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Surgical Management of Postero-Medial Tibial Plateau Fracture: Is Plate Osteosynthesis Mandatory?

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Abstract

Postero-medial tibial plateau fracture (Moore type 1) is challenging. Since several years a posterior approach has been described in order to use a butteress plate. In our opinion, it is possible to fix accurately this kind of fracture with 2 to 5 antero-posterior 6.5 mm cancellous screws through an anterior approach. The aim of this work was to present anatomical results and return to sport of 15 patients operated on for Moore type 1 tibial plateau fracture. We observed no pseudarthrosis or secondary varus displacement. 87% of patients resumed back to their sporting activities. The anteromedial incision has a dual advantage of anatomical postero-medial fragment reduction and tibial spine fixation (in 80% of our cases).

Keywords: Fracture; Postero medial tibial plateau; Moore I; Isolated screwing

Introduction

Postero-medial tibial plateau fracture (Moore type I) are fairly rare injuries (Figure 1) [1,2]. This fracture corresponds to dislocation-type fractures and is oftenly associated with ACL rupture (80% of the cases) [3-6]. In our institution we operate on a lot of skiing injuries. The spreading of new carving technique and freeride skiing explain an increasing number of this kind of fracture [7,8].

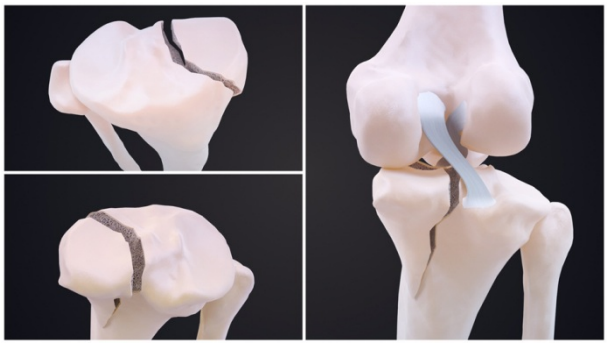

Figure 1: Postero medial tibial plateau fracture (Moore type 1 tibial plateau fracture).

In the literature, several surgical approaches are described as antero-medial, posterior or combined anterior and posterior approach in order to reduce and to fix this particular fracture. This prospective study was conducted to pay attention to radiological outcomes and complications related to the surgical procedure performed through an anterior approach without plate fixation and to assess post-operative return to sports activity [6,9-13].

Material and Methods

Population

For three consecutive ski seasons 2012, 2013 and 2014, we found 20 postero-medial tibial plateau fracture out of 154 tibial plateau fractures and 15, were included in this series (5 were excluded because not operated on in our department). The mean age of the patients, 7 males and 8 females, was 39.6 +/- 7 years (19-55) and 12 cases (80%) presented with an associated tibial spine fracture.

Surgical technique

The patient is operated on in supine position the knee bent with a meniscus positioning device at 90° of flexion. An anteromedial approach is performed with a medial para patellar arthrotomy. The anterior horn of the medial meniscus is lifted. An anatomical reduction of the posteromedial fragment is achieved with the help of an extending the incision to above the distal insertion of the hamstring avoiding the tendons. The key of the reduction is to perform an anatomical reduction of the posteromedial cortex using pointed clamp and/or temporary K-Wires. Bone stabilization is achieved by fixation with 3-5, 6.5 mm cancellous screws inserted in an anterior-posterior direction to enable perfect compression of the fracture (Figures 2 and 3). In the case of associated fracture of the tibial spines, fixation is achieved with a 4 mm cancellous bone screw or lacing.

Post-operative instructions are non-weight bearing during the first 60 days with the addition of a knee brace during the first 21 days allowing passive mobilization of the knee. Thereafter, active movement and quadriceps strengthening without restriction is authorized.

Outcome assessment

Patients were evaluated by an independent observer. The Tegner activity score and the UCLA scale were used to determine activity levels while the Lysholm score and the KOOS score helped assess the clinical functional outcomes.

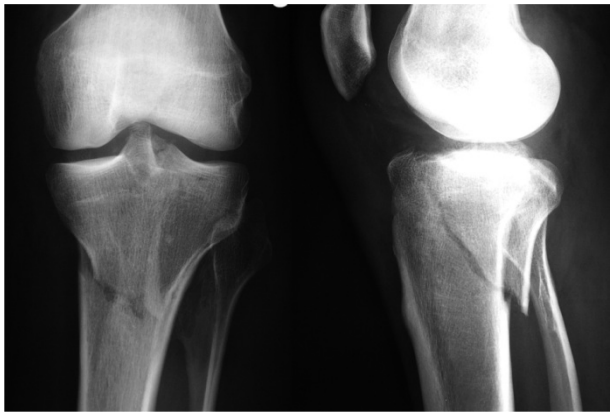

Figure 2: Moore type 1 tibial plateau fracture secondary to alpine ski injury.

Radiological parameters studied were: quality of fracture reduction, consolidation, secondary displacement, material failure, osteoarthritis according to modified Ahlbäck classification [14-18].

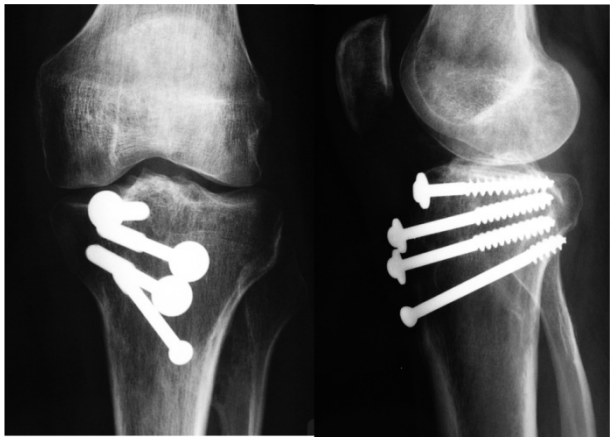

Figure 3: Osteosynthesis of the Figure 2 fracture using 4 antero posterior 6.5 cancellous screws: Result at 9 months follow-up.

Statistical analysis

Statistical analysis was carried out using EXCEL® (Microsoft Inc., Redmond, Wash.) and SPSS software® (SPSS Inc., Chicago, Ill). Gaussian distribution of continuous variables was verified using the Shapiro-Wilk test. The equality of variances corresponding to the condition of homoscedasticity required for the use of parametric tests was verified using the Levene test. Descriptive data analysis was performed using student t test. Preoperative and follow-up data were compared using paired Student t tests.

Results

The mean follow up of this study is 18.2 months +/- 6 months (range: 12-28). No complication was observed and no patient required further or corrective surgery.

Radiological analysis

Immediate postoperative radiographs demonstrated anatomic reduction was achieved in all cases and was maintained over their follow up. No pseudarthrosis was observed nor secondary displacement. Further radiographic analysis demonstrated there were no various deformation and no osteoarthritic findings. Moreover articular surface reduction seemed anatomical at times.

Functional outcome and sports activities

At the last follow up 13 patients (87%) resumed alpine skiing. The mean UCLA score was 7.3 +/- 1.6 (4-10) and the Tegner score was 4.6 +/- 1.3 (3-6). Differences between preoperative and postoperative Tegner score and UCLA score were statistically significant ($p<0.001$). All of these patients admitted skiing more cautiously than before the accident. The average Lysholm score was 85 +/- 14 points (59-100). The average KOOS was 77 +/- 15 (54-97) and 93% of patients were satisfied or very satisfied with the surgical management.

Discussion

Medial Moore type I and II injuries are usually fairly rare injuries characterised by a dorso-medial main fracture fragment [1,4]. Usually they represent around 8% of tibial plateau fractures according to literature [5,6]. In our series they represent 13% of tibial plateau fractures collected in our department. We observed an increasing number of these injuries in the past 10 years after ski accidents, which is probably related to the new carving technique with wider side cuts at both the tips and tails. Ligament injuries are extremely common in these fractures. Tscherne and Lobenhoffer described 96% of ACL injuries and 85% of all medial collateral ligament injuries in dislocation-type fractures [19]. In this series, we observed a combination of these injuries in 80% of cases. When fractured, the fragments of the tibial eminence are usually quite large, sometimes multiple and bare the ACL and anterior horn of the lateral (and sometimes) medial meniscus.

The operative procedure we described, allows to reduce and to fix anatomically the tibial plateau fracture as well as the tibial spines using 3-5, 6.5 mm cancellous screws for the tibial plateau and lacing or 4 mm cancellous screw for the tibial spines. Because the fracture is in a frontal plane, there is no need to put a plate on the medial side of the tibial plateau. In the literature, different approaches have been described to manage these injuries. A central midline incision with medial dissection and arthrotomy is proposed using an extensile midline approach with division of the patellar tendon or sometimes an osteotomy of the tibial tuberosity [11,20,21]. This approach, however, is associated with a high rate of wound-healing problems and seems risky for this injury. Alternatively, the first described a postero medial approach to perform reduction and stabilization of Moore type 1 « medial splint » fractures using a buttress plate [10]. In 2007, this procedure in English literature [6]. An extensile dorsal approach to the tibia headand a detachment of the proximal insertion of the medial gastrocnemius and the popliteus muscle [9]. After a mean follow up of 6.8 years, they reported an average extension lag of 7°. In 2005, 13 cases of posterior shearing fractures treated by the same technique [22]. The postoperative range of motion was limited up to 10° of flexion for 2-3 weeks, and, even though satisfactory anatomic reduction could be achieved in 10 of the 13 patients; a permanent lack of extension was observed in 6 cases. All fracture elements can be reached using a combined anterior and posterior approach, with an

optional dorsal or anterior arthrotomy as published by Georgiadis [12]. In summary, the drawbacks of all the described approaches are limited access to all fracture elements and hence the necessity of several incisions or extensive soft-tissue dissection. Posterior metalwork removal can also be a challenge if it is placed close to anatomical neurovascular structures.

Regarding return to sport, at the last follow up, 87% of the patients had resumed their sporting activities with a mean UCLA score of 7.3 +/- 1.6 (4-10), a mean Lysholm score of 85 +/- 14 points (59-100) and with a mean Tegner score of 4.6 +/- 1.3 (3-6). It is difficult to compare these results to other publications of the literature because no papers focus on return to sport after Moore type 1 tibial plateau fractures.

Conclusion

Management of postero-medial tibial plateau fractures by anterior approach and anteroposterior cancellous 6.5 screws provides excellent clinical and radiological results. In our series 87% of the patients had resumed their sporting activities. The anteromedial incision has a dual advantage of ensuring anatomical joint reduction, tibial spine fixation and posteromedial fragment reduction. There is no need to use plate fixation.

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