

AVULSION FRACTURES OF THE TIBIAL SPINES IN ADULTS: A REPORT ON A CASE**Mouad Beqqali Hassani*, Amine EL Maqrout*, Ayoub Mjidila, Moncef Boufettal, Reda Allah Bassir, Mohamed Kharmaz, Moulay Omar Lamrani, Mustapha Mahfoud, Ahmed EL. Bardouni 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: Mouad Beqqali Hassani**

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.

Article Received on 13/06/2020

Article Revised on 03/07/2020

Article Accepted on 24/07/2020

ABSTRACT

The avulsion fracture of the tibial spines is a common lesion among adolescents but rare among adults, resulting in discontinuity of the anterior cruciate ligament. The classification of Meyers and Mac Keever modified by Zaricznyj is the most used. The treatment will depend on whether or not the insertion of the anterior cruciate ligament is moved to the tibial plateau. Orthopedic treatment gives excellent results for stage I. Surgical treatment is imperative for stages III and IV. As for Stage II, it will be a case-by-case decision. This fracture can give complications that must be prevented. We present the clinical observation of a young adult who has a tibial spines' fracture, their diagnostic and therapeutic management with review of the literature.

KEYWORDS: fracture, tibial spines.**INTRODUCTION**

The avulsion fracture of the tibial spines is conventionally frequent among the adolescent, but more and more frequent in the adult and are generally related to an accident of sport (football or ski) or public road.^[1] According to the radiological classification of Meyers and Mac Keever, modified by Zaricznyj, there are 4 types of lesion. If types I and II respond to orthopedic treatment, the other types generally require open surgical reduction or arthroscopically with solid osteosynthesis.^[2] The main complication of these fractures is non-consolidation or non-union and knee instability. The objective of this study is to present the mechanism of these fractures, their management and the short and long term results through our two observations and the review of the literature.

OBSERVATION

This is a young adult aged 33, victim of a trauma to the right knee during a fall from his motorcycle, the examination of the musculoskeletal system finds an edematous and painful knee with total functional impotence. The standard (Figure 1) and CT (Figure 2) radiographic assessments showed a fracture of the type III displaced tibial spines of Mayer and Mc Keevers. He was treated in the open with a medial approach with an internal parapatellar arthrotomy followed by a reduction and osteosynthesis of the tibial spine mass by screwing (2 screws 4.5 mm in diameter with a washer). Passive

rehabilitation on an arthromotor was started as soon as the Redon was removed between 0 and 60 °, then active rehabilitation helped from the 3rd week onwards with support protected by a Zimmer splint. Unprotected free walking was resumed at 8 weeks and progressive sports activities resumed from the 6th month.

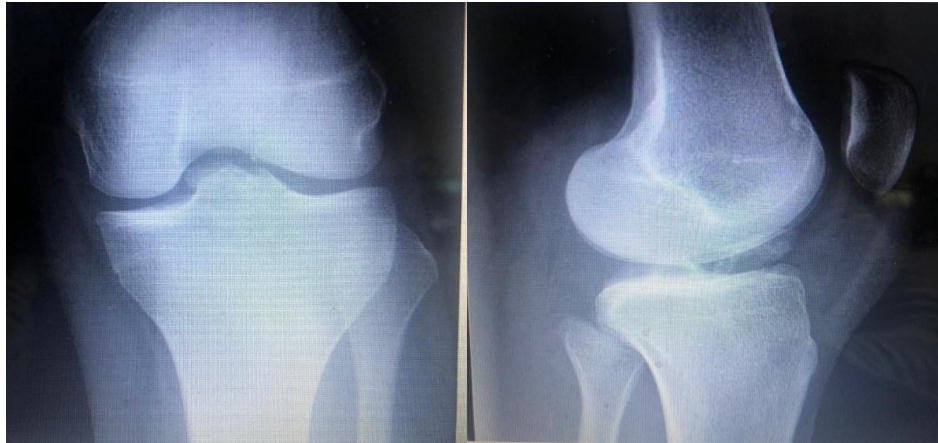


Figure 1: X-ray of the knee face and profile shows a tearing of the tibial spines.



Figure 2: Knee CT scan shows a fracture of type III displaced tibial spines from Mayer and Mc Keevers.

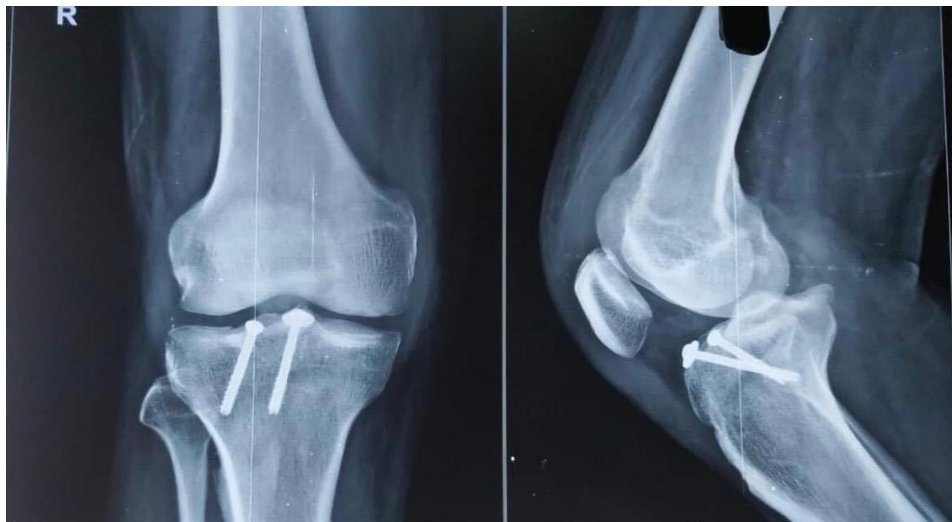


Figure 3: Screw fixing.

DISCUSSION

Avulsion fractures of the tibial spines are rare lesions in adults, on the contrary are frequent in adolescents due to the relative weakness of the tibial eminence incompletely ossified compared to the fibers of the anterior cruciate ligament, the causal mechanism is violent and complex and its analysis proves difficult, most authors consider this fracture most often as the consequence of a direct shock on the knee and most rarely of an indirect shock

(8) following a sports accident or an accident on the public highway.^[1,2]

The clinical presentation of this trauma is that of a large painful knee with functional impotence which can be partial or total. The radiological assessment, standard radiographs (face, profile), oblique radiographs, incidence of the notch and tomography, confirms the diagnosis.

The radiograph is not very demonstrative, especially if he takes his knee in extension and risks ignoring a fracture of the tibial spine. The pictures are taken with the knee bent at 20 ° or 30 °. The profile picture is more eloquent, especially when the knee is bent and puts the upward movement of the tibial spine well. Poncet was the first to describe these types of fractures in 1895 and it was not until 1959 that Meyers and McKeever established a radiological classification of these lesions comprising three types according to the displacement of the bone fragment.^[2] It was modified by Zaricznyj who described a fourth type when the comminution is comminuted.^[3] Zifko, B. and Gaudernak, T. added subtypes to the classification of Meyers according to the size of the fragment: stage A for small fragments and stage B for large fragments:

- Type I corresponds to a fracture without displacement.
- Type II results in an anterior uplift in "duckbill" with posterior continuity of the thorn massif.
- Type III is characterized by a complete lifting of the fragment with continuity solution and sometimes a rotation of it.
- Type IV corresponds to a comminuted fragment.

The therapeutic attitude of tibial spine fractures has two objectives:

- Restore joint congruence and full extension, avoiding flossum by anterior stop.
- Restore the integrity of the LCAE to maintain perfect knee stability.

There are two ways to manage these tibial spine fractures:

1. An orthopedic reduction in full extension with a cruro-pedious boot where the femoral condyles will press on the lateral bank of the avulsed fragment to reposition it in its cubicle. The immobilization must be carried out in perfect extension, which involves an anterior support of the roof of the notch. But this immobilization in extension has limits:
2. The irreducibility of the fracture with an interposition of the anterior horn of the medial meniscus or of the anterior intermeniscal ligament of Wrisberg.^[5]
3. A pre-fracture ligament distension which would lead to an elongation of the LCAE^[6] without real rupture of it on the macroscopic level, but with a non-negligible functional incidence^[7] This calls for a rather surgical attitude by considering the lesions rather as ligamentous as simple bone lesions. Finally, orthopedic reduction in full extension is an antinomic position for optimal healing of the LCAE if it is injured;
4. Type I generally benefits from orthopedic support with very slight knee flexion around 10 to 20 °, unlocking the knee. The evacuation of hemarthrosis must be prior to immobilization which must be kept between 4 to 6 weeks.

5. For type III or IV, orthopedic treatment will be ineffective and surgical treatment is necessary.^[7]
6. If the yawn is differential and more than 8 mm medially, it is also necessary to be interested in the repair of the tibial collateral ligament and perform a meniscal exploration in search of a possible antero-internal triad. The reduction is done anatomically either by arthroscopy or by open air. The fixings are made either by absorbable suture, or by metal wire by single or multiple stitching, and sometimes by screwing.
7. Currently, the choice is based on a surgical technique of Pull-out with resorbable wire by arthroscopy, followed by a cruro-pedal immobilization of 20 ° in flexion without support for at least 4 weeks. For type II, the therapeutic indications are discussed. They can be either surgical or orthopedic. No study has found a correlation between displacement and residual laxity in this stage. Anatomical reduction does not guarantee the absence of residual laxity. In 1984, Smith's studies,^[8] with 7 years of follow-up, showed that there was 100% laxity, but only 50% of symptomatic patients. In 1993, Willis et al.^[9] with 4 years of follow-up, found only 74% of laxity, 20% of the tibial plateau projecting and 10% only of symptomatic patients without instability.

The study by KT1000™ showed that type I was not significant, while types II and III showed significant differentials. In 1999, Iborra et al.^[10] with 7 years of follow-up, found 33% of laxity. In 1995 Janarv et al.^[11] found 38%.

The complications of this fracture are found after orthopedic treatment, but also sometimes after surgical treatment. They are essentially arthrofibrosis with stiffness and loss of around ten degrees of extension and, sometimes, a limitation in flexion which cannot go beyond 90 °.^[12] This arthrofibrosis is encountered in almost 10% of cases. The causes and the etiopathogenic hypotheses are prolonged immobilization^[13] and overly aggressive post-immobilization rehabilitation. It would be in fact, perhaps, of a minimal algoneurodystrophy.

The current practice is rather to propose an initial self-education and to make a more specific assumption of responsibility by arthrolysis in the event of persistent stiffness. The second complication encountered is the vicious callus^[14] which is a consolidation in the high position at more than 2 mm. It is often secondary to orthopedic treatment and leaves a residual laxity associated with a limitation of the extension. There is seldom a flossum by bone blocking which would require in this case a plasty of the notch. Finally, when there is a residual instability, the ligament reconstruction is discussed with or not passage at the level of the physis.

Pseudarthrosis is rare. This is generally an initial management error which manifests itself in pain, a

flessum, more or less associated with instability. Treatment is done on a case-by-case basis, but sometimes it is necessary to consider a bone graft at the insertion site.

CONCLUSION

Fractures of the massive tibial spines is much rarer in adults. In children, the cruciate ligament is resistant while the skeleton is growing. During the trauma, in children, the cruciate ligament tears off the mass of tibial spines. On the contrary, in adults, in a vast majority of cases, the cruciate ligament yields and the bone resists. The treatment will depend on the displacement or not of the insertion of the anterior cruciate ligament on the tibial plateau.

Orthopedic treatment gives excellent results for stages I. Surgical treatment is an imperative for stages III and IV. As for Stage II, it will be a case-by-case decision.

Consent

The patient has 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. Kendall NS, Hsu SYC, Chan KM. Fracture of the tibial spine in adults and children. *J Bone Joint Surg Br*, 1992; 74: 848-852.
2. Meyers MH, Mckeever FM. Fracture of the intercondylar eminence of the tibia. *J Bone Joint Surg Am*, 1959; 41-A: 209-20.
3. Zaricznyj B. Avulsion fracture of the tibial eminence: Treatment by open reduction and pinning. *J Bone Joint Surg Am*, 1977; 59: 1111-4.
4. Kocher MS et al. Tibial eminence fractures in children: Prevalence of meniscal entrapment. *Am J Sports Med*, 2003; 31: 404-7.
5. Noyes FR, De Lucas JL, Torvik PJ. Biomechanics of anterior cruciate ligament failure: An analysis of strain-rate sensitivity and mechanisms of failures in primates. *J Bone Joint Surg (Am)*, 1974; 56: 236-53.
6. McLennan JG. Lessons learned after second-look arthroscopy in type III fractures of the tibial spine. *J Pediatr Orthop*, 1995; 15: 59-62.
7. Ahn JH, Lee YS, Lee DH, Ha HC. Arthroscopic physeal sparing all inside repair of the tibial avulsion fracture in the anterior cruciate ligament: Technical note. *Arch Orthop Trauma Surg.*, 2008; 128: 1309-12.
8. Smith JB. Knee instability after fractures of the intercondylar eminence of the tibia. *J Pediatr Orthop*, 1984; 4: 462-4.
9. Willis RB et al. Long-term follow-up of anterior tibial eminence fractures. *J Pediatr Orthop*, 1993; 13: 361-4.
10. Iborra JP et al. Fractures of the intercondylar eminence of the tibia in children. Apropos de 25 cases with a 1-20 years follow-up. *Rev Chir Orthop Rep Appar Mot*, 1999 Oct; 85: 563-73.
11. Janarv PM et al. Long-term follow-up of anterior tibial spine fractures children. *J Pediatr Orthop*, 1995; 15: 63-8.
12. Vander Have KL, Ganley TJ, Kocher MS, Price CT, Herrera-Soto JA. Arthrofibrosis after surgical fixation of tibial eminence fractures in children and adolescents. *Am J Sports Med*, 2010; 38: 298-301.
13. Patel NM, Park MJ, Sampson NR, Ganley TJ. Tibial eminence fractures in children: Earlier posttreatment mobilization results in improved outcomes. *J Pediatr Orthop*, 2012; 32: 139-44.
14. Janarv PM, Nystrom A, Werner S, Hirsch G. Anterior cruciate ligament injuries in skeletally immature patients. *J Pediatr Orthop*, 1996; 16: 673-7.