

# Operative Treatment of Unilateral Bicondylar Hoffa Fractures

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**Summary:** A rare case of unilateral bicondylar fractures of the femoral condyles is presented. Internal fixation of the fragments was achieved by three cancellous lag screws, followed by a short period of cast immobilization and intensive physiotherapy. Full weight bearing was allowed 3 months postoperatively. Full range of motion of the knee and no presence of articular defects on femoral condyles were observed 2 years after hardware and heterotopic ossification removal.

**Key Words:** femoral condyles, bicondylar Hoffa fracture

The unicondylar tangential posterior fracture of the femur (Hoffa fracture) is an unusual injury, most commonly affecting the lateral condyle. The usual mechanism of injury is a combination of vertical shearing and twisting forces. A bicondylar Hoffa fracture is an extremely rare injury, and only five cases have been reported so far in the literature.<sup>1-5</sup> We present a patient with this type of fracture after a follow-up period of 2 years and discuss the appropriate treatment options.

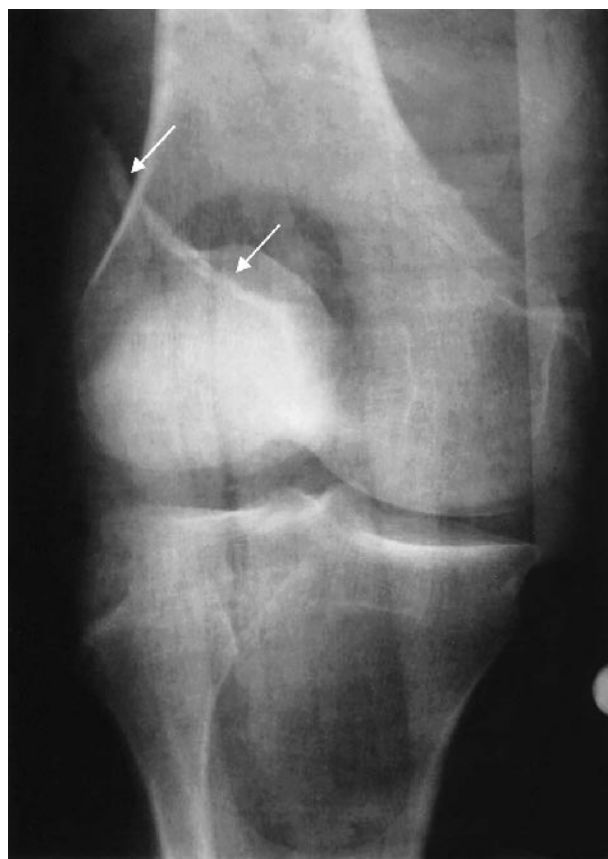
## CASE REPORT

A 39-year-old laborer presented to the emergency department with an isolated closed injury to the right knee. He had fallen from a 5-m-high scaffold with both knees flexed and landed on the ground on the right knee. On admission, 2 hours postinjury, physical examination revealed a painful, swollen knee with multiple abrasions on the anteromedial side. The patient was unable to perform any active movement because of the pain. No signs of acute ischemia of the lower limb or neurologic deficit were present.

Radiologic evaluation revealed unilateral bicondylar Hoffa fractures, with an intact anterior cortex of the distal femur (Figs. 1 and 2). The lateral Hoffa fragment was angulated and posteriorly dislocated, whereas the medial fragment was

not displaced. Open reduction and internal fixation was performed on the day of admission. Under general anesthesia with full muscle relaxation, the patient was placed supine with the affected limb exsanguinated and supported on a thigh bolster.

A lateral approach between the iliotibial tract and the biceps femoris tendon was used. With the knee flexed at 90°, the lateral Hoffa fragment was fixed first with two extraarticular, anteroposteriorly directed 6.5-mm cancellous screws. The heads of the screws were buried into the cartilage. A 3-cm medial incision was used for fixation of the undisplaced medial fragment with one 6.5-mm cancellous screw placed through the articular surface. The head of the screw also was buried



**FIGURE 1.** Anteroposterior view of bicondylar Hoffa fractures (arrows).

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**FIGURE 2.** Lateral view of bicondylar Hoffa fractures. The white arrows show significant displacement of the lateral condyle. The medial condyle is undisplaced (black arrows).

into the cartilage. A C-arm image intensifier was used to control reduction and screw placement. Intraoperatively, there was a question of penetration of the intracondylar notch by the medial screw; however, the usual projections using the C-arm did not reveal any misplacement. Screw direction was not revised, especially since passive flexion of the knee to  $90^\circ$  was unrestricted. Stability of the fracture was considered satisfactory, specifically on the medial side, and no other screws were used. Postoperative plain radiographs (Figs. 3 and 4) showed intraarticular placement of the medial screw, but an immediate reoperation could not be done because the skin on the medial side of the knee had multiple abrasions and areas of necrosis. A long plaster cast immobilization with the knee in  $20^\circ$  of flexion was used postoperatively for 2 weeks, followed by hinge brace application and progressive passive motion of the knee joint. The patient remained non-weight bearing for 6 weeks.

Full weight bearing was allowed afterward, but motion of the knee joint was significantly impaired ( $80^\circ$  of flexion). At 12 weeks postoperatively, both fractures had healed, and heterotopic ossification, mainly in the lateral side, was seen on plain radiographs. Intensive active exercises were started, but

the motion of the knee did not improve. Full weight bearing was allowed. Six months postoperatively, the patient underwent open knee arthrolysis through the old lateral incision, followed by hardware and heterotopic ossification removal. The delay to surgery was mandated by the patient's hesitation to consent. Postoperatively, flexion of the knee was increased and maintained to  $140^\circ$  with the aid of a continuous passive motion system.

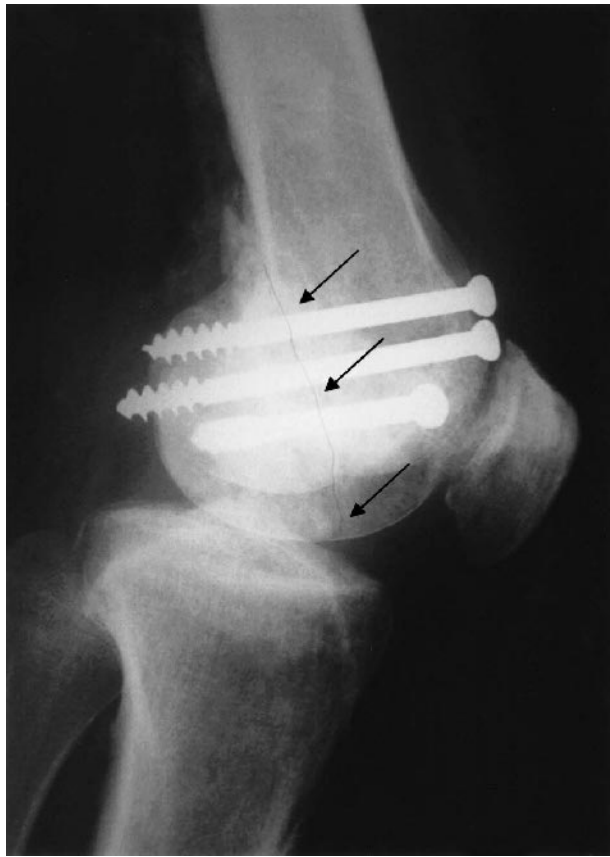
Indomethacin (75 mg) was given to the patient once a day for 2 weeks to prevent recurrence of heterotopic ossification. At 2-year follow-up, the patient had no complaints and had regained all his daily and working activities. Plain radiographs showed healing of both fractures (Figs. 5 and 6). There was a normal range of motion with  $145^\circ$  of flexion and full extension without any signs of instability of the knee joint.

## DISCUSSION

The isolated tangential posterior fracture of the distal femur is an unusual injury first described by Busch and Hoffa; the lateral condyle is more commonly involved.<sup>6</sup> Bicondylar Hoffa fracture is an extremely rare injury, representing the 33 B3.2 type, according to the AO classification.<sup>7</sup>



**FIGURE 3.** Postoperative anteroposterior view shows intraarticular placement of the medial screw (arrow).



**FIGURE 4.** Postoperative lateral view shows adequate reduction of both fragments. The arrows indicate the fracture line of the lateral fragment.

The mechanism of injury implies an oblique transverse force resulting from the impaction of the upper part of the tibia on the femoral condyles, particularly the lateral condyle, with the knee flexed greater than 90°. Our case is a typical example. Even when the clinical features suggest a lower femur fracture, the diagnosis may be missed because the fracture is obscured in the anteroposterior projection by the intact anterior part of the condyle. In the lateral view, the fracture can hardly be seen if it is minimally displaced.<sup>8</sup> Some anatomic considerations in coronal condylar fractures of the femur can influence prognosis and treatment. The popliteal vein and artery with their branches (superior lateral and medial genicular arteries) are situated directly between the medial and lateral condyles. Trauma to these arteries requires surgical intervention to prevent circulatory detrimental sequelae to the fragments leading to subchondral necrosis.<sup>9</sup> Depending on the extension of the fracture line, especially for the lateral condyle, detachment of the insertions of the popliteus tendon, lateral head of the gastrocnemius muscle, anterior cruciate ligament, and lateral ligaments (three types according to Letenneur's classification<sup>10</sup>) are common and may lead to knee instability or disruption of

blood supply to the fragments. Nonoperative treatment of bicondylar Hoffa fractures using tibial tubercle skeletal traction and manual posterior compression of the condyles does not always lead to satisfactory results. The residual flexion deformity at the fracture site may result in a disabling loss of extension of the knee that necessitates supracondylar osteotomy.<sup>4</sup> Especially in young persons, the long period of immobilization may have functional consequences to knee function. We prefer to do a meticulous anatomic restoration of the joint and firm stabilization of the condylar fragments, allowing early functional rehabilitation. The lateral approach is useful in most cases, but a standard anterior midline incision with medial parapatellar release and lateral dislocation of the patella, allowing direct access to the articular aspect of the fracture, also can be used.<sup>9</sup> In cases with good bone stock, as described here, we recommend the application of two anteroposterior cancellous screws from the anterior intact cortex to both Hoffa fragments, to provide rotational stability. In our case, the medial fragment was undisplaced, and that was one of the reasons we chose only one screw for fixation. The other reason was the bad skin condition on the anteromedial side of the knee, which prevented us from performing an immediate reoperation as



**FIGURE 5.** Anteroposterior view of the knee, 2 years postoperatively.





**FIGURE 6.** Lateral view of the knee, 2 years postoperatively.

soon as we noted the incorrect placement of the medial screw. At the reoperation, no cartilage damage caused by the medial screw was seen.

For a fracture in a frontal plane, devices such as a 95° angle plate or dynamic condylar screw are not suitable. In cases with osteoporotic bone, a buttress condylar plate may be helpful.<sup>2</sup> Mobilization is encouraged 2 weeks after the operation when secure fixation is obtained. If the surgeon is not sure of the fixation stability, plaster immobilization with the knee in full extension for 6 weeks is recommended.<sup>9</sup> Our patient's

postoperative compliance was in doubt, so a removable plaster cast was considered necessary for 2 weeks followed by hinge brace application because of the likelihood of secondary displacement if there was more immediate mobilization of the knee joint. This short time of immobilization also allowed for uncomplicated skin and wound healing.

Despite the short time of mobilization, our patient developed heterotopic ossification even though no head injury was present to precipitate this condition. We do not think that this complication was related to our approach, but we recommend that indomethacin prophylaxis should be administered in such injuries. Six months after the initial surgery, after open arthrolysis and hardware and heterotopic ossification removal, our patient eventually regained full active range of motion of his knee.

### CONCLUSION

We believe these rare injuries should be treated by early open reduction and anatomic rigid internal fixation to achieve full recovery of function. Additional operations may be needed to improve knee motion.

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