The Hoffa fracture: Three case reports

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INTRODUCTION

Unicondylar fractures of the lower end of the femur are uncommon injuries that usually occur in the sagittal plane. Coronal (tangential) plane fractures, first described by Hoffa in 1904, are unusual. We report our experience with three cases and the mechanism of injury is discussed. Open reduction and internal fixation is mandatory for good long-term results.

Key words: Hoffa's fracture, femur, open reduction, early mobilization

CASE REPORTS

Case 1
A seventeen-year-old girl fell off a ladder and landed on her left foot. The knee bent awkwardly outwards after the fall and she subsequently was unable to bear weight. She presented in casualty within four hours with tense hemarthrosis of the left knee. Radiographs showed a unicondylar coronal plane fracture of the lateral femoral condyle (Fig. 1a). Examination under anaesthesia demonstrated marked valgus instability in 30 degrees of knee flexion and none in full extension. Pre-operative comminution of the articular surface was seen in the non-weight-bearing area. The tibial surface, menisci and the posterior cruciate ligament were normal. The anterior cruciate ligament was vertically split. The posterior capsule and one part of the split anterior cruciate ligament were attached to the displaced fragment. The condyle was reduced and fixed with two antero-posterior lag screws. The heads of the screws were countersunk. Mobilization was started from day two post-operatively. Sixteen weeks after the injury, repeat radiographs were taken (Fig. 1b, 1c) and full weight-bearing walking was allowed. At eighteen months follow-up, the patient had a full range of knee movements with no ligamentous instability.

Case 2
A thirty-four-year-old man was riding a motorcycle and had a head-on collision with a car, sustaining injury to the left knee. He presented three days after the injury with tense hemarthrosis of the knee. Radiographs showed a comminuted fracture of the lateral femoral condyle in the coronal plane (Fig. 2a, 2b). Examination under anaesthesia demonstrated significant valgus instability in 30 degrees of flexion and none in extension. Pre-operative severe comminution with depressed articular cartilage was seen in the fractured femoral condyle. The tibial surface, menisci and the cruciate ligaments were normal. The displaced condylar fragment was attached to the posterior capsule. The condyle was reduced and stabilised with two buttress screws and two antero-posterior lag screws. The large osteochondral fragment was

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replaced after filling the gap with autogenous iliac crest graft and fixed with a cancellous screw. The screw heads through the articular cartilage were countersunk. Mobilisation was started on day two post-operatively and within six weeks a full range of knee movement was regained. After 16 weeks repeat check radiographs were taken (Fig. 2c, 2d) and full weight bearing was allowed. At one year follow-up the patient was asymptomatic and pursuing his pre-injury profession.

Case 3

A 39-year-old man fell from a height and sustained a comminuted fracture of the calcaneum, bimalleolar fracture of the ankle and a comminuted fracture of the lateral femoral condyle in the coronal plane in the same limb. Examination under anaesthesia revealed varus instability in extension and varus and valgus instability in 30° of knee flexion. Intraoperatively the lateral collateral ligament was found avulsed from its femoral attachment with a fragment of bone. The displaced condylar fragment was attached to the posterior capsule. The cruciate ligaments and menisci were normal. The condyle was reduced and fixed with two anteroposterior lag screws. The avulsed lateral collateral ligament was fixed with two screws in the coronal plane. Mobilisation was started from the second day postoperatively. At 8 years follow-up (Fig. 3) he had terminal restriction of knee flexion (Fig. 4a, 4b) with no instability. He walks with a limp and his functional rating is satisfactory.

DISCUSSION

The Hoffa fracture is an intra-articular fracture of the knee analogous to the capitellum fracture of the elbow. The injury is the result of violent force and generally occurs in young adults. Associated injuries to the skeleton significantly affect the end result and must be excluded. The fracture results from a combination of forces: direct trauma, possibly with an element of abduction. The ground reaction is transmitted through the tibial plateau. Axial compression on a flexed knee concentrates the force in the posterior half of the femoral condyles. In flexion the lateral condyle is the leading part of the knee to receive the impact. Although the Hoffa fracture may be of either condyle, the preponderance of lateral condylar fractures suggests an anatomic-biomechanical vulnerability due to the physiological valgus. Open reduction is mandatory for good long-term function.
Figure 2  (a) Anteroposterior and (b) lateral view showing the comminuted Hoffas’ fracture. (c) Anteroposterior and (d) lateral view at 16 weeks.
suggest a fracture of the lower end of the femur and the antero-posterior and lateral radiographs appear normal, a CT scan may be helpful.\textsuperscript{1} Coronal fractures when undisplaced can be overlooked easily and tend to displace with conservative treatment.\textsuperscript{1,4,6} The operative approach was lateral. The vastus lateralis was reflected off the lateral intermuscular septum and the knee joint opened. Maintaining the knee flexed during the surgery relaxes the posterior capsule, gastrocnemius and protects the neurovascular structures. Soft tissue attachments of the fractured fragment constitute the sole source of blood supply and must be preserved.\textsuperscript{4} The joint was carefully inspected for associated injuries. After reduction the fragments were temporarily fixed with Kirschner wires. Partially threaded cancellous screws were used in the lag mode to secure compression across the fracture. A minimum of two screws is mandatory to provide rotational stability.\textsuperscript{4} Post-operatively the knee was immobilized for 24 hours in 90° of flexion in a posterior slab. Following drain removal after 24 hours, a range of movement and strengthening exercises were begun.

The brunt of the injury is borne by bone and the ligaments are spared. With early anatomic restoration of the articular congruity the joint mechanics are minimally disturbed. Insertion of screws through the articular cartilage is necessary to achieve the lag effect. The screws should be placed as far laterally as possible with their heads countersunk to avoid damage to the
The stable fixation allows for early and pain-free mobilization, reducing the risk of fracture disease. According to Neer’s functional rating for fractures of the lower end of the femur, the two patients with an isolated Hoffa fracture have an excellent result till date.

Isolated coronal plane fractures of the femoral condyles are unusual high velocity injuries. The injury may be missed on routine radiography in the undisplaced fracture. Open reduction, internal fixation and early mobilization are essential for good long-term results.

REFERENCES

1. Allman KH, Altehoefer C, Wildanger G, Gufler H, Uhl M, Seif El Nasr M, Langer M. Hoffa fracture - a radiologic diagnostic approach. J Belg Radiol 1996, 79:201–2.
2. Arneson TJ, Melton LJ, Lewallen DG, O’Fallon WM. Epidemiology of diaphyseal and distal femoral fractures in Rochester, Minnesota, 1965–1984. Clin Orthop 1988, 234:188–193.
3. Hoffa A. Lehrbuch der Frakturen und Luxationen. 4th ed. Stuttgart: Ferdinand Enke-Verlag, 1904, 453.
4. Lewis SL, Pozo JL, Muirhead-Allwood WFG. Coronal fractures of the lateral femoral condyle. J Bone Joint Surg (Br) 1989, 71:118–120.
5. Neer CS, Ashby Grantham S, Shelton ML. Supracondylar fracture of the adult femur- a study on one hundred and ten cases. J Bone Joint Surg (Am) 1967, 49(4):591–613.
6. Ostermann PAW, Neumann K, Ekkernkamp A, Muhr G. Long-term results of unicondylar fractures of the femur. J Orthop Trauma 1994, 8(2):142–6.