Scientific Research Publishing

Surgical Science, 2025, 16(4), 247-255
https://www.scirp.org/journal/ss
ISSN Online: 2157-9415
ISSN Print: 2157-9407

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

Mamadou Bassirou Traore*, Mahamadou Diallo, Abdoul Kadri Moussa, Harouna Diallo

CHU Gabriel TOURE, Bamako, Mali
Email: *mamadoubassiroutraore@yahoo.fr

How to cite this paper: Traore, M.B., Diallo, M., Moussa, A.K. and Diallo, H. (2025) Surgical Treatment of Tibial Plate Fractures at CHU-Gabriel Toure (Bamako, Mali). *Surgical Science*, **16**, 247-255.
https://doi.org/10.4236/ss.2025.164026

Received: December 3, 2024
Accepted: April 24, 2025
Published: April 27, 2025

Abstract

This was a 4-year retrospective study from January 2019 to December 2022 involving 70 patients operated on in the orthopedic and trauma surgery department of the CHU-GT in Bamako. The aim was to study the epidemiological, anatomo-pathological, clinical characteristics, therapeutic and progressive, as well as the analysis of the results obtained. The male sex was the most affected with 87.1% of cases and a sex ratio of 6.7. The age group of 40 to 49 years represented 25.7%. The average age was 44.3 years with a range of 20 to 66 years. Public road accidents were the main cause of tibial plateau fractures with a rate of 92.9%. These joint fractures mainly affect the left side (64.3%) and are due in more than half of cases to traffic accidents. Radiographic analysis allows them to be properly coded according to the Schatzker classification. Surgical treatment is necessary for displaced forms. Our results were evaluated based on anatomical and functional criteria. They were satisfactory in 82.9% of cases, and thus remain in agreement with the data in the literature. Despite this, we should think about developing our therapeutic means, particularly minimally invasive techniques, in order to improve our results. To reduce the incidence of tibial plateau fractures and the severity of the injuries encountered, it is necessary to prevent road accidents and improve means of protection in road pathology.

Keywords

Fracture, Tibial Plateaus, Osteosynthesis

1. 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] [7]. These fractures are common, and they represent 1% of all fractures and 25% of tibial fractures [8] [9].

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 [10].

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 [11].

The main etiologies remain dominated by road accidents (RA) and sports accidents (SA) [2] [7]. 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 [12]. 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] [12].

However, However, the most encountered late complications in 2021 were those reported by DIAKITE B. [1]: 9.8% infection and 6.6% stiffness; ADOUN AH *et al.* in 2022 in Niger found 7.4% infection compared to 3.7% stiffness in their study.

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

2. Material and Method

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:

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.

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.

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.

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 (Table 1 and Table 2).

Table 1. Functional PMA criteria.

Criteria	Walking	Pain	Mobility	Stability
Very good	Normal	No pain	Extension complete, 120˚ bending or more	Perfect, no Laxity

Continued

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˚, flesum 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 2. MAZAS and DUPARC anatomical 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˚

3. Results (Tables 3-6, Figures 1-4)

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.

We note 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.

Table 3. Physical signs.

Swollen knee	48	68.8
Knee deformation	26	37.1

Continued

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

All patients received standard frontal and lateral radiographs.

17.10% of patients performed CT.

The type of fracture:

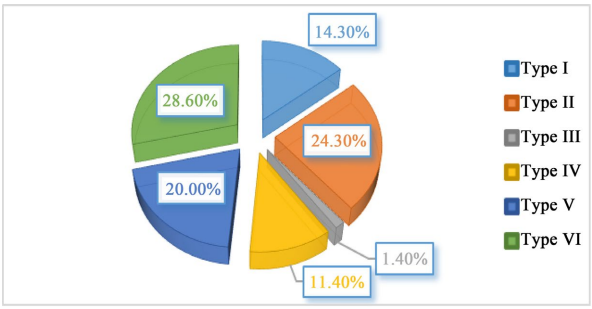

Figure 1. Distribution of patients according to the SCHATZKER classification.

The first way:

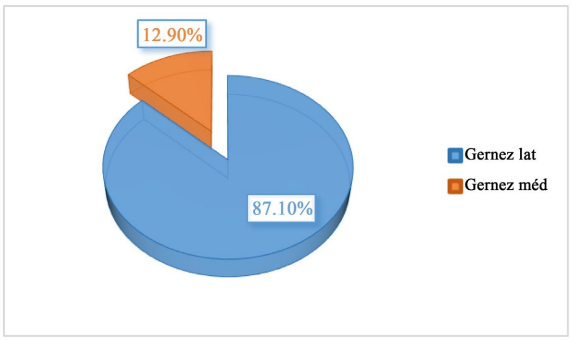

Figure 2. Distribution of patients according to approach.

Osteosynthesis equipment:

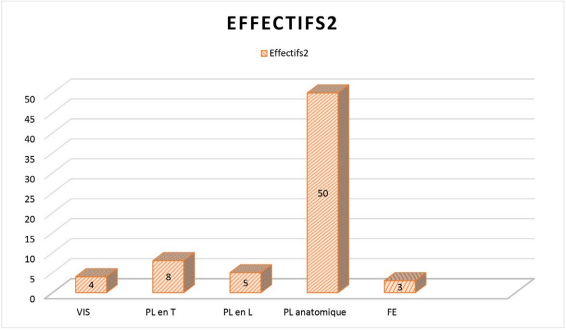

Figure 3. Patients according to osteosynthesis material.

Table 4. 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**

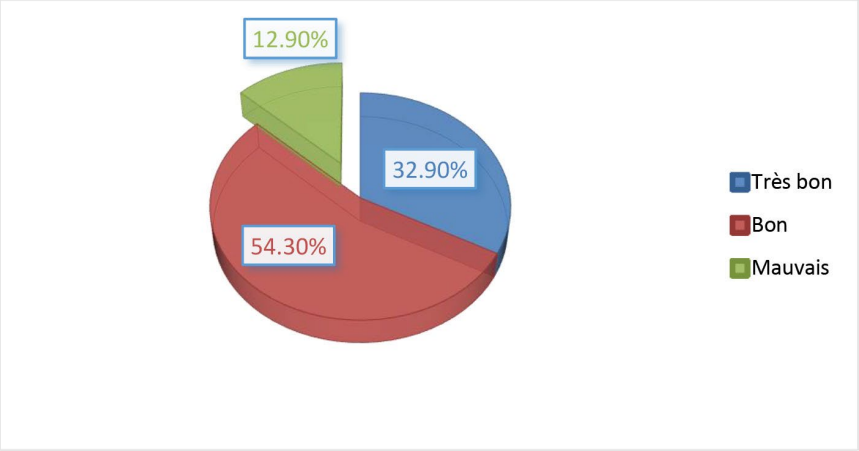

Figure 4. Distribution according to anatomical result.

Table 5. The 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 6. Correlation between fracture type and functional outcome.

Functional result	Schatzker Classification						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**

4. 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 (**Tables 3-6**, **Figures 1-4**):

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:

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

The lateral GERNEZ approach was the most used with 87.1% of cases. The lateral tibial plateau was the most often affected, and the lateral approach was much easier (**Figures 1-4**).

TADSAOUI S. [12] found a result superior to ours with 93.33% use of the lateral GERNEZ route.

Osteosynthesis was carried out by a screwed plate, by screwing associated with a screwed plate or by percutaneous screwing under scopic 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 [13]-[17], 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. 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.

5. 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.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] Diakite, B. (2021) Surgical Treatment of Tibial Plateau Fractures at the Kati BSS University Hospital. Memory, Mali.

[2] Keita, K. (2002) Epidemiological, Clinical and Therapeutic Study of Fractures of the Upper End of the Tibia in 50 Cases in the Orthopedic and Trauma Surgery Department of the H.G.T. Thesis FMPOS, Bamako (Mali).

[3] Huten, D., Duparc, J. and Cavagnan, B. (1990) Recent Fractures of Adult Tibial Plateaus. Technical Edition. Encyclopedia Medicosurgical (Paris France) Musculoskeletal System, 1408-B-10, 12 p.

[4] Moussaqid, M. (2020) Schatzker V and VI Tibial Plateau Fractures: Treatment and Prognosis. Medical Thesis in Marrakech, Marrakech (Marroco).

[5] Fofana, A. (2018) Clinical and Therapeutic Epidemiological Study of Fractures of the Proximal End of the Tibia in the Surgery Department Orthopedic and Traumatology at CHU Gabriel TOURE. Thesis of Medicine, FMOS Mali.

[6] Duparc, F. (1998) Recognize and Treat a Fracture of the Tibial Plateaus of the Adult. *Concours Medical*, **120**, 1179-1189

[7] Charalambous, C., Tryfonidis, M., Alvi, F., Moran, M., Fang, C., Samaraji, R., *et al.* (2007) Inter- and Intra-Observer Variation of the Schatzker and AO/OTA Classifications of Tibial Plateau Fractures and a Proposal of a New Classification System. *The Annals of The Royal College of Surgeons of England*, **89**, 400-404. https://doi.org/10.1308/003588407x187667

[8] Fontaine, C. and Vannineuse, A. (2005) Knee Fracture: Practical Approach in Orthopedics-Traumatology. Springer.

[9] Bengnér, U., Johnell, O. and Redlund-Johnell, I. (1986) Increasing Incidence of Tibia Condyle and Patella Fractures. *Acta Orthopaedica Scandinavica*, **57**, 334-336. https://doi.org/10.3109/17453678608994405

[10] Girish, H.V., Antin, S.M., Akkimaradi, R.C., Polocepatil, P. and Girsh, N. (2013) Surgical Management of Tibial Plateau Fractures—A Clinical Study. *Journal of Diagnostic Research*, **7**, 3128-3130.

[11] Trenholm, A., Landry, S., McLaughlin, K., Deluzio, K.J., Leighton, J., Trask, K., *et al.* (2005) Comparative Fixation of Tibial Plateau Fractures Usingα-BSM™, a Calcium Phosphate Cement, versus Cancellous Bone Graft. *Journal of Orthopaedic Trauma*, **19**, 698-702. https://doi.org/10.1097/01.bot.0000183455.01491.bb

[12] Tadsaoui, S. (2019) Surgical Treatment of Tibial Plateau Fractures Using the "Scaffolding" Technique. Medical Thesis, Marrakech.

[13] Rademakers, M.V., Kerkhoffs, G.M.M.J., Sierevelt, I.N., Raaymakers, E.L.F.B. and Marti, R.K. (2007) Operative Treatment of 109 Tibial Plateau Fractures: Five- to 27-Year Follow-Up Results. *Journal of Orthopaedic Trauma*, **21**, 5-10. https://doi.org/10.1097/bot.0b013e31802c5b51

[14] Prasad, G.T., Kumar, T.S., Kumar, R.K., Murthy, G.K. and Sundaram, N. (2013) Functional Outcome of Schatzker Type V and VI Tibial Plateau Fractures Treated with Dual Plates. *Indian Journal of Orthopaedics*, **47**, 188-194. https://doi.org/10.4103/0019-5413.108915

[15] Zhang, Y., Fan, D., Ma, B. and Sun, S. (2012) Treatment of Complicated Tibial Plateau Fractures with Dual Plating via a 2-Incision Technique. *Orthopedics*, **35**, e359-e364. https://doi.org/10.3928/01477447-20120222-27

[16] Barei, D.P., Nork, S.E., Mills, W.J., Henley, M.B. and Benirschke, S.K. (2004) Complications Associated with Internal Fixation of High-Energy Bicondylar Tibial Plateau Fractures Utilizing a Two-Incision Technique. *Journal of Orthopaedic Trauma*, **18**, 649-657. https://doi.org/10.1097/00005131-200411000-00001

[17] Kumar, V., Singhroha, M., Arora, K., Sahu, A., Beniwal, R. and Kundu, A. (2021) A Clinico-Radiological Study of Bicondylar Tibial Plateau Fractures Managed with Dual Locking Plates. *Journal of Clinical Orthopaedics and Trauma*, **21**, Article 101563. https://doi.org/10.1016/j.jcot.2021.101563