

Hoffa Fracture of Medial Femoral Condyle in a 9-Year-Old Child: A Case Report

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Abstract

Hoffa fractures are intra-articular fractures of the distal femoral condyles in coronal plane. These fractures may be of either condyle but lateral condyle is most commonly affected and medial condyle is extremely rare. Non-operative treatment of unicondylar femur fractures, including Hoffa fractures, yields poor result. We present a case of 9-year-old child with Hoffa fracture of medial femoral condyle with understanding of the mechanism of injury and its further management. He had history of fall from height of about 5 feet on his right knee which was in flexed position at around 90°. X-ray of knee showed fracture of medial femoral condyle in coronal plane. Three-dimensional (3D) reconstruction of computed tomography (CT) scan confirmed the coronal fracture of medial femoral condyle and was classified as Type 33 B3 according to orthopedic trauma association classification and Type 1 as per Letenneur classification. Open reduction and internal fixation were performed with partially threaded cancellous screws. The fixation of coronal fracture of medial femoral condyle done through cancellous screws in anterior to posterior direction was adequate in giving stable fixation and aided in union without disturbing the physis of the child. At 1 year, the child could do full extension and 130° flexion. There was no posterior or varus, valgus instability of the knee. We believe that a medial condyle Hoffa fracture is extremely rare in children, and the diagnosis can be missed. ORIF using partially threaded cancellous screws in the epiphysis provides stable fixation and can lead to a good functional outcome in the long term. The mechanism of injury in this fracture pattern was found to be direct impact on the knee in flexed position of 90°.

Key words: Cancellous screw fixation, Fixation, Hoffa fracture, Mechanism of injury, Medial condyle, Type 23B-3

INTRODUCTION

Hoffa first described this fracture in 1904.^[1] These are intra-articular fractures of the distal femoral condyles in coronal plane. This injury is classified as a Type 33-B3 fracture by the orthopedic trauma association (OTA)/Arbeitsgemeinschaft für osteosynthesefragen (AO) classification. The Hoffa fracture may be of either condyle but lateral condyle is most commonly affected and medial condyle is extremely rare in occurrence, which has been presented twice in literature.^[2,3]

To the best of our knowledge, the Hoffa fracture of medial condyle in skeletally immature patient has been described

only once in literature.^[3] The mechanism of injury of this type of fracture is not well understood.

We present a case of 9-year-old child with Hoffa fracture of medial femoral condyle with understanding of the mechanism of injury and the principles of management.

CASE REPORT

A 9-year-old child came with a history of fall from height of about 5 feet after which a brick fell on his right knee flexed at around 90°. The patient experienced severe sudden onset pain in the right knee and was unable to stand and bear weight. There were tenderness and swelling of right knee, and bony crepitus was felt on movement. The limb was immobilized in a long leg slab and elevated. The radiographs of knee in anteroposterior and lateral view were taken which showed fracture of medial femoral condyle in coronal plane [Figure 2]. A CT scan with 3D reconstruction was advised which revealed a coronal fracture of medial femoral condyle [Figures 1-3]. The fracture was classified as Type 3 Salter

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and Harris classification, Type 33-B3 according to OTA classification, and Type 1 as per Letenneur classification.^[2] The patient was treated with open reduction and internal fixation with two cancellous-cannulated screws. In supine position under general anesthesia and tourniquet application, the knee was approached with medial parapatellar incision and fragment reduced and held with two guide wires over which cannulated drill holes were made, and two 4 mm cancellous screws were passed over them in anterior to posterior direction without crossing the physal plate and screws were countersunk. Guide wires were removed and the integrity of the fracture checked [Figure 4]. A negative suction drain applied and wound was closed in layers. On post-operative day 1, static quadriceps exercise was started. On day 2, drain was removed. The patient was further seen at 2 weeks for suture removal, and above knee cast was applied. Further, radiological evaluation was done at 6 weeks post-operative. Partial weight bearing was delayed till radiological signs of union were seen at 10 weeks [Figures 5 and 6]. Moreover, full weight bearing allowed when union was visible at fracture site at 14 weeks [Figures 7 and 8]. Lewis *et al.* recommended

plaster immobilization in full extension for 6 weeks^[4] because in such a position, the posterior joint capsule is tightened to provide splintage to the condylar fragment, and any axial loading can be borne by the anterior portion of the condyles. The patient was regularly followed up at monthly when he complained of pain in terminal flexion, and therefore, at 6 months of follow-up, the screws were removed through medial parapatellar approach. On Operation table (OT) table, the flexion was seen to be 120°. The mobilization of the knee was further started next post-operative day after removal of the screws.

At the final follow-up of 24 months, the patient had 120° flexion, complete extension without a lag, no varus/valgus instability, and no limb length discrepancy. X-rays showed no signs of osteoarthritis, avascular necrosis, or physal bar formation. The patient is pain free and can carry out his daily sporting activities at school.

The fixation of coronal fracture of medial femoral condyle done through cancellous screws in anterior to

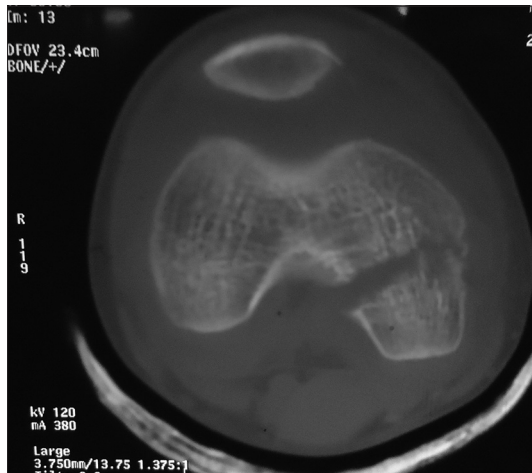


Figure 1: Axial CT with Hoffa's fracture



Figure 3: Saggital CT with Hoffa's fracture

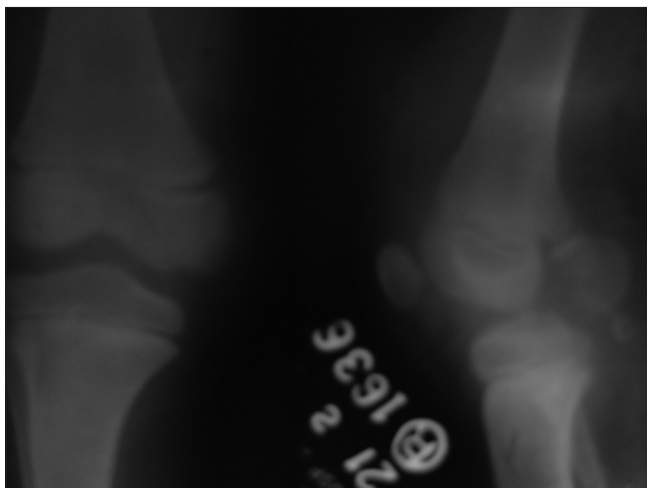


Figure 2: Pre-op Xray

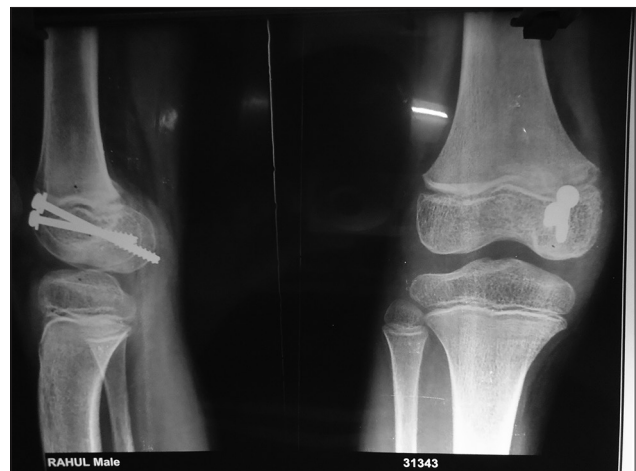


Figure 4: Post-op Xray

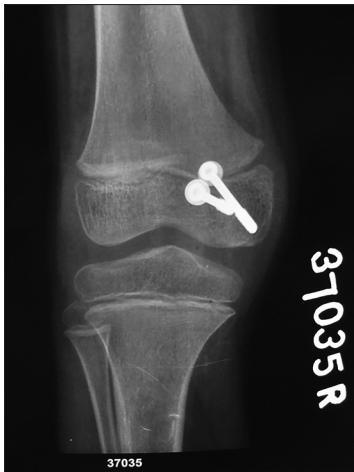


Figure 5: Post-op Xray AP



Figure 6: Post-op Xray lateral

posterior direction was adequate in giving stable fixation and aided in union without disturbing the physis of the child. The patient complained of pain in terminal flexion, and therefore, at 6 months of follow-up, the screws were removed through medial parapatellar approach. On operating table, the flexion was seen to be 120°. The mobilization of the knee was further started next post-operative day after removal of the screws. The final range of movements achieved at 2 years documented to be flexion 130°, full extension, no varus valgus instability, and negative anterior and post-drawer test. The patient has joined his school and can run and play well. The pain on 1–10 scales was noted to be 1 and subsided with rest. There was no limb length discrepancy observed at the final follow-up.

DISCUSSION

Hoffa fracture is a fracture of posterior femoral condyle in coronal plane. These are rare injuries, with lateral



Figure 7: Complete extension clinical picture



Figure 8: Complete flexion

condyle more commonly involved than medial. These fractures are even rarer in children. They were classified according to the AO/OTA classification as Type 33-B3. Letenneur *et al.*^[2] classified it into 3 types as Type I is a vertical fracture involving the entire condyle parallel to the posterior cortex of the femur, Type II is a fracture of variable size, horizontal to the base of the condyle, and Type III is a fracture oblique to the femur. They reported the best results with internal fixation and the poorest results in Type III. Because of physiological valgum, lateral condyle is more likely to sustain a direct shearing force and is more likely to fracture.^[6] A medial condyle Hoffa fracture is extremely rare in children, and the diagnosis can be missed. The mechanism of injury of these types of fracture is still not properly understood. Lewis *et al.*^[4] suggested that direct impact, leading to an axial loading force to the femoral condyle, with the knee in 90° or more of flexion and possibly with an element of abduction, results in a typical Hoffa fracture. Some investigators have postulated direct impact with the knee in a flexed position as the mechanism of injury while others have

attributed the fracture to simultaneous vertical shear and twisting forces.^[5,6]

These fractures are difficult to diagnose, clinically it may suggest a lower femoral fracture, but interpretation of radiographs can be difficult in minimally displaced fracture as the anterior part of the condyle is intact, and therefore, it needs 3D reconstruction of CT scan evaluation.^[7] These fractures are notorious for displacement if treated conservatively and can lead to long-term social and economic consequences of malunion, non-union, and degenerative changes in the joint. Internal fixation using partially threaded cancellous screws in the epiphysis provides stable fixation and can lead to a good functional outcome in the long term and decrease the risk of these complications. A minimum of two screws is mandatory to provide rotational stability.^[8] 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

opposing articular cartilage.^[8] The mechanism of injury in this fracture pattern was found to be direct impact on the knee in flexed position of 90°.

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