Dental Traumatology

Dental Traumatology 2010; **26**: 484–489; doi: 10.1111/j.1600-9657.2010.00936.x

The consequences of orofacial trauma resulting from violence: a study in Porto

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Accepted 17 August, 2010

Abstract – Orofacial injuries resulting from violence are a fairly common event. In Portugal, however, the impact of these injuries remains to be elucidated. This study aims to analyze the injuries and permanent consequences of orofacial trauma (in a three-dimensional perspective: organic, functional and situational), resulting from violence. To do so, a retrospective analysis of all violence-related forensic reports performed in the North Branch of the National Institute of Legal Medicine, during 2007, was carried out ($n = 513$). It was found that most victims were men with a mean age of 35.4 (SD = 15.1). Most aggressions were due to punches and/or kicks. The most frequent orofacial injuries were lip injuries (57.7%), followed by extra-oral soft tissue injuries (35.9%), gingival and oral mucosa injuries (29.2%), and teeth and/or periodontal injuries (17.5%). The most frequent long-term consequences concerned the teeth and periodontal area (14.0%), followed by the lip area (7.4%), and gingival and oral mucosa tissues (3.9%). In terms of the effect on functions and life situations, it was found that chewing and embarrassment in social life events were the most prevalent (43.6% and 83.6%, respectively). These results showed that orofacial trauma from violence-related events can damage a person's quality of life, especially those concerning the teeth area, as a result of their implications in normal function and in life situations.

Orofacial traumatic injuries happen in many different situations, such as domestic events (including play and falls), sport-related accidents, work-related events, road traffic accidents, violence-related events and animal accidents (1–9). Despite the various possible etiologic factors, many authors recognize that road accidents and interpersonal violence, are the most common causes of orofacial trauma (4, 10–16), while others refer to domestic accidents (falls, playing and household accidents, among others) as the main cause (1, 2, 7, 17, 18). Tanaka et al. (19) referred that sports and inter-personal violence are the third cause of maxillofacial fractures, comprising 15.5% of the patients studied; Brasileiro et al. (10) pointed assaults as the second cause of maxillofacial fractures, accounting for 22.6% of the events. Assaults were also referred by Adeyemo (20) as the second most common cause of maxillofacial injuries.

Conversely, in the United Arab Emirates (UAE), Al-Khateeb (3) referred that assault-related craniomaxillofacial injury constituted only 7% of cases. According to the author, this may be so because the majority of UAE population is foreigners, refraining from involvement in violence, and also to the strict regulations in force regarding the alcohol consumption. Some studies have, indeed, shown a high correlation between alcohol consumption and violence (21–23).

It is recognized that the main etiologic factor differs, varying with country, population group features, etc. Some relevant studies (1–4, 7, 10–18, 24–27) collected data in several countries, and it is known that the social and legal contexts can play an important role in injuries and their permanent consequences presentation (3).

In isolated dental trauma, it seems that acts of violence do not play such a big role. For instances, Gassner et al. (1) referred interpersonal violence as the forth cause of dental injuries. Caldas et al. (2) stated that violence was responsible for 8% of tooth injuries, being the third cause of trauma. In addition, many of these studies focus on dental injuries alone (1–3), excluding more severe injuries of the stomatognathic system, such as maxillofacial fractures (16). None of the studies found on literature refers to functional or situational consequences of orofacial trauma. In fact, long-term functional implications of injuries suffered are rarely pointed out. In the same manner, the situational implications (i.e., the life contexts that one changes because of the sustained injuries consequences) are not assessed. It must be pointed out that social consequences are included in the situational ones; but the latter are broader. These social consequence studies frequently include pathological characteristics and refer to the way one is judge by its peers.

For instances, Rodd et al. (28) sought to determine how children view other children with visible incisor trauma, attempting to assess how social judgment was made in these situations. Their findings suggested that negative social judgments may be made on the basis of poor dental appearance.

Feng XP et al. (29) also try to assess this characteristic, studying whether dental appearance affects

perceptions of personal characteristics and reached similar conclusions, concluding that dental appearance affected the judgments about some personal characteristics, and that dental appearance may, in fact, influence social interactions and contribute to social selection and the associations between health and socio-economic status.

In the same manner, Newton et al. (30) also tried to ascertain the influence of dental appearance upon subjective ratings of personal characteristics, specifically social competence, intellectual ability, and psychologic adjustment. They have reached identical results: subjects with less dental disease were seen as being more socially competent, to show greater intellectual achievement, and to have better psychologic adjustment.

Other investigators (31) address the emotional effect of tooth loss, exploring one's behavior toward these consequences; their conclusions pointed toward significant emotional effects of tooth loss in all groups.

Other studies referred to the economic burden of dental trauma: Persic et al. (32) refer to the cost of serious dental trauma (like an avulsion), stating that the estimated life-long cost for an avulsed tooth amounts up to €18 000.

However, with the exception of one investigation (33), we could not find any study exploring the impact of orofacial trauma resulting from violence, with simultaneous assessment of permanent consequences in the body (the organic component of injuries), in functions, and in life situations.

Considering that violence is an important etiologic factor of orofacial trauma in Portugal, it is now intended to investigate the permanent consequences of orofacial trauma among victims of interpersonal violence through a three-dimensional bodily harm assessment: organic, functional, and situational (i.e., life situations) (34).

Materials and methods

Violence-related event reports concerning forensic examinations performed in the North Branch of the National Institute of Legal Medicine in 2007 were analyzed ($n = 4460$). Of those, a selection was made considering the following inclusion criteria: (i) history of aggression, (ii) legal procedure in course which demands, according to the Portuguese law, a medico-legal report performed at the National Institute of Legal Medicine, (iii) final medico-legal report (i.e., when no positive evolution was expected from the injury, and their consequences were considered permanent) and (iv) reference to orofacial injuries in the report. All ages were included.

Table 1. Injury severity

Grade	Severity
0	No injury
1	Scratches, bruises ecchymoses, cuts – Mild severity
2	Skin lacerations, fractures, and others injuries that do not require open treatment – Medium severity
3	Injuries are not life-threatening, but require open treatment – Important severity
4	Injuries to high severity and potentially deadly – Very important severity

Table 2. Impact severity

Grade	Severity	
	Body	Functional and Situational
0	No impact	No difficulties
1	Mild impact (e.g. small, non-disfigurating scars)	Minimal difficulties (slowness, discomfort)
2	Medium impact (e.g. scars with embossing or retractable)	Medium difficulties (technical or medical aids)
3	Important impact (e.g. painful scars)	Important difficulties (partial human aid)
4	Very important impact (e.g., tissue avulsion)	Impossibility (total human aid)

Records were reviewed and analyzed according to the nature and consequences of orofacial injuries, age and gender distribution, employment status, and event characteristics by the first three authors.

To analyze orofacial injuries, the anatomic location and nature of the injury were identified; if the same area sustained more than one kind of injury, only the most severe was registered. Injuries' severity was assessed using the severity scale presented in Table 1. This scale is used, routinely, in the Portuguese medico-legal reports to assess injuries' severity.

These permanent consequences were assessed considering their organic, functional, and situational impact, using the 'Bodily Damage Assessment Inventory' (34) and its four-level scales (Table 2). The organic impact refers to the injuries permanent consequences in the body (e.g., scars, prosthetic devices, etc.), the functional impact to the functional consequences (e.g., cannot chew, cannot swallow, etc., and the situational to the consequences in a person's life situations (e.g., cannot eat in a restaurant, avoids intimate contact, etc.)

The findings were recorded in a database previously developed in a previous study (33).

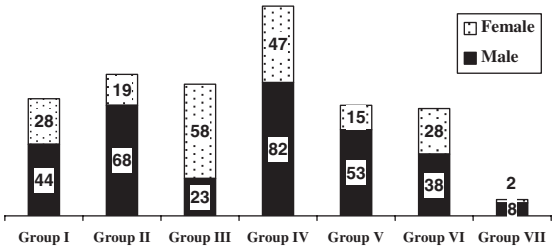
SPSS 11.5 software (SPSS Inc., Chicago, IL, USA) was used for the statistical analysis. Pearson's Chi-square (χ^2) test was used to compare qualitative data and determine statistical significance. The level of statistical significance was set at $P < 0.05$.

Results

During 2007, among 4460 reports of violence-related events, 513 (11.6%) referred orofacial trauma.

Age, gender ,and employment status

Most victims were men (61.6%), with a male: female ratio of 1.6:1, and their ages ranged from 2 to 91 years, with a mean age of 35.4 (SD = 15.1). The majority of victims were employed before injury (77.1%), and in about a quarter of the cases, the nature of employment was related to commercial activities. The second most frequent category of employment among victims was that of poorly defined jobs (e.g. between jobs, several employments) (Fig. 1).



Professional groups		Total (%)
I	Scientific, technical, artistic and similar activities	14.0
II	Industry, fishing, farming and hunting activities	17.0
III	Protection and security people; home work and house-keeping	15.8
IV	Linked to commercial activity	25.1
V	Students	13.3
VI	Unemployed, retired or on sick-leave	12.9
VII	Others	1.9

Fig. 1. Victim's employment (by sex).

Table 3. Main aggression mechanism

Means used	Victims number (%)
Punch	247 (48.1)
Kick	13 (2.5)
Punch and kick	151 (29.4)
Blunt force trauma	62 (12.1)
Knifes (or cutting instruments)	7 (1.4)
Firearms	2 (0.4)
Others	31 (6.1)

Event characteristics

We found several mechanisms of aggression, with the most frequent being the fist alone or in combination with kicking. Firearms were found to be responsible for 0.4% of total cases (Table 3). Of the events, 17.6% occurred in a familial context.

Injuries

The same person could present multiple injuries; therefore, there were a higher number of injuries ($n = 746$) than the number of people with injuries ($n = 513$). The lips and the orofacial soft tissues were the main injured areas: 57.7% of the victims sustained injuries in the lips, and 35.9% in other soft orofacial tissues. The jaws and the tongue were the least injured site, being that only 2.1% of the victims had injuries in the first and 0.2% in the later. The type of injury suffered depended on the injury location. Lacerations were the primary injury type observed in soft tissues (orofacial soft tissues, tongue, lips, and gingival and oral mucosa); the main injuries observed in the teeth area were fractures and luxations. The most serious injuries (bone fractures) were found in the jaw area.

Organic permanent consequences

Organic permanent consequences of orofacial injuries were present in 25.3% of the selected reports. As in the injuries, the same person could present multiple permanent consequences; therefore, the total number of organic permanent consequences was greater than the number of people with sequelae ($n = 155$). The areas presenting more permanent consequences were the teeth and periodontal tissues, and the most frequent permanent consequence was the tooth absence. The distribution, type, and severity of organic permanent consequences can be seen in Table 4.

Table 4. Distribution and type of body permanent consequences $n = 155$ (30.2%)

Area	% of victims	Type	*n*
Teeth and periodontal tissues	14.0	Absent tooth	27
		Prosthetic device	11
		Loss of structure	26
		Filling	8
Gingival and oral mucosa	3.9	Recession	4
		Scar	16
Jaws	0.6	Upper jaw disfiguration	2
		Upper and lower jaw disfiguration	1
Lips	7.4	Scar	38
Tongue	0	No sequelae	–
Other orofacial soft tissues	3.1	Scar	16
Nervous structures	0.2	Lower lip partial sensibility loss	1
TMJ	1.0	Mouth opening width diminish	5

TMJ, Temporo-mandibular joint.

Table 5. Distribution and type of functional permanent consequences $n = 55$ (10.8%)

Functions	% of victims	Type	*n*
Chewing	4.7	Difficulty and/or pain	21
		No chewing in left side	2
		No chewing in right side	1
Swallowing	0.2	Both liquid and solids	1
Talking	3.5	Difficulty	18
Pain existence	1.8	Mild pain	7
		Moderate pain	2
Changes in facial tonus and/or mobility	0.6	Bilateral	2
		Unilateral	1

Functional permanent consequences

The functional permanent consequences were present in 7.4% ($n = 38$) of the selected reports. Sometimes, several functions were impaired or diminished, with the total number of functional consequences equal to 55. The most common were chewing problems, which were described more frequently as chewing difficulties or painful chewing (Table 5).

Situational permanent consequences

Situational permanent consequences (life consequences) were present in 16.8% of cases ($n = 86$), and sometimes several situational impairments were referred by the same person, with the total number of situational consequences equal to 129. They were mainly related to social life and were found to be mostly mild – mild embarrassment in specific situations (Table 6).

Table 6. Distribution and type of situational permanent consequences $n = 129$ (79.2%)

Situations	% of victims	Type	*n*
Diet	5.5	Mild	24
		Moderate	4
Daily life	2.5	Mild	13
Professional life	1.2	Mild	4
		Moderate	2
Affectivity and social life	16.0	Mild	70
		Moderate	12

Table 7. Relationship between body and functional permanent consequences – *P* values (significant relationship in bold)

	Functions				
Body	Chewing	Swallowing	Phonation	Pain	Facial tonus and/or mobility
Anterior teeth	**0.008**	1.000	2.001	**<0.001**	**<0.001**
Posterior teeth	**<0.001**	1.000	0.499	0.998	1.000
Teeth	**<0.001**	0.862	**<0.001**	0.360	**0.049**
Gingival and oral mucosa	0.600	0.980	0.685	0.830	0.941
Jaws	0.604	0.963	0.501	0.209	0.107
Lips	0.440	0.076	0.150	0.488	0.212
Tongue	n.c[1]	n.c[1]	n.c[1]	n.c[1]	n.c[1]
Other orofacial soft tissues	0.953	0.998	0.965	0.982	0.994
Nervous structures	n.c[1]	n.c[1]	n.c[1]	n.c[1]	n.c[1]
TMJ	**<0.001**	0.990	0.164	**<0.001**	**0.029**

TMJ, Temporo-mandibular joint.
[1]No statistics computed because one variable is constant.

Table 8. Relationship between body and situational permanent consequences –*P* values (significant relationship in bold)

	Situations			
Body	Daily diet	Daily life	Professional activities	Social life
Anterior teeth	**<0.001**	**<0.001**	**<0.001**	**<0.001**
Posterior teeth	**<0.001**	0.265	**0.008**	**0.003**
Teeth	**<0.001**	**0.001**	**0.037**	**<0.001**
Gingival and oral mucosa	0.548	0.763	0.884	0.417
Jaws	0.722	0.391	0.204	**<0.001**
Lips	0.640	0.647	0.070	**<0.001**
Tongue	n.c[1]	n.c[1]	n.c[1]	n.c[1]
Other orofacial soft tissues	0.945	0.975	0.988	0.840
Nervous structures	n.c[1]	n.c[1]	n.c[1]	n.c[1]
TMJ	**<0.001**	**0.001**	**0.001**	**0.003**

TMJ, Temporo-mandibular joint.
[1]No statistics computed because one variable is constant.

Table 9. Relationship between situational and functional permanent consequences – *P* values (significant relationship in bold)

	Situations			
Functions	Diet	Daily life	Professional life	Social life
Chewing	**<0.001**	**<0.001**	**0.028**	**<0.001**
Swallowing	0.945	0.975	**0.012**	0.160
Phonation	**<0.001**	**<0.001**	**0.001**	**<0.001**
Pain	**<0.001**	**0.019**	**0.004**	**0.001**
Facial tonus and/or mobility	**<0.001**	**0.002**	**<0.001**	**0.004**

Relation among body, functional, and situational consequences

The relationship between body and functional permanent consequences can be observed in Table 7. Dental and periodontal permanent consequences were significantly associated with several functional consequences, namely chewing problems ($P < 0.001$), talking problems ($P < 0.001$), and tonus and/or mobility changes. However, it was found that the dental group involved was of the utmost importance; for instance, injuries concerning anterior teeth were strongly related with pain, chewing problems, and tonus and/or mobility changes; posterior teeth, on the other hand, were only significantly related with chewing problems.

Body permanent consequences also related with situational permanent consequences, as seen in Table 8. Dental and periodontal permanent consequences were also related with certain situational consequences, namely with changes in daily diet, daily life, professional activities, and social life, if anterior teeth were considered, and with changes in daily diet, professional activities, and social life, if posterior teeth were considered. When simultaneously considering the dental and periodontal permanent consequences, a significant relationship was found between these factors and changes in daily diet, daily life, professional activities, and social life.

Functional and situational permanent consequences were also related, because all function sequelae, except for swallowing, were significantly related with situational permanent consequences (Table 9).

Discussion

Orofacial damage occurring in violence related events in Porto, Portugal, are very accurately described in the present investigation. In fact, as stated before, in Portugal, in these situations, criminal prosecution requires a previous medico-legal assessment of the victim; in this investigation, all medical-legal reports concerning orofacial trauma in violence-related events in 2007 were analyzed. It is expected that only the most mild injuries, and therefore not resulting in any serious consequences, were, perhaps, excluded (or misrepresented), because they may not always lead to criminal prosecution.

This study found orofacial injuries to be more prevalent in men (1.6:1). This tendency agreed with various region of the world (1, 3, 7). However, it is clear that the obtained ratio is not as higher as in other countries (3, 12–14, 20, 24, 25, 35, 36), which may reflect differences in women participation in social activities, making them more (or less) prone to urban violence. In a

recent study, in Nigeria, Adeyemo et al. (20) also reported this tendency toward an equal male to female ratio; in the same region, Adebayo et al. (25), referred that women's facial injury increased from 8% to 18%; this study, however, refers to orofacial trauma regardless of the etiologic factor.

Regarding injuries' location, lip injuries were the most prevalent ones (57.5%), followed by those on orofacial soft tissues, with a prevalence of 35.9%. These data agree with those from other authors, although frequently these two areas are considered together: for instances, Zerfowski et Bremerich (37) referred to the soft tissue area (including lips) as the main site of injuries, affecting 68% of the patients studied.

The number of teeth and periodontal tissue injuries in this study contrast with others [17.5% in the current study compared with 42.8% or 50.8% (18, 23)]. However, previous studies focused on orofacial traumatic injuries regardless of their etiology, which is of the utmost importance.

Another difference was found in jaw area injuries prevalence: 2.1%, in this study, making this area the fifth most frequent site of orofacial injury. Epidemiological data in the literature refer to violence-related events as the second most frequent cause of maxillofacial fractures (25, 38), indicating the importance of this etiologic factor. Our data did not support these findings, perhaps because of different cultural contexts. In our study, firearm injuries represented only 0.4% of events; other authors such as Patrocínio et al. (12) found a much higher frequency of firearm injuries (13.1%) and a much higher incidence of mandibular fractures in instances of interpersonal violence (23.5%). But it must be noticed that this study was conducted in Brazil, a country with severe interpersonal violence issues (39).

Regarding functional and situational permanent consequences of orofacial trauma, it was found that chewing was the most troubled function (43.6%); another finding was that the vast majority of situational permanent consequences were related with discomfort in social interactions (83.6%). It was not possible to compare these results with literature, because most authors explore only the organic component of orofacial injuries. However, nowadays, it is recognized that orofacial trauma is very important to the victim's quality of life; thus, the 'reduction' of orofacial injuries to their organic component may be insufficient to understand all the consequences of the trauma, which will be important not only for its treatment and rehabilitation but also for the judicial procedures (for criminal or indenisation purposes).

Conclusions

The results of this study show that orofacial injuries are fairly common in violence-related events in Porto (11.6% of the cases of violence observed), affecting especially men with a mean age of 35.4 years, who are more prone to become involve in events concerning aggressions. These events frequently result in permanent consequences, which can be perceived at three different levels: body, functional, and life situations. Although there are no data in current literature concerning functional and situational permanent consequences of orofacial injuries, they are of the utmost importance, particularly in what concerns rehabilitation, criminal, or indenisation purposes.

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