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Epidemiological and Computed Tomography Aspects of Facial Trauma at Kira Hospital in Bujumbura

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Abstract

Background: Maxillofacial trauma affects young adults more. The injury assessment is difficult to establish in low-income countries because of the imaging means, particularly the scanner, which is poorly available and less financially accessible. The aim of this study is to describe the epidemiological profile and the various tomodensitometric aspects of traumatic lesions of the face in patients received in the Radiology department of Kira Hospital. **Patients and methods:** This is a descriptive retrospective study involving 104 patients of all ages over a period of 2 years from December 2018 to November 2019 in the medical imaging department of KIRA HOSPITAL. We included in our study any patient having undergone a CT scan of the head and presenting at least one lesion of the facial mass, whether associated with other cranioencephalic lesions. **Results:** Among the 384 patients received for head trauma, 104 patients (27.1% of cases) presented facial damage. The average age of our patients was 32.02 years with extremes of 8 months and 79 years. In our study, 87 of the patients (83.6%) were male. The road accident was the circumstance in which facial trauma occurred in 79 patients (76% of cases). These injuries were accompanied by at least one bone fracture in 97 patients (93.3%). Patients with fractures of more than 3 facial bones accounted for 40.2% of cases and those with fractures of 2 to 3 bones accounted for 44.6% of cases. The midface was the site of the fracture in 85 patients (87.6% of cases). Orbital wall fractures were noted in 57 patients (58.8% of cases) and the jawbone was the site of a fracture in 50 patients (51.5% of cases). In the vault, the fractures involved the extra-facial frontal bone (36.1% of cases) and temporal

bone (18.6% of cases). Cerebral contusion was noted in 41.2% of patients and pneumoencephaly in 15.5% of patients. Extradural hematoma was present in 16 patients and subdural hematoma affected 13 patients. **Conclusion:** Computed tomography is a diagnostic tool of choice in facial trauma patients. Most of these young patients present with multiple fractures localizing to the mid-level of the face with concomitant involvement of the brain.

Keywords

Road Accident, CT-Scan, Facial Trauma

1. Introduction

Facial trauma is defined as any injury of a traumatic nature affecting the anterior part of the cephalic end limited at the top by a plane passing through the base of the skull, and at the bottom by a horizontal line passing through the hyoid bone [1].

Facial traumatic lesions are of several types and can involve either the bone skeleton, the soft tissues, the vasculo-nervous bundles, and the glandular system at the same time or in isolation. They frequently occur in the context of road accidents [2] [3]. They can be variably associated with extra-facial lesions including head, spine, thoracic, abdominal, and pelvic trauma which must be found because some of them are life-threatening [2] [4].

Computed tomography is one imaging method of choice. The lesions are searched for using different multiplanar and volume reconstructions to be able to establish an exhaustive lesional assessment [2]. Computed tomography contributes a lot to the management of trauma to the face by allowing the surgeon to recognize lesions with a risk either vital or functional or both at the same time. Analysis of the lesions must then be done beyond the facial mass. The brain and cervical spine should be analysed carefully as they may be the site of life-threatening lesions [5].

However, there are only three hospitals that have CT scanning machines for the overall population of Burundi of around 12 million inhabitants. Conversely, there is an increase in the number of cases of trauma, including those involving the facial area due to road accidents.

Our study aims to describe the epidemiological profile and the different tomodensitometric aspects of traumatic lesions of the face in patients received in the Radiology department of Kira Hospital.

2. Patients and Methods

This is a descriptive retrospective study of 104 patients of all ages over a 2-year period from December 2018 to November 2019 in the Medical Imaging Department of KIRA HOSPITAL, one of the three hospitals with a CT scanner.

We included in our study any patient who underwent a CT scan of the brain

and/or the facial tissue for trauma and presenting at least one lesion of the facial tissue associated or not with other cranioencephalic injuries.

The data was collected using a previously established survey sheet. The data analysed included the socio-demographic characteristics (age, sex), the circumstances of occurrence and the various tomodensitometric aspects of trauma to the facial mass: location and feature of lesion, associated lesion). The processing and analysis of this data was carried out using Epi Info software version 7.2.2.6 and Windows 10.

3. Results

During the period of our study, out of 384 patients had been seen for head trauma in the medical imaging department of Kira Hospital, 104 patients (27.1% of cases) presented with facial involvement. The main socio-demographic characteristics are summarized in Table 1. The most affected age group was 31 to 45 years old (44 patients or 42.3% of cases) followed by 15 to 30 years (31 patients or 29.8% of cases). The average age of our patients was 32.02 years with extremes of 8 months and 79 years. In our study, 87 of the patients (83.7%) were male, for a sex ratio of 5.1.

The road accident was the circumstance in which facial trauma occurred in 79 patients (76% of cases). The 104 patients, in our series, presented tissue lesions in the head and among them, 43 patients (41.3% of cases) had a wound on the face and oedema, or bruising was noted in 92patients (88.5%). These traumas were accompanied by at least one bone fracture in 97 patients (93.3%) and all 7 patients (6.7%) had lesions limited only to the soft tissues. Patients with fractures of more than 3 facial bones accounted for 40.2% of cases (Figure 1) and those with fractures of 2 to 3 bones represented 44.6% of cases.

The midface was the site of the fracture in 85 patients (87.6% of cases); the upper floor had a fracture in 53 patients (54.6% of cases) and the lower floor had a fracture in 18 patients (18.6% of cases). The fractures concerned all the bones of the face as shown in the following table:

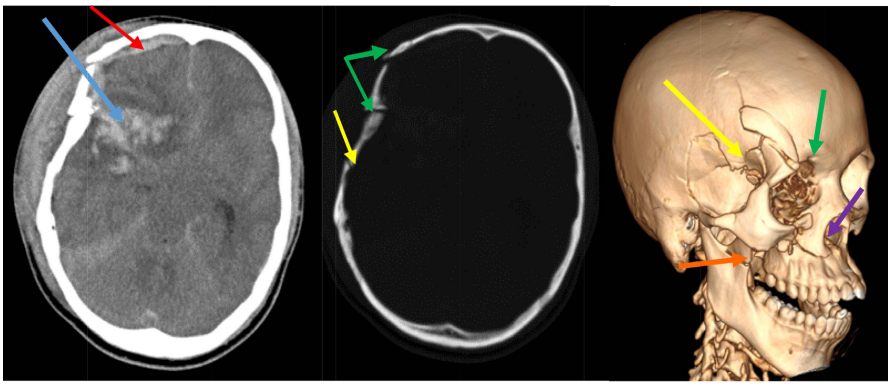
Bone fracture of the face	Number (N = 97)	Percent (%)
Orbital wall	57	58.8
Maxillary bone	50	51.5
Frontal bone	48	49.5
Zygomatic arch	45	46.4
Clean nose bones	26	26.8
Ethmoid	23	23.7
Mandible	18	18.6

3.1. Distribution of Patients by Facial Bone with Fracture

Orbital wall fractures were noted in 57 patients (58.8% of cases) with the frontal sinus wall affected in 49 patients (50.5% of cases) and were accompanied by

Table 1. Distribution of patients according to their socio-demographic characteristics.

	Number (N = 104)	Percentage (%)
	Age range (year)	
<15	15	14.66
16 - 30	32	30.76
31- 45	44	42.30
46 - 60	4	4
61 - 75	6	5.33
>76	3	2.66
	sex	
Female	17	16.3
Male	87	83.7
	Residence	
Bujumbura the capital of the country	53	50.66
Interiorurban center	30	29.33
Rural area	10	9.33
Foreign country (Democratic Republic of Congo)	11	10.66



(a) (b) (c)

Figure 1. Kira Hospital; 27-year-old patient: Cranioencephalic computed tomography: axial slice through the parenchymal window (a): right frontotemporal cortico-subcortical parenchymal contusion with peripheral oedema (blue arrow) and an ipsilateral frontal subdural hematoma blade (red arrow) accompanied by a mass effect on the median structure. Bone window (b) and 3D reconstruction (c): right plurilocular fractures: frontal fracture affecting the roof of the orbital (green arrow); fracture of the jawbone extended to the orbital floor (purple arrow), sphenoidotemporal fracture (yellow arrow) and fracture of the base of the coronoid process of the mandible (orange arrow).

pneumo-orbit in 15 patients (15.5%) and muscle incarceration in 2 patients. The jawbone (**Figure 1(c)**) was the site of a fracture in 50 patients (51.5% of cases) and Lefort fractures were noted in 19 patients (19.5%) with 7 cases of Lefort I

fracture (7.2%), 4 cases of Lefort II fracture (4.1%) and 8 cases of Lefort III fracture (8.2%). A hemosinus was observed in 60 patients (61.8% of cases). Fractures in the lower floor were found in 18 patients (18.6%). In the vault, fractures concomitant with those of the bones of the face were observed (part belonging to the vault of the frontal bone: 35 (36.1% of cases), temporal bone: 18 patients (18.6% In our study, an association with traumatic brain injury was noted: there were 40 patients with cerebral contusion (**Figure 1(a)**) (41.2%) and 15 patients (15.5%) had pneumoencephaly. Extradural hematoma was present in 16 patients (16.5%) and subdural hematoma (**Figure 1(a)**) affected 13 patients (13.4%).

3.2. Discussion

Imaging is an essential tool in the management of facial trauma to reveal lesions that threaten the patient's life, therefore requiring urgent treatment [1] [4]. In low-income countries, such as Burundi, there is the problem of access to CT-scan and MRI which would allow a complete lesion assessment to be carried out. Few patients benefit from CT scans due to lack of sufficient financial resources. Facial trauma remains a crucial public health problem in our country. In fact, in our study, trauma to the face represented 27.1% of cases of trauma to the head. In the study by Nóbrega LM *et al.* [6], facial trauma concerned 16.4% of all trauma cases and 15.6% of road accidents in the study by Caldas IM *et al.* [7]. Facial trauma, in our series, concerned more young adults of the fourth to fifth decades and males and occurred during road accidents and many of our patients (50.66%) resided in the capital of Burundi, Bujumbura. As also noted by most of the authors like Khalatbari S *et al.* [8], Gurung US *et al.* [9], Yadav SK *et al.* [10] and Holmgren EP *et al.* [11], male subjects, through their socio-behavioral habits, are more exposed to trauma from road accidents, brawls, assaults, and violent games. They also showed that the occurrence of road accidents was linked to non-compliance with the highway code, the increase in the number of motorcycles in public transport and the poor condition of certain roads.

In our study, soft tissue lesions of the head were noted in all our patients. Their presence and importance would motivate the realization of a tomodensitometric examination. This exploration made it possible to note that the trauma caused fractures of several bones at the same time in most cases and the lesions were limited to the soft tissues only in 6.7% of cases. The presence of several fractures in a single patient indicates the severity of the trauma [12]. The mid-level of the face, more precisely at the level of the zygomatico-maxillary complex, presented more fractures than the other two floors as also noted by some authors [13] [14] [15] [16]. The middle floor, being made up of a mosaic of bones of varying size and shape, the trauma can lead to fractures of several bones at the same time. Their tomodensitometric analysis after trauma therefore requires multiplanar and volume reconstructions to reduce any unrecognized fractures [2] [5] [17] [18] [19]. Orbital fractures, more found in our series (58.8%), are rarely isolated. In fact, they were accompanied by fracture of the wall of the

frontal sinus and pneumencephaly in 50.5% and 15.5% of patients, respectively. This observation was made by Avery L L *et al.* [2] who noted most orbital fractures were associated with those of the frontal sinus and the base of the skull and were accompanied by intra-orbital damage and the eyeball. The fractures of the jawbone found in our series concerned 51.5% of patients. These fractures, as well as those of the orbit, are seen in severe trauma that causes complex fractures [20] [21] [22]. Lefort fractures were noted in 19.5% of cases and were dominated by Lefort III fractures (8.2%). The latter achieve complete cranio-facial disjunction and are rarely isolated [19]. The predominance of Lefort III fractures was noted by Scheyerer MJ *et al.* [3]. Our finding is different from that made by most of the other authors who noted that there was a predominance of Lefort II fractures among those of Lefort [9] [19] [23] [24]. Lefort II and Lefort III fractures are frequently associated with potentially life-threatening brain damage [25] [26]. Facial fractures were accompanied by hemosinus in 61.8% of patients in our series. Hemosinus occurs when the mid-upper or upper level of the face is involved with a fractured sinus wall [15]. In our series, there were cranioencephalic lesions associated with fractures of the face. Fractures of the vault bones were dominated by fractures of the frontal bone (36.1% of cases). These fractures are often accompanied by damage to the brain parenchyma. This impairment of the cerebral parenchyma was marked, in our series, by contusions (41.2% of patients), pneumoencephaly (15.5% of patients) and extra-dural hematomas (16.5% of patients). The concomitant occurrence of facial mass lesions and brain lesions is recognized and is indicative of high energy trauma [19] [27]. Brain lesions were noted by several authors as the most frequently associated with facial fractures in 50% of cases and especially during trauma to the upper face of the face [2] [3] [21] [28] [29]. In a traumatic context, the tomodensitometric exploration of the face must imperatively extend to the brain so as not to ignore the lesions the brain lesions, some of which can put the patient's vital prognosis at risk [2] [3] [15] [17].

3.3. Limitation of the Study

The limitations of our study are linked to its retrospective nature. Furthermore, more patients are referred by various hospitals that do not have scanner equipment. Access to their complete medical file becomes difficult and some data, especially epidemiological and clinical, are not accessible.

Nevertheless, this study sheds light on the extent of facial trauma and the types of lesions that are important to expect in Burundi and in another country with the same socio-demographic and economic aspects.

4. Conclusion

Computed tomography is a diagnostic tool of choice in facial trauma patients. Most of these often-young patients present with multiple fractures localizing to the middle level of the face. A systematic search for concomitant lesions in the

brain should be done because they are frequently observed.

Data Availability

The data for this case are available in the patient file of the paediatrics department. They can be obtained on request from the corresponding author.

Ethical Approval

This study was approved by the ethics committee of the Faculty of Medicine at the University of Burundi.

Consent

Written consent was obtained from the child's parents. The parents were informed of the purpose of the article.

Authors' Contributions

All authors have read and agreed to the final manuscript.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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