

FRACTURES OF TIBIAL PLATEAU SCHATZKER V AND VI: TREATMENT AND PROGNOSIS**Tarik El Mountassir*, Karim El Hammiri, Yassine Moubadi, Anass Lahlou, Moncef Boufettal, Reda Allah Bassir, Mohamed Kharmaz, Moulay Omar Lamrani and Mohamed Saleh Berrada**

Department of Orthopedic Surgery, Ibn Sina Hospital, University Mohamed V, Faculty of Medicine of Rabat, Avenue Mohamed Belarbi El Alaoui B.P.6203 10000, Rabat. Morocco.

***Corresponding Author: Tarik El Mountassir**Department of Orthopedic Surgery, Ibn Sina Hospital, University Mohamed V, Faculty of Medicine of Rabat, Avenue Mohamed Belarbi El Alaoui B.P.6203 10000, Rabat. Morocco. DOI: <https://doi.org/10.17605/OSF.IO/KPZ5V>

Article Received on 02/12/2020

Article Revised on 22/12/2020

Article Accepted on 12/01/2021

ABSTRACT

Tibial endplate fractures are joint fractures that lead to post-traumatic knee osteoarthritis. The aim of our work is to analyze the therapeutic and evolutionary aspect (prognosis) of fractures of the Schatzker V and VI tibial plates, collected at the orthopedic trauma service of the Ibn Sina University Hospital in Rabat and to compare them with those in the literature. This was a retrospective, descriptive and analytical study, spread over a period of 6 years from January 1, 2015 to December 31, 2020 at the traumatology-orthopedics department of CHU Ibn Sina in Rabat. We included in the series all patients hospitalized for a tibial plateau fracture classified Schatzker V and VI during the study period 62 cases. The medical file, the treatment card and the hospitalization register formed the basis of entry of epidemiological, clinical, therapeutic and evolutionary data. The external Gernez approach was the most used in 59.3% of cases, the osteosynthesis material used varied from a screw plate, a simple screw connection or a combination of the two. In our series, we noted 42% good and very good results based on functional results and 46.7% good and very good results based on anatomical results according to the criteria of MERLE D'AUBIGNE and MAZAS.

KEYWORDS: Fracture - Tibial plateau - Schatzker V - Schatzker VI - Treatment - Prognosis.**INTRODUCTION**

Tibial plateau fractures are articular fractures, which are defined as a solution of continuity of the epiphyseal-metaphyseal cancellous block of the upper end of the tibia, at least one feature of which involves the articular cartilage.^[1]

In 1875 Richet individualized them as an entity apart from other tibial fractures.^[2]

They often result from violent trauma, in particular accidents on the public road and accidents at work, which are the main etiologies.^[1]

They constitute a therapeutic emergency because of their intra-articular nature and must benefit from an adequate management by an anatomical reduction (by arthrotomy under meniscal or under arthroscopic control), a stable osteosynthesis and an early rehabilitation with the aim of avoid many complications, the most formidable in the long term being osteoarthritis.^[3]

The diversity and complexity of tibial plateau fractures have led to several classifications being proposed in the literature (Duparc and Ficat, AO, Hohl and Schatzker

classification), based on the analysis of basic lesions and the mechanisms of their occurrence.^[1,2,4,5]

The Schatzker classification established in 1976 is widely used by authors to assess initial injury, gestational plan and to predict prognosis, it is based on the topography of the upper end of the tibia.

The aim of this work is to analyze the therapeutic and evolutionary aspect (prognosis) of a series of 62 cases of fractures of the Schatzker V and VI tibial plates, collected at the orthopedic Traumatology service of the Ibn Sina University Hospital in Rabat during a period 5 years from January 2015 to December 2020 and compare them to those in the literature.

RESULTS

The average age of our patients is 45 years, with a clear predominance of men.

The etiologies were dominated by accidents on the public highway 79% of the cases, lateral compression was the dominant mechanism, and the positive diagnosis was radio clinical, supplemented by computed tomography in 12.1% of cases. Schatzker VI fractures

were predominant (figure 1) 52.5% of cases. All of our patients were treated surgically.

The external Gernez (figure 2) approach was the most used in 59.3% of the cases, the osteosynthesis material used varied from a screwed plate, a simple screwing or a combination of the two (figure 3).

In our series, we scored 42 % good and very good results based on the functional results and 46.7 % good and very

good results based on the anatomical results according to the criteria of MERLE D'AUBIGNE and MAZAS.

Among the complications, we noted: 2 cases of superficial suppuration (3.2%), 2 cases of thrombophlebitis (3.2%) 8 cases of joint stiffness (12.9%), 6 cases of post-traumatic osteoarthritis (9.67%), 4 cases of vicious cal, (6.45%).3 cases of axis defect(4.83%). 2 cases of non-union (3.2%) and 1 case of algodystrophy (1.6%).



Figure 1: Knee x-ray face + profile: Schatzker VI tibial plateau fracture.



Figure 2: Per operative image of external GERNEZ approach



Figure 3: post-op Radio Control 2 plates screwed in L.

DISCUSSION

The fractures of the tibial plates are a therapeutic emergency because the evolution mode of these fractures towards consolidation is extremely fast.

The Schatzker classification established in 1976 is widely used by authors to assess the initial injury, the gestation plan and to predict the prognosis, it is based on the topography of the upper end of the tibia, and it thus separates the fractures of the plateau tibial in 6 types.^[6]

- Type I: pure separation fracture of the external tibial plateau.
- Type II: separation fracture depression of the external tibial plateau.
- Type III: pure depression fracture of the external tibial plateau.
- IIIa: peripheral depression.
- IIIb : central depression
- Type IV: fracture of the internal glenoid cavity, whether or not associated with a fracture of the spines.
- Type V: bituberosal fracture.
- Type VI: tuberosity fracture associated with a high diaphyseal fracture of the tibia

The goal of treatment,^[10,11] is to restore a mobile, painless and stable knee, to treat all associated lesions and to avoid complications.

To achieve this goal, processing must adhere to four general principles.^[14,15,16]

- Early treatment due to the rapid aging of joint fractures
- Perfection of the reduction restoring an anatomical joint profile
- Strength and effectiveness of the restraint which will ensure a consolidation in good position
- Precocity of rehabilitation and all physiotherapist resources

Surgical treatment is the treatment advocated by the majority of authors. It is for these, only able to deduce an important depression to fix stably separation and to obtain an assembly allowing immediate mobilization.^[11,14,17-18]

The patients in our series were operated on within an average of 2 days with extremes ranging from 1 day to 25 days, going hand in hand with the other series in the literature which varied from 9 to 11 days.^[12,19]

The surgical approach is done on a normal table under general anesthesia or spinal anesthesia, the patient is installed in strict supine position at the edge of the table so that the knee can bend if necessary. A pneumatic tourniquet is put in place and it is prudent to inflate it without using Esmach's bandage to avoid embolic problems, especially when the surgery is postponed. The

iliac crest will always be prepared to face the need for a corticospongiosis graft.^[13,15]

Spinal anesthesia was used in 91.1% of cases (57 patients), peripheral nerve blocks of the lower limb (epidural) were used in 3.2% of cases (2 patients), while general anesthesia was only given in 8.1% of cases (5 patients).

Multiple approaches are described, most often anterolateral, para patellar, internal, external or even mixed.

The external latero-patellar approach is most often used because of the frequency of external lesions.^[1,15,20-21] It is performed 2 cm behind the patella and extends to the upper end of the tibia; the fascia lata is incised in the axis of its fibers directly above Gerdy's tubercle. The incision then continues on the leg aponeurosis, along the tibial crest, leaving a fragment of the fascia to be able to close first.^[1,20] The release of the external face of the tibia must be careful. The vascularization of the fragments must be preserved as much as possible.^[20]

In our series, the external approach is performed in 38 patients 59.3% and the internal approach in 2 3.2% case. The double approach internal and external is performed in 22 patients 35.5%.

Currently, most authors rather use the submeniscal approach, although it is insufficient and do not always allow an accurate assessment of the lesions, especially posterior depression; it remains the most anatomical and least invasive approach.^[1,15] In our series, we adopted sub-meniscal arthrotomy for all our patients.

Several methods are described, among the most used

- Screwing: can be performed either in the open or with a closed focus by percutaneous screwing under fluoroscopic control alone or assisted by arthroscopy. When percutaneously screwing in a tilted tilt of the fracture pad, be careful and, if necessary, first fix the distal part of the tibial scale of the fracture.^[4,9] In our series, screwing alone was not performed as a definitive treatment.
- Support plates: This means of restraint makes it possible to achieve a solid and stable assembly allowing the patient an early mobilization. It has the advantage of combining transverse compression with cortical support.^[1,24]

Some authors avoid massive internal fixation by two plaques that expose them to skin necrosis and infection.

In our series, osteosynthesis by: Screw retained plate was performed in 24 cases (38.8%); 2 Screw-retained plates were performed in 18 cases (29%); Screw-retained plate + screwing was performed in 20 cases (32.3%). Several types of plates can be used The OA T-plate, L-plates and kerbul plates.

The closure will be done plan by plan after checking that a perfect reduction of the fracture is obtained, the stability of the assembly, the evacuating washing of all cartilage debris and the verification of hemostasis. Particular care must be taken during this operation, given the risks of skin necrosis and therefore the exposure of the osteosynthesis material.^[16,23]

The complementary cast immobilization is variously conceived by the authors. For CHAIX,^[22] immobilization in a cast is not essential because it gives confidence to its assembly and to the solidity of the osteosynthesis so the patient can start early rehabilitation. KARAS.^[8] has also shown that prolonged postoperative immobilization is responsible for poor results. It can be tolerated for up to two weeks. In our series, the operated patients benefited from post-operative immobilization by armed knee orthosis, for 2 to 6 weeks depending on the stability of the assembly, as an analgesic, to improve the comfort of the operated on during the period of healing.

Rehabilitation remains a fundamental step. It allows the restoration of muscle strength, range of motion, indolence and good trophic status,^[25] the early rehabilitation will slow installation of arthrofibrosis posttraumatic can lead to the complete ankylosis.^[1]

We evaluated the results according to the criteria of MERLE D'AUBIGNE and MAZAS. We obtained 42% good and very good results based on the functional results and 46.7% good and very good results based on the anatomical results. This is inferior to the results in the literature and can be explained by the severity of the trauma and the complexity of the lesions in our series.

The most accurate restitution possible of the entire osteoarticular anatomy, but also the stability of the joint are determining factors for the long-term functional prognosis and the development of osteoarthritis in fractures of the tibial endplates,^[7,26] The type of fracture as well as the rehabilitation also seem to intervene in the prognosis.

CONCLUSION

Schatzker V and VI tibial endplate fractures are serious joint lesions involving the functional prognosis of the knee and exposing them to post-traumatic knee osteoarthritis. They are relatively frequent and road accidents are the most frequent etiology. The complexity of the anatomical lesions and the difficulties of their evaluation explain the multiplicity of classifications. The diagnosis is clinical radio requiring a careful analysis of the pathological type of each fracture, based on standard radiographs and, if necessary, computed tomography. Treatment of fractures tibial endplates requires full restoration of the articular surface and repair of meniscus ligament injuries which are all determining factors for the functional prognosis of the knee. A surgical technique adapted to each aspect of the lesion will prevent or at least delay the long-term progression to

post-traumatic knee osteoarthritis for these often young patients. Rehabilitation remains an essential therapeutic complement. It must be early and thorough to recover the previous function of the knee as quickly as possible. The formidable long-term complications are osteoarthritis, favored by cartilaginous, ligament and meniscal lesions; vicious calluses and stiffness; Hence the interest of an anatomical, stable, rigid joint reconstruction and early rehabilitation.

Education and improvement of road pathology protections remain the best guarantees to avoid complex fractures which affect the functional prognosis of our patients.

Consent

The patients have given their informed consent for the case to be published.

Competing Interests

The authors declare no competing interest.

Authors 'Contributions

All authors have read and agreed to the final version of this manuscript and have equally contributed to its content and to the management of the manuscript.

REFERENCES

1. LE HUEC J-C, PAIN F, BENQUET B. Fractures articulaires récentes de l'extrémité supérieure du tibia de l'adulte. Cah Enseign SOFCOT, 1996; 55: 97-117.
2. Tarchouli M. Le traitement chirurgical des fractures des plateaux tibiaux. Thèse doctorat médecine Rabat, 2005; 133.
3. Trenholm A, Landry S, McLaughlin K, Deluzio KJ, Leighton J, Trask K, et al. Comparative fixation of tibial plateau fractures using α -BSMTM4. Trojani C, Cambas PM, Loubière R, Argenson C., a calcium phosphate cement, versus cancellous bone graft. J Orthop Trauma, 2005; 19(10): 698-702.
4. Trojani C, Cambas PM, Loubière R, Argenson C. Coral as support of traumatic articular compression. A prospective study of 23 cases involving the lower limb. Rev Chir Orthop Reparatrice Appar Mot, 1996; 82(3): 234-240.
5. Walton NP, Harish S, Roberts C, Blundell C. AO or Schatzker? How reliable is classification of tibial plateau fractures? Arch OrthopTrauma Surg, 2003; 123(8): 396-398.
6. Duparc J, Ficat P. Fractures articulaires de l'extrémité supérieure du tibia. Rev chir Orthop, 1960; 46: 399-486
7. Hung SS, Chao E-K, Chan Y-S, Yuan L-J, Chung PC-H, Chen C-Y, et al. Arthroscopically Assisted Osteosynthesis for Tibial Plateau Fractures: J Trauma Inj Infect Crit Care. Févr, 2003; 54(2): 356-63.

8. Honkonen SE. Indications for Surgical Treatment of Tibial Condyle Fractures. *Clin Orthop*, 1994; (302): 7.
9. Zecher SB, Danziger MB, Segal D, Foster T, Whitelaw GP, Covall DJ. Treatment of high-energy proximal tibial fractures using the Monticelli-Spinelli external fixator: a preliminary report. *Am J Orthop Belle Mead NJ.*, 1996; 25(1): 49–54.
10. Chauveaux D, Le Huec JC, Roger D, Le Rebeller A. Traitement chirurgical sous contrôle arthroscopique des fractures des plateaux tibiaux. A propos d'une série de 20 cas. *Rev Chir Orthopédique Réparatrice Appar Mot*, 1991; 77(sup1): 00162–00163.
11. Kode L, Lieberman JM, Motta AO, Wilber JH, Vasen A, Yagan R. Evaluation of tibial plateau fractures: efficacy of MR imaging compared with CT. *AJR Am J Roentgenol*, 1994; 163(1): 141–147.
12. Barei DP, Nork SE, Mills WJ, Henley MB, Benirschke SK. Complications associated with internal fixation of high-energy bicondylar tibial plateau fractures utilizing a two-incision technique. *J Orthop Trauma*, 2004; 18(10): 649–657.
13. Asik M, Cetik O, Talu U, Sozen YV. Arthroscopy-assisted operative management of tibial plateau fractures. *Knee Surg Sports Traumatol Arthrosc*, 2002; 10(6): 364–370.
14. De Boeck H, Opdecam P. Posteromedial Tibial Plateau Fractures: Operative Treatment by Posterior Approach. *Clin Orthop Relat Res.*, 1995; 320: 125–128.
15. Georgiadis GM. Combined anterior and posterior approaches for complex tibial plateau fractures. *J Bone Joint Surg Br*, 1994; 76(2): 285–289.
16. BEJUI J, QUINCONA, VARGAS J, CARRET J, FISCHER L. Les fractures des plateaux tibiaux chez les sujets âgés de plus de 60 ans. *Lyon Chir*, 1985; 81(1): 30–34.
17. Lansinger O, Bergman B, Körner L, Andersson GB. Tibial condylar fractures. A twenty-year follow-up. *J Bone Joint Surg Am*, 1986; 68(1): 13–19.
18. Marsh JL, Smith ST, Do TT. External fixation and limited internal fixation for complex fractures of the tibial plateau. *J Bone Joint Surg Am*, 1995; 77(5): 661–673.
19. Jiang R, Luo C-F, Wang M-C, Yang T-Y, Zeng B-F. A comparative study of Less Invasive Stabilization System (LISS) fixation and two-incision double plating for the treatment of bicondylar tibial plateau fractures. *The Knee*, 2008; 15(2): 139–143.
20. DIRSHL R, DAHNER L, CHAPEL HILL. Current treatment of tibial plateau fractures. *J. Southern Orthop. Association*, 1997; 6: 1.
21. Georgiadis GM. Combined anterior and posterior approaches for complex tibial plateau fractures. *J Bone Joint Surg Br.*, 1994; 76(2): 285–289.
22. Koechlin P, Nael JF, Bonnet JC, D'Ythurbide B, Apoil A. Ligamentous lesions associated with fractures of the tibial plateau. *Acta Orthop Belg*, 1983; 49(6): 751.
23. EL FATH S. Les fractures des plateaux tibiaux à propos de 28 cas. Thèse doctorat Méd Rabat, 1997, n°188. FMPR, UNIVERSITE MOHAMMED, 1997.
24. Dejour H. Les fractures des plateaux tibiaux avec lésion ligamentaire, 1981.
25. Chin TY, Bardana D, Bailey M, Williamson OD, Miller R, Edwards ER, et al. Functional outcome of tibial plateau fractures treated with the fine-wire fixator. *Injury*, 2005; 36(12): 1467–1475.
26. Stamer DT, Schenk R, Staggers B, Aurori K, Aurori B, Behrens FF. Bicondylar tibial plateau fractures treated with a hybrid ring external fixator: a preliminary study. *J Orthop Trauma*, 1994; 8(6): 455–461.