

Management of Open Lower-Leg Fractures in Adults at the Gabriel Touré University Hospital in Bamako

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Abstract

Original Research Article

Introduction: Open lower-leg fractures most often result from high-energy trauma and constitute a medical-surgical emergency. This study aimed to evaluate the outcomes of managing open lower-leg fractures in adults within the Department of Orthopedic Surgery and Traumatology at the Gabriel Touré University Hospital. **Patients and methods:** This was a retrospective, descriptive study conducted at the Traumatology-Orthopedics Department of the Gabriel Touré University Hospital in Bamako, Mali, from January 1, 2022, to December 31, 2023 (2 years). We included all patients over the age of 15 with an open leg fracture who underwent surgery and follow-up in the department during the study period. The parameters studied were epidemiological, clinical, paraclinical, therapeutic, and related to clinical outcome. **Results:** Over a two-year period, the incidence of open leg fractures was 9.7%. There was a male predominance (77.9%, n = 74). The mean age was 37.37 years, ranging from 16 to 72 years. Road traffic accidents were the most common cause (90.5%, n = 86). The fracture pattern was simple in 39 patients (41.1%) and complex in 56 cases (58.9%). Regarding surgical management, an external fixator was used in 49 cases (51.6%). Outcomes were generally good. The main complications were surgical site infection (17 cases), non-union (1 case), osteitis (3 cases), malunion (2 cases), delayed union (2 cases), and stiffness (2 cases). **Conclusion:** Open fractures of the lower leg are common in adults, and the majority result from road traffic accidents. In this study, the choice of osteosynthesis hardware based on age and the anatomopathological type yielded satisfactory results.

Keywords: open lower leg fractures, adult, Bamako.

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INTRODUCTION

Open fractures of the leg are disruptions of bone continuity in which the fracture site communicates with the exterior via a soft-tissue wound. They are common, accounting for 15% to 20% of all fractures [1].

These fractures generally result from high-velocity trauma primarily due to road traffic accidents and constitute a medical-surgical emergency [2]. Any delay in treatment carries a risk of severe complications that could jeopardize the patient's life.

The aim of this study is to share our experience in the management of open fractures of the lower leg in adults and to document potential complications.

PATIENTS AND METHODS

This was a retrospective, descriptive study. It was conducted over a two-year period, from January 2023 to December 2024, in the Department of Traumatology and Orthopedics at the Gabriel Touré University Hospital (CHUGT) in Bamako, Mali. The study included all patients admitted with open leg fractures who underwent surgical management and follow-up within the department. The parameters studied covered epidemiological, clinical, paraclinical, therapeutic, and outcome-related aspects. Functional outcomes were assessed following fracture healing based on the clinical and functional criteria established by Olerud and Molander [3]. The resulting scores allowed patient outcomes to be classified as good, fair, or poor.

- Good: patients showing satisfactory reduction, no leg-length discrepancy, no moderate callus

formation, and no pain or limitation of joint range of motion (knee and ankle).

- Fair: patients showing mild pain, moderate callus formation, suboptimal reduction, and moderate limitation of joint range of motion (knee and ankle) after six (6) months of treatment.
- Poor: patients showing malunion, persistent pain, non-union, leg-length discrepancy, delayed union, limitation of joint range of motion (knee and ankle), or chronic osteitis after 6 months of treatment.

RESULTS

In total, we recorded 1,928 fracture cases, including 187 cases of open leg fractures, representing a frequency of 9.7%. There were 74 men (77.9%) and 21 women (22.1%), yielding a sex ratio of 3.52. The mean age was 37.37 years, with a range of 16 to 72 years.

The 16–25 age group was the most represented, accounting for 27.36% (n = 26). Clinically, road traffic accidents were the primary cause, accounting for 90.5% of cases (n = 86).

The table below presents the circumstances surrounding the occurrence of open leg fractures.

Etiologies	Number	Percentage (%)
Road traffic accident	86	90.5
Domestique accident	2	2.1
Workplace accident	6	6.1
Mine collapse	1	1.1
Total	95	100

Road traffic accidents were the most common cause of injury, accounting for 90.5% (n = 86) of cases. The mean time to patient admission was 6 hours and 3 minutes, ranging from 15 minutes to 72 hours. Radiologically, the fracture pattern was simple in 41.1% (n = 39) of cases and complex in 58.9% (n = 56); in 47.4% (n = 45) of cases, the fracture was located in the middle third of the leg. Regarding the specific bones involved, fractures of both leg bones accounted for 89.5% (n = 85) of cases, followed by tibial fractures (7.4%; n = 7) and fibular fractures (3.2%; n = 3).

Therapeutically, the management was medico-surgical. Medical treatment consisted of the administration of analgesics (paracetamol 1 g every 6 hours, tramadol 100 mg every 6 hours for 5 to 7 days), antibiotic prophylaxis (amoxicillin/clavulanic acid 1000/125 mg every 8 hours and metronidazole 1 vial every 8 hours for 7 to 10 days), anticoagulants (enoxaparin 4000 IU every 24 hours until weight-bearing was permitted), and tetanus Sero vaccination.

Surgical management consisted of meticulous wound debridement for all patients, fracture reduction, and internal or external fixation: external fixation in 51.6% (n=49), locked intramedullary nailing in 25.3% (n=24), plate and screw fixation in 12.6% (n=12), elastic stable intramedullary nailing in 2.1% (n=2), and cast immobilization in 8.4% (n=8); amputation was performed in 6.3% (n=6). The mean length of hospital stay was 8.92 days, ranging from 2 to 45 days.

Postoperative recovery was uncomplicated in 68 cases (71.6%) and complicated in 27 cases (28.4%), specifically: surgical site infection (17.89%, n = 17), gangrene (6.3%, n = 6), vascular complications (1.05%, n = 1), and secondary displacement (3.15%, n = 3).

For 95 patients (80.9%), the mean time to bone healing was 4.20 months; outcomes included 1 case of non-union, 3 cases of osteitis, 2 cases of malunion, 2 cases of delayed union, and 3 cases of stiffness.

Based on the Olerud and Molander functional score, results were classified as good in 82.1% of patients (n = 78), fair in 10 cases (10.5%), and poor in 7.4% (n = 7).

DISCUSSION

Open fractures of the lower leg in adults are common, accounting for 9.7% of all fractures treated in our department. The incidence of open lower-leg fractures in adults observed in our study is higher than the rate of 17 per 100,000 people per year reported by Raphael *et al.*, [4], but significantly lower than the 63.8% frequency found by Toure *et al.*, [5] in Mali. In our series, the mean age was 37.37 years, with a range of 16 to 72 years. The 16–25 age group was the most represented, accounting for 27.36% (n = 26) of cases. These epidemiological data were consistent with those reported by certain African authors [5–7]. The male predominance observed in our study was also reported by Ide G *et al.*, [8] in Niger and Anad [9] in India. This male predominance could be explained by the fact that in countries like Mali, men go out to earn a living for their families and make greater use of two-wheeled vehicles, thereby facing a higher risk of road traffic accidents than women.

As in our study, road traffic accidents were the leading cause of open leg fractures in the series reported by Barry A *et al.*, [10] and Reddy *et al.*, [11]. Regarding the nature of the injuries, concomitant involvement of both leg bones was the most common presentation, accounting for 89.5% of cases. Our results are

comparable to those reported by Diallo *et al.*, [12] and Traoré D. [13], which were 80.2% and 88.37%, respectively. This can be attributed to the high-energy impact associated with road traffic accidents.

In our series, the predominant fracture site was the middle third of the leg in 47.4% of cases. Our data are similar to those reported by Ide G *et al.*, [8] in Niger and Madougou *et al.*, [6] in Benin in 2017. This could be explained by the fact that this part of the leg is highly exposed and covered only by skin. However, in the study conducted by Myriem [14] in 2013, open fractures of the lower third of the leg were the most common.

In our study, external fixation was the most frequently used method for bone stabilization. According to Dubrana [2], the external fixator is the method of choice for stabilizing open fractures of the lower leg, given the subcutaneous location of the tibia. In contrast, the team led by Melvin *et al.*, [15] used intramedullary nailing exclusively; these authors argue that external fixation carries a higher risk of infectious complications. In our series, the rate of bone union achieved was 88.59% (n = 101); at the 10-month follow-up, one case of non-union and three cases of osteitis were observed. Our results are comparable to those of Toure *et al.*, [5] in Mali. Patient outcomes, assessed using the Olerud and Molander functional score, were generally satisfactory; 82.1% (n = 78) of patients were classified as having a "good" outcome. Our results are comparable to those reported by Ide G [8]. The excellent results observed in our series may be attributed to early patient management and the preference for external fixation.

CONCLUSION

Open fractures of the lower leg remain frequently encountered medical-surgical emergencies among adult males. The various fixation methods used in our setting have yielded generally encouraging results.

Conflicts of interest: None.

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