

Prevalence of Fractures of the Knee among Orthopedic Patients, Jeddah, Saudi Arabia

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Abstract

Fractures of the knee include fractures of the patella, femoral condyles, tibial eminence, tibial tuberosity, and tibial plateau. Direct and indirect forces can cause these fractures. Patellar and tibial plateau fractures each account for 1% of all skeletal fractures. Distal femoral condyle fractures account for 4% of all femur fractures. Fractures of the patella are much less common and associated with rheumatoid arthritis, use of steroid, osteonecrosis and malalignment of implants. Fractures of the knee can result in neurovascular compromise or compartment syndrome, with resultant risk of limb loss. Soft-tissue infection or osteomyelitis can occur with open fractures. Other complications include nonunion, delayed union, osteoarthritis, avascular necrosis, fat embolism, and thrombophlebitis.

Keywords: Fractures; Knee; Patella; Tibial Plateau

Introduction

Patella fractures represent roughly 1% of all skeletal injuries. They end up noticeably dangerous if the extensor system of the knee is non-functional, articular congruity is lost, or firmness of the knee joint follows. To evade these issues, the specialist must accomplish

anatomic rebuilding of the joint and should permit early movement. In the 1800s, treatment of patella fractures was disputable. Attributable to an absence of satisfactory obsession procedures, surgical experience, and imaging, treatment frequently comprised of expansion supporting. This prompted poor outcomes in view of intra-articular confusion, nonunion, and poor movement. Introductory endeavors at agent adjustment of these fractures yielded acceptable repair rates lower than half. Treatment at that point advanced to extraction of fractured patellar pieces or of the whole patella. In spite of empowering early outcomes, long haul follow-up uncovered degenerative changes in the femoral condyles and diminished quadriceps control [1,2].

An isolated coronal fracture of each or both femoral condyles is an uncommon injury. First stated by Friedrich Busch in 1869, this fracture was later called after Albert Hoffa in 1904 [3]. The mechanism of injury is axial compression to the knee with transmission of the ground reaction force through the tibial plateau to the femoral condyles. In a flexed location, the posterior portion of the lateral condyle is the one receiving the first influence. Even though Hoffa fractures can happen in either femoral condyle, this locating makes them more common on the lateral side [4]. As this type of fracture pattern is bare to continual shear stresses in both the coronal (varus/valgus) and sagittal (flexion/extension) planes, it is an intrinsically unsteady type of intra-articular fracture that warrants operative fixation. Certainly, cases of malunion and nonunion have been stated when Hoffa fractures have not been treated surgically [5]. A technique for treating a fracture of the posterior lateral femoral condyle (Hoffa fracture) is described with arthroscopic decline and fixation with cannulated screws. The method presented great outcomes as a marginally invasive method to deal with this fracture.

The tibial plateau is a standout amongst the most basic loadbearing ranges in the human body; fractures of the level influence knee alignment, steadiness, and movement. Early recognition and fitting treatment of these breaks are basic for limiting patient incapacity and decreasing the danger of recorded difficulties, especially posttraumatic arthritis [6]. Sir Astley Cooper initially depicted fractures of the proximal tibia in 1825. Outrage treated most insignificantly displaced fractures with early knee traction mobilization [7]. Rasmussen presented open reduction and internal fixation (ORIF) of tibial condylar fractures [8], and Sarmiento promoted useful cast supporting of most tibial condylar fractures [9].

Tibial tuberosity fractures are rare fractures influencing physically dynamic youths [10,11]. Activities including effective withdrawal of the knee extensors, for example, springing and jumping movements, can cause in avulsion fractures of the tibial tuberosity apophysis [12,13]. This condition ought to be recognized from Osgood-Schlatter malady, a chronic apophysitis of the tibial tuberosity because of repetitive traction harm. The Nondisplaced type I injuries can be managed conventionally by cast immobilization in a long leg cast in full-knee extension. All other injuries are best treated by open reduction and internal fixation with cast immobilization for 6 - 8 weeks.

Patella Fractures

The patella is the main sesamoid bone in the body. It is confined within the extensor mechanism, consisting of the quadriceps tendon proximally and the patellar ligament distally. At this location, it works to increase the extensor moment by almost 30%. The patella is covered at its proximal aspect by thick cartilage. Due to its comparatively small size, the patellofemoral joint is exposed to the highest contact stress of any weightbearing joint. Consequently, any aberration in its anatomy or alignment may lead to symptomatic deteriorating variations. Patient who has continuous a patella fracture regularly presents with pain in the affected knee. The history tells a direct blow to the knee, a fall, or a permutation of the two. Overlying abrasions, ecchymosis over the anterior aspect of the knee, or both might exist. Objective of a hemarthrosis followed by instillation of intra-articular lidocaine may perhaps relieve the pain connected to the fracture and allow a more thorough evaluation of extensor mechanism disruption. This measure is not regularly essential, on the other hand if it is, it should be completed under sterile conditions to minimize the risk of infection.

Signs for operative treatment of a patella fracture incorporate the following:

- More than 3 mm of separation between primary fracture fragments
- Articular incongruity with more than 2 mm of stepoff
- Disturbance of the extensor mechanism

Relative contraindications to closed treatment of patella fractures include the following [14,15]:

- Open fractures
- Intra-articular displacement with disruption of the extensor mechanism

Contraindications to operative repair of patella fractures include the following:

- Fixed flexion contractures of the knee
- Preexisting lack of active extensor function
- Septic arthritis

Future management choices possibly will contain osteochondral allograft reconstructions of the patella for posttraumatic arthritis. Bioabsorbable fixation approaches might reduce the incidence of hardware-related symptoms.

Surgical Treatment For displaced patellar fractures, surgical treatment is reasonable to maximize the potential for successful results. Operative treatment purposes to restore extensor function, support articular incongruities, and permit early motion. Operative treatment is carried out on an emergency basis if the fracture is open or if an accompanying traumatic arthrotomy is current (Figure 1) [16].



Figure 1: Radiograph of patella fracture.

In the event that the fracture is not uprooted and the extensor system is in place, the fracture might be dealt with by methods for immobilization. This for the most part includes putting the influenced furthest point in a cylinder cast for 4 a month and a half. The patient is permitted to manage weight in the cast. Once radiographic proof demonstrates union and clinical indications of recuperating (nontender to palpation) are available, the patient is changed to a removable support. A pivoted knee prop is utilized amid ambulation. A program underlining scope of movement and fortifying is then executed. Once the patient can play out a straight leg raise without extensor slack and has more noteworthy than 90° of knee flexion, prop utilize might be ended. With appropriate patient choice, great outcomes can be normal in around 90% of patients with nondisplaced fractures.

Femoral condyle fracture

The administration objective for a wide range of intra-articular fractures is to accomplish anatomic diminishment and sufficient dependability empowering early activation. It is for the most part acknowledged that agent fixation of Hoffa fractures is important to accomplish this objective. The irregularity and unconventional anatomic location of Hoffa fractures render their administration a challenge [17]. Damage happens as the aftereffect of a fierce drive and for the most part happens in youthful adults. The fracture outcomes from a mix of forces, including direct injury, perhaps with a component of abduction. The ground response compel is transmitted through the tibial level. Axial compression on a flexed knee concentrates the force in the posterior half of the femoral condyles. In flexion the sidelong condyle is the main piece of the knee to get the effect. In spite of the fact that a Hoffa fracture may happen in either condyle, the dominance of parallel condylar cracks proposes an anatomic-biomechanical susceptibility because of physiological valgus [18].

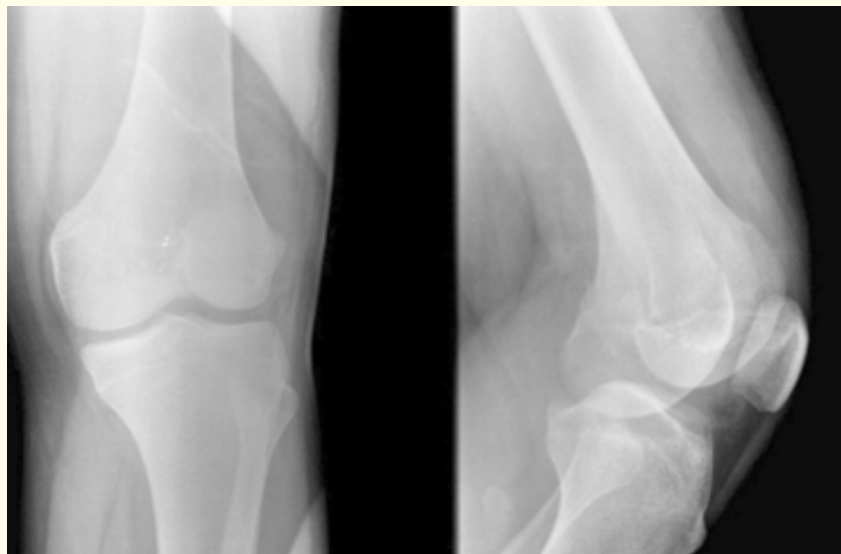


Figure 2: Anteroposterior and lateral radiographic views of left knee.

In Hoffa fracture the piece is persistently presented to physiological shearing stresses in the sagittal plane amid ordinary flexion/augmentation. Varus/valgus stresses additionally exists in the coronal plane despite the fact that the collateral ligaments are intact. The lag screws can just give interfragmentary pressure. To brace the piece against the shearing power, screws ought to be connected on the back viewpoint simply over the section to prevent it from superiorly moving or a support bolted plate (Synthes, Oberdorf, Switzerland) ought

to be used [19]. Such treatment is troublesome and practically infeasible on account of restricted get to when utilizing the horizontal parapatellar exposure [20]. Consequently, the benefit of arthroscopic- assisted reduction and fixation with cannulated screws (Synthes). The displaced condylar fragment is not obviously seen on the lateral radiograph. Therefore, when clinical features suggest a fracture of the lower end of the femur and the anteroposterior and lateral radiographs look regular, a computed tomography scan might be helpful [21]. Coronal fractures when undisplaced can be overlooked easily and tend to displace with conservative management [18]. With early anatomic restoration of the articular congruity, the joint mechanics are slightly disturbed. Inclusion of screws through the articular cartilage in an oblique direction, aiming medially and anteriorly from the lateral and posterior aspect of the fragment, is needed to attain the lag effect as much as possible and is better than the opposed direction from anterior to posterior. The screws must be located as far laterally as possible with their heads countersunk to evade injury to the opposing articular cartilage. Even though the direction of the screws is not perpendicular to the fracture and might affect some displacement with tightening, this worry is overwhelmed by first fixing the fracture with 2 guidewires before drilling and placing in the screws. The stable fixation agrees for early and pain-free mobilization, decreasing the hazard of knee stiffness [22]. With respect to recovery, there is dependably a contention between break site strength and early assembly. Solidness of the crack must be tried intraoperatively with knee scope of movement. This imitates the physiological anxieties and demonstrates any crack movement that could occur amid physical recovery. In instances of uncertainty, Lewis, *et al.* [5] suggested mortar immobilization in full augmentation for a month and a half in light of the fact that, in such a position, the back joint case is fixed to give supporting to the condylar part, and any pivotal stacking can be borne by the foremost segment of the condyles. Other than backing off the restoration program, a shorter follow-up interim, each 1 to 2 weeks, is fundamental, and the clinician must stay watchful and examine any unexplained increment in torment or swelling over the span of recovery.

Tibial Plateau

The overall management can be one of the following:

- **Traction:** This may be used as a provisional or conclusive management modality; calcaneal traction may be continued throughout the traction mobilization treatment of selected plateau fractures without gross articular incongruity; traction is contraindicated in patients undergoing vascular repairs.
- **Fasciotomy for impending compartment syndrome:** Emergency management is compulsory as a delay in management is directly associated with additional damage; if signs of compartment syndrome are present, four compartment fasciotomies are performed.
- **Spanning external fixator:** Closed fractures go through external fixator placement on the basis of patient stability and operating room accessibility, without the patient has signs of compartment syndrome; patients go through debridement for open fractures and fasciotomy for compartment syndrome could be managed with a temporary external fixator until the soft-tissue condition develops.
- **Antiedema measures:** Joint aspiration, rest, immobilization, compression, elevation, and other antiedema measures are advocated in patients with high-energy fractures encircled by evidence of compromised soft tissues (e.g. skin blisters, edema); limbs with features suggestive of compartment syndrome must not be treated with antiedema methods.
- **Debridement of open injuries:** Open fractures must be addressed in agreement with universal guidelines; patients optimally go through surgical debridement of open traumatic wounds within 8 hours of injury; aggressive debridement of open fracture wounds is performed, including removal of contaminating debris and any devitalized fascia, muscle, and bone.

Management of these fractures is represented by the vascularity (nearby tissue and distal), the state of the delicate tissues, and the nearness or nonappearance of compartment disorder. Not all fractures of the tibial level require surgery. The principal challenge in the administration of upper tibial cracks is to settle on nonoperative and surgical management. Fracture displacement ranging from 4 - 10

mm may be cured nonoperatively; nevertheless, a depressed fragment more than 5 mm must be elevated and grafted [23]. Open or arthroscopic-assisted methods are deliberated for fractures with displacement, depression of the condylar surfaces, or both [24,25]. Open surgical therapy can be immediate or staged. Internal fixation can be accomplished by biologic fixation - Screw fixation, minimally invasive plate osteosynthesis, and least invasive stabilization system; Arthroscopic-assisted fixation and conventional double-plating. External fixation can be accomplished with Ilizarov fixator and Hybrid fixator.

Absolute indications for surgery	Relative indications	Contraindications
<ul style="list-style-type: none"> Open plateau fractures. Fractures with an allied cubicle syndrome. Fractures allied with a vascular injury. 	<ul style="list-style-type: none"> Most displaced bicondylar fractures. Displaced medial condylar fractures. Lateral plateau fractures that result in joint instability. 	<ul style="list-style-type: none"> Presence of a compromised soft-tissue envelope (for immediate open reduction) Fractures that do not result in joint instability or deformity and can therefore be treated with nonoperative modalities.

Table 1: Absolute, Relative indications and Contraindications for surgical treatment.

Tibial Tubercle Fracture

Therapeutic treatment regularly includes absence of pain for torment control and thromboprophylaxis. The patient’s uneasiness can be controlled with acetaminophen and nonsteroidal anti-inflammatory drugs. On the off chance that the torment proceeds with, an opiate pain relieving can be included. The surgical strategy is controlled by the kind of break [26]. The preoperative evaluation is intended to distinguish the break, its removal, and any related wounds. Sort IA wounds are dealt with minimalistically with thrown immobilization in full augmentation, trailed by continuous restoration of the quadriceps. Sort IB, sort II, and sort III wounds are treated with open reduction and internal fixation. Sort III wounds may likewise require investigation of the knee joint for meniscal and ligamentous harm, with exact lessening of the intra-articular surface [27]. In open reduction and internal fixation, the break is drawn nearer from a front or horizontal parapatellar cut. Mediated delicate tissue is cleared to advance exact lessening. The tibial tuberosity is decreased and settled to the tibia by utilizing maybe a couple screws. Arthroscopy or arthrotomy might be required to repair harmed menisci and to refashion a smooth articular surface, especially in sort III wounds [28].

Physiotherapy is additionally part of the patients’ postoperative care. Dynamic restoration of the quadriceps is required after thrown immobilization. Physiotherapy and dynamic weightbearing activities can be performed not long after open reduction and internal fixation is finished. Early assembly lessens joint firmness and shortcoming because of delayed immobilization. The prognosis is outstanding, and most patients improve full function within 1 year. An orthopedic surgeon should follow patients to ensure that the fracture is healing correctly and that any complications are managed. Complications are uncommon and incorporate those identified with injury (e.g. thromboembolism) or impacts particular to the crack. The last incorporates meniscal harm in sort III wounds, bursitis over metalwork, malunion, nonunion, repeat, early degenerative change, genu recurvatum, and leg-length inconsistency. Frey, *et al.* reflectively evaluated 20 tibial tuberosity breaks in 19 young people (mean age, 13.7 years; extend, 10-19 years) for crack morphology, component of damage, break administration, and complexities. There were nine remaining side wounds and 11 right-side wounds; one patient had two-sided breaks. Damage instruments included b-ball (n = 8), running (n = 5), football (n = 3), tumble from a bike (n = 2), high-bouncing (n = 1), and fall (n = 1). Comorbidities included Osgood-Schlatter malady (n = 3) and osteogenesis imperfecta (n = 1). Every one of the 19 patients was treated with ORIF, incorporating arthroscopic systems in two cases. Complications included preoperative introduction of compartment disorder (n = 4, all requiring fasciotomy), postoperative firmness (n = 1), and excruciating equipment that required expulsion (n = 1). Scope of movement was begun a normal of 4.3 weeks postoperatively, and come back to play was a normal of 3.9 months postoperatively [29].

Conclusion

Fractures of the Knee are common pediatric orthopaedic injuries. Even though most fractures can be treated non-surgically, those that require surgical interference might come across specific complications. Surgical treatment of fractures of the knee might be complicated by failed fixation, knee joint stiffness, and arthrofibrosis of the knee, a complication infrequently seen in children but occurring most frequently after injuries. Complications of healing after fractures in pediatric patients are rare, even though some fractures show delayed union or nonunion, infection, and soft-tissue complications.

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