MAXILLOFACIAL INJURIES ASSOCIATED WITH DOMESTIC VIOLENCE

Bach T Le, DDS, MD[i], Brett Ueeck, DMD[ii], Eric J Dierks, DMD, MD, FACS[iii], Louis D Homer, MD, PhD[iv], Bryce E Potter, DMD, MD, FACS[v]

[i] Former chief Resident, Department of Oral & Maxillofacial Surgery, Oregon Health Sciences University, Portland, Oregon; currently Assistant Professor, LAC-USC Medical Center, LA, California
[ii] Resident, Department of Oral & Maxillofacial Surgery, Oregon Health Sciences University, Portland, Oregon
[iii] Vice Chairman, Department of Oral & Maxillofacial Surgery, Oregon Health Sciences University, Portland, Oregon
[iv] Medical Director of Clinical Investigations & Biomedical Research, Legacy Health Systems, Portland, Oregon
[v] Clinical Professor, Department of Oral & Maxillofacial Surgery, Oregon Health Sciences University, Portland, Oregon

MAXILLOFACIAL INJURIES ASSOCIATED WITH DOMESTIC VIOLENCE

Purpose: **The purpose of this study is to report the incidence, causes, and patterns of maxillofacial injury associated with domestic violence.**

Patients & Methods: **A retrospective review of patients treated for domestic violence injuries at an inner-city hospital over a 5-year period was done and data were collected on type and location of injury, mechanism of injury, alcohol involvement and treatment.**

Results: **The sample consisted of 236 emergency room admissions. The majority (81%) of victims presented with maxillofacial injuries. The fist was a favorite tool for assaults (67%). The middle third of the face was most commonly involved (69%). Soft tissue injuries were the most common type of injury (61%). Facial fractures were present in 30% of victims. The average number of mandible fractures per patient was 1.32. The majority of facial fractures (40%) were nasal fractures. Left-sided facial injuries were more common than right-sided.**

Conclusions: **These data confirms that most victims of domestic violence sustain maxillofacial injuries. Midface injuries predominate. The preponderance of facial injuries makes it very likely that oral and maxillofacial surgeons will be involved in the care of these patients.**

MAXILLOFACIAL INJURIES ASSOCIATED WITH DOMESTIC VIOLENCE

Bach T Le, DDS, MD, Eric J Dierks, DMD, MD, FACS, Louis D Homer, MD, PhD, Bryce E Potter, DMD, MD, FACS

Introduction

Domestic violence afflicts millions of people each year. A woman has a greater than 1 in 5 chance of being injured during such violence.[1] In the United States, 2 to 4 million women are assaulted by their intimate partners annually and domestic violence is currently the most common cause of nonfatal injury in women.[2] Currently, 1 in 3 homicides in the United States are a direct result from domestic violence.[3]

Aside from the knowledge that most injuries resulting from domestic violence involve the face, there is little information about facial injury patterns that occur. This article attempts to identify the specific patterns of maxillofacial injuries that are commonly seen in such victims.

Patients and Methods

The records of 236 patients treated for domestic violence injuries between the beginning of January 1992 and the end of December 1996 at an inner city level I trauma hospital (Legacy Emanuel Hospital, Portland, Oregon) were retrospectively reviewed. Using the Emanuel ER Registry, information was requested on all women who gave a positive history of being intentionally injured by their spouse or sexual partner during this period. Data were collected on type and location of injury, mechanism of injury, alcohol involvement and treatment.

Injuries were recorded according to anatomic location as head, maxillofacial, neck, breast, chest, abdomen, back, buttocks, and extremities. These injuries were

classified as contusions and abrasions, lacerations, and fractures and dislocations. Facial injuries were classified according to location, type, lateralization (left versus right) and facial third. The data were analyzed and tested for statistical significance using descriptive statistics and the chi square test.

Results

The results are based on the records of 236 consecutive emergency room admissions for domestic violence. Mean patient age was 31.4 years, with a range between 15 and 71 years. All cases were females. One hundred and fifty-five (66%) had reported previous abuse. Thirty-four patients (14%) had injuries severe enough to require admission to the hospital. One patient died as a result of her injuries.

The majority (78%) of victims were single, separated, or divorced. One hundred and seventy-nine (76%) were unemployed. Alcohol was involved in 33% of the cases. One hundred and forty-two (60%) had a drug abuse history. Nine patients were pregnant at the time of assault.

The 236 women had a total of 257 contusions and abrasions, 70 lacerations, and 93 fractures and dislocations (Figure 1-3). The majority of injuries were located on the face. Eighty-one percent of victims presented with maxillofacial injuries. Fifty percent of the study population had an isolated maxillofacial injury as the only presenting trauma. The remaining cases (31%) had multiple presenting injuries while only 14% had an isolated non-maxillofacial injury (Figure 4).

Figure 5 shows the results for the types of facial injuries encountered. There were 236 patients but the numbers add up to more than 236 because some victims had more

than one injury recorded. Accordingly, the percentages total more than 100%. A "none" category was created to take into account patients with no facial injuries.

Soft tissue injuries in the form of contusions of the maxillofacial region were the most common types of injury (61%). Forty patients (17%) had facial lacerations serious enough to require repair. The middle third of the face was most commonly involved (69%), followed by upper third (13%), and lower third (19%) (Figure 6). Patients with facial injury locations that were not clearly specified were labeled "not specified."

Seventy patients (30%) sustained 85 facial fractures. The majority of facial fractures were nasal fractures (40%). One fracture (1.2%) involved the upper face only, 57 fractures (67%) involved the middle face only, and 27 fractures (32%) involved the lower face only. The one upper fracture was isolated. Midface fractures were isolated in thirty-nine of fifty-seven instances, but were present as 2 fractures in eight cases, and as 3 fracture in one case (Figure 7). The majority of middle third fractures sustained were also nasal fractures (68%).

The mandible fractures were a single fracture in 17 cases; there were double fractures in 2 cases, and as a 4 fractures in one case. The average number of fractures per patient was 1.32. It appears that multiple fractures were more often located in the midface (Figure 7). A likelihood ratio chi-square test of the hypothesis that multiple fractures were equally common in each region could not be rejected (chi-square = 2, 2 degrees of freedom, P value = .3). When the question was asked whether a fracture was just as likely to be located in one region as in another, each with a probability of one in three, the likelihood ratio test for this null hypothesis has a chi-square statistic of 77 with

2 degrees of freedom, P<0.000001, indicating that there is a predilection for the midface over the upper region.

The fractures were further classified as midline (34), right-sided (10), or left-sided (43) (Figure 8). Left-sided facial fractures were more common than right-sided fractures. Among the lateralized fractures, 43 of 53 (81%) were on the left, with an upper 95% confidence limit of 89%, and a lower 95% confidence limit of 70%. The null hypothesis that right-sided and left-sided fractures were equally likely was easily rejected using the binomial distribution, P<0.0001. Figure 9 shows the distribution of facial fractures among the 70 patients who sustained facial fractures. Because some patients had more than 1 fracture, the total percentage will totaled more than 100%.

Mechanism of Injuries

Injuries were inflicted by either blunt or penetrating forces or a combination of both. Multiple sources of trauma accounted for a total number of injuries greater than the 236 victims. The fist was a favorite method of assaults (67%) in this study population. A weapon was used to inflict injuries in 36 (15%). The majority of the weapons were blunt objects, such as bottles, sticks, and pipes. A knife was used in 8 cases. Twenty-two women were kicked and 8 women were choked. One woman suffered a gunshot wound. Figure 10 lists the frequency of the different mechanisms of injury in this study population.

Figure 11 shows the cross tabulation of mechanism of injury with location and type of injury. Again, this demonstrates the fist as the preferred mechanism of injury and the midface as the most frequent target.* No statistical evaluation was done of whether

* Because a visit may appear more than once in a row or column, the total number of entries exceeds the 236 cases whose records were reviewed. Also some visits had no entries in these categories,

the coincidence of the 2 factors was greater than might be expected by chance. The usual tests for chance assortment require that the categories being examined be mutually exclusive. It should be noted that with 45% in the LCM category and 68% in the fist category, a chance assortment would give 45 times 68 or 31%, which is not far from the 35% actually recorded.

Alcohol was consumed by the victims in 77 cases (33%) at the time of assault. Alcohol uses by the assailants were not available. When the use of alcohol was not documented it was assumed not to have been a factor. The association of alcohol with the mechanism of injury is shown in Figure 12. The percent of cases in which alcohol was a factor in these categories was not statistically different from the overall figure of 33%. Figure 13 shows a similar association between injury categories and alcohol as a factor. Again no percentages were very different from the overall percentage of 33%

Of the 77 patients in which alcohol was involved, 62 (81%) had a total of 78 injuries related to the maxillofacial region. Twenty (30%) of these patients had a total of 25 facial fractures and 15 (19%) patients had no maxillofacial injury.

Sixty-six percent of the 236 patients required only minor treatment and were released. The remaining 34% received treatment, which required a procedure. Thirty-one patients (14%) had injuries severe enough to require admission to the hospital.

Eighty-one percent of the patients had maxillofacial injuries as a component of their injury. Those patients with more serious maxillofacial injuries were referred to the OMFS service for further evaluation and treatment. Of the midface fractures, 76% did not require treatment. When a procedure was undertaken, 60% were open procedures, while

---

meaning no maxillofacial injuries were recorded, and this is noted in the rows and columns labeled "NONE".

40% were treated closed. Of the mandible fractures, 18.4% were not treated. When the mandible fractures were treated, 71.4% were treated by an open procedure, and 28.6% were treated as a closed procedure. Of the 70 patients who sustained facial fractures, 24.2% were treated in the operating room, whether it was an open or closed procedure.

The majority of untreated facial fractures were nasal fractures that were minimally displaced. Most of these patients were followed on an outpatient basis and may have required surgery at a later time. These data do not reflect the follow-up treatment of these patients.

The majority of patients (86%) were discharged to home after the emergency department rendered medical services. The 34 patients admitted to the hospital had a length of stay (LOS) totaling 126 days (average LOS of 3.7 days per patient; 1 patient had a 50 days LOS). In the majority of these patients (85%), the primary reason for admission was related to the treatment of OMFS injuries, mainly maxillofacial fractures (zygoma and mandible fractures). Most patients (68%) were admitted to the OMFS service, while 8 were admitted to the Trauma service, 2 to the Obstetric-Gynecologic service, and 1 to the General Medicine service. One patient died from her injuries and 1 patient became a quadriplegic as a result of her injury.

Discussion

This is a retrospective study of 236 consecutive emergency room visits of patients who sustained injuries as a result of domestic violence. The patients included in this study were obtained from the LEHHC Patient Registry. Data for this registry, started in 1983, is collected at multiple points of entry. The data are entered and E-coded based on

the nature of the disease, mechanism of injury, trauma, etc. Only those patients designated through an E code as injured by interpersonal violence by a sexual partner were included.

The limitations of a retrospective study include recall bias and misclassification of study variables. Furthermore, the assessment based on chart review may under estimate the problem of drug and alcohol abuse, because these variables could only be included if they were clearly documented. Fortunately, the LEHHC patient registry has detailed and accurate records of most of the variables that were scrutinized. The ER physicians or RNs complete data input, rather than it being entered by a coding technician who has never seen the patient. In addition, the data entered is double-checked by computer verification software,* which completes up to 100 routine data checks looking for contradictions. The registry coordinator is responsible for the database, and completes the final verification in this process.

This study showed that most women victims of domestic violence sustain a high number of maxillofacial injuries, supporting the study hypothesis. The upper limb was also a common site of injury. This may reflect the tendency of victims to defend themselves with their hands during the assault.

The pattern of facial injuries was similar to that in other studies on assault victims.[4],[5],[6],[7] Some explanations for this include preference and accessibility of the face as a target for assailants. The proportion of fractures of the middle face, mainly nasal fractures, was considerably high. This was due to the prominent projection of the nose from the face and to the fact that it takes less force to fracture the nasal bones than other

---

 Six patients left the hospital against medical advice before treatment could be rendered.

* Collector Digital Innovation Inc., Belair, Maryland.

facial bones. The left zygomatic region was the second most commonly fractured facial bone. This probably reflects the fact that the most common mechanism of injury was the fist and that over 90% of the population is right-handed.[8] Furthermore, Grinkler and Saks suggest that hemispheric cerebral dominance leads the victim to turn to the right in a reflexive manner to avoid being punched, thus presenting the left side of the face to the assailant.[9]

The average number of facial fractures per patient was 1.21. Larger series of facial fracture have found higher numbers of fractures per patient, from 1.6 to 1.8.[10,11] The lower average number of fractures per patient could be explained by the fact that the mechanism of injury in this study population was predominantly assault, primarily the fist. Other studies reporting facial fracture patterns include multiple etiologies, such as from motor vehicle accidents, that tends to cause a greater number of fractures per patient due to a higher force of impact. In this series, midface fractures were more common than mandible fractures, whether nasal fractures are counted or excluded. Fractures of the condylar process showed the highest incidence of all mandibular fractures. This was in contrast to other series in which a predominance of fractures of the body of the mandible is reported. This difference may have been due to the small number of mandible fractures in this study.

The use of alcohol and/or illicit drugs has been a controversial topic in domestic violence. Some clinicians believe that they are causative in both violent acts and victimization, while others feel that alcohol and drug abuse by the victims may be a consequence of the violence.[12,13,14,15,16] There is no question that there is an association. Alcohol was found to be associated with at least one third of the assaults and over half of

our study group had a history of illicit drug use. Again, in a retrospective study, this is an under assessment. It is suspected that many more of the patients were under the influence of alcohol at the time of abuse. McDade et al., in a prospective study of patients with facial fractures, found that half of them showed some degree of alcohol dependence and that 60% of them sustained fractures as a result of an assault.[17]

Clearly there is evidence of increased mortality and morbidity in patients who abuse alcohol and present with facial injuries.[18] It is important to note this association with alcohol and drug abuse because it has important implications in the immediate management of the patient.

Although it was thought that the patterns of injury would be more severe with he introduction of alcohol, no relationship was noted. These findings are different from those of Hutchison et al., who found in their prospective study of a large number of patients with facial injuries that alcohol consumption was associated with more serious facial injuries.[19]

Domestic violence is a source of considerable morbidity. The spectrum of injuries in our patients was broad. The majority of patients were treated for minor contusions and abrasions. Many victims required repair of lacerations (primarily on the face) and casting of broken and dislocated bones. Others required admission to the hospital for treatment of more serious injuries. When considering the fact that many of these patients repeatedly access the health-care system before they are finally identified, it is important to recognize such victims early, before the escalating violence leads to more severe injuries or death. Asking directly about violence as a cause or contributing factor to a woman's injuries may save time, money, and the patient.

Although family physicians, obstetricians, and emergency physicians are sometimes considered the most likely to see battered women, oral and maxillofacial surgeons are more likely to see these patients because of the severe facial injuries. Of the patients who required hospital admissions, the majority was admitted to the Oral and Maxillofacial Surgery service at Legacy Emanuel Hospital for treatment of their facial injuries.

The preponderance of facial injuries in this study makes it very likely that the oral and maxillofacial surgeon will be involved in the care of these patients. It is therefore important that we as oral and maxillofacial surgeons be cognizant to the broad social implication of domestic violence. Appropriate referrals are mandatory in the overall care of these patients. The proper identification and referral of victims will be greatly expedited if clinicians become more aware of the prevalence of domestic violence and more alert to its risks factors.

FIGURES

Fig. 1 Distribution of contusions and abrasions

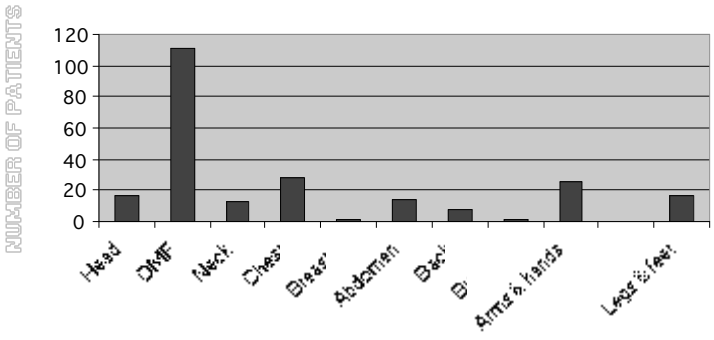


Fig. 2 Distribution of lacerations

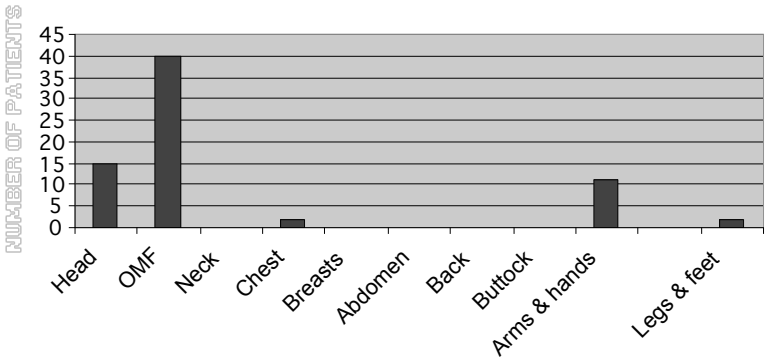


Fig. 3 Distribution of fractures and dislocations

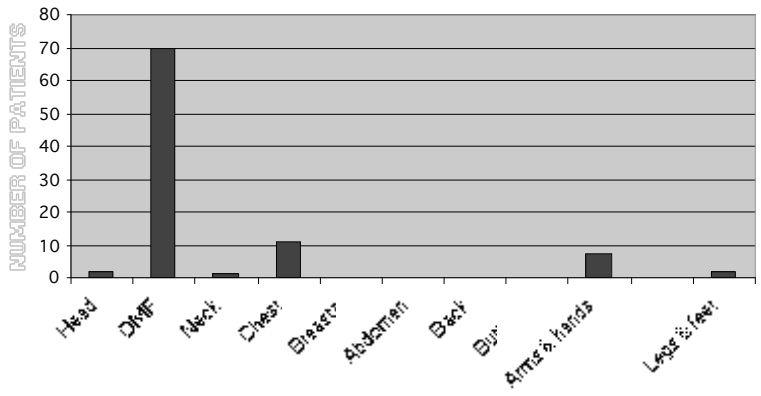


Fig. 4 Distribution of Injuries

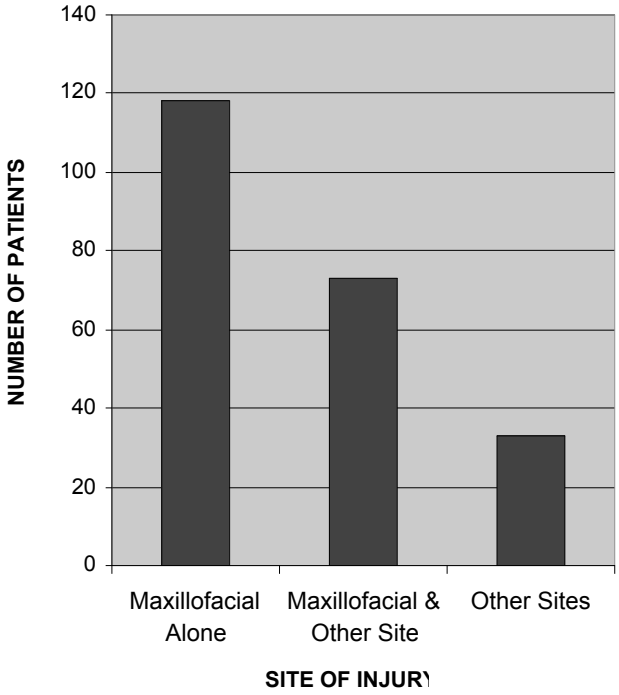
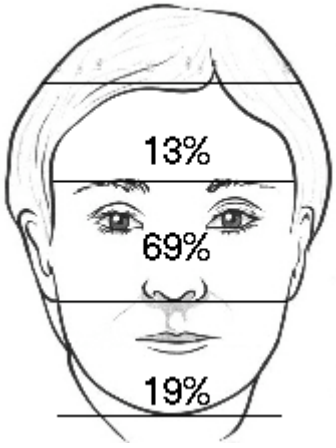


Fig. 5 Distribution of Facial Injuries

	Fracture Upper Face	Fracture Midface	Fracture Lower Face	L/C Upper Face	L/C Midface	L/C Lower Face	NONE / NOT SPECIFIED
Count	1.00	57.00	27.00	30.00	105.00	17.00	46.00
Percent	0.42	24.15	11.44	12.71	44.49	7.20	19.49

L = Laceration C = Contusion

Fig. 6 Distribution of Facial Injuries in Facial Thirds*



* Percentage will total to more than 100% because some women had injuries in more than 1 location.

Fig. 7 Distribution of facial fractures

Areas Fractured	**No. of Fractures**
Upper face only	1
Middle face (total = 57)	
- Isolated midface	39
- 2 fractures of midface	8
- 3 fractures of midface	1
Lower face (total = 25)	
- Isolated mandible	17
- 2 fractures of mandible	2
- 3 fractures of mandible	0
- 4 fractures of mandible	4
Upper face and middle face	0
Middle face and lower face	3
Upper face and lower face	0
All regions	0

Fig. 8 Maxillofacial Skeletal Fracture Distribution

Fracture Types	Subtype	Right side	Left side	Frequency fractures
Temporal[i] (n=2)		1	1	2
Orbit (n=16)	Rims		1	1
	Blow out	3	12	15
Nasal (n=28)				28 (midline)
Maxilla (n=0)	Le Fort I			0
	Le Fort II			0
	Le Fort III			0
Zygoma (n=14)	Body/complex		12	12
	Arch	1	2	3
Mandible (n=25)	Condyle	4	4	8
	Coronoid			0
	Ramus		1	1
	Body		3	3
	Angle	1	6	7
	Symphysis / parasymphysis			4 (midline)
	Alveolar			2 (midline)

[i] Two women sustained temporal bone fractures from blunt injuries with weapons

Fig. 10 Mechanism of injury during abuse

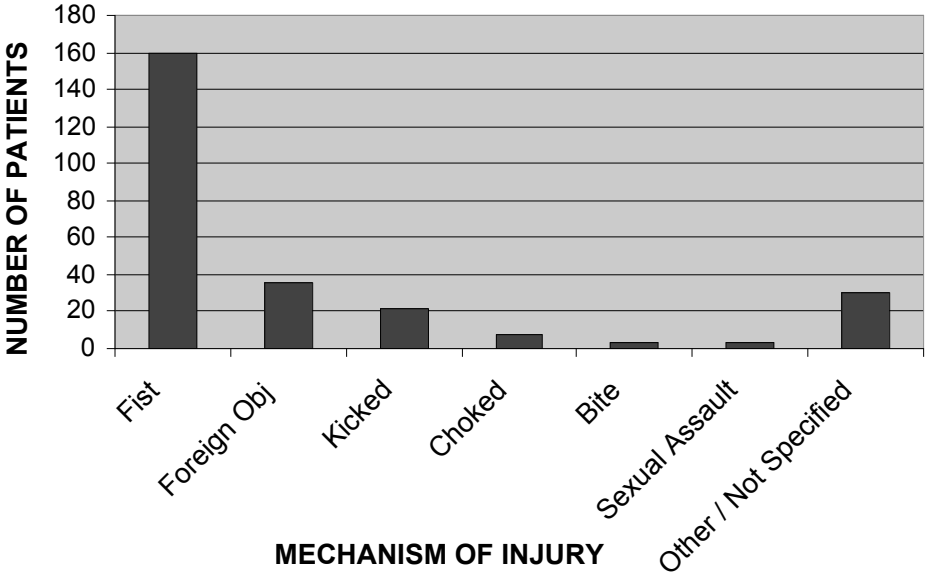


Fig. 11 Cross tabulation of Mechanism of Injury Vs. Location & Type of Injury

Mechanism of Injury	Fracture Upper Face	Fracture Midface	Fracture Lower Face	C/L Upper Face	C/L Midface	C/L Lower Face	None / Not Specified
Sexual Assault	0	0	.42	0	.4	0.4	.85
Fist	0	20	9.3	6.8	35.2	6	5.9
Bite	0	0	0	0	.85	0	.42
Foreign Object	.4	3.4	.85	3.4	6.4	.4	4.2
Kicked	0	1.3	0	.85	4.7	.85	3
Choked	0	0	0	.85	1.7	0.4	.85
Other / Not Specified	0	0	.85	2.1	2.5	.85	5.9

L = Laceration C = Contusion

Fig. 12 Association of alcohol with mechanism of injury

	Sexual Assault	Fist	Bite	Weapon	Kick	Choke	None / Not specified
Count	3	160	3	36	22	8	30
Alcohol present	0%	31.3%	0%	44%	32%	13%	30%

Fig. 13 Nature of facial injury and alcohol

	Facial fractures	Facial lacerations & contusions	None / Not specified
Count	85	152	46.00
Alcohol present	33%	38%	37%

REFERENCES

[1] Wilt S, Olson S. Prevalence of domestic violence in the United States. J Am Med Womens Assoc 1996; 51:77-82.

[2] Grisso JA, Wishner AR, Schwartz DF, Weene BA, Holmes JH, Sutton RL. A population-based study of injuries in inner-city women. Am J Epidemiol 1991; 134:59-68.

[3] Kellermann AL, Mercy JA. Men, women, and murder: gender-specific differences in rates of fatal violence and victimization. J Trauma 1992; 33:1-5.

[4] Andersson L, Hultin M, Nordenram A, Ramstrom G. Jaw fractures in the County of Stockholm. International Journal of Oral Surgery 1984; 13:194.

[5] Hill CM, Crosher RF, Carroll MJ, Mason DA. Facial fractures: the results of a prospective four-year study. Journal of Maxillofacial Surgery 1984; 12:267.

[6] McLennan WD. Fractures of the malar (zygomatic) bone. Journal of the Royal College of Surgeons of Edinburgh 1977; 22:187.

[7] Voss R. Changing etiologic pattern of jaw fractures. Maxillofacial Trauma: An International Perspective 1983. Jacobs, J.R. (Ed.). New York: Praeger.

[8] Dejong, NR. The Neurologic Examination (2nd edition). Pitman Medical Publishing Co. Ltd. 1958.

[9] Grinker RR, Saks AL. The cerebrum – cerebral hemishpheres. In Neurology (6th edition). Springfield: Charles C. Thomas.

[10] Van Hoof RF, Merkx CA, Stekelenburg C. The different patterns of fractures of the facial skeleton in four European countries. Int Journal of Oral Surg 1977; 6: 3-11.

[11] Hagan EH, Huelke DF. An analysis of 319 case reports of mandibular fractures. Journal of Oral Surgery 1961;19:23.

[12] Lindman R, von der Pahlen B, Ost B, Eriksson CJP. Serum testosterone, cortisol, glucose, and ethanol in males arrested for spouse abuse. Aggressive Behavior 1992; 18:393-400.

[13] Hotaling GT, Sugarman DB. An analysis of risk markers in husband to wife violence: the current state of knowledge. Violence Vict 1986; 1:101-24.

[14] Gustafson R. Alcohol and aggression: a replication study controlling for potential confounding variables. Aggressive Behavior 1992; 18:21-28.

[15] Gantner AB, Taylor SP. Human physical aggression as afunction of alcohol and threat of harm. Aggressive Behavior 1992; 18: 29-36.

[16] Cloninger CR. Neurogenetic adaptive mechanisms in alcoholism. Science 1987; 236: 410-6.

[17] McDade DM, McNicol RD, Ward-Booth P, Chesworth J, Moos KF. The aetiology of maxillo-facial injuries, with special reference to the abuse of alcohol. International Journal of Oral Surgery 1982; 11: 152-155.

[18] McInnes GP, Young R E, Areny B S. Cardiac arrest following chlormethiazole infusion in chronic alcoholics. Post Grad. Med. Journal 1980; 50: 724-743.

[19] Hutchison IL, Magennis P, Shepherd JP, Brown AE. The BAOMS United Kingdom Survey of Facial Injuries Part 1: Aetiology and the Association with alcohol consumption 1998; 36:3-13.