

Case Report

Ipsilateral femoral shaft and medial Hoffa fracture in a 13-year-old male following road traffic accident

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ABSTRACT

Hoffa fractures, particularly of the medial femoral condyle, are rare in pediatric populations. Their association with ipsilateral femoral shaft fractures is exceedingly uncommon. We present a case of a 13-year-old boy who sustained an ipsilateral femoral shaft fracture and medial Hoffa fracture following a high-energy road traffic accident (RTA). The shaft fracture was managed with closed reduction and titanium elastic nailing (TENs), and the medial Hoffa fracture was treated via open reduction and internal fixation with cannulated Herbert screws using a medial parapatellar approach. This report highlights the importance of high clinical suspicion and appropriate imaging to diagnose these rare injury patterns.

Keywords: Trauma, Hoffa fracture, Femur fracture, Pediatric

INTRODUCTION

Hoffa fractures, first described by Friedrich Busch and later popularized by Albert Hoffa, are coronal plane fractures of the femoral condyles.¹ Medial Hoffa fractures are significantly rarer than lateral ones.² In the pediatric population, these fractures are even more infrequent due to the inherent elasticity of bone and the presence of open growth plates.³

The combination of a medial Hoffa fracture with an ipsilateral femoral shaft fracture has scarcely been reported in children.⁴ This case report discusses the diagnostic challenges, surgical approach, and post-operative management of such an injury.

CASE REPORT

A 13-year-old male presented to the emergency department following a high-velocity road traffic accident. The patient reported severe pain and inability to bear weight on the right lower limb. There were gross swelling and deformity of the thigh and knee without any distal neurovascular deficit.

Radiological findings

X-ray femur showed a displaced mid-diaphyseal fracture of the left femur. A true lateral X-ray of the knee suggested a coronal plane fracture of the medial femoral condyle. CT scan of the knee confirmed a medial Hoffa fracture (Letenneur type III).⁵ Contrast enhanced CT abdomen showed grade I liver laceration with mild haemoperitoneum.

Surgical management

The patient was taken to the operating room within 24 hours of admission.

Step 1: Fixation of femoral shaft fracture

Under general anesthesia, the femoral shaft fracture was managed with closed reduction and internal fixation using TENS through standard entry points at the distal femur.

Step 2: Fixation of medial Hoffa fracture

A medial parapatellar arthrotomy was performed to expose the medial femoral condyle. Fracture reduction was

achieved under direct vision and fixed with two 4.0 mm Herbert screw (HCS) inserted in an anteroposterior direction, ensuring subchondral placement and compression and one CCS from medial to lateral direction for epiphyseal injury. Confirmed anatomical reduction and hardware positioning with intraoperative imaging with C-Arm.

Postoperative management

Knee was immobilized in an above-knee slab for 2 weeks. Passive range of motion exercises started after 2 weeks.

Partial weight-bearing started at 6 weeks. Full weight-bearing was allowed after 10 weeks post-op, based on radiographic healing.

Follow-up

At 6 months

Radiographs confirmed complete fracture healing. The patient had full, painless range of motion of the knee. No angular deformities or limb length discrepancies were noted.

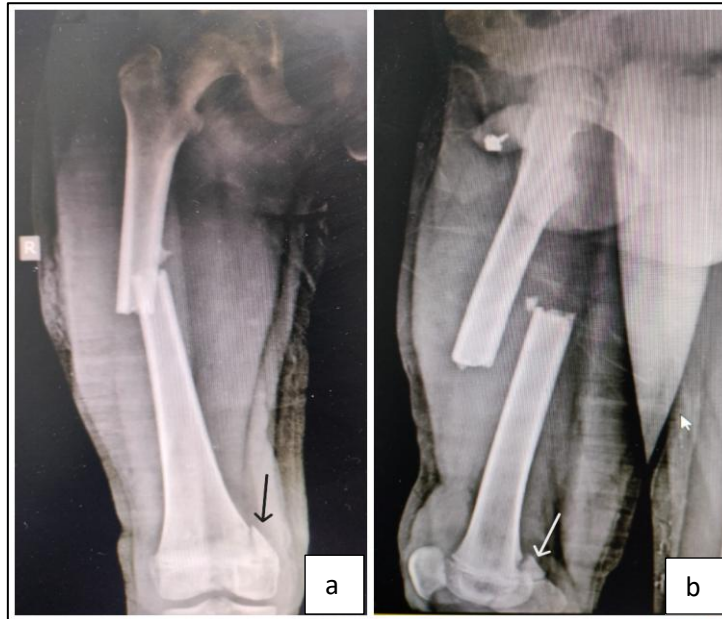


Figure 1 (a and b): Antero-posterior and lateral X-ray views of right thigh showing displaced mid diaphyseal fracture of right femur with Hoffa fracture of medial femoral condyle in Antero-posterior (black arrow) and lateral view (white arrow).



Figure 2 (a and b): Antero-posterior and lateral X-ray views of right knee showing Hoffa fracture of medial femoral condyle in Antero-posterior and lateral view (black arrows) Letenneur type III.

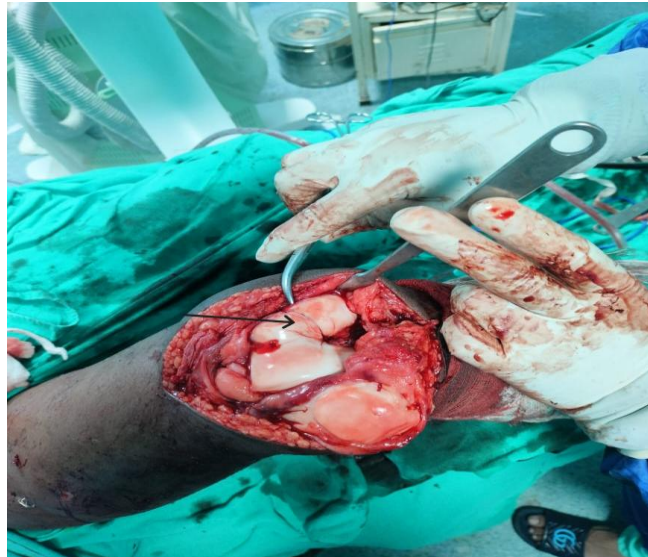


Figure 3: Intra-operative image of right knee showing Hoffa fracture of medial femoral condyle fixed with HCS.

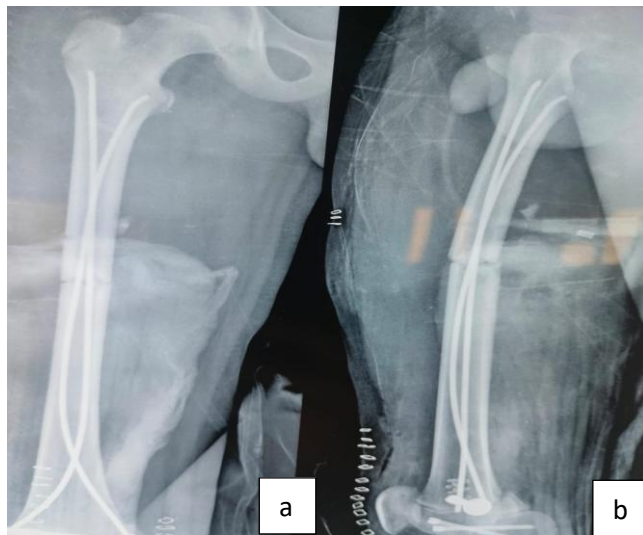


Figure 4 (a and b): Post-operative Antero-posterior and lateral X-ray views of right thigh showing diaphyseal fracture of right femur fixed with closed reduction and TENS.

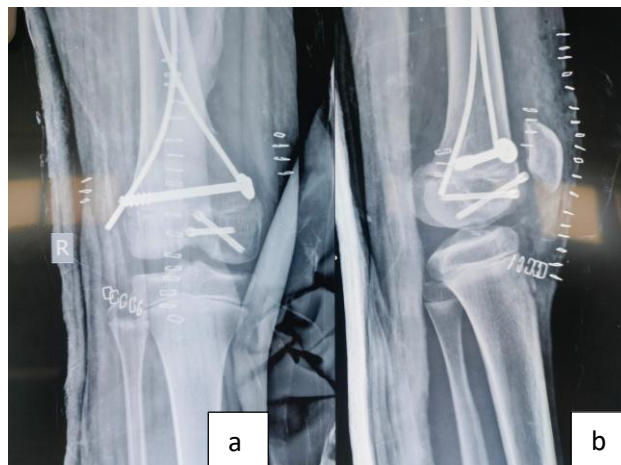


Figure 5 (a and b): Post-operative antero-posterior and lateral X-ray views of right knee showing Hoffa fracture of medial femoral condyle fixed with HCS and CCS.

DISCUSSION

Medial Hoffa fractures are uncommon due to the mechanical axis being closer to the lateral condyle, making the lateral condyle more vulnerable.^{2,6} The concomitant occurrence with a shaft fracture indicates high-energy trauma, which may mask the intra-articular injury if not carefully evaluated.⁷ This case report describes a rare combination of a femoral shaft fracture with a concomitant medial Hoffa fracture in a 13-year-old male patient, managed surgically with TENS for the shaft fracture and a Herbert screw for the Hoffa fracture. The injuries were sustained in a road traffic accident, highlighting the high-energy mechanism typically associated with such complex fractures. The presentation of these injuries in a pediatric patient is noteworthy due to the rarity of Hoffa fractures in this age group, the complexity of managing intra-articular and diaphyseal injuries simultaneously.

Hoffa fractures, which are coronal plane fractures of the femoral condyles, are uncommon in adults and exceedingly rare in pediatric populations, with limited literature documenting their occurrence in children.⁹ These fractures typically result from high-energy trauma, such as road traffic accidents, as seen in patient. The medial Hoffa fracture in this case, classified as a Letenneur type III based on intraoperative findings, involved a significant fragment of the medial femoral condyle, requiring precise anatomical reduction to restore joint congruity and prevent long-term complications such as post-traumatic arthritis. In contrast to adult cases, where Hoffa fractures are often associated with comminution, the pediatric skeleton's resilience likely contributed to a relatively simpler fracture pattern, facilitating surgical fixation.¹⁰

The femoral shaft fracture, a more common injury in pediatric trauma, was managed with TENS, a well-established technique for diaphyseal fractures in children aged 5–15 years.¹¹ TENS provides flexible intramedullary stabilization, promotes early mobilization, and minimizes growth plate injury compared to rigid nailing systems used in adults. The decision to use TENS in this case was supported by its biomechanical advantages and alignment with current pediatric orthopedic guidelines. A study by Flynn et al. demonstrated excellent union rates and low complication rates with TENS for femoral shaft fractures, with over 90% of patients achieving full functional recovery within 6–12 months.¹¹ The patient's radiographic union of the shaft fracture by 12 weeks and return to pre-injury activity levels by 6 months corroborate these findings.

The management of the medial Hoffa fracture with a Herbert screw, a headless compression screw, was chosen to achieve stable fixation of the intra-articular fragment while minimizing soft tissue disruption. The Herbert screw's design allows for compression across the fracture site, promoting primary bone healing, and its headless profile reduces the risk of intra-articular prominence. A case series by Lal et al. reported successful outcomes with

screw fixation for Hoffa fractures in adults, with anatomical reduction being a key predictor of good functional results.¹² However, pediatric data remain sparse. The successful outcome in our case, with restoration of knee range of motion (0–130 degrees) and no evidence of joint incongruity on follow-up imaging, suggests that Herbert screw fixation is a viable option for pediatric Hoffa fractures, provided anatomical reduction is achieved.

The combination of these injuries posed unique diagnostic and therapeutic challenges. Hoffa fractures can be missed on standard anteroposterior radiographs, necessitating lateral views or advanced imaging such as computed tomography (CT), which was instrumental in confirming the diagnosis. This aligns with recommendations by Aravindh et al., who advocate for CT in suspected intra-articular distal femoral injuries to delineate fracture morphology and guide surgical planning.¹³ The simultaneous management of diaphyseal and intra-articular fractures required careful surgical sequencing, with prioritization of the Hoffa fracture to restore articular anatomy before addressing the shaft fracture. This approach is consistent with principles outlined in pediatric polytrauma management, where articular injuries take precedence to prevent long-term joint dysfunction.¹⁴

The significance of this case lies in its rarity and the successful outcome achieved with a combined surgical strategy tailored to the pediatric skeleton. Unlike adult patients, where rigid fixation and prolonged rehabilitation are often required, the pediatric population benefits from the healing potential of immature bone and the flexibility of implants like TENS.¹¹ The absence of complications such as nonunion, malalignment, or growth disturbance in our patient at 12-month follow-up further underscores the efficacy of this approach. However, the case also highlights diagnostic pitfalls, as Hoffa fractures may be underdiagnosed in children due to their rarity and subtle radiographic findings.⁹

Limitations of this case report include its single-case nature, which precludes generalizability, and the relatively short follow-up period of 12 months. Although no growth disturbances were observed, longer-term follow-up is needed to assess potential physeal injuries, given the proximity of the distal femoral physis to the Hoffa fracture site.¹⁴ Additionally, the lack of comparative data on alternative fixation methods, such as bioabsorbable screws or plate constructs for pediatric Hoffa fractures, limits our ability to assert the superiority of Herbert screw fixation.

This case has several implications for clinical practice. First, it emphasizes the importance of a high index of suspicion for intra-articular injuries in pediatric femoral fractures, particularly in high-energy trauma such as road traffic accidents. Second, it supports the use of CT imaging to characterize complex fractures and guide surgical planning.¹³ Third, it demonstrates that a combination of TENS and Herbert screw fixation can yield excellent

outcomes in managing concurrent diaphyseal and intra-articular femoral fractures in children. Future research should focus on multicenter studies to establish the incidence, optimal management, and long-term outcomes of Hoffa fractures in pediatric patients. Additionally, biomechanical studies comparing different fixation methods for pediatric Hoffa fractures could inform evidence-based guidelines.

Diagnosis may be missed on plain radiographs. CT scan plays a crucial role in preoperative planning.⁸ Surgical fixation is essential to restore joint congruity and prevent long-term complications like arthritis and instability.

CONCLUSION

This case highlights the rare occurrence of a femoral shaft fracture with a concomitant medial Hoffa fracture in a 13-year-old patient following a road traffic accident, successfully managed with TENS and Herbert screw fixation. It underscores the importance of early recognition, advanced imaging, and tailored surgical strategies to achieve anatomical reduction and optimal functional outcomes in complex pediatric femoral injuries

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