

Arthroscopic Minimal Invasive Treatment of Posterolateral Tibial Plateau Impression Fractures

Atroskopická miniinvazivní léčba impresní zlomeniny posterolaterálního plató tibie

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SUMMARY

Posterolateral fractures of the tibial plateau are difficult to address. Malunion can lead to early posttraumatic arthritis of the knee due to instability and elevated joint reaction forces. Arthroscopically assisted percutaneous reduction facilitates visualization and avoids open approaches either directly from posterolateral or from lateral with optional extension via a lateral epicondylus osteotomy. We describe and illustrate a minimal invasive technique using an arthroscopic posterolateral viewing portal. Using this technique, we demonstrated very good clinical outcome with excellent patient satisfaction.

Key words: Schatzker, tibia head fracture, knee arthroscopy, multiligamentary injury.

INTRODUCTION

Fractures of the tibial plateau are joint fractures that often lead to secondary arthritis of the knee (5). Dealing with these injuries is daily practice in orthopaedic trauma departments worldwide. Posterolateral impression-, rim-, or so-called apple bite fractures of the tibial head can quite often be found concomitant to injuries of the anterior cruciate ligament (ACL). Addressing these pathologies can be challenging.

The classic Schatzker classification for tibial head fractures uses only two-dimensional radiographs and has six types (6, 8). This classification was expanded to the third dimension (axial plane) by adding CT to standard X-ray imaging (3). This was a relevant improvement of the classification system. It describes the main fracture plane(s) at the tibial head better than the AO classification (4) and allows for planning of the appropriate surgical approach or approaches.

We demonstrate successful arthroscopic controlled closed reduction and bone grafting of a dislocated posterolateral impression fracture of the tibial plateau in a 29-year-old patient.

CASE

A 29-year-old male snowboarder injured his right knee due to a fall after a jump. Clinical examination on the day of injury showed effusion and posterolateral pain on palpation. There was no sagittal or frontal ligamentous instability. Neurological and vascular clinical examination demonstrated no pathologic findings. Diagnostic imaging revealed a posterolateral impression fracture of the tibial head. Because of the fragment size and the amount of dislocation, the patient received surgery on the third day after injury by arthroscopically assisted percutaneous reduction and bone grafting.

Diagnostic imaging

Radiography revealed an impression fracture of the tibial head showing dislocation of the posterolateral tibial plateau in the lateral view (Fig. 1).

CT showed in detail the amount of fragmentation, dislocation, and the exact localization of the bony pathology (Fig. 2).

MRI showed that all intra- and extraarticular ligaments were intact in this case.

Surgical technique

Initially, standard diagnostic arthroscopy showed the dislocated posterolateral fracture of the tibial plateau. There were no additional concomitant intraarticular injuries. The fracture could be visualized using a posterolateral viewing portal (Fig. 3a).

Via an ACL aiming device, a drill wire was positioned starting medial to the tibial tuberosity just proximal to the pes anserinus tendons (Fig 3b, c). This wire was

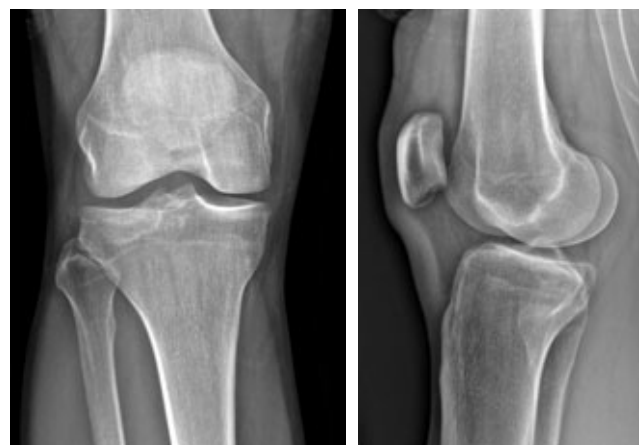


Fig. 1. Preoperative X-rays of the right knee on the day of injury. a – ap-view, b – lateral view.



Fig. 2. Preoperative CT of the right knee showing a fragmented posterolateral impression fracture of the tibial plateau. a – frontal plane through the posterior part of the femorotibial joint, b – sagittal plane through the lateral compartment, c – axial plane through the tibial plateau.

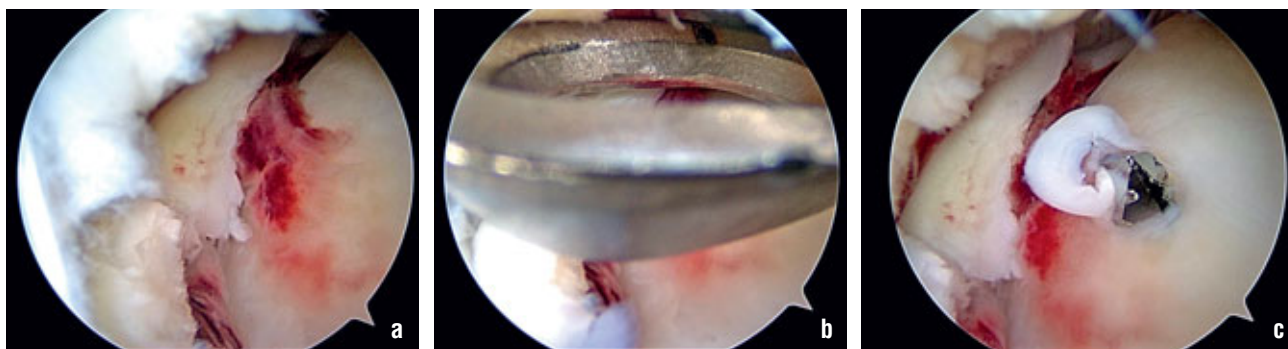


Fig. 3. Preparation of percutaneous reduction under arthroscopic view. a – view through a posterolateral portal showing the dislocated fracture situation of the posterolateral tibial plateau, b – placement of a tibial ACL aiming device through the anterolateral portal, c – Drill wire placed.

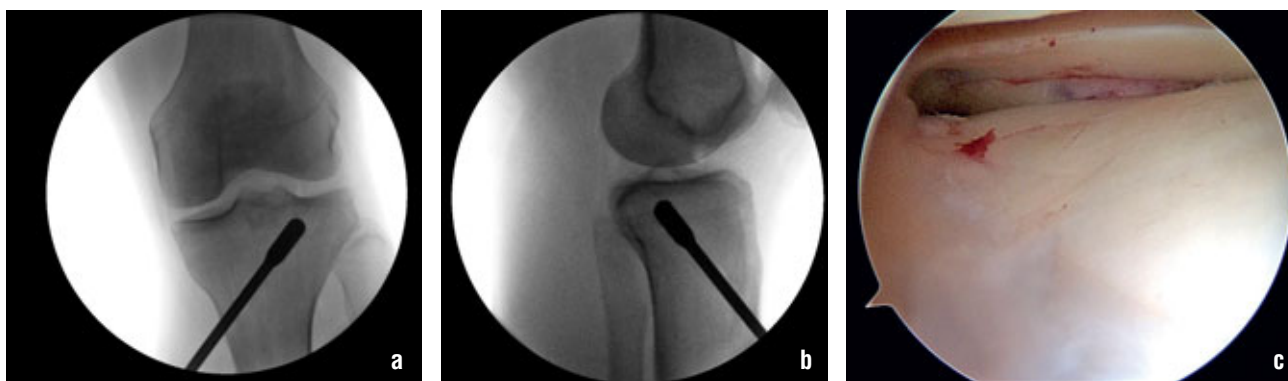


Fig. 4. Percutaneous reduction under visual control by fluoroscopy (a, b) and arthroscopy through the posterolateral portal (c).

overdrilled until 1 cm below the joint surface. Then, the impression fracture was elevated and reduced using a cannulated dilatator as a plunger. Alternatively, special devices for this maneuver are available (Arthrex). The process of reduction was controlled arthroscopically and via fluoroscopy (Fig. 4). It is important to achieve not only stepless reduction, but also to elevate the tibial plateau to a level of normal height.

Finally, the bony tunnel was filled with autologous cancellous bone from the borders of the tunnel and additional allograft. As the bone was impacted, the surgeon felt that no additional osteosynthesis would be necessary

in this case. A percutaneous screw could have been positioned underneath the joint surface from anterior to posterior.

Postoperative CT control after mobilization of the patient with crutches and 15 kg partial weight bearing showed stepless fracture reduction (Fig. 5).

Postoperative management

Postoperatively, the patient used crutches with partial weight bearing for six to eight weeks. Range of motion (ROM) of the knee was limited to 0/0/30° for the first two weeks, then 0/0/60° for two weeks, and 0/0/90° for



Fig. 5. Postoperative CT of the right knee showing stepless fracture reduction of the posterolateral tibial plateau. a – frontal plane through the posterior part of the femorotibial joint, b – sagittal plane through the lateral compartment, c – axial plane through the tibial plateau.

another two weeks. At this time, full ROM and weight bearing was allowed.

RESULTS

Twelve weeks postoperatively, the patient was pain-free and fully active in normal daily life. He had a free ROM with 0/0/130°. The knee was stable.

Radiographs and CT showed bony consolidation without loss of reduction eight weeks postoperatively (Fig. 6, 7).

DISCUSSION

We demonstrated very good clinical outcome after arthroscopically assisted percutaneous reduction and bone grafting of a dislocated posterolateral tibial plateau impression fracture.

Radiologically, stepless reduction was achieved, but the tibial plateau was not quite enough elevated to reach



Fig. 6. X-rays of the right knee eight weeks after surgery. a – ap-view, b – lateral view.



Fig. 7. CT of the right knee showing bony consolidation eight weeks after surgery. a – frontal plane through the posterior part of the femorotibial joint, b – sagittal plane through the lateral compartment, c – axial plane through the tibial plateau.

the original anatomic level (Fig. 5b, Fig. 7b). This did not lead to instability of the joint in this case.

Mostly, fracture types like the one presented here are associated with ACL tears. Furthermore, additional injuries of the medial collateral ligament are common. This is because of the typical valgus injury mechanism.

Using the described technique, those injuries can be treated simultaneously in a minimal invasive manner. This was also described earlier by other authors reporting good results (1, 2, 7).

For sufficient retention, percutaneous screw fixation might be recommended and necessary in most cases. Sometimes, meticulous bony impaction using cancellous bone next to the tunnel and additional allograft offers enough support for retention of the tibial plateau until bony consolidation.

In conclusion, an arthroscopic posterolateral viewing portal allows for visualization of percutaneous reduction in posterolateral tibial plateau fracture situations. This technique can be a useful alternative to open posterolateral surgery.

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