



# Patient injury-related alcohol use—underestimated in patients with facial fractures?

Roope Hirvikangas, BDS,<sup>a</sup> Julia Bertell, DDS,<sup>a</sup> Emilia Marttila, MD, DDS, PhD,<sup>a</sup> Maja Löfgren, BDS,<sup>a</sup> Johanna Snäll, MD, DDS, PhD,<sup>a</sup> and Johanna Uittamo, MD, DDS, PhD<sup>a</sup>

**Objective.** The aim of this study was to highlight the current underestimation of the role of alcohol in facial fracture etiology and patients' daily life.

**Study Design.** A prospective cross-sectional study was conducted. Alcohol consumption habits were evaluated, and data were collected through a constructed questionnaire and interview. Case-related data collection was performed, with the primary predictor variables being mechanism of injury; fracture type; and associated injury (any). Outcome variables were alcohol involved in injury (yes/no) and heavy alcohol use (yes/no). The explanatory variables were gender and age. Descriptive and bivariate statistics were computed, and the *P* value was set at .05.

**Results.** In total, 166 patients were included in the study. Of these, 55% of patients reported being under the influence of alcohol when they sustained the injury. Alcohol was involved most often among male patients (*P* = .0006) and in the younger age groups (*P* < .0001). Of the study patients, 17% reported heavy alcohol use. The majority of the interpersonal violence events had taken place under the influence of alcohol (84%; *P* < .0001).

**Conclusions.** The role of alcohol in facial fracture etiology is significant. A brief intervention for alcohol abuse should be included routinely in patient care to identify and, if necessary, address this problem. (Oral Surg Oral Med Oral Pathol Oral Radiol 2020;130:236–240)

A recent European multicenter prospective study reported alcohol consumption before injury in 32% of facial fractures caused by assault.<sup>1</sup> Young males are a distinct group of patients susceptible to fractures, representing 79% to 92% of patients with facial fractures.<sup>1,2</sup> Interpersonal violence has been reported previously as the main injury mechanism for facial fractures, causing 38% to 43% of these injuries, but there are notable variations between countries.<sup>1,3,4</sup> Alcohol consumption has been shown to increase the risk of facial fractures in motor vehicle accidents.<sup>5</sup> Despite the evident influence of alcohol on facial fracture etiology, few studies have focused on patients' alcohol consumption, before the injury or generally. Nonetheless, it is known that falls also play a significant role in facial fractures, especially among older adults.<sup>6</sup> However, the role of alcohol in these injuries is limited.

Alcohol consumption before the injury was shown to vary from 11% to 18% in studies that included different facial fracture types and all injury mechanisms.<sup>2,7,8</sup> In one-fifth of patients with facial fractures, daily use of alcohol has been reported.<sup>9</sup> However, these were retrospective studies and, thus, were not based on brief intervention, with data on alcohol consumption being obtained from patient registers for analysis.

Brief intervention is a method used to determine a patient's alcohol consumption. In this process, information

on the patient's alcohol consumption is obtained by asking about the amount of alcohol used in doses (1 alcohol dose contains 12 g of ethanol), followed by assessing the risk level, listening to the patient, and thereafter motivating the individual to reduce alcohol use. The intervention is often accompanied by follow-up of the patients. This method has proven helpful to patients in reducing their alcohol consumption. After screening, clinicians may assess the patient's risk level and recommend appropriate treatment strategies. Multiple studies have shown brief intervention to be effective in a variety of settings, including emergency departments and inpatient trauma units.<sup>10,11</sup>

The objective of this prospective study was to clarify the role of alcohol and its use in general as a predisposing factor in facial fractures, through interviews and the brief intervention approach. We hypothesized that the role of alcohol in facial fracture etiology and patients' daily life may be underestimated.

## MATERIALS AND METHODS

### Study design

A prospective, cross-sectional study was designed to investigate patients' alcohol habits and the role of alcohol in injuries. Patients' alcohol habits were evaluated on the basis of a method called *brief intervention*,

## Statement of Clinical Relevance

This study found that the role of alcohol in facial fractures seems to be underestimated, and this finding highlights the importance of alcohol screening and brief intervention for patients with facial fractures.

<sup>a</sup>Department of Oral and Maxillofacial Diseases, University of Helsinki and Helsinki University Hospital, Helsinki, Finland.

Received for publication Oct 10, 2019; returned for revision Jan 3, 2020; accepted for publication Mar 11, 2020.

© 2020 Elsevier Inc. All rights reserved.

2212-4403/\$-see front matter

<https://doi.org/10.1016/j.oooo.2020.03.041>

which included screening, assessing the risk level, listening, and motivating. The questionnaire survey recorded alcohol consumption habits and alcohol involvement in trauma. Patients were asked to determine their average weekly alcohol consumption and whether they were under the influence of alcohol at the time of injury. The alcohol consumption reported by the patients was calculated as alcohol doses.

Data were collected through a constructed questionnaire and interview implemented by the doctor or the nurse providing care to the patient. Written consent was obtained from all participants. Data from patients' trauma-related medical records were combined with the survey data.

Patients included were seen for facial fractures between January 1 and December 31, 2018, at the Töölö Hospital Emergency Department, Helsinki University Hospital (Helsinki, Finland), which is a level-one trauma center with a catchment area of greater than 1.6 million people. The Oral and Maxillofacial Emergency Service at Töölö Hospital is part of the Department of Oral and Maxillofacial Surgery, Helsinki University Hospital (Helsinki, Finland).

Patient records of those with trauma-related injuries were reviewed. Recorded patient data included age, gender, date of trauma, facial fracture type, associated injuries, and cause of injury.

Patient recruitment was done during hospital admission.

### Inclusion and exclusion criteria

The included patients (age  $\geq 18$  years) were examined for facial fractures. Only those who agreed to participate in the study were included. Unconscious patients and those who did not consent to the study were excluded.

### Study variables

To investigate the role of alcohol in the injury event, the main outcome variable was whether alcohol was involved in the injury (yes/no). Involvement was determined to be present if the patient had consumed any alcohol before the event.

To clarify the role of patients' alcohol use in general, the secondary outcome variable was heavy alcohol use (yes/no). Habitual alcohol consumption was assessed on the basis of answers to the questionnaire, and heavy drinking was determined, according to the current Finnish care guidelines, as 24 alcohol doses per week or greater in males and 16 alcohol doses or greater in females.<sup>12</sup>

The primary predictor variables were mechanism of injury, fracture type, and associated injury (any). Mechanism of injury was classified as interpersonal violence; falls to the ground (including falls from stairs); biking accidents; sports-related accidents; motor vehicle accidents; falls from a height; or accidents in which the individual was hit by an object (e.g., being kicked by a horse or a work-related injury). Fracture type was classified as

upper face, midface, mandible, or combined fracture. Fracture type was categorized as "combined" in cases with any combination of the aforementioned three types. In addition, the type of associated injury was analyzed. The correlation between being under the influence of alcohol during the trauma and weekly alcohol consumption as well as heavy alcohol use were analyzed. Associated injuries were grouped according to the affected organ into the following 7 groups: brain, limb, cerebrovascular, skull, thoracic, cervical spine, or multiple injuries.

The explanatory variables were patient gender and age, which were analyzed in 3 groups: 30 years or younger, 31 to 60 years, and older than 60 years.

### Ethical approval

This study followed the tenets of the Declaration of Helsinki on medical protocol and ethics. The regional Ethical Review Board of Helsinki University Central Hospital (Helsinki, Finland), approved the study (No. HUS/2193/2017). The Internal Review Board of the Head and Neck Center, Helsinki University Hospital (HUS/356/2017) also approved the study.

### Statistical analyses

Data were analyzed by using GraphPad Prism version 5.00 (GraphPad Inc. San Diego, CA). The 2-tailed Mann Whitney U test was used for comparisons of the study groups. Fisher's exact test was used to examine the association between different variables. *P* values  $< .05$  were considered statistically significant.

### RESULTS

During the 1-year study period, 173 patients were recruited. Seven patients declined to participate. Thus, 166 patients were included in the analyses. The mean age of the patients was 42 years (range 18–94 years). Female patients were significantly older than male patients (age 54 years [range 21–86 years] and age 38 years [range 18–94 years], respectively;  $P < .0001$ ). In the age groups of those age 30 years and younger and those 31 to 60 years, a significantly higher proportion of patients were males (88% males and 76% females), whereas in the age group of those older than 60 years, there were more female patients (56%) ( $P < .0001$ ). Most of the patients were diagnosed with fractures of the midface (60%). Interpersonal violence was the leading cause of trauma (38%). The frequency of associated injuries was 28%.

The associations between predictor variables and primary and secondary outcomes are presented in Table I. According to self-reporting, 55% of the patients were under the influence of alcohol at the time of the trauma ( $n = 92$ ). Only 15% of the patients under the influence of alcohol were females, whereas 85% were males ( $P = .0006$ ). Patients who were under the influence of alcohol

**Table I.** Associations between alcohol use by 166 patients with facial fractures and predictors

	No. all	%	No. of patients with alcohol involved in injury	%	<i>P</i> value*	No. of patients with heavy alcohol use	%	<i>P</i> value*
<b>All patients</b>	166		92	55%		28	17%	
Females	43	26%	14	33%		4	9%	
Males	123	74%	78	63%	.0006	24	20%	
<b>Age groups</b>								
≤ 30 years	59	36%	40	68%		10	17%	
31–60 years	75	45%	45	60%		14	19%	
> 60 years	32	19%	7	22%	< .0001	4	13%	
<b>Fracture type</b>								
Isolated midface	100	60%	60	60%		16	16%	
Isolated mandible	47	28%	22	47%		9	19%	
Isolated upper face	3	2%	2	67%		0	—	
Combined	16	10%	8	50%		3	19%	
<b>Mechanism of injury</b>								
Interpersonal violence	63	38%	53	84%	< .0001	20	32%	< .0001
Fall to the ground	52	31%	26	50%		5	10%	
Biking accident	25	15%	11	44%		2	8%	
Sports accident	12	7%	0	0%	< .0001	1	8%	
Motor vehicle accident	6	4%	1	17%		0	0%	
Fall from height	5	3%	1	20%		0	0%	
Hit by object	3	2%	0	0%		0	0%	
<b>Associated injury</b>	45	27%	24	53%		2	4%	
Affected organ								
Brain	17	38%		59%		0		
Limb	13	29%	5	38%		0		
Cerebrovascular	6	13%	4	67%		1	17%	
Skull	3	9%	2	50%		0		
Thorax	2	4%	1	50%		0		
Cervical spine	1	2%	1	100%		1	100%	
Multiple	3	7%	1	33%		0		

\**P* value provided when statistically significant (< .05).

were significantly younger (mean age 37 years; range 18–79 years) compared with the patients who were not under the influence (mean age 49 years; range 18–93 years) ( $P = .0003$ ). The majority of the interpersonal violence events had taken place when the patients were under the influence of alcohol (84%;  $P < .0001$ ). There were 12 sports-related accidents, none of which was associated with alcohol ( $P < .0001$ ).

Most of the patients (71%) were classified as moderate drinkers, whereas 17% were heavy drinkers, and the remaining 12% were nondrinkers. Overall, 9% of female patients and 20% of male patients were heavy drinkers. The proportion of heavy drinkers among patients who were under the influence of alcohol at the time of trauma was significantly higher compared with the proportion of patients who were not heavy drinkers (28% and 7%, respectively) ( $P < .0001$ ). Weekly consumption of alcohol was significantly higher among patients who were under the influence of alcohol

(mean 4.73 vs. 16.6;  $P < .0001$ ). There was no correlation between alcohol involvement during trauma and associated injuries in all patients.

## DISCUSSION

The present study aimed to clarify prospectively the role of alcohol use before injury and general alcohol consumption in patients with facial fractures and confirmed our hypothesis. Patients reported alcohol use before injury more often than expected. The present study revealed that more than half the patients (55%) were under the influence of alcohol during injury, which is 3 times higher than previously reported.<sup>2,7,8,13</sup> A previous retrospective study conducted in the same level I trauma center reported rates corresponding to those from other countries.<sup>7</sup> Therefore, it can be assumed that other maxillofacial trauma centers could have similar findings as those reported in this study. Significantly, alcohol was involved most often in trauma in

males and younger age groups; however, it was present in 22% of the cases among older adults as well.

Among assault cases, 84% of patients reported drinking alcohol before the trauma; however, alcohol consumption preceded other injury types also. Of the total 166 patients, 17% reported a history of heavy alcohol use. Alcohol drinking before the injury was 4 times more common in these patients compared with those who reported lower alcohol consumption. The present study was based on an interview, so it is also possible that patients' alcohol consumption is actually higher than reported.

The higher rates of alcohol use before injury were explained clearly on the basis of data from this prospective study and the brief intervention approach, along with an interview in which any minor alcohol consumption before injury was discovered. In the present study, we also registered the history of alcohol use in cases where it might otherwise have been overlooked. Patients with facial fractures do not always seek hospital care immediately after injury, and therefore measuring their alcohol levels may not have been possible on their arrival at the hospital. Additionally, patients may not mention alcohol use unless they are specifically asked about it. Therefore, a prospectively conducted interview is the most comprehensive method to clarify previous alcohol consumption in this patient population.

Alcohol consumption by patients with facial fractures has previously been evaluated prospectively.<sup>13–15</sup> Interviews comparable with that in the present study have been conducted, one in a study performed by Mcdade et al. in the early 1980s,<sup>15</sup> and another in a study by Lee et al. in 2017.<sup>16</sup> However, both studies included only 20 patients each. Our study showed that alcohol is of particular importance in the etiology of facial fractures. Prospective studies are rare; therefore, more such studies are needed.

Alcohol can make people less fearful, potentiate aggressive behavior, and decrease the ability to plan in the face of threat or punishment.<sup>17</sup> Not surprisingly, alcohol consumption has been reported to precede assaults in 78% to 89% of cases of facial fractures.<sup>13,18–20</sup> Our results agree with the findings from these studies. The face largely defines perceptions of self-image and identity,<sup>21</sup> and thus, it is no surprise that patients with facial trauma experience emotional and psychosocial problems as a result of their injuries.<sup>22</sup>

A considerable number of falls on the ground (50%) and biking accidents (44%) occurred after alcohol consumption. A previous prospective study also showed a notable association between facial fractures and falls: Alcohol was involved in 40% of injuries.<sup>13</sup> Alcohol, even in small doses, can impair balance and judgment, as may be observed especially in older patients. Previous studies have found that the risk of injury is highest among those who drink during the 6 hours before the incident and

binge drinkers.<sup>23</sup> It is no surprise that alcohol increases the risk of facial trauma. In the present study, alcohol consumption did not correlate with associated injuries. Thus, even though alcohol has a significant role in facial fracture etiology, it does not seem to increase the severity of the injury, if all injury mechanisms are considered.

In the present study, 17% of patients reported a history of heavy alcohol consumption. Corresponding rates were reported previously; the study by Goulart et al.<sup>9</sup> with 154 patients, however, showed significantly higher rates. It must be noted that only patients with fractures resulting from interpersonal violence were included in that study. Studies on social challenges and heavy alcohol use often focus on the same type of patient population; these patients often require many forms of support. Close cooperation with social services is, therefore, desirable. Substance abuse may also manifest as infections as a result of possible immunosuppression,<sup>24</sup> other physiologic alterations, and changes in patient behavior<sup>25</sup> as well. Facial trauma surgeons who frequently encounter these patients play a key role in detecting a history of substance abuse. Accordingly, brief intervention and subsequent reintervention at later appointments can be conducted by nurses in surgical units. This kind of division of labor between maxillofacial surgeons and the nursing staff has previously shown favorable results.<sup>26</sup> Even a short intervention by a health care professional may help the patient understand the dangers of substance abuse, and this understanding is a prerequisite for stopping this behavior.

A limitation of the present study was that unconscious patients and patients who did not consent to the study were excluded. In addition, not all patients with facial fractures encountered during the study period were recruited because of limited resources of health care providers, including doctors and nurses, trained for the study. The amount of alcohol consumed before the trauma was not measured but was asked about on the questionnaire. Therefore, we have not drawn any conclusions on the relationship between the degree of intoxication and the type of injury. Finally, this study did not investigate drug-related facial fractures but focused only on those related to alcohol consumption.

## CONCLUSIONS

On the basis of the results of the present study, we recommend that screening and brief intervention for alcohol be done for all patients with facial fractures to understand the role of alcohol in the incidence of facial injuries and to tackle the problem of excessive alcohol use by patients. Clinicians treating patients with facial trauma involving alcohol consumption should have knowledge of alcohol screening and the brief intervention approach. It is appropriate to plan and design alcohol screening and intervention programs in trauma centers for patients with facial fractures.

## REFERENCES

1. Boffano P, Roccia F, Zavattoni E, et al. European Maxillofacial Trauma (EURMAT) project: a multicentre and prospective study. *J Craniomaxillofac Surg*. 2015;43:62.
2. Zaleckas L, Pečiulienė V, Gendvilienė I, et al. Prevalence and etiology of midfacial fractures: a study of 799 cases. *Medicina*. 2015;51:222.
3. Lee KH, Qiu M. Characteristics of alcohol-related facial fractures. *J Oral Maxillofac Surg*. 2017;75:786.e1-786.e7.
4. Thorén H, Numminen L, Snäll J, et al. Occurrence and types of dental injuries among patients with maxillofacial fractures. *Int J Oral Maxillofac Surg*. 2010;39:774-778.
5. Shapiro AJ, Johnson RM, Miller SF, et al. Facial fractures in a level I trauma centre: the importance of protective devices and alcohol abuse. *Injury*. 2001;32:353.
6. Toivari M, Helenius M, Suominen AL, et al. Etiology of facial fractures in elderly Finns during 2006-2007. *Oral Surg Oral Med Oral Pathol Oral Radiol*. 2014;118:539.
7. Weihsin H, Thadani S, Agrawal M, et al. Causes and incidence of maxillofacial injuries in India: 12-year retrospective study of 4437 patients in a tertiary hospital in Gujarat. *Br J Oral Maxillofac Surg*. 2014;52:693-696.
8. Lee K, Olsen J, Sun J, Chandu A. Alcohol-involved maxillofacial fractures. *Aust Dent J*. 2017;62:180-185.
9. Goulart DR, Durante L, de Moraes M, et al. Characteristics of maxillofacial trauma among alcohol and drug users. *J Craniofac Surg*. 2015;26:783-786.
10. Gentilello LM, Rivara FP, Donovan DM, et al. Alcohol interventions in a trauma center as a means of reducing the risk of injury recurrence. *Ann Surg*. 1999;230:473-480.
11. Monti PM, Colby SM, Barnett NP, et al. Brief intervention for harm reduction with alcohol positive older adolescents in a hospital emergency department. *J Consult Clin Psychol*. 1999;67:989-994.
12. Working group appointed by the Finnish Medical Society Duodecim and the Finnish Society of Addiction Medicine. In: *Treatment of alcohol abuse. Current Care Guidelines*, Helsinki, Finland: The Finnish Medical Society Duodecim; 2018.
13. O'Meara C, Witherspoon R, Hapangama N, Hyam DM. Alcohol and interpersonal violence may increase the severity of facial fractures. *Br J Oral Maxillofac Surg*. 2012;50:36-40.
14. Murphy DA, Shetty V, Resell J, Zigler C, Yamashita DD. Substance use in vulnerable patients with orofacial injury: prevalence, correlates, and unmet service needs. *J Trauma*. 2009;66:477-484.
15. Mcdade AM, Mcnicol RD, Ward-Booth P, Chesworth J, Moos KF. The aetiology of maxillofacial injuries with special reference to the abuse of alcohol. *Int J Oral Maxillofac Surg*. 1982;11:152-155.
16. Lee KH, Dastaran M, Chandu A. Brief alcohol intervention in alcohol involved facial fracture patients—a survey of patient attitudes to screening and intervention. *Oral Maxillofac Surg*. 2017;21:219.
17. Pihl RO, Peterson JB, Lau MA. A biosocial model of the alcohol-aggression relationship. *J Stud Alcohol*. 1993;11:128-139.
18. Laverick S, Patel N, Jones DC. Maxillofacial trauma and the role of alcohol. *Br J Oral Maxillofac Surg*. 2008;46:542-546.
19. Lee KH, Snape L. Role of alcohol in maxillofacial fractures. *N Z Med J*. 2008;121:15-23.
20. Kai HL. Interpersonal violence and facial fractures. *J Oral Maxillofac Surg*. 2009;67:1878-1883.
21. Bronheim H, Strain JJ, Biller HF. Psychiatric aspects of head and neck surgery. Part II: Body image and psychiatric intervention. *Gen Hosp Psychiatry*. 1991;13:225-232.
22. De Sousa A. Psychological issues in oral and maxillofacial reconstructive surgery. *Br J Oral Maxillofac Surg*. 2008;46:661-664.
23. Watt K, Purdie DM, Roche AM, McClure RJ. Risk of injury from acute alcohol consumption and the influence of confounders. *Addiction*. 2004;99:1262-1273.
24. Senel FC, Jessen GS, Melo MD, Obeid G. Infection following treatment of mandible fractures: the role of immunosuppression and polysubstance abuse. *Oral Surg Oral Med Oral Pathol*. 2007;103:38-42.
25. Serena-Gomez E, Passeri LA. Complications of mandible fractures related to substance abuse. *J Oral Maxillofac Surg*. 2008;66:2028-2034.
26. Oakey F, Ayoub AF, Goodall CA, et al. Delivery of a brief motivational intervention to patients with alcohol-related facial injuries: role for a specialist nurse. *Br J Oral Maxillofac Surg*. 2008;46:102.

## Reprint requests:

Roope Hirvikangas  
Haartmaninkatu 4 E  
PL 220  
00029 HUS  
Helsinki  
Finland.  
Hirvikangasroope@gmail.com