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### This is the author's manuscript

*Original Citation:*

*Availability:*

This version is available <http://hdl.handle.net/2318/1610834> since 2016-11-10T11:38:02Z

*Published version:*

DOI:10.1016/j.jcms.2016.05.021

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## **An analysis of 711 victims of interpersonal violence to the face, Turin, Italy**

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### **Abstract**

#### **Aim**

The aim of this work is to analyze the risk factors in interpersonal violence and to describe the epidemiology, patterns and management of maxillofacial fractures in high volume trauma center of the northern Italy.

#### **Material**

This retrospective study recorded patients hospitalized with maxillofacial fractures, at the division of maxillofacial surgery, Città della Scienza e della Salute University Hospital, Torino, Italy, since January 2001.

#### **Methods**

Only patients who presented with “violence” in the database field for “cause of injury” and with “interpersonal violence” as a subtype of etiology were considered. Statistical analysis was determined using the  $\chi^2$  or Fisher's exact test.

#### **Results**

2567 patients were admitted. 711 patients (27.7%) had undergone interpersonal violence that has increased from 20% to 35% in the study period. The male-to-female ratio was 11:1; the mean age was 32.7. 247 patients were foreigners (34.7%). 107 patients were enrolled in that study, referred alcohol or drugs abuse. IPV episodes account for 953 maxillofacial fractures localized in 55.3% of the cases in the midface, 43.1% in the lower third. Particularly the trauma involved the orbital region and the maxillo-orbito-zygomatic region. 4.4% of patients had combined trauma.

#### **Conclusion**

IPV maxillofacial fractures in Europe such as in Italy are becoming one of the first cause of injuries. This study shows that young males and foreigners are involved in violence mostly during the weekend. These fractures occur due to fists frequently involving the maxillo-zygomatic-orbital complex.

#### **Keywords**

- Maxillofacial trauma; Trauma; Maxillofacial surgery

## 1. Introduction

The violence is today one of the integrative parts of the human experience and it shows its different aspects worldwide.

World Health Organization (2004) defines violence as: “the intentional use of physical force or power, threatened or actual against oneself, another person, or against a group or community, that either results in or has a high likelihood of resulting in injury, death, psychological harm, maldevelopment or deprivation” (Krug et al., 2002).

To date, mostly in developed countries, interpersonal violence is spreading. The consequence of this phenomenon is the increasing of injuries also in the head and neck region with subsequent maxillofacial fractures (Bakardjiev and Pechalova, 2007, Eggensperger et al., 2007, Brink, 2009, Hallmer et al., 2010, Lee, 2012 and Rallis et al., 2015b).

Interpersonal violence (IPV) is defined to include violence between family members and intimate partners and violence between acquaintances and strangers that is not intended to further the aims of any formally defined group or cause. Self-directed violence, war, state-sponsored violence and other collective violence are specifically excluded from these definitions (World Health Organization, 2004).

The aim of this paper is to evaluate the risk factors for the escalation of the interpersonal violence and to describe the epidemiology, patterns and management of maxillofacial fractures in high volume trauma center of the northern Italy.

## 2. Patients and methods

This study is based on a systematic computer-assisted database that has continuously recorded patients hospitalized with maxillofacial fractures, at the division of maxillofacial surgery, Città della Scienza e della Salute University Hospital, Torino, Italy, since January 2001. Only patients who presented with “violence” in the database field for “cause of injury” and with “interpersonal violence” as a subtype of etiology over the period from 1 January 2001 to 31 December 2014 were considered for this study.

The following data were considered for each patients: age, gender, nationality, alcohol or drug abuse, mechanism of injury, date of trauma, site and severity of facial fracture (Facial Injury Severity Scale – FISS) (Bagheri et al., 2006), associated injuries, type of treatment and hospital stay.

Patients with injuries produced by self-inflicted violence and by gunshot wounds were excluded.

Statistical analysis was determined using the  $\chi^2$  or Fisher's exact test. Probabilities of less than 0.0001 were accepted as significant.

## 3. Results

There were 2567 patients admitted to our division due to maxillofacial trauma (Table 1). There were 711 patients (27.7%) injured by interpersonal violence, which was the second leading cause of traumatic events after falls (Fig. 1).

Table 1.  
Etiology of overall maxillofacial fractures. RTAs, road traffic accidents.

2001–2014	Patients N° (%)	Mean age	Ratio M:F	Hospitalization days	Associated injuries N° (%)	FISS
Fall	746 (29.1%)	49.8	1.4:1	5	124 (16.6%)	1.9
Assault	711 (27.7%)	32.7	11:1	4	31 (4.4%)	1.9
RTAs	577 (22.5%)	34.4	2.2:1	7	264 (45.7%)	2.8
Sport	321 (12.5%)	29.2	7.2:1	3.7	23 (7.2%)	1.7
Job	158 (6.1%)	44.6	25.3:1	5.7	44 (27.8%)	2.6
Other	54 (2.1%)	40.8	2.3:1	7.2	8 (14.8%)	2.2
TOTAL	2567 (100%)	38.5	3.3:1	5.1	494 (19.2%)	2.2

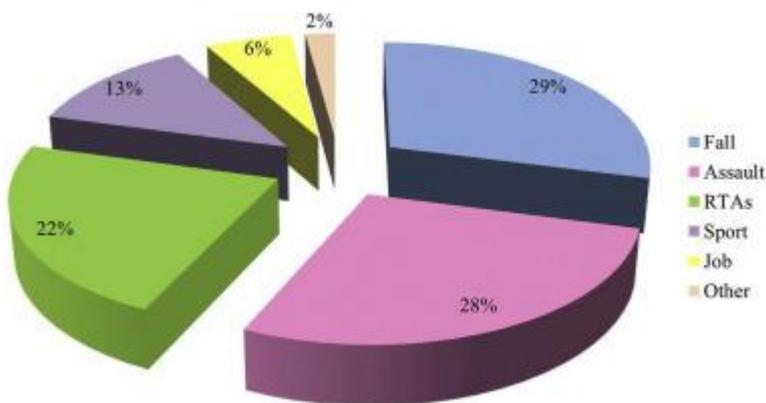


Fig. 1.  
Etiology of maxillofacial fractures over the 14-year-period studied. RTAs, road traffic accidents.

Fig. 2 shows a progressive increase in interpersonal violence lesions, and the rate increased from 20% to 35% during the study period.

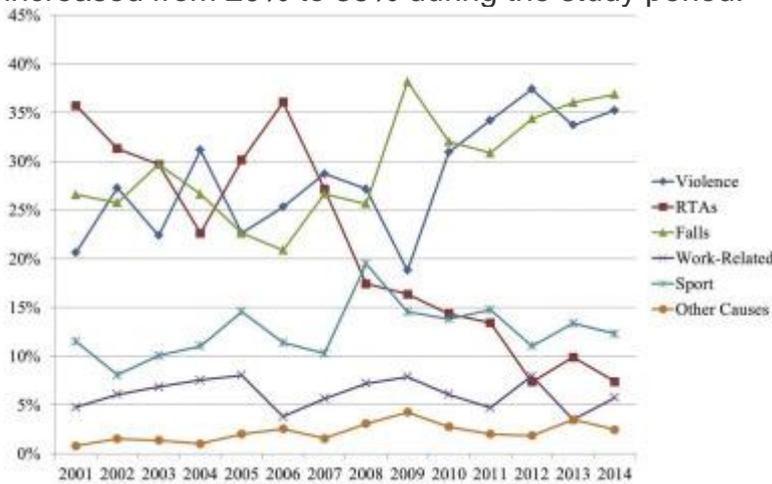


Fig. 2.  
Trend of incidence of the major causes of maxillofacial fractures. RTAs, road traffic accidents.

The data indicate that the population of 711 patients contained 652 male patients and 59 female patients ( $p < 0.0001$ ) (ratio 11:1). The mean patient age was 32.7 years (range 11–95). The majority of events occurred between the second and the third decade of life (Fig. 3).

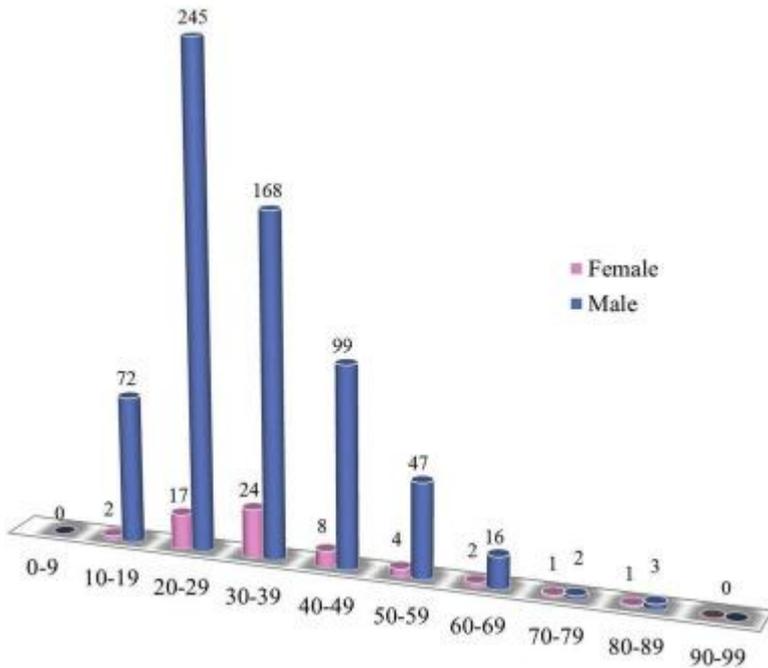


Fig. 3.  
Patient's distribution to age and gender.

The data show that 247 of the 711 patients were foreign (34.7%) ( $p < 0.0001$ ). There were 222 male and 25 female patients (ratio 9:1). The mean patient age was 30.9 years (range 15–56).

The rate of interpersonal violence for foreign patients is three times higher than the rate of work related accidents (12.6%), motor vehicle accidents (10.1%), sports injuries (9.3%), and falls (7.7%). Fifty-one percent of foreign patients with IPV maxillofacial fractures are European. The majority of patients were from Romania or Albania. Additionally, 38% of foreign patients were African and were originally from Morocco and Nigeria (Figure 4).

The data show that 46 of the 711 (6.5%) patients enrolled in the study abused alcohol or drugs.

Our results indicate that Mondays had relatively few patients with fractures. However, the incidence of maxillofacial fracture due to IPV increased during the week in our male population. During the weekends, the incidence was higher than on weekdays, and 69% of patients were admitted between Friday night and Monday.

Table 2 shows that the month with the highest rate of IPV maxillofacial fractures was July.

Table 2.  
Month distribution of IVP injuries.

	Male	Female	Total
January	46	5	51
February	45	6	51
March	62	7	69
April	65	3	68
May	48	6	54
June	57	2	59
July	70	3	73

	Male	Female	Total
August	55	2	57
September	55	7	62
October	56	7	63
November	38	6	44
December	55	5	60
	652	59	711

The lesion causes included the following: fists in 92.4% of patients, kicks and fists in 15 patients, hits by a stick in 12 patients, kicks in 7 patients, hits by a head in 5 patients, hits by an elbow in 4 patients, hits by a bottle in 3 patients, and hits by other types of tools in 8 patients.

The results showed that 631 of the 652 male patients were injured by strangers. Conversely, 41 of the 59 female patients indicated that they were injured by a person that they knew.

The IPV episodes accounted for 953 maxillofacial fractures. The data show that 55.3% of the cases had injuries to the midface (57.7% male, 73.6% female). The trauma often involved the orbital region and the maxillo-orbito-zygomatic region.

IPV caused fractures of the lower third of the face in 43.1% of the cases (44.5% male and 26.4% female). The trauma often involved the angle of the mandible (Table 3).

Table 3.  
Site of maxillofacial fractures in interpersonal violence injuries.

	Site	Male	Female	Total
Upper third (1.6%)	Frontal sinus	15	0	15
Middle third (55.3%)	Maxillo-zygomatic-orbital complex	191	14	205
	Orbital floor	157	24	181
	Orbital medial wall	38	10	48
	Orbital roof	7	1	8
	Nose	59	4	63
	Le Fort	9	2	11
	NOE	7	0	7
	Palatal bone	2	0	2
	Dento-alveolar	2	0	2
Lower third (43.1%)	Angle	157	7	164
	Parasymphysis	91	7	98
	Condyle	69	5	74
	Body	34	1	35
	Symphysis	19	0	19
	Ramus	12	0	12
	Coronoid	6	0	6
	Dento-alveolar	3	0	3
Total		877	76	953

FISS was 1.9 (1.98 of males and 1.66 of females), which was slightly lower than the injury caused by sports trauma and equal to falls as reported in Table 1.

The results show that 4.4% of patients had associated injuries. The majority of injuries were orthopedic lesions.

The data indicate that 84% of patients underwent open reduction of the maxillofacial fractures and 10% underwent conservative treatment. There was no surgery performed in 6% of the patients.

The mean hospital stay was 4 days.

#### 4. Discussion

In a recent review of maxillofacial fracture etiology during the last 30 years, Boffano et al. (2014) showed that motor-vehicle accidents were the main cause of trauma in the USA, Africa, and Asia. However, assaults were the main cause of fractures in Oceania.

The etiology varied in Europe. The data show that assaults and road traffic crashes were the most important factors, and the rates ranged from 7.3%–72% and 4% to 68.8%, respectively.

The results of a multicentre and prospective study conducted in 2013 reported the changing trend in maxillofacial trauma epidemiology in Europe and that “trauma cases caused by assaults and falls now outnumber those due to road traffic accidents,” with rates of 39% and 31%, respectively (Boffano et al., 2015a).

The decrease of motor-vehicle accidents in Europe is mainly attributed to rigorous enforcement of traffic rules and regulations. These laws include the obligatory wearing of a seat-belt or helmet, obeying speed limits, increased frequency of car safety inspections, and introduction of legislation to outlaw drunk driving (van Beek and Merckx, 1999 and Hallmer et al., 2010).

The increase in the life expectancy of the European people and the more active lifestyle of the elderly population could explain the increase of maxillofacial trauma due to falls according to several authors (Wade et al., 2004, Al-Qamachi et al., 2012 and Roccia et al., 2014).

The results of this study confirm the dramatic decrease in the rate of maxillofacial fractures caused by MVA (from 35% to 7%) and a progressive increase of fractures caused by falls and IPV. Fig. 2 shows the rates increased from 26% to 36% for falls and from 20% to 35% for IPV.

A previous epidemiological study conducted in our Department between 1985 and 1990 (Viterbo et al., 1991) showed that IPV maxillofacial fractures were the third leading cause of lesions, with a rate of 10.3%. This rate was less than the incidence of MVA (52.4%) and falls (13%). However, the IPV rate was found to be approximately three times higher in this study (27.7%).

The rate of falls could be overestimated. For example, female patients in the emergency department may not always report an assault or domestic violence as the true cause of their injury. They could report a fall injury instead (Perciaccante et al., 1999, Gerber et al., 2009 and Ferreira et al., 2014).

The escalation in IPV-related maxillofacial fractures involves more young males. The changes could be the result of several social and economic factors, such as unemployment, an economic crisis, and uncontrolled immigration (Eggensperger et al., 2007, Chrcanovic, 2012, Lee, 2012, Rallis et al., 2015a and Boffano et al., 2015b).

Italy has one of the highest rates of unemployed young people in Europe (ISTAT, 2015). Italy has a high rate of clandestine immigration, which is similar to Greece (FRONTEX, 2015). These issues may be the cause of increased IPV facial lesions in young people and foreigners.

Rocchi et al. (2007) examined a cohort of Italian teenagers and showed that the percentage of fractures due to physical assault increased considerably when the immigrant population was considered.

In our study, the male population had a mean age of 32.7 years and showed the highest rate of maxillofacial fractures. The male predominance is consistent with other European epidemiological studies (Bakardjiev and Pechalova, 2007, Eggersperger et al., 2007, Brink, 2009, Salonen et al., 2010 and Boffano et al., 2015b). The average age is similar to the age reported by Eggersperger et al. (2007). However, it is less than the age reported by Rallis et al. (2015b), (36 year) and Salonen et al. (2010) (38 years).

Our study showed that females reported IPV maxillofacial fractures were caused by people they know, which is similar to the results reported by Zachariades et al. (1990).

Our data also showed that more events occurred during the weekends and during July, which is consistent with previous studies (Eggersperger et al., 2007 and Brink, 2009). This result may be related to alcohol and drug abuse during these periods (Eggersperger et al., 2007 and Lee, 2009; Elledge et al., 2011 and O'Meara et al., 2012).

The face is often injured during violence because the aggressor commonly targets the prominent parts of the face, such as the cheek or the angle of the jaw (Eggersperger et al., 2007, Lee, 2009 and Chrcanovic, 2012).

The angle of the mandible is the most common site of facial fracture due to damage on the lateral side of the face. Angle fractures of the mandible are often associated to parasymphysis fractures. However, condyle fractures are commonly caused by injuries directed toward the chin.

Our report showed that fractures involving the inferior third of the face are more frequent in males. However, the common fracture sites in females include the middle third of the face, which contains the orbit and the zygoma.

The male patients in our series had high energy trauma, and no females had frontal fractures or NOE (FISS of 1.66 in females versus 1.98 in males). These findings were consistent with the results reported by Salonen et al. (2010).

The rate of associated injuries in our IPV cohort is lower than other causes of fracture, such as MVA, falls, and work accidents. This result may be related to the energy associated with an injury that is focused directly at the craniofacial skeleton. Therefore, other organ systems are not injured. This allows more directed maxilla-facial fracture management, which results in a shorter hospital stay when admission is required.

## **5. Conclusion**

IPV maxillofacial fractures are becoming a major cause of injury in Europe and Italy. The data show that young males and foreigners are involved in violence during the weekend. Our study showed that if the victim is male, the aggressor is often an unknown person that causes a maxillofacial fracture. These fractures occur frequently, with high impact energy in the middle third of the face.

The female patients tend to know their aggressor because it is often their partner and orbital floor and medial wall fractures are most commonly involved.

Oral and maxillofacial surgeons are in the frontline of managing victims of IPV, and are beginning to play a crucial role in interagency violence prevention. Therefore, by recognizing higher risk age groups and patterns of injury that might indicate IPV can better identify and assist the intentionally injured patient. In this way, resources can be directed to prevention, education, and intervention efforts.

## **Financial disclosure and products**

None of the authors has a financial interest in any of the products, devices, or drugs mentioned in this manuscript.

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