

## Price for Care of Open Fractures of Limbs in the Surgical Emergency of the Brazzaville Hospital and University Center

Bhodeho Medi Monwongui<sup>1\*</sup>, Elion Ossibi Pierlesky<sup>2, 4</sup>, Bouhelo-Pam Kevin Parfait Bienvenu<sup>3, 4</sup>, Service Yanguedet Moïse<sup>2</sup>, Tsouassa Wa Ngono Giresse Bienvenu<sup>2</sup>, Ngoya Ngondo Michael<sup>3</sup>, Nguagueie Kessara<sup>2</sup>, Massamba Miabaou Didace<sup>2, 4</sup>, Monka Marius<sup>3, 4</sup>

<sup>1</sup>Department of Surgical Emergency, University Hospital Center of Brazzaville, Brazzaville, Congo - Brazzaville

<sup>2</sup>Department of Digestive Surgery, University Hospital Center of Brazzaville, Brazzaville, Congo - Brazzaville

<sup>3</sup>Department of Orthopedic and Traumatologic, University Hospital Center of Brazzaville, Brazzaville, Congo - Brazzaville

<sup>4</sup>Faculty of Health Sciences, University Hospital Center of Brazzaville, Brazzaville, Congo - Brazzaville

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\*Corresponding author: Bhodeho Medi Monwongui

Department of Surgical Emergency, University Hospital Center of Brazzaville, Brazzaville, Congo - Brazzaville

### Abstract

### Original Research Article

**Introduction:** The aim of this work was to describe the emergency management of open fractures at the Brazzaville University Hospital (CHUB). **Patients and Methods:** this was a descriptive study with retrospective data collection from January 1 to December 31, 2022, in the surgical unit of the medical-surgical emergency department of the CHUB. All injured people hospitalized during the study period for recent open fractures whose initial treatment was carried out at the CHUB were included. The parameters studied were epidemiological, clinical, paraclinical and therapeutic. The GUSTILO Anderson Classification was used to assess the extent of skin lesions. **Results:** We collected 114 patients for 121 open fractures. There were 93 men (81.57%) and 21 women (18.43%), i.e. a sex ratio of 4.42. The average age was  $32.4 \pm 6.23$  years, the etiologies were dominated by public road accidents (73.68%). The average consultation time was 4.45 hours. The pelvic limbs were affected in 80.99% of cases. Open fractures of both leg bones were the most frequent (75.20%). Type II fractures of the GUSTILO classification were in the majority (69.42%). There was one case of vascular involvement of the leg tripod and one case of radial nerve involvement. The average time for initial treatment was  $8.36 \pm 1.20$  hours. Types I and II lesions required emergency suture before definitive treatment in 14.87% and 46.28% of cases respectively. The average time for definitive treatment was 22.91 hours. Osteosynthesis was performed in 86.78% of cases, cast immobilization with fenestration in 12.39% of cases and transfemoral amputation in 1 case. Internal fixation using an external fixator was the most frequent surgical indication (68.59%). **Conclusion:** Open leg fractures are very common traumatic injuries in our daily practice. Surgical treatment with an external fixator is the most commonly performed.

**Keywords:** open fracture, limbs, legs, Brazzaville.

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## INTRODUCTION

The open fracture is a solution of bone continuity bringing bone fragments into contact with the surrounding environment. This is a surgical emergency due to the risk of infection linked to skin breakage. It constitutes a real public health problem which requires the identification of the factors inherent to this phenomenon for better prevention, but also adequate initial management of the lesion [1].

Initial treatment must be early and comprehensive. Despite the different therapeutic modalities offered to surgeons, they remain formidable lesions due to the risk of infectious complications and

late sequelae, notably pseudarthrosis [2]. In 2017 in Congo Brazzaville, Monka M *et al.*, Reported external fixator treatment of open limb fractures [3]. Although the delay in the early treatment of open fractures has always been visible and felt in the surgical emergencies of the CHUB due to the lack of financial means for patients to meet the cost of treatment, very few studies have been carried out on the subject. Thus, the present study aims to describe the epidemiological, clinical and therapeutic aspects of patients admitted to the emergency room for open limb fractures.

## PATIENTS AND METHOD

We conducted a cross-sectional study with retrospective data collection over a period of 12

months, from January 1 to December 31, 2022, in the surgical unit of the medical-surgical emergency department of the Brazzaville hospital and university center (CHUB).

All adults admitted to the CHUB emergency room during the study period for recent open fracture were included in this study.

We excluded from this work files with incomplete information, those whose initial treatment was carried out elsewhere (this concerns patients evacuated from localities in the interior), open fractures whose treatment was deferred as well as patients who refused hospital care in favor of traditional treatment.

The sampling was carried out exhaustively on all the files of patients who met our selection criteria.

The parameters studied were: Epidemiological, clinical, paraclinical and therapeutic. The GUSTILO Anderson Classification [4] was used to assess the extent of skin lesions.

- Type I: Skin opening less than 1cm, clean wound, suturable without tension.
- Type II: Opening greater than 1cm without significant damage, loss of substance or avulsion.
- Type III: Cutaneo-muscular damage, vascular-nervous lesion, major bacterial contamination.
- Type IIIA: Skin and tissue damage allowing closure to cover the fractured bone.
- Type IIIB: Skin closure cannot be ensured without a flap.
- Type IIIC: Associated vascular-nervous lesions requiring repair

Data analysis was carried out using Excel software version Microsoft 2017.

## RESULTS

### Epidemiological aspects

Among the 1123 patients admitted for limb trauma during the study period, 152 patients had an open fracture, i.e. a hospital frequency of 13.53%. But our work was limited to 114 patients for 121 open fractures.

The sample consisted of 93 men (81.57%) and 21 women (18.43%), i.e. a sex ratio of 4.42. The average age of the patients was  $32.4 \pm 6.23$  years with extremes ranging from 18 years to 67 years. The most affected age group was 18 to 29 years old with 53.51% (Table I).

The socio-economic level was low for 56 patients (49.12%), medium for 35 patients (30.70%) and high for 23 patients (20.18%).

The etiologies of the open fractures are presented in Table II in which we noted a predominance of public road accidents with 73.68%.

### Diagnostic Aspects

The average consultation time was 4.45 hours and 87.71% of patients consulted between 0 – 6 hours (Table III).

On admission, six patients had hemodynamic instability, there were 7 polyfractured patients (6.14%): 2 cases associating an open fracture of both limbs, 5 cases of bilateral open fracture.

All patients had performed a radiographic examination with frontal and profile views of the traumatized limb (Figure 1A, B, C). A patient urgently performed a CT angiogram of the pelvic limbs for vascular complications (Figure 2A and B).

Out of a total of 121 open fractures, the lower limbs were affected in 98 cases (80.99%). Open fractures of the 2 bones of the leg were the most frequent with 91 cases (75.20%) followed by those of the bones of the hand with 11 cases (9.10%) (Table IV).

The associated traumas were head trauma in 11 patients (9.64%), section of the flexor tendons (6.14%) and extensors (4.38%) of the hand, thoracic trauma (3.50%) and abdominals (3.50%).

### Anatomy pathology:

According to the skin opening, we observed mostly type II fractures of the GUSTILLO classification in 84 cases (69.42%) (Figure 3).

The most common type of fracture was complex fractures in 72 cases (59.50%).

In addition, there was one case of vascular damage to the tibial tripod documented on CT angiography (Figure 2A and B) and one case of radial nerve damage.

### Therapeutic aspects

#### • Initial support:

The average delay of the initial care was  $8.36 \pm 1.20$ H with extremes of 30 minutes to 14H. Initial treatment was systematic and included venous filling, tetanus serovaccination, intravenous antibiotic prophylaxis based on amoxicillin + clavulanic acid or Ceftriaxone combined with Metronidazole, analgesics combining a first level (paracetamol) and a second level (Tramadol or Acupan), a dermal betadine dressing was made for the wounds and a posterior plaster splint.

Six patients (5.26%) were transfused in emergency. Type I lesions required suture in emergency before definitive treatment in 18 cases (14.87%) and type II lesions in 56 cases (46.28%).

- **Definitive treatment**

The average time for definitive treatment was 22.91 hours with extremes ranging from 3 hours to 120 hours (5 days). The debridement of the wounds was systematic for the open fractures operated on in the block. Image intensifiers were used for bone reduction in 29 cases (23.96%).

Osteosynthesis was carried out in 105 cases (86.78%) including 68 cases (64.76%) operated openly, cast immobilization with fenestration in 15 cases (12.39%) and trans femoral amputation in 1 case (0.83%).

Osteosynthesis by external fixator was the most frequent surgical indication in 83 of the cases, or 68.59% (Table V), the Hoffmann assembly in one plane was the most performed.

**Table I: Distribution of patients by age group**

Age groups	Effectifs	%
<b>18 – 29 years</b>	<b>61</b>	<b>53,51</b>
30 – 39 years	29	25,44
40 – 49 years	18	15,79
50 – 59 years	4	3,50
60 years and over	2	1,76
<b>Total</b>	<b>114</b>	<b>100</b>

**Table II: Distribution of patients according to etiologies of open fracture**

Etiologies of open fractures	Effectifs	%
<b>AVP</b>	<b>84</b>	<b>73,68</b>
Accident de sport	9	7,89
Accident de travail	6	5,26
Accident domestique	5	4,38
Chute de hauteur	4	3,50
Coup et blessures	3	2,63
Arme à feu	3	2,63
<b>Total</b>	<b>114</b>	<b>100</b>

**Table III: Distribution of patients according to consultation times**

consultation times	Effectifs	Effectifs cumulés	% cumulé
H1	15	15	13,16
H2	17	32	28,07
H3	23	55	48,24
<b>H4</b>	<b>29</b>	<b>84</b>	<b>73,68</b>
H5	8	92	80,70
H6	8	100	87,71
7 – 24 H	10	110	96,49
Plus de 24 H	4	114	100
<b>Total</b>	<b>114</b>	-	-



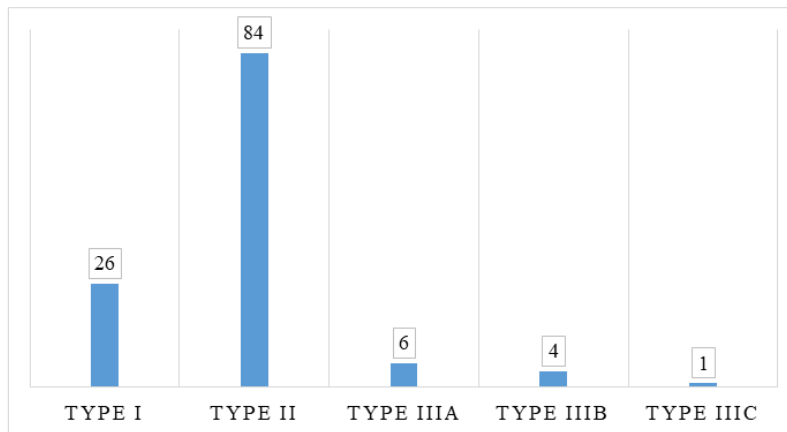
**Figure 1: Open fracture of both leg bones following AVP**



**Figure 2: X-ray image of open fracture with bone crush**

**Table IV: Distribution of open fractures according to site**

Membres atteints	Sièges des fractures ouvertes	Effectifs	%
Membres supérieurs N = 23	Humérus	4	3,30
	Radius/ulna	8	6,62
	<b>Métacarpes/phalanges</b>	<b>11</b>	<b>9,10</b>
Membres inférieurs N = 98	Fémur	3	2,48
	Patella	1	0,82
	<b>Tibia/fibula</b>	<b>91</b>	<b>75,20</b>
	Métatarse/phalanges	3	2,48
<b>Total</b>		<b>121</b>	<b>100</b>



**Figure 3: Distribution of fractures according to Gustilo Anderson classification**

**Table V: Répartition des fractures ouvertes selon les méthodes de stabilisation osseuse**

Type de traitement	Méthodes de stabilisation osseuse	Effectifs	%
Chirurgical	Fixateur Externe	83	68,59
	Embroschage	13	10,74
	ECMV	6	4,95
	Plaque vissée	3	2,48
	Amputation	1	0,83
Orthopédic	Plâtre BABP	4	3,31
	Manchette plâtrée	4	3,31
	Plâtre cruro-pédieux	4	3,31
	Gantelet plâtré	2	1,65
	Botte plâtrée	1	0,83

**Table VI: distribution of patients according to delays in definitive treatment**

Delays in definitive treatment	Effectifs	%
Entre 0 – 6H	18	15,79
7H – 24H	54	47,37
Plus de 24 H	42	36,84
<b>Total</b>	<b>114</b>	<b>100</b>

**Figure 4: External fixator of the army health service on the left leg**

## DISCUSSION

By their high proportion at 13.53%, open fractures of the limbs represent a significant part of the activity in the surgical emergencies of the CHUB. Several authors have made the same observation [1, 5, 6]. Our result can be explained by the influx of accident victims at the Brazzaville university hospital center, which is the single largest specialty medical center.

We observed a male predominance of 81.57% with a sex ratio of 4.42. Our results are comparable to those of Mathieu *et al.*, In Chad [7], de Mulumba *et al.*, In the Democratic Republic of Congo [8] as well as Touré *et al.*, in Senegal [9] with respectively 74%, 88.88% and 91.37%. It should be noted that men are more exposed to trauma because of the activities they carry out.

The age group from 18 to 29 years was more representative in our series, ie 53.51% and the average age was 32.23 years. This predominance is due to the fact that this is the most dynamic age group in life, a major factor in exposure to trauma. These results are similar to those of other authors [10-12].

Non-compliance with the highway code, excessive speed, and drunk driving make public road accidents the primary etiology of open fractures in our series and in the literature [11-13]

The average consultation time was 4.45 hours and 87.71% of patients consulted within 6 hours following the trauma (Table IV). Fourteen patients consulted within more than 24 hours; this delay in consultation could be explained by socio-cultural reasons (recourse to traditional medicine), economic or by simple negligence of patients and their entourage. Therapeutic delay is common in developing countries [14-16]

In our study, fractures of the pelvic limb were the most represented with 98 cases or 80.99% against 23 cases for the thoracic limb or 19.01%. This lesion predominance of the lower limb was reported by Diallo MM *et al.* In Guinea Conakry with 72.71% [5]. This result could be explained by the exposure of this region of the body to the slightest shocks during accidents.

The main location of open fractures was in the leg (75.20%). IBRAHIMA *et al.*, in Cameroon found a clear predominance of the femur with 70 cases, i.e. 12.4% and of the 2 bones of the leg with 52 cases, i.e. 9.2% [14]. This high frequency of leg fractures is explained by the antero-internal subcutaneous situation of the bony guardian of the leg, the tibia, which very frequently exposes it to trauma, especially in two-person machine operators (2) wheels and the height of the strut relative to the bumpers. In the upper limb,

traumatic lesions are most often located on the phalanges (9.10%)

Regarding injuries associated with fractures, 9.64% were head trauma, 10.52% hand tendon injuries, 3.50% chest trauma and 3.50% abdominal trauma. These results are similar to several studies [12, 14]. These types of injuries occur through direct bumping contact with the ground or the vehicle or both effects combined.

According to the anatomical pathology, the majority are complex fractures (59.50%) of GUSTILLO type II (69.42%). Diallo *et al.*, Reported 64.62% of Gustilo Anderson type II fractures [5]. Ngaroua *et al.*, in their study reported 74.57% [1]. Our results can be explained by the fact that most patients with type I fractures were treated deferred and some patients remained with traditional practitioners. The complex nature of the fracture lines also depends on the violence of the shock and the mechanism involved [17, 18].

The initial care of the patients was established upon admission, i.e. an average of 6.36 hours with extremes of 1 and 14 hours. The time between the accident and the initial management of open fractures is of great importance in the prognosis of the lesions. This initial management including antibiotic therapy must be done within 3 hours of the trauma [19]. But the crucial delay would be one hour after the trauma [20]. In our work, type I lesions required emergency suture before definitive treatment in 18 cases (14.87%) and type II lesions in 56 cases (46.28%). Early initial treatment increases the probability of conversion of open fractures into closed fractures and therefore reduces the risk of infection [21, 22]. The conversion of open fractures has a greater influence on the therapeutic choice, particularly between orthopedic treatment and internal or external osteosynthesis.

In our series, the average time to definitive treatment was 22.91 hours with extremes ranging from 3 hours to 120 hours (5 days). 52 fractures (42.98%) were operated on within 24 hours or more, even though these fractures constitute a therapeutic emergency. In developed countries, this time does not exceed 6 hours, treatment is provided immediately following the accident [21]. Indeed, some authors emphasize the benefit of quickly operating on open fractures [19, 22]. Because delay in treatment can cause serious infectious complications, sometimes with risks of non-union and amputation of the limb. We must not condone the delay in the treatment of open fractures because the risk of infection is always present, especially after 24 hours, whatever the degree of opening [20].

Of the 114 patients totaling 121 fractures, we performed surgical treatment in 108 cases (89.26%) versus orthopedic treatment in 13 cases (10.74%). Our choice of treatment was based on the type of skin

opening, the location of the fracture, the degree of bone comminution and the availability of osteosynthesis equipment.

The treatment of type II fractures is still a subject of controversy regarding the choice of therapeutic modalities, particularly the choice of the type of osteosynthesis (internal or external) and the orthopedic treatment [16, 21].

Internal fixation using an external fixator was the most frequent surgical indication in 83 cases or 68.59% (Table VI).

The external fixator was the most used type of osteosynthesis in our series because it was indicated in type II and III open Gustilo fractures. Many authors [19-24] use this mode of osteosynthesis as first intention judging that it is less invasive without being limited to a patient category. The external fixator allows rapid containment of the fracture site, reduces the risk of infection by facilitating local treatment of skin lesions [25]. Our result can be explained by the fact that our fracture cases mostly responded to the indications for surgical treatment.

It should be noted that in adults, orthopedic reduction with cast immobilization causes secondary displacements in casts.

## CONCLUSION

Open leg fractures are very common traumatic injuries in our daily practice. Young men are the most exposed to road traffic accidents. In the majority of cases, these fractures involve both bones of the leg. Gustilo and Anderson type II skin opening was the most common, complex fractures were the most represented.

The processing time is long in our context. Surgical treatment with an external fixator is the most common. Our choice of treatment was based on the type of skin opening, the location of the fracture, the degree of bone comminution and the availability of osteosynthesis equipment. The management of open fractures requires rigor from admission with strict compliance with hygiene, asepsis and monitoring measures.

**Conflicts of Interest:** All the authors do not have any possible conflicts of interest

**Authors Contributions:** All the authors have contributed of this work

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