

The Functional And Radiological Outcomes Of Hoffa's Fracture Treated With Cannulated Cancellous Screws.

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Abstract

Introduction: Isolated Hoffa fracture is an infrequent injury. the purpose of this study was to evaluate the function outcome and complication of surgically managed Hoffa fracture with cannulated cancellous screw.

Material and methods: this study was conducted at Nalanda medical collage and hospital ,patna ,bihar, from December 2022 to December 2023 with total sample 15 patients as a sample size.

Result : fifteen patient with Hoffa's fracture were treated with cannulated cancellous screws included 8 male and 7 female with mean age of 31.1 years. the range of motion range from 120 to 135 degree of flexion. three patient had extensor lag ranging from 5 to 10 degree. neer score were excellent in 11, good in 3, fair in 2 patient. the average fracture union time for lateral condylar was 16 month and for medial condylar , it was 16.8.

Conclusion : open reduction and fixation with two cannulated cancellous screw with early mobilization yielding good function outcome in isolated Hoffa fracture.

Key Words : Hoffa Fracture, Intra articular Fracture of Distal Femur

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I. INTRODUCTION :

Hoffa fracture described by Albert Hoffa in 1904, is an intra-articular fracture affecting the femoral condyle in the coronal plane. Hoffa's fracture is a tangential, unicondylar fracture of the distal femoral condyle and is a relatively rare injury. They are isolated fractures of the femoral condyle and rare in occurrence [1]. Lateral condyle Hoffa fractures are three times more common than medial condyle fractures [2]. Hoffa's fracture and type 33 B fractures may affect either of the condyles but they have a preponderance to affect the lateral condyle due to physiological valgus and the direction of force, which is usually direct trauma to the flexed knee with an element of slight abduction .

It follows a zone of weakness in the anatomic location of the distal femur, which leads to a fracture in a specific pattern. The distal femur in the cross-section is trapezoid and anterior and posterior surfaces are not parallel to each other. Also, there is an inclination of 10 degrees on the medial and 25 degrees on the lateral aspect [1].

The mechanism of injury has been reported to be a direct anteroposterior force to the flexed and abducted knee for lateral condylar fractures and a direct impact on the medial side of the knee in flexion for a medial condylar fracture. The combinations of forces including vertical thrust and twisting may bring about this intra-articular fracture of the knee. This fracture is intrinsically unstable owing to bony instability. Muscular pull. (3-7)

Hoffa's fractures are further classified according to Letenneur into three types: Type I - Fracture line is parallel to the posterior femoral cortex involving the entire posterior condyle; Type II - Fracture occurs in the area behind the line parallel to the posterior femoral cortex; Type III - Fracture line runs obliquely, therefore, responds poorly to conservative treatment.

LETENNEUR CLASSIFICATION.

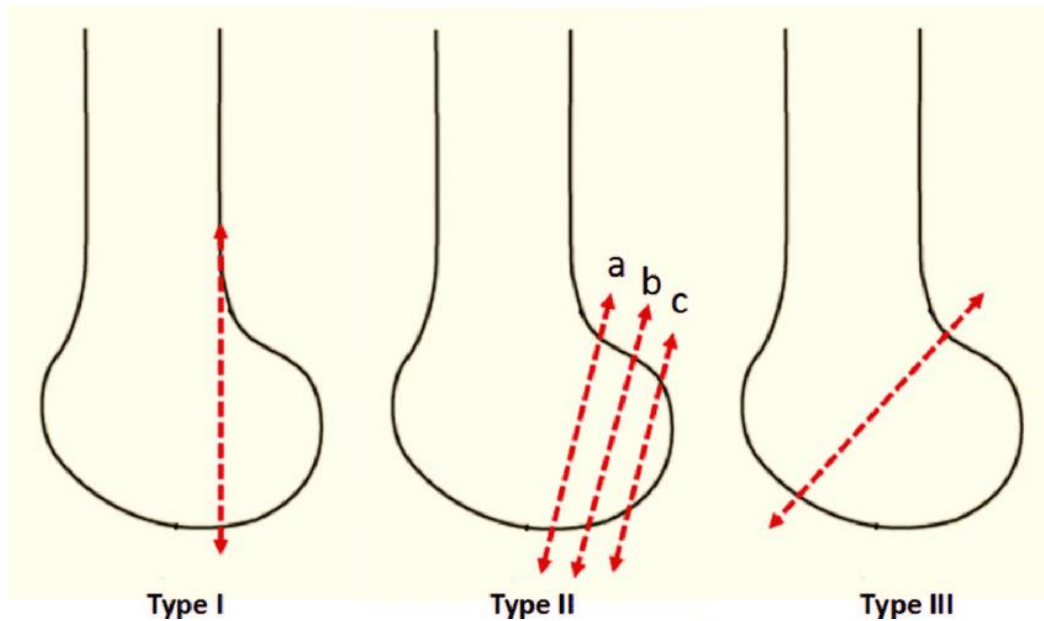
According to this classification Hoffa fracture is divided into 3 types

-Type 1 : vertical type of fracture that runs parallel to the posterior cortex of the femur. Fractures are located adjacent to the attachment of ACL & LCL. –

Type 2 : fracture horizontal to the base of the posterior condyle and lies posterior to attachment of the LCL. –

Type 3: Oblique type of fracture, the fracture line is located anterior to the joint capsule, ACL, LCL, popliteal tendon & lateral head of gastrocnemius muscle. –

Type 1 is the most common fracture & Type 1 & 3 fractures have the best prognosis



Surgical approaches to these fractures depend upon the condyle involved, the location of the fracture line, and also the presence of comminution [1]. Several articles have been published documenting superior functional results using internal fixation [8,9,10]. Various approaches like lateral parapatellar for lateral condylar Hoffa's fixation, with or without posterior approach for open reduction of Hoffa's fracture with screw or buttress plate fixation, medial parapatellar for medial condylar Hoffa's fracture screw fixation are used.

Two 6.5mm partially threaded cannulated cancellous screws are the preferred modality, especially in cases of undisplaced Hoffa's fracture to provide rotational stability. Rigid fixation has also enabled earlier knee motion and weight-bearing, which help prevent some of the serious complications attributed to prolonged bed rest and traction [11,12].

A broad condylar buttress plate may be used as a treatment modality for displaced Hoffa's fracture associated with osteoporosis or associated with the supracondylar component. Articular reductions were classified as anatomical acceptable (2 mm) on the immediate post-operative radiographs [1]. All techniques have their own merits and demerits and still more studies are required to conclude which will be the better modality of treatment for a particular fracture pattern.

All the procedures were done by an open approach with the patients placed in supine position on radiolucent table and under tourniquet control. Operations were performed either by senior consultant (first author) or by trained trauma residents. All surgeries were performed under the supervision of senior consultant after thorough deliberations and preoperative planning. Standard lateral incision (Figure 1) was given for lateral condylar fractures and exposure made between iliotibial tract and biceps femoris, while a medial incision (Figure 2) was used in case of medial condyle fractures. After thorough joint inspection, the fracture surfaces were identified and the presence of any comminution, meniscal injury, or collateral ligament injury was noted. The fracture surfaces were debrided, reduced anatomically, and fixed provisionally with Weber bone clamps and/or K wires. For placement of lateral screw, knee was flexed to approximately 90 and 6.5-mm or 4-mm partially threaded cancellous screw was placed in AP direction perpendicular to fracture line, starting proximal to patellofemoral joint. In cases where articular cartilage was violated by screw insertion, screw head was countersunk. Similarly, medial side fixation was done with 6.5-mm or 4-mm cancellous screw in AP direction perpendicular to fracture line, and screw head was buried into the cartilage. A minimum of two screws were used to gain rotational control. AP screw positioning was facilitated by small stab incisions placed anteriorly (Figure 2). The usage of different screw diameter and number was based on fracture configuration. The decision regarding choice of implant was done by the senior author (VT) based on the fracture pattern, bone morphology, and patient general profile. The presence of comminution, osteoporosis, and metaphyseal extension prompted us to use an antilglide plate in addition to the lag screw. Image intensifier was used to control reduction and screw placement. Care was taken to protect fat pad and meniscal attachments. Stability of knee was checked routinely after fracture fixation. Meticulous hemostasis was achieved after tourniquet deflation, and standard wound closure was done after placing a drain.



Figure 1. anteroposterior view (a) and lateral view (b) radiograph of knee showing lateral condyle Hoffa fracture. And (b,c) post operative x ray of Hoffa fracture.



Figure 2. anteroposterior and lateral radiograph of medial condyle hoffa fracture after fixation

Post-operatively, the patients were followed up at six weeks, three months, six months, and one year as documented in the inpatient and outpatient records of the patients. Patients were immobilized with a long leg knee brace for three weeks with non-weight-bearing walker-assisted walking and static quadriceps exercises. Patients were allowed a progressive active knee range of motion (ROM) as tolerated and assisted knee ROM from the fourth week. Partial weight-bearing was allowed from six weeks to full weight-bearing by twelve weeks.

II. Material And Method :

This study was conducted at Nalanda medical collage and hospital ,patna ,bihar, from December 2022 to December 2023 with total sample 15 patients as a sample size. Informed consent was obtained from all the study participant. Hoffa fractures in adults were included in the study, whereas patients with open physes,

pathological fractures, concomitant supracondylar or intercondylar involvement, associated ipsilateral tibial fracture, or preexisting knee arthritis were excluded.

Preoperative radiographs and routine surgical profile of blood investigations were done for all study patients and computerized tomography (CT) scan was done for comminuted Hoffa's fracture patients. Then the patients were operated on after informed written consent. Post-operatively, the patients were followed up at six weeks, three months, six months, and one year as documented in the inpatient and outpatient records of the patients. Patients were immobilized with a long leg knee brace for three weeks with non-weight-bearing walker-assisted walking and static quadriceps exercises. Patients were allowed a progressive active knee range of motion (ROM) as tolerated and assisted knee ROM from the fourth week. Partial weight-bearing was allowed from six weeks to full weight-bearing by twelve weeks.

III. Results :

Fifteen patients with Hoffa's fracture were treated with cannulated cancellous screws with lag effect including 10males and five females aged from 24 years to 48years with a mean age of 31.1 years. THREE patients sustained falls from height and 13 patients had road traffic accidents as described in Table 1. Right sided femurs were involved in EIGHT patients and SEVEN patients had left-sided femur fractures. Of the patients, 16 sustained closed fractures and one had an open fracture, as depicted in Table 1. Among the 15 patients, according to Letenneur classification, lateral femoral condyle fractures include three of type I, four of type II, and two of type III; medial femoral condyle fractures include two of type I, two of type II, and two of type III. All the patients were followed up for a duration of 12 to 22 months with a mean duration of 17 months. There were no complications like injury to a popliteal artery or tibial or peroneal nerve.

The ROM ranged from 120 to 135 degrees of flexion with a mean of 125.2 degrees as described in Table 2. Table 3 depicts the percentage of fractures getting

united at different time periods. Average fracture union time for lateral condyle was 16.4 months and for medial condyle was 16.7 months. Two patients had extensor lag ranging from 5-10 degrees with an average of 6.3 degree. table 4 describe the patient detail of patient.

TABLE NO 1.

| MACHANISM OF INJURY | NO OF PATIENT |
|---------------------|---------------|
| FALL FROM HEIGHT | 3 |
| RTA | 12 |
| TYPE OF FRACTURE | |
| CLOSE | 14 |
| OPEN | 1 |

TABLE NO .2

| Range of motion | Number of patient | percentage |
|-----------------|-------------------|------------|
| 120-130 | 13 | 86.6 |
| 131-140 | 2 | 13.3 |

TABLE NO.3

| UNION(WEEK) | Number of patients | percentage |
|-------------|--------------------|------------|
| | | |
| 12-13 | 2 | 13.3 |
| 14-15 | 7 | 46.6 |
| 16-17 | 4 | 26.6 |
| 18-20 | 2 | 13.3 |

IV. DISCUSSION

Isolated Hoffa fracture is an infrequent injury and commonly emerges from the lateral femoral condyle in comparison to the medial condyle. There is no certainty about the exact mechanism leading to this injury. These fractures commonly occur following motor vehicle accidents.

The usual mechanism is postulated to be a combination of vertical shearing and twisting forces [13]. Lewis et al. argued that with the knee flexed to just beyond 90 degrees, the lateral femoral condyle is the leading part of the knee to receive an oblique or lateral impact . Direct trauma to this area, possibly with an element of abduction, results in the typical Hoffa fracture. The physiological genu valgum may be the underlying basis for the predominant lateral condyle involvement in these fractures [14]. Conservative management is generally associated with suboptimal results; therefore, management has evolved into open reduction and internal fixation at present, which is stemmed from the fact that like any intra-articular fractures, anatomic reduction and stable fixation are cornerstones for optimal outcome.

We used the anterior approach with lateral parapatellar arthrotomy for lateral Hoffa's fracture and the medial parapatellar approach for medial Hoffa's fracture.

Open reduction and internal fixation is the dominant treatment strategy for Hoffa fractures and has yielded satisfactory results in appropriate time periods. A variety of techniques and equipment have been discussed in the literature, most of which refer to the treatment of distal femur fractures. The surgical approach relies on the location of the injury and the presence or absence of posterior comminution [15]. For Letenneur II and some Letenneur III fractures close to the posterior cortex of the femoral condyle, cannulated lag screw fixation is commonly used. The exposed fracture line is initially fixed with a Kirschner wire (K-wire) and screws are placed perpendicular to the fracture surface. The use of several 3.5-mm diameter screws is recommended to fix the fractures [16]. The average age of patients in our study was 31.1 years, which was comparable with Trikha et al. where it was 34.8 years, Siddiqui et al. [19] showed 39.3 degrees and Singh et al. [20] 39.2 years. Males were more commonly affected in our series compared to females with 12:5 (70.58%:29.42%). In the study by Trikha et al., 25 males (78.12%) and seven females (21.88%) were affected. In Siddiqui et al., 13 were males (81%) and three were females (19%) [17]. Singh et al.'s study show six males (75%) and two females (25 %) [18].

The mean ROM of the patients in our study was 125.2 degrees, which was comparably better than that of patients studied by Trikha et al. where it was 115 degrees. Siddiqui et al.'s study shows 102.8 degrees, but was comparable with Singh et al. which showed it as 115 degrees. The mean fracture union time for Hoffa's fracture for lateral condyle was 16.4 weeks and for the medial condyle was 16.7 weeks in our series compared to the average union time of 11.56 +/- 1.5 weeks as studied in a series of patients by Trikha et al. In a study by Siddiqui et al. [19], the average fracture union time was 15.5 weeks, but Singh et al. [20] reported fracture union time as 16 weeks. The Neer knee scores were excellent in 11 patients, good in four patients, and fair in two 56 patients, which is comparable to a study by Siddiqui et al.

TABLE NO 4:

| NO | AGE/SEX | SIDE/SITE | FIXATION | ROM | COMPLICATION |
|----|---------|-----------|--------------|--------|-----------------------------|
| 1 | 25/M | L/MC | AP SCREW/4MM | 0-120 | SURGIACAL SITE INFECTION |
| 2 | 30/F | L/LC | AP SCREW/6.5 | 0-125 | |
| 3 | 41/M | R/LC | AP SCREW/4 | 0-125 | STIFFNESS |
| 4 | 25/M | R/MC | AP SCREW/6.5 | 0-130 | |
| 5 | 30/M | L/LC | AP SCREW/4 | 0-125 | |
| 6 | 39/M | R/MC | AP SCREW/4 | 0-120 | |
| 7 | 33/F | R/LC | AP SCREW/4 | 5-125 | Stiffness |
| 8 | 36/M | L/LC | AP SCREW/6.5 | 0-135 | |
| 9 | 34/M | R/MC | AP SCREW/4 | 0-125 | |
| 10 | 29/F | L/LC | AP SCREW/4 | 0-120 | stiffness |
| 11 | 35/M | R/MC | AP SCREW/4 | 0-125 | |
| 12 | 47/M | R/LC | AP SCREW/6.5 | 0-135 | |
| 13 | 35/M | L/MC | AP SCREW/4 | 10-125 | |
| 14 | 36/M | R/MC | AP SCREW/6.5 | 0-130 | |
| 15 | 30/F | L/LC | AP SCREW/4 | 0-120 | |

V. Conclusion :

Lateral para patellar and medial para-patellar approaches provide good exposure for reduction and fixation of these fractures. Open reduction and stable internal fixation of these coronal plane fractures lead to a good functional outcome. Two 6.5mm screws make the construct stable for early mobilization.

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