Treatment of Lateral Tibial Plateau Fractures – Do We Need Arthroscopy?

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Fractures of the lateral tibial plateau are usually a consequence of combined valgus and axial forces. Split-depression type fractures (AO/OTA type B3.1) are usually treated with open reduction and plate fixation. The first publications on arthroscopically assisted treatment of tibial plateau fractures are from 1985 (1–3) and this technique has gained popularity during the last decade. One important reason for this has been the reported high incidence of concomitant injuries. Some MRI studies have even shown the incidence of concomitant injuries such as meniscal tears and cartilage lesions to be as high as 50-99% (4–7). The obvious advantage of arthroscopy is that such concomitant lesions can be addressed during the treatment of the fracture (8–11). The possible drawbacks of arthroscopically assisted fracture treatment are increased risk for development of compartment syndrome, prolonged operative time and additional costs.

The purpose of this study was to determine if the incidence of concomitant injuries preoperatively detected using MRI correlates with arthroscopic findings during the treatment of lateral tibial plateau fractures. A secondary aim of the study was to evaluate the proportion of these concomitant injuries that require operative intervention.

Patients and methods

The study population consisted of 50 consecutive patients with AO/OTA type B3.1 (split-depression) lateral tibial plateau fractures treated at our institution between April 2009 and February 2012. Exclusion criteria included the presence of osteoarthritis (Kellgren-Lawrence grade >1), an open fracture, or a pathological fracture. In all patients, a preoperative CT scan and an MRI of the affected knee was obtained for accurate evaluation of both fracture morphology and concomitant injuries. Two independent musculoskeletal radiologists evaluated the MR images. All patients underwent knee arthroscopy prior to ORIF within the same procedure so as to indentify and treat clinically relevant concomitant injuries.

During arthroscopy the condition of both menisci were evaluated. Meniscal tears were treated according to size and type by either resection or repair. The size, depth (ICRS grade 0-4), and location of cartilage lesions were also recorded. Grade 4 cartilage lesions were treated with microfracture. Additionally, the integrity of both the ACL (anterior cruciate ligament) and PCL (posterior cruciate ligament) were evaluated (intact, partial tear, complete tear). LCL (lateral collateral ligament) and MCL (medial collateral ligament) stability were clinically evaluated.

Following arthroscopy, ORIF was performed using an anterolateral incision and an arthrotomy was performed beneath the lateral meniscus. Depression of the joint surface was elevated under direct visual control and the bone defect was filled with either autograft or synthetic bone material. Fixation was performed using an angular stable locking plate. The postoperative management protocol included early mobilization using an orthosis for twelve weeks. All patients were instructed to be non-weight bearing for

Table 1. Diagnostic accuracy of MRI compared to arthroscopy for detection of concomitant injuries in 50 patients operatively treated for lateral tibial plateau fractures.

Arthroscopically diagnosed lesion	All lesions identified with MRI	Correctly identified with MRI	Incorrectly identified with MRI	Lesions missed with MRI
Tear of lateral meniscus (n=13)	13	6 (46%)	7 (54%)	7 (54%)
Tear of medial meniscus (n=7)	18	4 (22%)	14 (78%)	3 (43%)
ACL * (n=2)	3	1 (33%)	2 (77%)	1 (50%)
PCL * (n=2)	2	2 (100%)	0 (0%)	0 (0%)
* Total or partial rupture				

the first ten weeks, followed by partial weight bearing for a further two weeks. Clinical and radiographic evaluation was performed at 6, 12, 26 and 52 weeks to assess the fracture healing and joint stability.

Results

The overall incidence of concomitant injuries identified using arthroscopy was as follows: medial meniscus tear in 7 patients (14 %), lateral meniscus tear in 13 patients (26 %), ACL rupture in 2 patients (4%) and PCL rupture in 2 patients (4%). No LCL ruptures were identified clinically.

Meniscal tears

Arthroscopy identified 13 tears of the lateral meniscus (Table 1). Nine of these were bucket-handle tears and were treated using open suture repair, and the remaining four were resected arthroscopically. Seven (54%) lateral meniscus tears detected using MRI were not confirmed using arthroscopy (false positive). Arthroscopy also identified seven tears of the medial meniscus. Six of these were resected and one was minor and did not require treatment. 14 (78%) medial meniscus tears detected using MRI were false positive findings.

ACL and PCL rupture

Arthroscopy identified one total ACL rupture, which MRI had detected as partial rupture. Arthroscopy also identified one partial ACL/PCL rupture, which MRI had only detected as a partial PCL rupture. In both of these patients follow-up clinical examination revealed anteroposterior knee laxity. Both MRI and arthroscopy correctly identified a total PCL rupture in one patient. This patient had posterior laxity on follow-up clinical examination. All the aforementioned patients did not however have any subjective symptoms of instability and thus did not require operative intervention. Furthermore, MRI detected one ACL rupture and one ACL avulsion injury, which were found to be normal on arthroscopy and stable during clinical examination.

Collateral ligaments

MRI detected one total and seven partial LCL ruptures. None of these patients demonstrated varus instability and thus were considered stable. Furthermore, no clinical signs of LCL injury were evident at follow-up examinations. MRI also identified four total and three partial ruptures of the MCL, which were all treated non-operatively. MCL laxity was noted in one patient on follow-up, however this patient was asymptomatic.

Cartilage lesions

Arthroscopy identified deep cartilage lesions (grade IV) on the weight-bearing surface in two patients (one on the lateral and the other on the medial femoral condyle). Both were treated with microfracture technique. Only one of these lesions was correctly visualized as a grade IV lesion using MRI but the other was not detected. MRI detected four grade IV cartilage lesions of the weight-bearing surface in three patients, which arthroscopy confirmed as only grade II-III in severity and did not require surgical intervention.

Discussion

In lateral tibial plateau fractures, the number and severity of concomitant injuries detected with MRI was not fully in concordance with the injuries detected using arthroscopy. The number of concomitant lesions was also less than previously reported in MRI studies. The results of this study suggest that the incidence of clinically relevant concomitant lesions is too low to justify routine use of preoperative MRI or arthroscopy in operative treatment of lateral AO/OTA type B3.1 lateral tibial plateau fractures.

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