ECRONICON OPEN ACCESS

EC ORTHOPAEDICS
Research Article

Open Fractures of Femur at Chu Gabriel Toure

Abdoul Kadri Moussa, Layes Touré, Mahamadou Diallo, Louis Traoré, Mamadou B Traoré, Tiéman Coulibaly and Abdou A Touré

Department of Orthopedics-Traumatology, Hospital and University Center (CHU) Gabriel Toure, Bamako, Mali

***Corresponding Author:** Abdoul Kadri Moussa, Department of Orthopedics-Traumatology, Hospital and University Center (CHU) Gabriel Toure, Bamako, Mali.

Received: August 17, 2020; **Published:** September 29, 2020

Abstract

Introduction: The type of open fracture and the frequent association of associated lesions often complicate treatment.

Goals: Were to determine the anatomopathological aspects and to evaluate the results of the treatment of open fractures of the femur at the CHU Gabriel TOURE.

Materials and Methods: This was a retrospective study of patients with an open fracture of the femur managed from January 2015 to December 2017 (3 years).

Results: We collected 28 patients with an open fracture of the femur. The male sex represented 82.1%. The average age of our patients was 30.07 years. Road accidents were the main aetiologies (85.7%). The mechanism was direct in 100%. The most common pathological type was type A3 (42.9%). Gustilo and Anderson type I predominated (53.6%). The fracture was located in the middle third and the distal third in 39.3% each. The associated lesions were noted 53.57%. The initial trimming was performed before 6 hours in 75% of cases. The mean time to internal fixation was 23.53 days. Internal fixation was provided by a 65.38% screw plate. The mean time to union was 4.84 months. The main complications observed were stiffness of the knee (32.14%), and sepsis (25%). After a mean follow-up of 41.07 months, the functional results were good in 35.71%.

Conclusion: The frequent association of lesions associated with an open fracture of the femur, leads to difficulty in early internal stabilization leading to the frequency of late complications.

Keywords: *Fractures; Openings; Femur; Anatomopathology; Treatment; Evolution; Mali*

Introduction

The fracture of the femoral shaft is a great classic of trauma Open fractures of the femur represent 10 to 20% of fractures of the femur [1]. The open fracture remains one of the most difficult chapters in trauma [2]. The frequency of associated lesions (other fractures, multiple trauma) contributes to the initial severity and the prognosis [1,3]. Open fractures require early and appropriate curative treatment because endogenous and/or exogenous contamination of bony foci and soft parts is almost constant. The type of open fracture and the frequent association of associated lesions often complicate treatment [3]. Internal osteosynthesis in open fractures in general and in ballistic fractures in particular remains controversial [4,5]. Emergency treatment to avoid serious complications: infection, delay/absence of union. This treatment is mainly based on antibiotic therapy, surgical removal of the wound and stabilization of the fracture [2].

Aim of the Study

The aim of our study was to determine the anatomopathological aspects and to evaluate the results of the treatment of open fractures of the femur at the CHU Gabriel TOURE.

Materials and Methods

This was a retrospective study of patients with an open fracture of the femur treated from January 1, 2015 to December 31, 2017 (3 years) at the CHU Gabriel TOURE.

We included patients with an open fracture of the femur, whose treatment and follow-up were carried out in the department.

Patients whose follow-up was less than 2 years and those lost to follow-up were not included.

We typed the fractures according to the AO classification and the skin opening according to the Gustilo and Anderson classification.

Data management and analysis were done using SPSS 20.0 software, Word and Excel 2010, Fischer statistical test with a risk $p < 0.05$.

The results were assessed according to the Thorensen classification (Table 1).

Results				
		Well	**Way**	**Bad**
Anatomical defects Proximal diaphyseal metaphyseal varus		< 10°	10-15°	>15°
Valgus or other varus		< 5°	5-10°	> 10°
Curved or bent		<10°	10-15°	>10°
External rotation		<10°	10-20°	<20°
Internal rotation		<15°	15-20°	>20°
Shortening		< 2 cm	2- 3 cm	>3 cm
Joint and muscle recovery				
Knee	Flexnm	>120°	90-120°	<90°
	Extension	Normal	<10°	>10°
Hip mobility		Normal	>80°	<80°
Pain		Minimal occasional	Moderate not limiting activities	Severe

Table 1: *Thorensen classification.*

Results

Over the period concerned we recorded 486 fractures of the femur including 63 cases of open fractures. Which represents 13%. Only 28 patients were collected.

Description of the population

The male gender represented 82.1% against 17.9% female, i.e. a sex ratio of 4.6. The mean age of our patients was 30.07 years with extremes of 2 years and 59 years and a standard deviation of 12.41. The aetiologies were road accidents with 24 cases (85.7%) and gunshot wounds in 4 cases (14.3%). The mechanism was direct in 100%. The anatomopathological types were AO types in 14 cases (50%) with a predominance of type 3A (42.9%) (Figure 1a), 10 cases of type B (35.7%) (Figure 2a) and 4 type C cases (10.7%) (Figure 3a). We recorded according to the classification of Gustilo and Anderson 15 cases of type I (53.6%), 10 cases of type II (35.7%) (Figure 1b) and 3 cases of type IIIA. The fracture was located in the middle third and the distal third in 11 cases each (39.3%), in the proximal third in 5 cases (17.9%), diaphysometaphyseal in 1 case (Figure 3a). Associated lesions were noted in 14 cases (50%) with 11 cases of osteo-articular le-

sions of other limbs (39.3%) (Figure 1b), 2 cases of head trauma associated with other osteo-articular lesions and 1 case of pelvic trauma. The initial trimming was performed before 6 hours in 21 cases (75%), and in 7 cases (25%) between 6 hours and 12 hours. Our average delay in osteosynthesis was 23.53 days with extremes of 1 day to 114 days. All patients received antibiotic therapy and thromboembolic prophylaxis (except the two-year-old child). Osteosynthesis was provided by a screw-in plate in 17 cases (60.7%) (Figure 4b), the external fixator in 7 cases (25%) (Figure 3b and 4a), intramedullary nailing in 1 case. Orthopedic treatment was performed in 3 cases (10.7%) with traction in 2 cases and pelvic foot plaster restraint in one case in a 2-year-old child. The mean time to union was 4.84 months. We observed the following complications: stiffness of the knee in 9 cases (32.14%) (Figure 4b), sepsis in 7 cases (25%), callus in 4 cases (Figure 3c), 1 case of pseudarthrosis (Figure 4c) and 1 case of death. After a mean follow-up of 41.07 months, the anatomical results were judged to be good in 19 cases (67.8%), average in 5 cases (17.8%) and bad in 4 cases (14.2%) (Figure 3c and 4c). As for the functional results, they were good in 13 cases (46.4%), average in 12 cases (42.8%) and bad in 3 cases (10.7%).

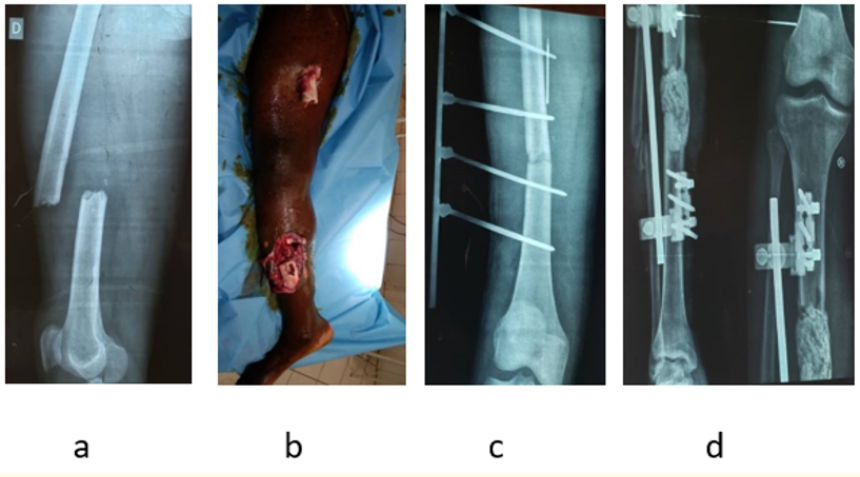

Figure 1: *1a: Mid-shaft transverse fracture of the right femur (type A3). 1b: Open type 2 fracture of Gustilo and Anderson associated with an ipsilateral fracture of the right leg type IIIb of Gustilo and Anderson. 1c: osteosynthesis by a FESSA of the femur. 1d: Osteosynthesis of the right tibia by FESSA (with the Masquelet technique).*

Figure 2: *2a: Open fracture of the proximal third of the left femur by firearm (type B3). 2b: Secondary osteosynthesis by a 130° blade-plate.*

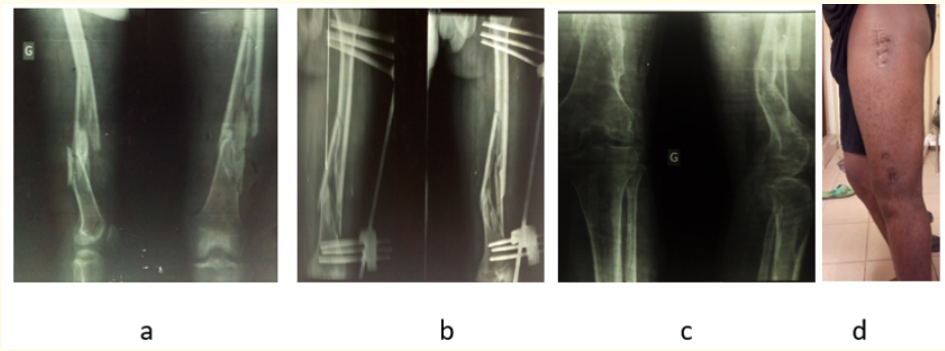

Figure 3: *3a open ballistic diaphysometaphyseal comminuted fracture of the left femur (type C3). 3b: osteosynthesis of the femur by FESSA. 3c: AP/profile x-ray showing a malignant callus (2 years of evolution). 3d: clinical evolution after 2 years.*

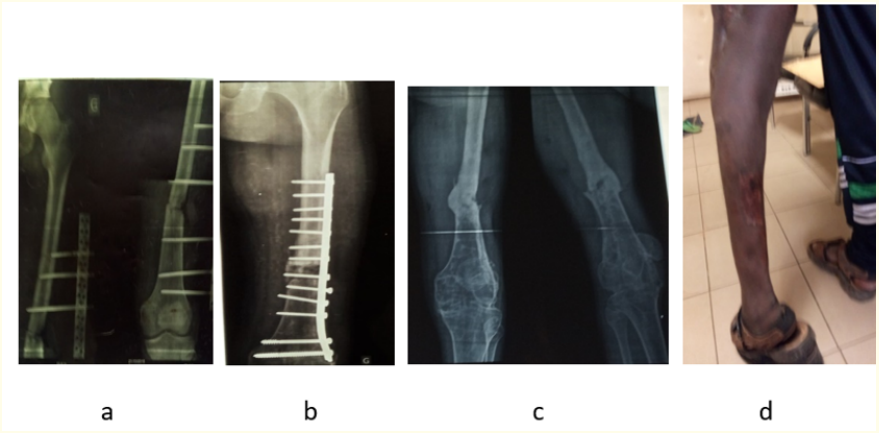

Figure 4: *4a: Open fracture of the distal third of the left femur (type A3) and type I by Gustilo and Anderson treated with FESSA (initially). 4b: multiple revision by femoral plate with bone graft. 4c: Tight pseudarthrosis (removal of osteosynthesis material) after 3 years of development. 4d: Clinical course with limb shortening of more than 5 cm compensated by an orthopedic shoe with significant stiffness of the knee.*

In statistical analysis: there is a relationship between the type of immobilization and the anatomical results T Fischer 0.00 T value (26.358), it is the same between the anatomical result and the functional result (T Fischer: 0.006, T value: 16.747). On the other hand, there is no relationship between the skin opening and the anatomical result for T Fischer: 0.99 and T value: 9.020. There is also no statistical relationship between the anatomoradiologic type and the anatomic result for T Fischer: 0.932 T value: 17.705.

Discussion

The limits of our work is the small size of our sample making it difficult to use statistical tests. Nevertheless, this work allows us to compare our results with those of the literature. There were 23 men (82.1%) against 5 women (17.9%). This male predominance is explained by the fact that men are the ones who take more risk with two-wheeled vehicles. Our results corroborate those of the literature: Charles M., *et al*. [3] with 65%, Monka., *et al*. [6] with 78.5% and Mazen A., *et al*. [7] which find 80.95%. The average age of our patients was 30.07

years with extremes of 2 years and 59 years. This is because it is the 21 to 30 age group who are the heavy users of two- and three-wheeled vehicles. Our data are close to those of Bonnevialle P., *et al*. [8] who found an average age of 31 years, but on the other hand a little different from those of Lhowe., *et al*. [9] and Gross., *et al*. [10] who find respectively 21 years and 25 years old. The main etiology was constituted by road traffic accidents (involving two or three-wheeled vehicles), with 85.7%. Our results are similar to those of Charles M., *et al*. [3], of Monka., *et al*. [6] and of Gross., *et al*. [10] who found 89%, 84.3% and 97.3% respectively. The type of bone lesion most encountered in our study according to the AO classification was constituted by type A (50%), of which type A3 was predominant (42.8%), while in the series by Charles M., *et al*. [3] and Monka., *et al*. [6], the most frequent types were the C types with respectively 30% and 70% (C2). This could be explained by the less severe trauma violence of our cases compared to those of these authors. The most observed skin lesion in our series was Gustilo and Anderson type 1 (53.6%). On the other hand Charles M., *et al*. [3], Monka., *et al*. [6], Bonnevialle P., *et al*. [8] and Gross., *et al*. [10] found the majority types 3 of Gustilo and Anderson with 65% respectively; 60.52%; 57.5%; 66.6%. We observed associated lesions in 50% of cases. This lesional association is explained by the violence of the trauma. Lesions associated with fractures femur openings are frequently described in the literature. Our results approximate those of Charles M., *et al*. [3], but lower than those of Lhowe., *et al*. [9] with 68.6% and Gross., *et al*. [10] with 92.5%. Screw-retained plate osteosynthesis was performed secondarily in 60.7%. Our data are similar to those of Moyikoua., *et al*. [11] with 55% of secondary osteosynthesis by screw-retained plate; whereas external osteosynthesis was performed 100% in the study by Monka., *et al*. [6] and on the other hand intramedullary nailing was performed 100% in the series by Mazen A., *et al* [7]. This difference is explained by the greater availability of the screw-retained plate as well as its relatively low cost compared to the locked intramedullary nail. Our average time to union was 4.84 months. This result is close to those of Gross A., *et al*. [10] who found 5.5 months and Christie J., *et al*. [12] who found 4.87 months. On the other hand, Monka., *et al*. [6] found an average time to union of 6 months. This relatively short average time, despite the sometimes complexity of bone lesions and skin opening, can be explained by the young age of our patients. Knee stiffness was noted in 32.1%. The relative frequency of this complication is explained by the sometimes rather long delay of secondary osteosynthesis, a combination of other osteo-articular lesions leading to late physiotherapy and/or insufficient rehabilitation. This high frequency of stiffness was reported in the series by Bonnevialle P., *et al*. [8] (35%). Our vicious callus rate was 14.2%. This result is close to that of Monka., *et al*. [6] 15.7%, and lower than that of Lhowe., *et al*. [9] with 7%. This relatively high rate of vicious callus can be explained by the size of our sample, type of external fixator (Hoffman type a single plane which was complicated by significant secondary displacement). Seven cases of infection (25%) were observed (including 2 deep and 5 superficial). This rate is much higher than those of Monka., *et al*. [6] with one in 20 cases, Lhowe., *et al*. [9] with 4.8%, Gross A., *et al*. [10] with 2.6%, and Christie J., *et al*. [12] (2.1%). This difference can be explained by the size of the sample, the quality of the initial trimming and post-operative care, also the first approach with the use of the screwed plate, which has a higher risk of septic. At an average follow-up of 41.07 months, we obtained 46.4% good results. Our data are close to those of Monka., *et al*. [6] who found 42.1% very good and good results. Our less satisfactory results in the majority can be explained by the difficulty of managing open fractures of the femur, the complexity of the bone lesions and the difficulty of performing secondary internal fixation early and stable allowing early rehabilitation of the joints.

Conclusion

The frequent association of lesions associated with an open fracture of the femur, leads to difficulty in early internal stabilization leading to the frequency of late complications. Analysis of the results highlights a relevant use of early internal fixation. Internal/external osteosynthesis is performed late, as our results show; and requires rapid availability of the operating room, osteosynthesis equipment, and the surgical and anesthesia team.

Bibliography

1. Bonnomet F and Clavert P. "Cognet Fracture of the femoral shaft of the adult". EMC (2006).

2. AC Masquelet "Surgical Techniques Orthopedics-Traumatology of adults". Principles and General Elsevier-Masson Paris (2004).

3. Charles M and Court Brown MD. "Femoral Diaphyseal Fractures". Skeletal Trauma Basic Science, Management and Reconstruction Third Edition Elsevier Science (USA) (2003).

4. Bonnevialle P. "Adult diaphyseal fractures (Pathological excluded)". EMC (2005).

5. Jacques Barsotti., *et al.* "Femoral shaft fractures, Practical guide to traumatology". 5th edition -Masson (2004).

6. Monka M., *et al.* "Treatment of open limb fractures with an external fixator in Brazzaville in 38 cases". Health Sciences and Diseases The Journal of Medicine and Health Sciences Health SG: Dis 18.1 (2017).

7. Mazen Ali., *et al.* "Results of treatment of open fractures of the femur with locked nailing in adults. About 49 cases Intramedullary nailing of open fractures of the femoral shaft". *Journal of Orthopedic and Trauma Surgery* 103.7 (2017): S58.

8. Bonnevialle P., *et al.* "Monoplane external fixation in recent fractures of the femur Critical study of a series of 53 cases". *Journal of Orthopedic Surgery and Motor System Repair* 91.5 (2005): 446-456.

9. Lhowe DW and Hansen ST. "Immediate nailing of open fractures of the femoral shaft". *Journal of Bone and Joint Surgery American* 70 (1988): 812-820.

10. Gross A., *et al.* "Open adult femoral shaft fracture treated by early intramedullary nailing". *The Journal of Bone and Joint Surgery British* 75 (1993): 562-565.

11. Moyikoua A., *et al.* "Results of initial treatment of recent open fractures of the limbs About 150 cases treated at the Brazzaville CHU". Black African Medicine (1992): 39.

12. Christie J., *et al.* "Intramedullar locking nails in the management of femoral shaft fracture". *The Journal of Bone and Joint Surgery British* 70 (1988): 676.

Volume 11 Issue 10 October 2020