

Original article

Injury severity in patients with facial fractures and concomitant injuries

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Abstract – Introduction: Facial fractures in combination with other serious injuries occur in a significant proportion of trauma patients. The objective of this study was to evaluate injury severity and its determinants in facial fracture patients presenting with associated injuries. **Patient and Methods:** a retrospective study was carried out in 110 patients, in a university hospital in Burkina Faso. **Results:** Two-wheel motor vehicle collisions were by far the main aetiology. Cranial injuries and limb fractures were the most common associated injuries. The injury severity score (ISS) ranged between 5 and 75 (mean 11.1, SD 8.3). Severe injury, defined as ISS above 15, was recorded in 13.6% of the patients. Death was recorded in two patients, giving a mortality rate of 1.8%. There was a statistically significant association between the ISS and multiple facial fractures ($p = 0.001$). **Discussion:** Given the retrospective character and the limited sample size of this study, the IS and its determinants could have been underestimated. However this work provides knowledge on the IS in patients presenting with facial fractures and concomitant injuries, in Burkina Faso. The findings of this study indicate the need for special attention in patients presenting with multiple facial fractures in the emergency room.

Mots clés :

face / fracture /
traumatisme /
lésion associée /
score de sévérité
du traumatisme

Résumé – La sévérité du traumatisme chez les patients présentant des fractures faciales et des lésions associées. Introduction : L'association de fractures faciales à d'autres lésions graves est une observation courante chez les patients victimes de traumatisme. **Patients et Méthodes :** Pour évaluer la sévérité du traumatisme et ses déterminants chez des patients présentant des fractures faciales et des lésions associées, une étude rétrospective a été réalisée chez 110 sujets dans un hôpital universitaire au Burkina Faso. **Résultats :** Les accidents de véhicules à moteur à deux roues étaient de loin l'étiologie la plus fréquente. Les traumatismes crânio-encéphaliques et les fractures des membres étaient les lésions associées les plus fréquentes. Le score de sévérité du traumatisme (SST) était compris entre 5 et 75 (moyenne 11,1 ; DS 8,3). Un traumatisme sévère, défini par un SST supérieur à 15, était observé chez 13,6 % des patients. Le décès était noté chez 2 patients, soit un taux de mortalité de 1,8 %. Une association statistiquement significative était notée entre la sévérité du traumatisme et le nombre des fractures faciales ($p = 0,001$). **Discussion :** Les résultats de cette étude indiquent la nécessité d'accorder une attention particulière aux patients présentant des fractures faciales multiples en salle d'urgence.

Introduction

Facial fractures in combination with other serious injuries such as cranial, orthopaedic, and cervical spine injuries occur in a substantial proportion of patients, mostly as the result of trauma with high velocity [1]. There is a wide variation of injury severity (IS) in these patients and mortality rates reaching up to 21% are reported [1]. IS evaluation is useful for triage in the emergency room, and to establish a treatment plan and a

prognosis [2,3]. Reports on the severity of facial trauma occurring in patients from developing countries, particularly from Africa are scarce. The aim of this study was to evaluate IS and its determinants in patients presenting with facial fractures and associated injuries (AIs), in a university hospital in Burkina Faso. Such knowledge will be helpful to guide the appropriate management of facial trauma patients in emergency departments.

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Patients and methods

A retrospective study was carried out between 2001 and 2010 on the IS of patients presenting with facial fractures and AIs, at CHU Sourou Sanou, a referral university hospital in Burkina Faso. Any patient having a facial fracture in combination with at least one AI was included in this study. Data were collected from patients' medical records.

AI was defined as any extra-facial injury excluding brain concussion and wounds, i.e. intracranial, vascular, thoracic or abdominal organ injuries, and fractures other than those of the face.

The injury severity was calculated using the injury severity score (ISS) described by Baker *et al.* [2]: the ISS is the sum of the squares of the three highest abbreviated injury scale (AIS) scores, the maximum being 75. The AIS score defines the injury severity of a body region, from 1 (minor) to 6 (fatal). In each body region, only the highest AIS score is used. A severe injury was defined greater than 15, in a similar way than the study of Smith *et al.* i.e. ISS [4].

The collected data included the patient's age and gender, the trauma aetiology, the site of the facial fracture, the type and the site of the AI, and the ISS. The diagnosis of facial fracture and AIs was based on clinical and radiological findings.

The chi-square test was used for comparing proportions and the *t*-test was used for means comparison; the difference was significant when the *p*-value was <0.05.

The study did not require ethical approval to perform this study, according to the Institutional Review Board standards of Sourou Sanou University Hospital.

Results

Patient characteristics, fracture aetiology and site

A total of 110 patients have been included. The age, gender, fracture aetiology and site of the patients are detailed in Table I. Patient's age ranged from 2 to 75 years (mean, 32.5 years). The incidence peak of patients (51.8%) was observed from 20 to 39 years. There was a male predominance with a male to female ratio of 9:1. The leading aetiology was by far road traffic accidents characterized mostly by two-wheel motor vehicle collisions. In the 110 patients, a total of 132 AIs were recorded, with cranial injuries and limb fractures, being by far the most common.

IS and its related-factors

ISS according to age, gender, and fracture aetiology and site is described in Table II. The ISS ranged between 5 and 75 (mean 11.1, SD 8.3). Severe injuries (ISS above 15) were recorded in 13.6% of patients. Death was recorded in two

patients, giving a mortality rate of 1.8% in our study. Of these, one died of pulmonary injury and the other from complications of neurologic injury that appeared after his discharge from hospital.

There was no statistically significant association between the ISS and age ($p = 0.9$) or gender ($p = 0.8$). Concerning the facial fracture aetiology, the ISS was higher even though this was not statistically significant ($p = 0.1$). There was a statistically significant association between the ISS and multiple facial fractures ($p = 0.001$). When the fracture involved one facial bone, there was no statistically significant association between the ISS and the fracture site ($p = 0.5$).

Discussion

Injury severity measurement is necessary in facial fracture patients who present with concomitant injuries for treatment and prognosis. This scoring may be based on anatomical or physiologic parameters [3]. The ISS, a numerical description of the overall severity of anatomic injury in patients presenting with injury to more than one body region correlates linearly with patient mortality, morbidity, and hospital stay duration [2]. Most of studies dealing with the severity of facial fractures and their associated injuries are focused on severely injured patients [1,5,6]. In these studies where severe injuries are defined as that with ISS above 12 [5,6] or even 15 [1, 4], severity scores ranging from 12 to 75 and mortality rate reaching up to 21%, are reported [1,5]. The mortality rate of 1.8% and the rate of severe injury of 13.6% in the present series could be explained by the study design dealing with all the degrees of injury severity. These rates could, however, be underestimated as most severely injured patients die prior to any accurate assessment of their injuries, because of the under-equipped medical setting in this department. Moreover, any error in AIS scoring will result in an alteration of the ISS, as the ISS calculation is based on the AIS [2]. Patients and injuries characteristics in this study are close to those classically reported in the literature. The age and gender (young males) predominance and the leading rank of road traffic accidents involving two-wheel motor vehicles are reported in series from developing countries [7,8]. The first rank of cranial trauma and limb fractures as facial fracture concomitant injuries are reported in most studies [6,7,9,10,11]. Absence of correlation between the injury severity and age or gender in this study could suggest similar violence of trauma in the compared groups, despite differences of occurrence risk. Absence of correlation between the injury severity and the aetiology of the trauma is however unexpected as the prevalence of injuries varies with the velocity and the body distribution of the trauma [10]. Above all, it was observed that injury severity was higher in interpersonal violence than in road traffic accidents, and even if it was not statistically significant, this is an unexpected result. In motor vehicles collisions, large amounts of energy are distributed to

Table I. Patient distribution according to age, gender, and fracture aetiology and site.*Tableau I. Distribution des patients selon l'âge, le sexe et l'étiologie ainsi que le siège de la fracture.*

	n	%
Gender		
Male	99	90
Female	11	10
Age		
0 – 19 years	20	18.2
20 – 39 years	57	51.8
≥ 40 years	33	30
Aetiology of facial fracture		
Road traffic accident	87	79.1
Violence	13	11.8
Falls	7	6.4
Other	3	2.7
Site of facial fracture		
Mandible	79	71.8
Zygomatic complex	41	37.3
Le fort fracture	30	27.3
Nasofrontoorbital Ethmoid complex	5	4.5
Type of AI		
Cranial injury	60	54.5
Limb fracture	55	50
Chest trauma	11	10
Spine injury	3	2.7
Eye ball rupture	3	2.7

the body whereas in assault, the forces are targeted to a limited part of the body [5,10]. Comparing interpersonal violence and motor vehicle accidents in maxillofacial fractures, Lee et al. have described a statistically significant association between motor vehicle accidents and a need for active intervention as well as hospitalization [12]. In 38 patients with panfacial fractures, Follmar et al. have reported concomitant injuries in 70% of the 23 victims of motor vehicle collision whilst no patient in the 5 victims of assaults had concomitant injuries [10]. The contrasting findings in the present series are likely due to the characteristics of road traffic accidents and interpersonal violence in this study setting. Concerning the collisions occurring in two-wheel motor vehicles, which represent the most common mechanism of road traffic accidents in this series, velocity is low compared to that observed in motor vehicle collisions in other reports. Additionally, assaults by multiple persons as well as gunshots are common forms of interpersonal violence in this study setting.

Significant correlation between the number of facial fractures and the injury severity is intuitively logical as trauma involving sufficient energy to fracture multiple bones of the face is also likely to cause injuries in other parts of the body, and thus to increase global injury severity.

Given the retrospective character and the limited sample size of this study, the IS and its determinants could have been underestimated. However this work provides knowledge on the IS in patients presenting with facial fractures and concomitant injuries, in Burkina Faso.

Conclusion

Injury Severity in the patients of this study ranges from moderate to severe. Patients presenting with multiple facial fractures are more at risk of severe injury score. Patients with such fracture patterns deserve special attention in the emergency room.

Table II. ISS according to age, gender, and fracture aetiology and site.
Tableau II. SST selon l'âge, le sexe et l'étiologie ainsi que le siège de la fracture.

	Mean ISS (S.D)	p
Gender		
Male	10.6 (5.8)	0.8
Female	10.2 (3.9)	
Age		
0 – 19 years	10.5 (5)	0.9
20 – 39 years	10.4 (5.6)	
> 40 years	10.7 (5.9)	
Aetiology of facial fracture		
Road traffic accident	10.4 (5)	0.1
Violence	13.4 (8.9)	
Falls	8.9 (4.6)	
Other	5 (0)	
Number of facial bones		
One facial bone	9.4 (4.8)	0.001
Multiple facial bones	13 (6.4)	
Type of facial bone		
Mandible	9.7 (5.1)	0.5
Zygomatic complex	8.2 (4.4)	
Le Fort fracture	9.5 (2.7)	

Conflicts of interests: none declared.

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