

Case Report



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A Rare Unreported Case of Comminuted Bicondylar Hoffa's Fracture

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Abstract

A coronal plane fracture of the distal femur (Hoffa's fracture) is very uncommon and usually occurs as a consequence of high velocity trauma. Bicondylar involvement of coronal femoral fractures is even less common, especially in children. To our knowledge, this is the first case report of a comminuted bicondylar Hoffa's fracture in the paediatric age group managed by low profile solid locking screws.

A fourteen-year-old boy was referred with complaints of pain, swelling and deformity of the left knee after a fall from a height of approximately 10 feet. Clinical examination of the left knee revealed swelling and effusion with a low-lying patella and multiple superficial abrasions. X-ray of the left knee revealed bicondylar Hoffa's fracture (Letenneur type III, Salter Harris type III). Computed tomography (CT) revealed a comminuted non-conjoint bicondylar Hoffa's fracture with a low-lying patella. The fracture was approached through an anterior midline incision. Extensor mechanism of the knee was found intact. Fracture fragments were reduced anatomically and held in compression with long ball-tipped clamps. Four screws were placed in an antero-posterior (two screws for each condyle) and two screws in a medio-lateral direction to achieve a strong fixation construct. The screws were kept entirely in the epiphysis. At 12 months follow-up, the patient was walking with a normal gait, and full extension and 90° degrees of flexion at the knee. Quadricepsplasty was performed at 1 year to improve knee flexion. At final follow up of 2 years, he had full range of knee motion with no functional limitation.

Keywords: Hoffa's, Hoffa's, bicondylar, adolescent, comminuted, quadricepsplasty.

Introduction

Coronal plane fracture of the distal end of femur is very uncommon and usually occurs as a consequence of high velocity trauma [1]. Bicondylar involvement of coronal femoral fracture is even rarer especially in children. Five cases of bicondylar Hoffa's fracture have been reported in the English literature. There is no description of a comminuted bicondylar Hoffa's fracture in the pediatric age group and reported cases were stabilized by either cannulated cancellous screws or Herbert screws [2, 3].

Case Report

A 14-year-old boy was referred with pain, swelling and deformity of the left knee and inability to bear weight over the left lower limb after fall from height of 10 feet

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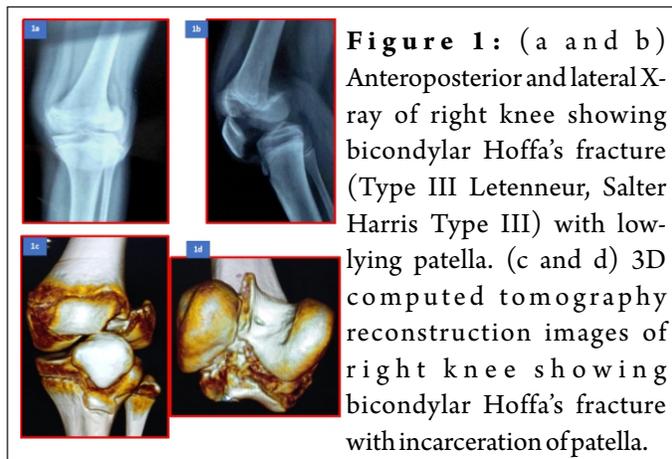


Figure 1: (a and b) Anteroposterior and lateral X-ray of right knee showing bicondylar Hoffa's fracture (Type III Letenneur, Salter Harris Type III) with low-lying patella. (c and d) 3D computed tomography reconstruction images of right knee showing bicondylar Hoffa's fracture with incarceration of patella.



Figure 3: (a and b) X-ray anteroposterior and lateral view of left knee at 1 year of follow up. (c and d) Clinical images showing 90–180° of range of motion at 1 year follow up.

about 48 h previously. Initial plaster slab immobilization was performed elsewhere. Examination revealed swelling, moderate joint effusion and visually low-lying patella with intact neurovascular status. Multiple abrasions were present over the anterior aspect of knee.

X-ray revealed a complex condylar fracture (Letenneur type III [1]) with an abnormally low-lying patella. Three Dimensional (3D) computed tomography (CT) revealed comminuted non-joint bicondylar Hoffa's fracture (Fig. 1). Under combined general and epidural anesthesia, the fracture was approached through an anterior midline incision and medial parapatellar arthrotomy. Extensor mechanism of the knee was intact. The patella was incarcerated between the fractured fragments. It was retracted laterally and knee was placed in hyper-flexion for better exposure of the fracture and ease of reduction. Fracture fragments were reduced anatomically and held in compression with long ball tipped clamps. Intraoperative image intensifier was used to confirm accurate alignment of the articular surface. Preliminary fixation was done using K-wires. Four solid 3.5 mm locking screws were used in an anterior-to-posterior direction (two for each condyle) and two in a medio-lateral direction.

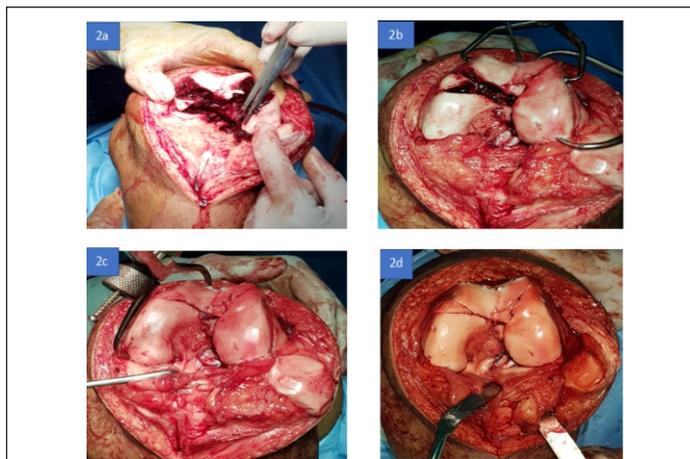


Figure 2: Steps of fracture reduction. (a) Removal of hematoma. (b) Reducing fracture fragments. (c) Maintaining the reduction using ball tipped reduction clamps. (d) Post screw fixation.



Heads of locking screws were buried under the articular cartilage. The screws did not cross the physis. Final reduction, length and trajectory of the screws was confirmed perioperatively. The collateral ligaments, meniscus, and tibial plateau were found uninjured. The capsule was repaired and patellar tracking was checked. Wound was closed in layers (Fig. 2). Postoperative immobilization was done with high-groin plaster slab for 2 weeks in 15° of knee flexion. Passive motion was initiated from 0 to 90° on 14th postoperative day with the help of dynamic knee brace. Full weight bearing was started after 3 months after confirmation of radiological union. Regular 3 monthly follow-up was ensured and at the end of 1st year patient was walking normally with 0–90° knee range of motion. He had difficulties in squatting and sitting cross legged. Quadriceps strength was MRC grade 5. Radiological evaluation confirmed that there was no growth arrest (Fig. 3). Quadricepsplasty was done after 1 year to improve knee flexion along with release of intra-articular fibrous adhesions. Active-assisted knee mobilization was started immediately from day 1 after surgery. At final follow up of 2 years, the patient had full range of knee motion with no functional limitation (Fig. 4).

Discussion

Coronal plane fracture was first described by Friedrich Busch in 1869. Letenneur et al. were the first to call this coronal plane fracture as "Fractures de Hoffa's" in 1977 [4]. Hoffa's fracture is a rarity in paediatric age group. To date, 12 cases have been reported in children, with five of those involving both condyles [2, 3, 5, 6, 7]. The mechanism of Hoffa's fracture involves axial loading of the femoral condyle in 90° of knee flexion [1]. The fracture pattern varies according to the orientation of rotational force and the amount of knee flexion during impact. Undisplaced fractures in the coronal plane are seen in about 33% of cases [8]. Displacement of the fracture fragments are better visualized on the lateral radiograph. Magnetic resonance imaging and 3D-CT play a crucial role in evaluating the soft tissues and understanding the fracture geometry.

Undisplaced Hoffa's fractures can be treated with knee bracing and protected weight bearing until union. The outcome, in case of multi-fragmentary displaced fractures, depends on anatomic reduction and stable fixation of the fragments. Surgical approach depends on the initial injury pattern and associated injuries. Commonly used surgical approaches include lateral parapatellar (Swashbuckler), midline or medial parapatellar (sub-vastus) approach [9]. Reaching the opposite condyle in pure medial or lateral approach is difficult and thus avoided. In adult counterparts of these fractures rigid fixation is achieved

with cortical and cancellous screws with variable pitch length. In children, this may pose a problem due to the reduced operative field, small fracture fragments, size of the screw head, and proximity to the physis. To overcome these limitations, we used low profile 3.5 mm solid locking screws instead of traditional implants. Compression of the fracture fragments is not possible with this implant. We overcame this problem by direct visualization of the articular surface and using ball tipped clamps while advancing the screws. Screws directed from posterior to anterior are biomechanically more favorable. However, screws were placed anterior-to-posterior and buried under the cartilage due to its ease of insertion and easier accessibility.

The child presented with flexion restriction of 90° at 1 year follow up. To improve knee flexion, Quadricepsplasty was performed at 1 year [10]. At final follow up of 2 years, child has full range of knee motion with no functional limitation.

Conclusion

Hoffa's fracture is a challenging situation in paediatric age group. Along with all other odds physeal injury leading to growth arrest is also a concern for surgeons. Solid 3.5 mm locking screw can be a good alternative to the other conventional implant.

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Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the Journal. The patient understands that his name and initials will not be published, and due efforts will be made to conceal his identity, but anonymity cannot be guaranteed.

Conflict of interest: Nil; **Source of support:** None

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