

Management of Tibial Plateau Fractures: A Retrospective Study of 50 Cases at IBN TOFAIL University Hospital, Marrakesh

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Abstract

Original Research Article

Introduction: Tibial plateau fractures are severe intra-articular injuries that threaten knee function. This study aimed to analyse their epidemiological features, management and functional outcomes in our department. **Methods:** Retrospective study of 50 patients treated for a tibial plateau fracture between July 2025 and August 2026. Fractures were classified according to Schatzker, and outcomes were assessed using the Merle d'Aubigné and Mazas criteria. **Results:** Mean age was 41 years (17–68) and 64% of patients were men. Road traffic accidents accounted for 84% of cases. Schatzker types II (32%) and III (24%) predominated. Forty-seven patients (94%) underwent surgery. At a mean follow-up of 18 months (6–36), functional outcomes were good or very good in 84% of cases. Satisfactory outcomes were more frequent in patients aged 55 years or younger (93% vs 25%, $p < 0.001$) and in unicondylar fractures (97% vs 53%, $p < 0.001$). **Conclusion:** Surgical treatment of tibial plateau fractures yields good outcomes. Age over 55 years and complex fractures (Schatzker V and VI) are associated with poorer functional results. **Keywords:** Tibial Plateau Fracture, Schatzker Classification, Internal Fixation, Percutaneous Screw Fixation, Functional Outcome.

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INTRODUCTION

Tibial plateau fractures involve the articular surface of the proximal tibia. They are fractures of the cancellous epiphyseal-metaphyseal block in which at least one fracture line crosses the articular cartilage [1]. They are an archetype of intra-articular fractures of the lower limb and particularly affect young men [1].

These fractures threaten knee mobility and stability. Prompt and appropriate management is required to prevent post-traumatic knee osteoarthritis, the most feared long-term complication. Computed tomography (CT) has improved their assessment, and their treatment, largely surgical, has evolved towards minimally invasive techniques and arthroscopy [1].

The aim of this study was to analyse the epidemiological features, management and functional outcomes of tibial plateau fractures in our department, and to compare them with the literature.

MATERIALS AND METHODS

Study Design

This was a retrospective descriptive and analytical study of 50 patients treated for a tibial plateau fracture in the Department of Orthopaedic and Trauma Surgery a of Ibn Tofail Hospital (Mohammed VI University Hospital, Marrakech) over a 1-year period, from July 2025 to August 2026.

Inclusion and Exclusion Criteria

We included all patients with a recent tibial plateau fracture who were treated and regularly followed up in the department.

We excluded physeal fractures in children, tibial spine fractures, apophyseal fractures of the tibial tuberosity, infratuberosity fractures, patients lost to follow-up and incomplete or missing records.

Data Collection

Epidemiological, clinical, imaging, therapeutic and follow-up data were collected from medical records using a standardised data collection form. Fractures were classified on radiographs and CT scans according to the Schatzker classification [2].

Outcome Assessment

Functional and anatomical outcomes were assessed at last follow-up using the Merle d'Aubigné and Mazas criteria [3, 4], and graded as very good, good, fair or poor. Very good and good results were considered satisfactory.

Statistical Analysis

Quantitative variables are expressed as means and ranges, and qualitative variables as counts and percentages. The proportion of satisfactory outcomes was compared by age (≤ 55 years vs > 55 years) and by fracture type (unicondylar, Schatzker I–III, vs complex,

Schatzker IV–VI) using Fisher's exact test. Statistical significance was set at $p < 0.05$.

RESULTS

Epidemiological Data

Mean age was 41 years (range 17–68), with a peak frequency between 35 and 44 years (32%). The series included 32 men (64%) and 18 women (36%). The left knee was involved in 30 cases (60%). Six patients (12%) had a medical history (diabetes, hypertension, osteoporosis) and three (6%) a surgical history.

Road traffic accidents accounted for 42 cases (84%), followed by sports injuries (3 cases, 6%), falls (3 cases, 6%), work accidents (1 case, 2%) and assaults (1 case, 2%) (Fig. 1). The mechanism was lateral compression in 25 cases (50%), axial compression in 8 cases (16%) and mixed in 17 cases (34%).

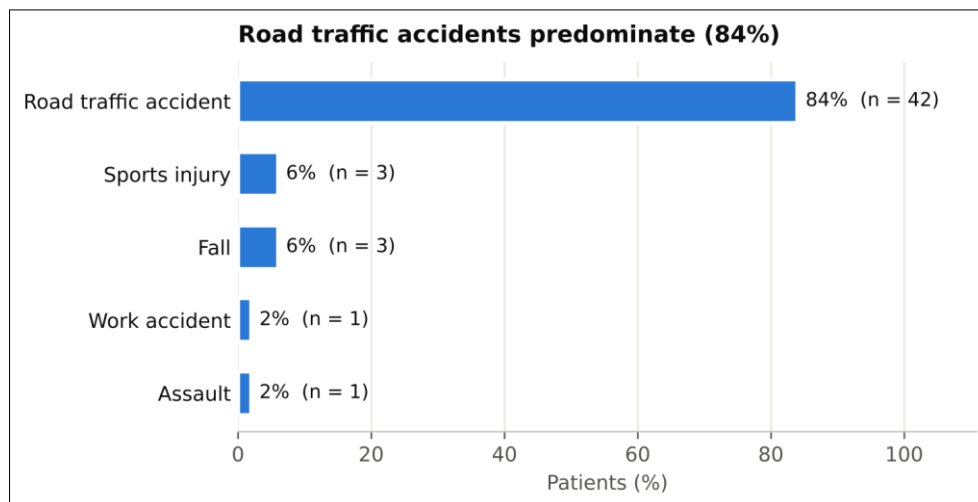


Figure 1: Distribution of patients by actiology (n = 50)

Clinical Data and Associated Injuries

All patients presented with a painful knee and functional impairment. The knee was swollen in 45

patients and deformed in 35, and a patellar tap was present in 30.

Table 1: Associated injuries (n = 50)

Associated injuries	n	%
Open wound (Cauchoix-Duparc I: 3; II: 2; III: 1)	6	12
Associated bone injuries	17	34
— fibular head fracture	13	26
— patella fracture	2	4
— leg fracture	2	4
Ligament injuries (ACL: 3; MCL: 1; LCL: 1)	5	10
Meniscal injuries (lateral meniscus: 3; medial: 1)	4	8
Polytrauma	7	14
Neurovascular injuries	0	0

Imaging Data

All patients underwent anteroposterior and lateral radiographs, supplemented by oblique views in 9 patients (18%). CT was performed in 37 patients (74%)

and MRI in 6 (12%). The elementary lesion was a split in 13 cases (26%), a depression in 17 cases (34%) and a split-depression in 20 cases (40%). Figure 2 shows two

examples (Schatzker types II and V), and Figure 3 shows the distribution according to this classification.

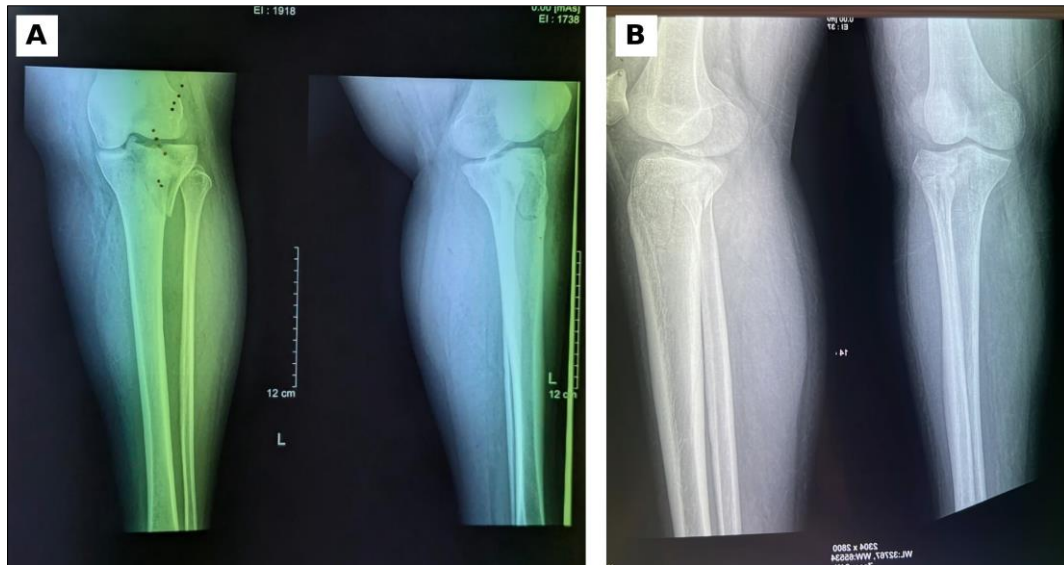


Figure 2: Preoperative anteroposterior and lateral radiographs of the knee. A: Schatzker type II fracture. B: Schatzker type V fracture

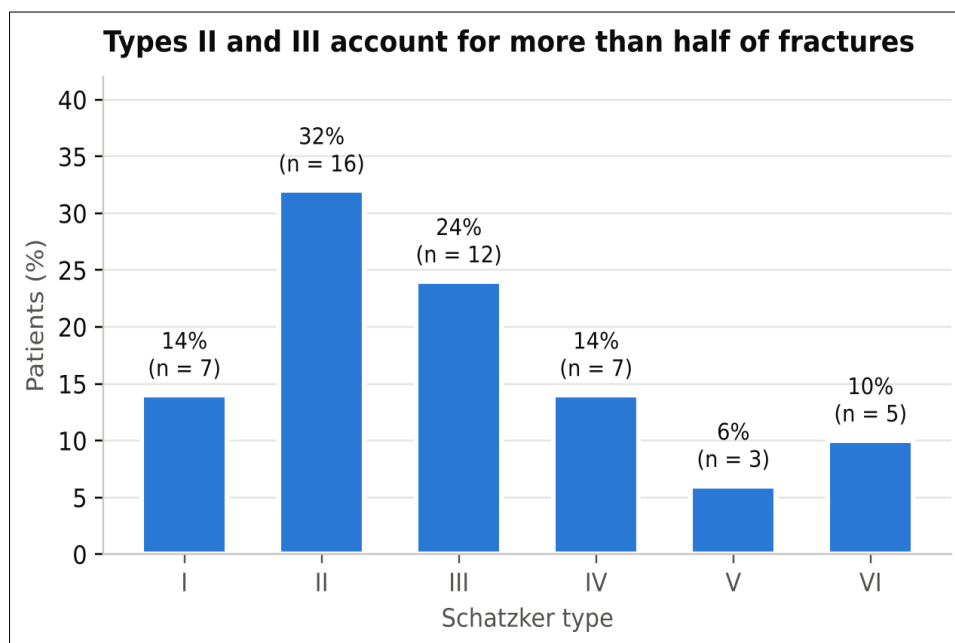


Figure 3: Distribution of fractures according to the Schatzker classification (n = 50)

Management

Mean time to surgery was 6 days (range 0–20 days). Three patients (6%) were treated non-operatively with a hinged knee brace: two undisplaced type I fractures and one medial unicondylar fracture.

Forty-seven patients (94%) underwent surgery, under spinal anaesthesia in 43 cases (91.5%) and general anaesthesia in 4 cases (8.5%), in the supine position with a pneumatic tourniquet, a bolster under the ipsilateral buttock and fluoroscopic control. The approach was an

anterolateral Gernez approach in 26 cases, anteromedial in 2 cases and dual in 4 cases; the 15 percutaneous screw fixations were performed through a lateral mini-incision. Submeniscal arthrotomy was performed in 30 patients (63.8%). An iliac corticocancellous bone graft was used to fill the metaphyseal void in 15 cases (31.9%). The four meniscal injuries were treated by partial meniscectomy or meniscal repair, and the five ligament injuries by ligament reconstruction. Fixation methods are shown in Figure 4.

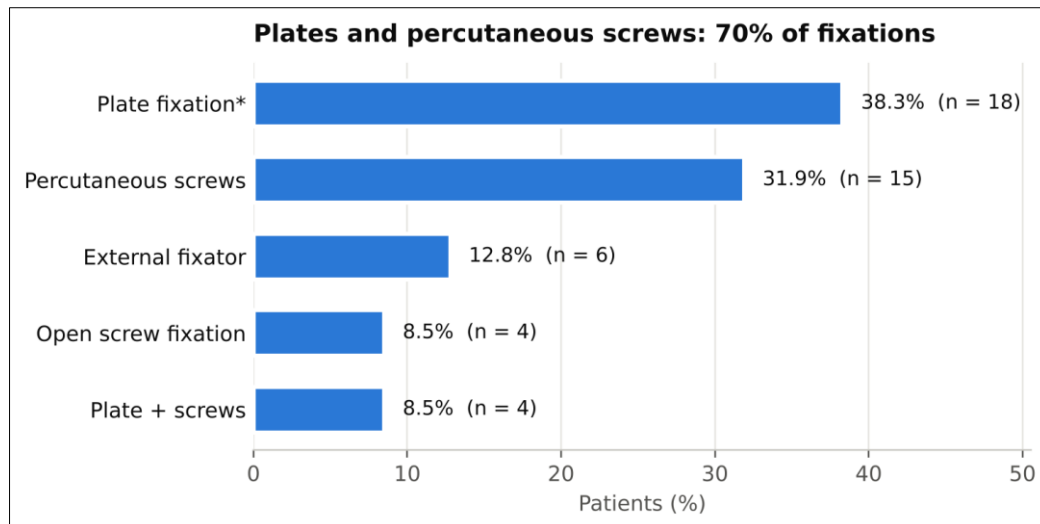


Figure 4: Distribution of fixation methods in the 47 operated patients. *Including 5 dual-plate fixations.

Figure 5 shows two examples of plate fixation: a lateral plate and a T-plate.

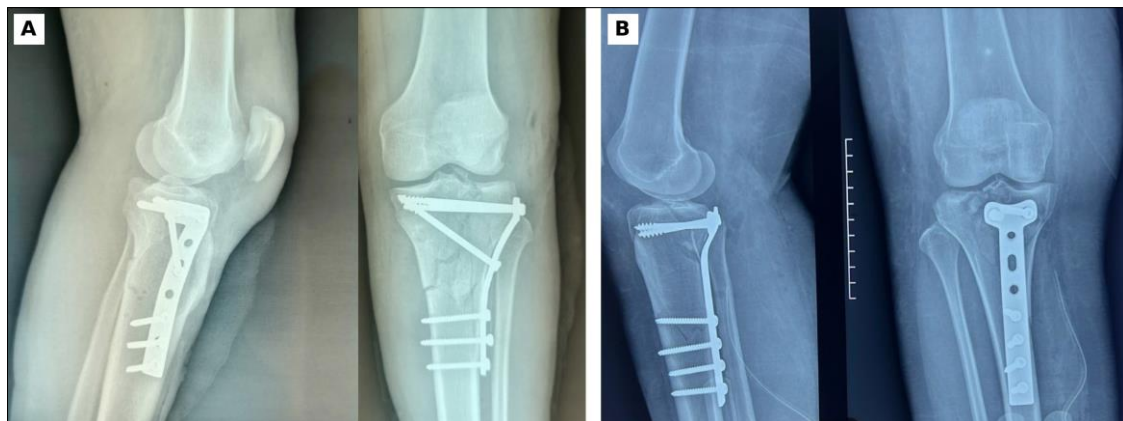


Figure 5: Postoperative anteroposterior and lateral radiographs. A: lateral plate fixation. B: T-plate fixation.

Postoperative immobilisation in a knee brace was maintained for 4 to 6 weeks depending on construct stability. Rehabilitation was started early in all patients. Partial weight-bearing was allowed at day 45 and full weight-bearing at 3 months.

Complications

Early complications were three superficial infections (6%), which resolved with antibiotics and

local wound care. One deep vein thrombosis (2%) was treated with anticoagulants. Late complications occurred in 6 patients (12%): 4 cases of knee stiffness (8%) with flexion limited to 70–90°, one malunion (2%) and one case of osteoarthritis (2%). No epiphyseal necrosis, non-union or complex regional pain syndrome was observed.

Functional and Anatomical Outcomes: Mean follow-up was 18 months (range 6–36 months).

Table 2: Overall outcomes according to Merle d'Aubigné and Mazas (n = 50)

Outcome	Functional n (%)	Anatomical n (%)
Very good	15 (30)	17 (34)
Good	27 (54)	27 (54)
Fair	5 (10)	—
Poor	3 (6)	6 (12)

Outcomes were satisfactory in 42 cases (84%) functionally and in 44 cases (88%) anatomically.

Satisfactory functional outcomes were significantly more frequent in patients aged 55 years or

younger (39/42, 92.9%) than in patients older than 55 years (2/8, 25%) ($p < 0.001$). They were also more frequent in unicompartmental fractures (Schatzker I–III: 34/35, 97.1%) than in types IV–VI (8/15, 53.3%) ($p < 0.001$) (Fig. 6).

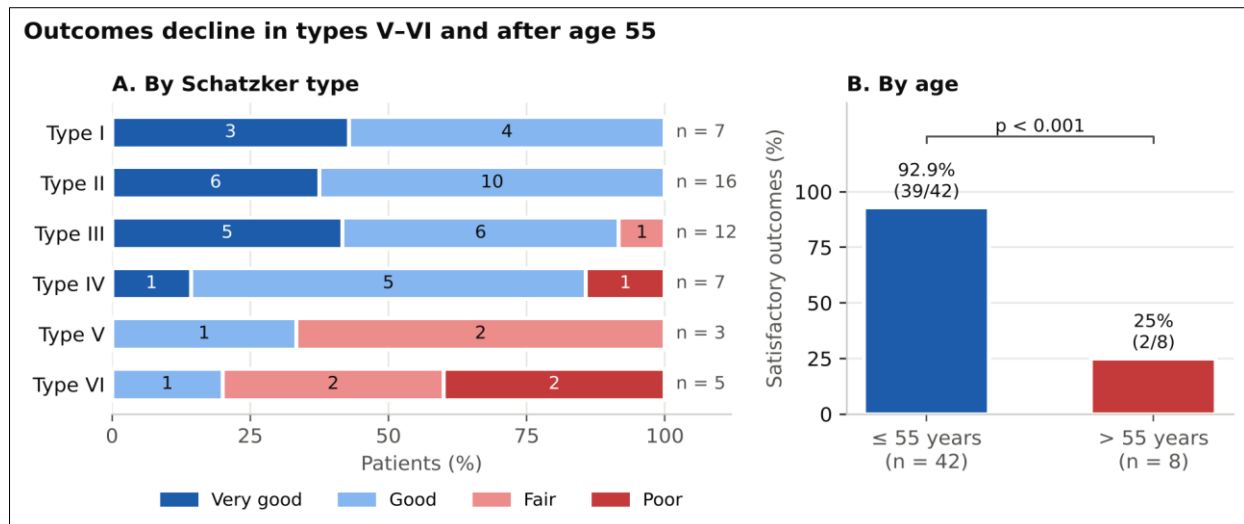


Figure 6: Functional outcomes by Schatzker type (A, counts within bars) and proportion of satisfactory outcomes by age (B; Fisher's exact test)

Screw fixation, whether percutaneous or open, yielded 100% satisfactory outcomes (19/19 cases).

DISCUSSION

Epidemiology

The mean age of our patients (41 years) is comparable to that of published series, which ranges from 36 to 52.6 years [5–10]. The male predominance (64%) is consistent with reported proportions of 60.5 to 92% [7–11], explained by the greater exposure of young men to high-energy trauma.

Road traffic accidents accounted for 84% of cases, a higher proportion than in European and Asian series (50 to 80%) [7–12]. This reflects the burden of road traffic injuries in our setting, which is also reflected in

the frequency of associated injuries: 34% bone injuries, 14% polytrauma and 12% open wounds, the latter being reported in 4.6 to 22.8% of cases in the literature [5–14].

Classification

Schatzker type II was the most frequent (32%), as in the series of Xiao-jun, Chan and Russell [15–17]. Type V was the least frequent (6%), in agreement with the data of Xiao-jun and Russell [15–17]. CT, performed in 74% of our patients, has become essential to define the location and depth of depressions and to plan fixation.

Outcomes and Prognostic Factors

Our 84% rate of good and very good outcomes is comparable to published series, which report 45.4 to 100% satisfactory outcomes depending on the types of fracture included [5–20].

Table 3: Overall outcomes in the literature

Series	n	Good and very good (%)	Fair (%)	Poor (%)
Bouaouad [5]	87	86.2	10.3	3.5
Koulali [9]	100	67	20	13
Khan [11]	26	45.4	46	15.3
Messaoudi [14]	44	72.7	23.3	—
Duwelius [18]	57	82.5	17.5	0
Prasad [19]	40	100	0	0
Kumar [20]	36	80.5	19.4	0
Our series	50	84	10	6

Age appears to be a major prognostic factor in our series: 75% of patients older than 55 years had an unsatisfactory outcome. This is consistent with studies reporting poorer surgical outcomes in elderly patients due to bone and soft-tissue quality [13–21], although other authors report satisfactory results in this population [22, 23].

Fracture type is the second determinant of prognosis. Unicondylar fractures yielded 97%

satisfactory outcomes, compared with 53% for types IV to VI and only 20 to 33% for types V and VI. Chan *et al.*, also reported excellent results for types I to III and fair to poor results for types V and VI [16].

Percutaneous screw fixation yielded 100% satisfactory outcomes, as in the series of Bouaouad and Koval [5–24], and Hachimi reported 91% good or very good results with this technique [25]. These results should nevertheless be interpreted with caution: screw

fixation was reserved for simple fractures, and the comparison between techniques mainly reflects the initial severity of the injuries.

Complications

The rate of late complications (12%) remains moderate. Stiffness (8%) was the most frequent; its prevention relies on stable fixation allowing early mobilisation. Osteoarthritis was observed in only one case (2%), compared with 19% in Chan's series [16], but our mean follow-up of 18 months is insufficient to assess this risk, which develops in the long term.

Limitations

This study has several limitations: its retrospective, single-centre design; its limited sample size, particularly for complex fractures; and the exclusion of patients lost to follow-up, which may overestimate good outcomes. The mean follow-up of 18 months does not allow post-traumatic osteoarthritis to be assessed. Finally, outcome assessment relied on the Merle d'Aubigné and Mazas criteria rather than validated patient-reported scores such as the KOOS or IKDC.

CONCLUSION

Tibial plateau fractures are severe intra-articular injuries, dominated in our setting by road traffic accidents. Surgical treatment tailored to the fracture type achieves 84% satisfactory functional outcomes. Percutaneous screw fixation gives excellent results in simple fractures. Age over 55 years and complex fractures (Schatzker V and VI) are associated with poorer outcomes, which justifies systematic CT assessment and specialised management of these patterns.

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