involved alcohol ($n = 202$).

Cause of injury	Alcohol	No alcohol
Interpersonal violence	91	14
Motor vehicle crash	7	13
Fall	6	25
Sport	2	39
Other	1	4

($n = 107$) were compared with those that did not involve alcohol ($n = 95$). Data are presented as mean (SD). The Statistical Package for the Social Sciences (SPSS version18) was used for data analysis. A Mann–Whitney's U test was used to find the statistical difference ($p < 0.05$) between groups (alcohol compared with no alcohol, and interpersonal violence compared with no interpersonal violence).

Calculation of relative risk

To find out whether alcohol increases the relative risk of requiring surgical intervention, the risk of exposure (operation) or non-exposure (no operation) for disease (involvement of alcohol or interpersonal violence) was calculated.

Results

A total of 202 eligible patients with facial fractures presented for OMF review within the defined study period. Most cases were secondary to interpersonal violence ($n = 105$), which represented 52% of the facial fracture caseload (mean age 28 years, range 15–68), 91 (87%) of these involved alcohol (Table 3). The number of facial fractures resulting from sport increased during the winter months and were predominately associated with contact sports (rugby and Australian football) during official sporting events. The two cases that involved alcohol had occurred during non-official sporting events not played on a sports field. Alcohol was involved in seven cases of motor vehicle crashes, although patients may be reluctant to admit to drinking alcohol, and this proportion may be higher. Only six falls involved alcohol, but the mean age of presentations in this group was older (mean age 60 years, range 2–96). Many patients in this group were from nursing homes and the falls resulted in predominately non-displaced orbital or zygomatic fractures, which were treated conservatively because of coexisting conditions. Almost all injuries caused by interpersonal violence involving alcohol ($n = 81/91$) required surgical intervention (89%), unlike those that did not involve alcohol ($n = 9/14$). The trend differed for motor vehicle crashes ($n = 2/7$) and falls ($n = 1/6$) that involved alcohol, with a smaller proportion of cases resulting in surgical intervention than those not involving alcohol (8/13 and 8/25, respectively). Seventy-four percent of sporting injuries (29/39) that did not involve alcohol required operation, and one of the two sports injuries that involved alcohol required operation. The involvement of alcohol in patients with facial fractures (Table 4) increased the relative risk of requiring surgical intervention by 1.61 (CI = 1.12–2.32). The risk of surgical intervention also increased if patients were involved in interpersonal violence in contrast to all other mechanisms (3.10, CI = 1.7–5.5). Relative risk also increased if alcohol in conjunction with interpersonal violence was compared with alcohol in conjunction with other mechanisms of facial fracture: 1.44 (CI = 1.12–2.17).

Table 4
Number of cases that required operation compared with the number that did not for interpersonal violence and alcohol to enable calculation of relative risk.

	Operation	No operation	Relative risk
Interpersonal violence	81	10	3.10
No interpersonal violence	55	42	
Alcohol	86	21	1.61
No alcohol	59	95	
Alcohol with interpersonal violence	86	21	1.44
No alcohol with interpersonal violence	5	11	

Table 5
Results of maxillofacial injury severity scores (MFISS) for patients with oral and maxillofacial injuries secondary to interpersonal violence (IPV) compared with no interpersonal violence, and injuries involving and not involving alcohol (Fig. 1).

Group	No	MFISS		P value
		Mean (SD)	Range	
Interpersonal violence	105	11.0 (6.7)	2–40	<0.05
No interpersonal violence	97	7.4 (7.6)	1–45	
Alcohol	107	11.4 (7.6)	2–40	<0.05
No alcohol	95	6.8 (6.2)	1–45	

The MFISS identified that cases where alcohol was involved resulted in a mean facial fracture severity score that was significantly higher than those that did not involve alcohol. When the MFISS for interpersonal violence was compared with all other causes, the severity of injury was significantly increased (Fig. 1, Table 5).

The results show that a large number of mandibular fractures were related to the involvement of alcohol (Fig. 2), and they are weighted numerically in this scoring system because of the increased functional deficit caused by fractures of the lower third.

Discussion

The association between the consumption of alcohol and maxillofacial trauma is well documented. Research has shown that people most at risk of injury are those who drink during the 6 h before the incident, and those who normally drink small amounts of alcohol or none, but periodically drink large quantities (binge drinking).[16] Alcohol is easily available to the Australian population and recent evidence suggests

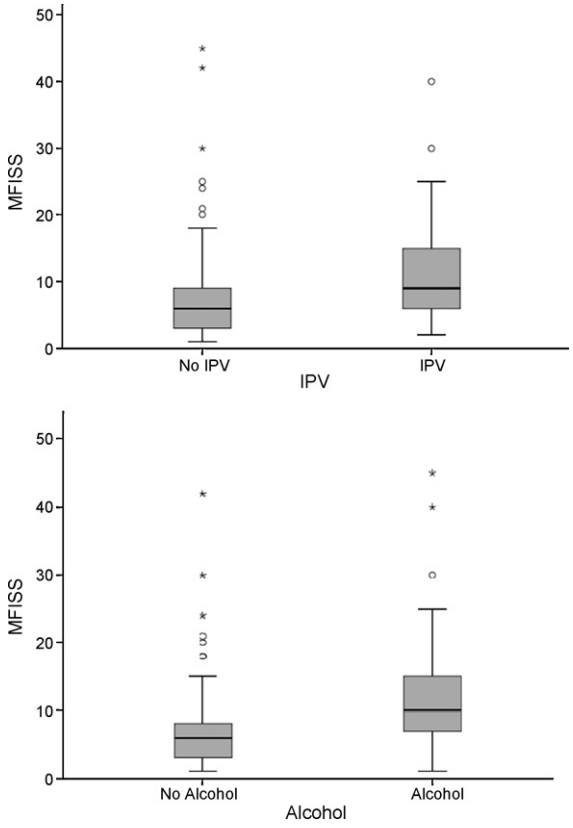

Fig. 1. Maxillofacial injury severity score (MFISS) for patients with oral and maxillofacial injuries secondary to interpersonal violence (IPV) compared with no interpersonal violence and injuries involving and not involving alcohol.

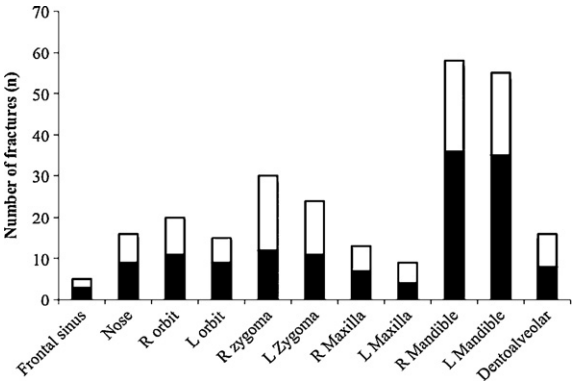

Fig. 2. Proportion of types of facial fracture involving alcohol. Solid bars = alcohol involved, open bars = no alcohol involved.

that the consumption of dangerous amounts of alcohol by Australian adolescents is increasing.[17]

We have shown that the consumption of alcohol increased the severity of facial fractures and also increased the relative risk of requiring an operation when compared with common causes that did not involve alcohol. We also identified that interpersonal violence caused more severe facial fractures than other causes.

More severe fractures may result from the effect that alcohol has on people. It has been shown to influence neurotransmission and the function of brain receptors,[18] which cause people to feel less fearful and anxious about the legal, physical, or social consequences of their actions.[19] It has also been shown to impede cognitive function and motor responses, to impair the ability to solve problems in conflict situations, to increase aggression, and to produce overly emotional responses.[20–23] As trends in alcohol consumption are moving towards patterns of binge drinking, it is our concern that the number of facial fractures will increase and that the long-term consequences of these injuries will burden the healthcare system. OMF trauma is characterised by injuries of varying severity, and although most are not life threatening, many can cause chronic functional deficits that involve speech, aesthetic contour, mastication, and other biopsychosocial problems.

Research has identified that anxiety, depression, and psychological distress can develop in patients within three months of mandibular fractures, while patients who experience facial trauma were likely (27%) to develop post-traumatic stress disorder by seven weeks after injury.[24,25] Surgical procedures also have many intrinsic risks and costs including failed procedures, infection, chronic pain, and functional deficit. They also cause considerable economic expense secondary to procedural costs; the time a patient is off work, and the associated loss of income. The association between a poorer quality of life and facial trauma is well known. Consequently, proactive community and education programmes about the consequences of binge drinking, and the implementation of effective interventions such as taxation, regulation of production and sales of alcohol, restriction of the content of advertisements, and a ban on sponsorship, similar to those imposed on the tobacco industry, may help to reduce facial trauma caused by interpersonal violence.

Further research will explore the economic cost of facial fractures associated with alcohol and interpersonal violence, and the psychological effects of such injuries. We also aim to find out why interpersonal violence results in more severe injuries than other common causes of OMF trauma, and whether incidents that involve alcohol and interpersonal violence result in more complications.

The limitations of this study are as follows: Firstly, there was the subjective measurement of intoxication. Although previous research has found that patients' statements of alcohol consumption are reliable, it does not enable analysis of the level of intoxication at the time of incident. Further study will incorporate the use of a breathalyser, used at the time of the patient's statement of consumption. Secondly, it would be important to exclude interpersonal violence as a potential confounder when evaluating whether alcohol truly increased the severity of facial fractures. This would require a considerably larger sample population, as there were few presentations of interpersonal violence without the involvement of alcohol compared with those that did involve alcohol.

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