

## Open Fractures of the Forearm at the Gabriel Touré Hospital and University Center: Epidemiological, Therapeutic and Evolutionary Aspects

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### Abstract

**Introduction:** The management of open fracture requires meticulous attention to detail, both for soft tissues and skeleton.

**Objectives:** To determine the epidemiological, therapeutic and evolutionary aspects of open fractures of the forearm at the CHU Gabriel TOURE Bamako.

**Materials and Methods:** This was a retrospective study of patients with an open forearm fracture managed from January 2014 to December 2017 (4 years).

**Results:** We collected 53 patients with an open fracture of the forearm. Male accounted for 88.7% with a sex ratio of 7.83. The average age of our patients was 28.28 years, with extremes of 6 years and 70 years. Road traffic accidents were the main causes (79.2%). The direct mechanism was found in 100%. Type A3 was the most common anatomoradiological type (45.3%). As for the skin opening, Gustilo and Anderson's type II was predominant (60.37%). Bone lesions of other segments were the most common associated lesions (15.09%). The initial trimming was carried out before 6 a.m. in 67.9% of the wounded. The mean time to osteosynthesis was 20.7 days. Fracture stabilization was surgical by screwed plate in 75.4%. The average consolidation time was 4.8 months. Decreased prognosis was the main late complication (16.98%). After an average decline of 37.73 months, functional results were good in 49.1%.

**Conclusion:** Open fractures of the forearm often pose in the immediate future a problem of stable surgical stabilization after trimming the wound, and the evolution, remains marked by the limitation of the prognosis.

**Keywords:** Emergency; Fractures; Open; Forearm; Epidemiology; Treatment; Evolution

### Introduction

Open fractures should encourage more vigilance in the search for vascular or nerve damage. They continue to be a challenge for the orthopedist [1,2]. The presence of a skin opening makes treatment difficult and darkens the prognosis. This is a therapeutic emergency [3-6]. Management of the open fracture requires meticulous attention to detail, both for the soft tissues and the skeleton [7,8]. They can involve the vital prognosis of the limb: lodge syndrome/amputation; functional prognosis/prognosis-flexion/extension [4]. No studies

have been done on open fractures of the upper limb specifically. This is how we became interested in this theme whose goal was to determine the epidemiological, therapeutic and evolutionary aspects of open fractures of the forearm at the CHU Gabriel TOURE Bamako.

**Materials and Methods**

This was a retrospective descriptive and analytical study of patients with an open forearm fracture managed from January 2014 to December 2017 (4 years).

Included were all patients who had an open fracture of the forearm, whose treatment and follow-up were carried out in the ward. Not included: patients who signed the discharge, and those who lost to follow-up.

Standard X-rays of the front and profile forearm were performed in all our patients and the fractures were typed according to the AO classification. The assessment of the field and operability was also carried out in all the patients. All patients underwent physiotherapy sessions.

Data management and analysis was done using SPSS 20.0, Word and Excel2010 software. For the comparison of our data, we used the Fisher statistical test with a significant risk  $p < 0.05$ .

Functional results were assessed according to Anderson’s classification (Table 1).

Rating	Outcome
excellent	Union with $< 10^\circ$ loss of elbow or wrist flexion or extension and $< 25^\circ$ loss of forearm rotation
Satisfactory	Union with $< 20^\circ$ loss of elbow or wrist flexion or extension and $< 50\%$ loss of forearm rotation
Unsatisfactory	Union with $> 30^\circ$ loss of elbow or wrist flexion or extension and $> 50\%$ loss of forearm rotation
Failure	Malunion, non union, or unresolved chronic osteomyelitis

**Table 1:** Anderson’s classification.

*Outcome evaluation scale.*

**Results**

We collected 53 patients with an open fracture of the forearm. There were 47 men (88.7%) versus 6 women (11.3%) with a sex ratio of 7.83. The 21 and 30 age groups were the most affected. The average age of our patients was 28.28 years, with extremes of 6 years and 70 years. The etiologies were road traffic accidents in 42 cases (79.2%), ballistic trauma in 4 cases (7.5%), stabbing attacks in 4 cases (7.5%), 2 cases of work accidents (3.8%) and 1 case of sports accident (1.9%). The impact was direct in all patients (100%). Type A in 30 cases was type A (56.6%) with predominance of type A3 (45.3%: Figure 1), type B was noted in 10 cases (18.8%), and type C in 13 cases (24.5%). We recorded 32 cases (60.4%) of gustilo and Anderson type II open fractures, 10 type I cases (18.8%) and 11 type III cases (20.7%), with 5 type IIIA cases, 4 type IIIB cases and 2 type IIIC cases (Figure 2). Associated lesions were observed in 16 cases (30.1%) including 8 cases of osteoarticular lesions, 3 cases of polytrauma, 2 cases of vascular lesions, 2 cases of tendon lesions and 1 case of nerve damage. Initial trimming was performed before 6 a.m. in 36 cases (67.9%) and in 17 cases (32.1%) between 6 a.m. and 12 p.m. The mean time to osteosynthesis (screwed plate) was 20.7 days with extremes of 9 days and 43 days. Stabilization of the fracture after trimming was surgical in 46 cases (86.7%). This osteosynthesis was ensured by screwed plate in 40 cases (75.4%: Figure 3) delayed at a distance from any infection and wound healing, pin in 4 cases (7.5%), external fixative in 2 cases (Figure 4). An amputation was carried out urgently in front of a significant decay of the soft parts of the forearm. The average consolidation time was 4.8 months with extremes of 4 months

and 7 months. We recorded the following secondary complications: infections (11.3%), secondary displacement of the fracture (13.2%), lodge syndrome (7.5%), nerve damage in 1 case (neurotmesis of the median and ulnar nerves) performing functional amputation of the forearm (Figure 5). Late complications were: elbow and wrist stiffness (16.9%), pseudarthrosis (7.5%), vicious callus (5.6%). At an average decline of 37.73 months, functional results were: excellent (5.6%), good (49.1%), average (32%) and poor (13.2%).



**Figure 1:** X-ray of the left forearm from the front and profile showing a complex mediodiaphyseal fracture type A3.



**Figure 2:** Gustilo and Anderson's open diaphyseal fracture type III C.



**Figure 3:** Diaphyseal fracture control X-ray of the radius and the left ulna of the front and profile treated by osteosynthesis by two screwed plates.



**Figure 4:** X-ray of an open diaphyseal fracture of the radius and right ulna type C of Gustilo/Anderson treated with external fixator.



**Figure 5:** Sequellar image of open fracture of the right forearm.

In statistical analyses:

- There was a relationship between the associated A/O-lesions type: Fischer test = 58.3 p = 0.039.
- It was the same between type of Gustilo- complications: Fischer test = 47.4 p = 0.041.
- There was a correlation between the associated lesion results: Fischer test = 23.27 p = 0.019.

## Discussion

We encountered difficulties in carrying out this work, including the number of certain variables which makes it difficult to use Chi<sup>2</sup> tests, the insufficiency or even the absence of a bibliography dedicated specifically to open fractures of the forearm.

During our study the male sex predominated with 88.7%. Our data are similar to those of Jacques Barsotti, *et al.* [3], Obert L., *et al.* [9] and Khalid Sahl, *et al.* [10] with 85%. This male predominance is explained by the more frequent exposure of men to all types of accidents. The average age of our series was 28, 28 years old. This result is superimposed on those of Mba Mba., *et al.* [11] who found the predominance of limb fractures in the 20 and 40 age group, and Mahmut Bilit., *et al.* [6] who found an average age of 27 years. This is explained by the fact that young subjects are the individuals who take more risks in all activities and expose themselves to violent accidents. Road traffic accidents. The direct mechanism was observed in 100%. This result is consistent with data from the literature [9,12]. Type A was the most common anatomoradiological type with 56.6%. Khalid Sahl [10] also finds a predominance of type A (86.6%). This high frequency of type A fracture is explained by the decrease in kinetics before reaching the bones. We observed 60.4% of open fractures type II of Gustilo/Anderson. Our result is superimposed on that of Moyikoua., *et al.* [13] who find 8 cases/11 of type II; but differs from those of Khalid Sahl [10], Jung Pan Wang [14] of Moed., *et al.* [15] who found respectively 71%, 64% and 35% of type I. In our series we observed 30.1% of associated lesions. Our is similar to that of Yung Pan Wang [14] who found 28% of associated lesions. This relative frequency of associated injuries is explained by the violence of trauma most often due to road traffic accidents and assaults. Fractures were stabilized after trimming and in the absence of any screwed plate infection in 75.4%. In the literature there is a high rate of achievement of osteosynthesis by screwed plate [8,9,14,15]. Our lower rate of osteosynthesis per screw plate than the literature is explained by the frequency of open type III fractures, the reluctance of some patients to place implants and financial insecurity. Our average consolidation time was 4.8 months. This delay is superimposed on that of Jung-Pan Wang., *et al.* [14] who find 20.2 weeks. On the other hand, our results differ a little from those of the literature [8,9,14] where we find an average delay of about 4 months. This can be explained by the frequency of open fractures of type II and III in our series, ballistic lesions, external fixator and the relatively long time for the synthesis of the fracture. We achieved 54.7% excellent and good results. This rate is much lower than those of Yung-Pan Wang., *et al.* [13] who find 92% excellent and good results, Moed., *et al.* [15] with 85% good results and Dunca., *et al.* [16] who find 90% good results. Our low rate of excellent results is explained by the frequency of sequelae with a case of amputation.

## Conclusion

Relatively rare open fractures of the forearm. They are mainly the prerogative of young adult males. These lesions often pose a problem of stable surgical stabilization after trimming the wound in the immediate future. The evolution is most often marked by significant functional sequelae.

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