

## Surgical Treatment of Tibial Plate Fractures at CHU-Gabriel Toure (Bamako Mali)

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### Abstract

This was an 18-month retrospective study from January, 2019, to December, 2022, involving 70 patients operated on in the orthopedic and trauma surgery department of the center hospitalize university Gabriel Toure of Bamako.

The goal is to study the characteristics epidemiologic, anatomo-pathological, clinical, therapeutic and evolutionary, as well as the analysis of the results obtained.

The male sex was most involved with 87.1% and a sex ratio of 6.7. The age group 40-49 years represented 25.7%. The average age was 44.3 years, with extremes of 20 and 66 years. Motor vehicle accidents (MVA) were the main cause of diaphyseal forearm bone fractures in adults, accounting for 92.9% of cases.

These articular fractures interest mainly the side left (64.3%) and are due in more half of the cases to traffic accidents. The radiographic analysis makes it possible to codify them well according to the classification of Schatzker. The surgical treatment is essential in front of the moved forms.

Our results were evaluated while being based on anatomical and functional criteria (walk, stability, pain, and mobility). They were satisfactory in 82.9% of the cases, and thus remain in agreement with the data of the international literature. In spite of that, it would be necessary to think of developing the our average therapeutic in particular initially mini-invasive techniques in order to improve even more the results. To decrease the incidence of the fractures of the tibial plates and the gravity of the lesions met, it is necessary to prevent the accidents of the public highway and to improve the means of protection in road pathology.

**Keywords:** Fracture; Tibial Plates; Osteosynthesis

### Introduction

Fractures of the upper extremity of the tibia are solutions of continuity whose line seat at the level of the proximal metaphyso-epiphyseal area of the tibia [1].

These fractures occupy an important place among skeletal trauma in general and knee trauma in particular (1 to 2% of all fractures) [2].

In 1875 Richet individualized them as an entity apart from other tibia fractures [3].

In Morocco in 2020 at the Mohamed V University Hospital in Marrakech, tibial plateau fractures represented an annual frequency of 12.4 cases per year [4]. A study carried out in 2018 at CHU Gabriel Touré found a frequency of 1.13% [5]. These fractures are on the

rise, especially affecting young and active people. They are twice as common in men as women and extremely rare in children [6]. These fractures are common, they represent 1% of all fractures and 25% of tibial fractures [7,8].

In 1980, in industrialized countries, the incidence of tibial plateau fractures was 123 per 10,000 inhabitants among women and 104 per 10,000 inhabitants among men [9].

In India in 2013 at Bapuji Hospital, these fractures encompass numerous and varied fracture configurations involving the medial condyle (10 to 23%), the lateral condyle (55 to 70%) or both (11 to 30%) with varying degrees of depressions and joint displacement [10].

The main etiologies remain dominated by road accidents.

AVP and sports accidents (AS) [2,6]. They constitute a therapeutic emergency due to their intra-articular nature and must benefit from adequate management by anatomical reduction (by submeniscal arthrotomy or under arthroscopic control), stable osteosynthesis and early rehabilitation with the aim of avoid numerous complications, the most serious in the long term being osteoarthritis [11]. Union of these fractures is achieved in 3 months on average if properly treated.

The management of these fractures depends on several elements: the age of the patient, the skin condition, the radiological type of the fracture, and the previous joint condition [1,11].

However, the most encountered late complications in 2021 Diakite B [1] found 9.8% infection and 6.6% stiffness in his study; Adoun AH., *et al.* in 2022 [12] in Niger found 7.4% infection compared to 3.7% stiffness in their study.

### Objective of the Study

The objective of the present study was to evaluate the results of surgical management of these fractures.

### Materials and Methods

Our study was carried out in the orthopedic and trauma surgery department of the Gabriel Touré University Hospital in Bamako, Mali.

This was a retrospective and analytical study carried out over a period of 4 years: January 2019 to December 2022.

Sampling was done taking into account the selection criteria of our study population.

The study population consisted of all patients admitted for knee trauma and who met our inclusion criteria during the study period.

All patients who underwent surgery for a tibial plateau fracture during the study period and followed for 10 months.

Surgical treatment was indicated in all cases of displaced fractures except in cases of operative contraindication or patient refusal.

Knee x-ray was the main diagnostic tool. It was supplemented by CT each time there was doubt about the type or extent of the fracture.

The osteosynthesis was carried out both urgently and deferred. The approach was defined according to the type of fracture.

In pure separation fractures, reduction and synthesis by screw or plate was the rule. In all cases with a depression component, the iliac cortico-cancellous graft was performed followed by plate synthesis. The arthrotomy was submeniscal with reconstruction at the end of the operation.

Antibiotic prophylaxis was systematic. Anticoagulant treatment began on admission and was continued postoperatively until weight bearing. Rehabilitation began the day after the operation and continued until knee mobility was restored. The patients were reviewed periodically with an interval of 4 weeks. Support was authorized depending on the progress of the consolidation process.

It consisted of four phases:

1. Data support design phase: It included the variables following: Administrative data (age, sex, consultation time), the etiologies and mechanism, anatomopathological aspects, therapeutic means, the surgical consequences and the final result.

We defined as consultation time, the time elapsed between the trauma and admission to our service; and as treatment time the time elapsed between admission and completion of definitive treatment.

2. Data collection phase: Data was collected from the files, consultation registers, operative reports and hospitalization registers of the Orthopedics-Traumatology department. Each patient had a file in which all administrative, clinical, diagnostic and therapeutic and evolving data were recorded.
3. Data analysis and processing: Text entry was carried out on the Word 2016 software and the graphics were made using Excel software 2016. Data were analyzed using IBM SPSS Statistics 21 software.

The statistical test used was Fisher’s with a significance threshold of  $P \leq 0.05$ . Pearson’s chi-square test was used if Fisher’s was inconclusive.

4. Assessment of the result: The evaluation was made after a minimum of 10 months, according to the anatomical criteria according to MAZAS and DUPARC and the functional criteria according to PONSTEL MERLE d’AUBIGNE.

Criteria	Walking	Pain	Mobility	Stability
Very good	Normal	No pain	Extension complete, 120° bending or more	Perfect, no laxity
Good	Normal or light lameness	Pain rare and moderate	Flexion of more 90°, extension complete at flesum less of 10°	No laxity in extension, squat unilateral possible but with difficulty minimal
Medium	Limited or with a cane	With effort	Flexion from 60° to 90°, Flexum less than 20°	Laxity in extension, squat unilateral impossible
Bad	Walk impossible or with 2 canes	Permanent	Flexion less than 60°, flesum greater than 20°	Serious instability, Monopodal support impossible

**Table 1:** Functional PMA criteria.

Criteria	Articular surface	Interline	Osteoarthritis	Axis
Very good	Reconstruction perfect	Normal	Absent	No defects axis
Good	Little depression residual and localized	Alteration minimal	Signs minimal	No deviation in varus, valgus less than 15°
Bad	Embedding significant	Alteration severe	Clear signs	Deviation in varus, valgus more than 15°

**Table 2:** MAZAS and DUPARC anatomical criteria.

### Results

During the study period, we recorded 116 cases of tibial plateau fractures out of 3768 hospitalizations, or 3.07%.

Among the 116 cases only 70 cases were retained and operated on, representing an inclusion rate of 60.3%.

Among the 3768 hospitalized patients, 1.8% of patients were operated on for tibial plateau fractures. During this study period, 1323 patients were operated on. Tibial plateau fractures represented 5.3% of interventions.

The average age was 44.3 years with extremes of 20 and 66 years and a standard deviation of 1.26.

A male predominance with 87.1%, i.e. a sex ratio of 6.7. All patients presented with a painful knee and functional impotence of the traumatized limb.

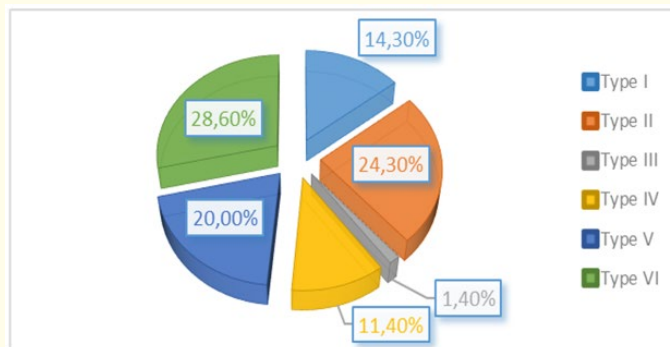
Swollen knee	48	68.8
Knee deformation	26	37.1
Wound	8	11.4
Exquisite pain	70	100
Patellar shock	30	42.9
Sensitivity and motor skills of the toes preserved, pulse perceptible	70	100

**Table 3**

All patients received standard frontal and lateral radiographs.

17.10% of patients performed CT.

### Type of fracture



**Figure 1:** Distribution of patients according to the SCHATZKER classification.

The first way

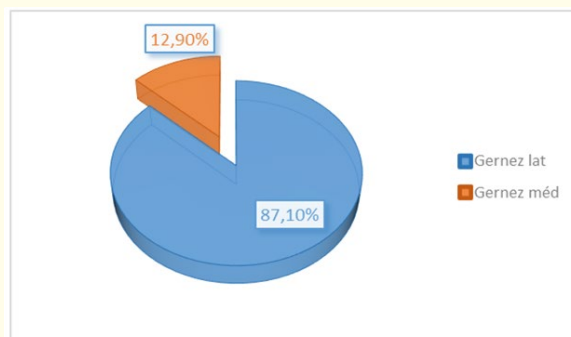


Figure 2: Distribution of patients according to approach.

Osteosynthesis equipment

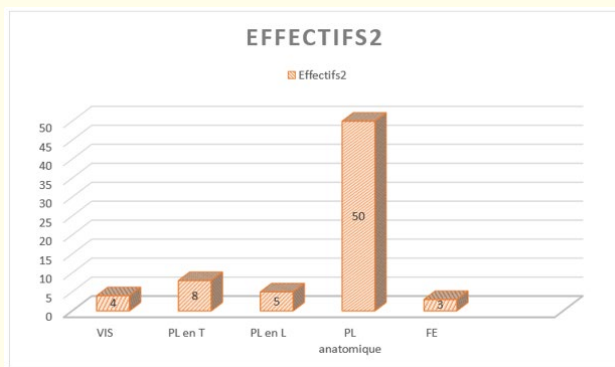


Figure 3: Patients according to osteosynthesis material.

Complications

Complications	Numbers	Frequency %
Infection	8	33,3
Secondary movement	2	8,3
Hardware disassembly	2	8,3
Secondary displacement and infection	3	12,5
Vicious callus	2	8,3
Stiffness	2	8,3
Malunion and stiffness	1	4,2
Infection and stiffness	4	16,7
Total	24	100

Table 4

**Functional result**

Result	Numbers	Frequency %	Cumulative frequency
Very good	24	34,3	34,3
Good	34	48,6	82,9
Average	11	15,7	98,6
Bad	1	1,4	100,0
Total	70	100,0	

**Table 5**

**Correlation between fracture type and functional outcome**

Functional result	Classification de Schatzker						Total
	Type I	Type II	Type III	Type IV	Type V	Type VI	
Very good	6	12	0	3	1	2	24
Good	4	3	1	5	10	11	34
Average	0	1	0	0	3	7	11
Bad	0	1	0	0	0	0	1
Total	10	17	1	8	14	20	70

**Table 6**

**Discussion**

We conducted a retrospective study from January 1, 2019 to December 31, 2022, a period of 04 years. It concerned 70 cases of tibial plateau fractures admitted to the orthopedic-traumatology surgery department of the Gabriel Touré university hospital center in Bamako.

We were faced with difficulties linked to the retrospective nature, in particular the lack of certain useful information in the files as well as the absence of the operative report of certain patients. The low follow-up of the study limits the evaluation of long-term complications such as osteoarthritis and algodystrophy. The follow-up was a minimum of 10 months.

Anatomo-pathological type of fracture: Schatzker type VI was the most represented with 28.6% of cases, followed by type II with 24.3% of cases. This type could be justified by a high velocity mechanism. This result differs from those reported in the literature, which suggests a predominance of type II: see table.

The treatment: All patients received medical treatment consisting of analgesia, anticoagulant and antibiotics.

The first way: The lateral Gernez approach was the most used with 87.1% of cases. The lateral tibial plateau being the most often affected, the lateral approach was much easier.

Tadsaoui S [20] found a result superior to ours with 93.33% use of the lateral Gernez route.

### Osteosynthesis equipment

Osteosynthesis was carried out by a screwed plate, by screwing associated with a screwed plate or by percutaneous screwing underoscopic control. No case of double plate osteosynthesis requiring a double approach was used in our series, because the double approach exposes to skin necrosis and increases the risk of infection. Even if some authors recommend the use of two screwed plates in the event of a fracture involving both pillars [23-27], we perform reduction and osteosynthesis using a screwed plate combined with direct screwing. Only three patients benefited from an external fixator.

This preference is justified by the greater stability offered by the screwed plate. Our results are superior to those of Bounabe R [14] who found 22% plate osteosynthesis compared to 62% screwing.

### Evolution

In our study the result was satisfactory in 82.9% of cases. Surgical treatment is best indicated in the management of tibial plateau fractures, it allows the reconstruction of the articular surfaces guaranteeing a good result.

### Conclusion

Tibial plateau fractures remain a frequent trauma problem. These are serious injuries that can jeopardize the functional prognosis of the knee. Surgical treatment, which currently leaves little room for orthopedic treatment, must ensure the restoration of the functional quality of the knee and respect for the static balance of the lower limb. Functional rehabilitation is a fundamental and essential step which must be meticulous and diligent from early on in order to allow better recovery of the joint and avoid complications. Furthermore, we must ensure the prevention of these fractures through road regulations.

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