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A prospective study of functional outcome of coronal plane fracture of femoral condyle treated with cannulated cancellous screws

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Abstract

Background: Lower limb fractures constitute one third of all fractures. The most common fractures involves around the shaft of femur. Distal femur fractures constitute 3-6% of all femur fractures and 1% of all orthopaedic trauma^[1]. Distal femur fractures can be either supracondylar or condylar type. Condylar type involves in two planes, sagittal & coronal planes (Hoffa Fracture). The incidence of Hoffa fracture is 8.7 to 13% of all distal femur fractures^[2].

Material and Methods: Eighteen cases of Hoffa's fracture fixed with cancellous screws between from June 2017 – June 2019 at Stanley medical college hospital, Chennai.

Results: The mean follow up period was 24 months. The results were analysed using knee society score. The outcome was excellent in 65%, good in 15%, fair in 10% and poor in 10% by Knee society

Conclusion: we conclude that the early anatomical reduction and rigid fixation with screws provide best results with minimal complications.

Keywords: Hoffa's fracture, cancellous screw, knee society score

Introduction

Lower limb fractures constitute one third of all fractures. The most common fractures involve around the shaft of femur. Distal femur fractures constitute 3-6% of all femur fractures and 1% of all orthopaedic trauma^[1].

Distal femur fractures can be either supracondylar or condylar type. Condylar type involves in two planes, sagittal & coronal planes (Hoffa fracture). The incidence of Hoffa fracture is 8.7 to 13% of all distal femur fractures^[2].

Coronal plane femoral condyle fractures are more common in young adults as a result of high velocity road traffic accidents & falls. But some cases have also been reported in paediatric & geriatric group as a result of low velocity trauma.

In 1869- Friedrich Busch, a German by origin first described fracture of femoral condyle in coronal plane in cadaver's knee joint specimen^[3] and in the year 1888- ALBERT HOFFA who is also a German surgeon, used the Busch's drawing in his textbook (first edition), but this picture got noticed only in the fourth edition of his textbook^[3].

In 1891- BRAUN described the full case history of this fracture pattern, but this article went unnoticed. So, the fracture that occurs in femoral condyle in coronal plane is known as Busch – Hoffa fracture.

1978 – Letenneur classified coronal fractures of femoral condyle^[4]. 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, LCL, popliteal tendon& lateral head of gastrocnemius muscle. Type 1 is the most common fracture & Type 1& 3 fractures have the best prognosis. Although surgical fixation is the preferred method of treating Hoffa fracture, still there is lack of awareness in the approach for fixation, type of implant to be used and post-operative rehabilitation.

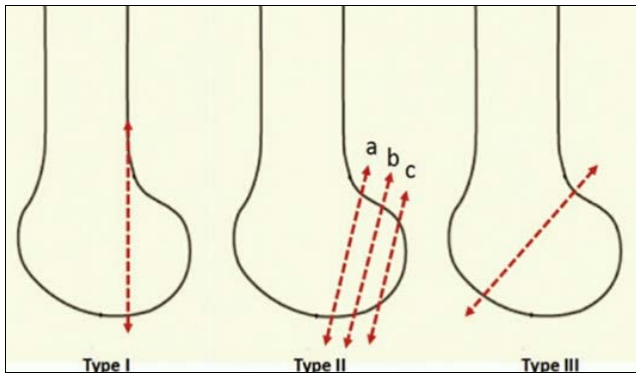


Fig 1: Classification

The challenges in fixing the femoral condyle are also huge. Since the fracture extends intra particularly it is necessary to restore the anatomical joint congruity.

Both conservative & surgical management are practiced for coronal plane femoral condyle fractures depending upon the type of fracture & degree of displacement.

For displaced Hoffa fracture, cannulated cancellous screw fixation or plate fixation can be done. Screw fixation can be done either by open approach or percutaneous approach or arthroscopically.

In case of displaced fractures, the technique of reduction is quite difficult as it needs complete exposure of fracture site and manual reduction before applying lag screws. In case of medial condyle fixation, disturbing the vascular anatomy may lead to osteonecrosis of condylar fragment.

Materials and Methods

In our study, patients above 18 years with displaced coronal plane Hoffas fracture who were willing for surgery included in the study.

Patients with suspected pathological fracture and with other injuries like head injury, neuro vascular have been excluded from the study.

After complete evaluation with X-ray and CT all patients were taken up for surgery at the earliest. All fractures were treated by open reduction & internal fixation with cannulated cancellous screws. The approach was decided depending upon condyle involved & all fixation were done using fluoroscopic image intensifier.

Medial and lateral par patellar approach used depending on condyle involved. After exposing the femoral condyle, a large pointed reduction clamps can be used to hold the fracture fragments & anatomy of the joint congruity must be checked before fixation. A joystick technique can be helpful in difficult cases where a schanz pin is inserted into the Hoffa fragment & rotation can be controlled through this pin after which reduction clamp can be applied.



Fig 2: Knee position



Fig 3: Exposure

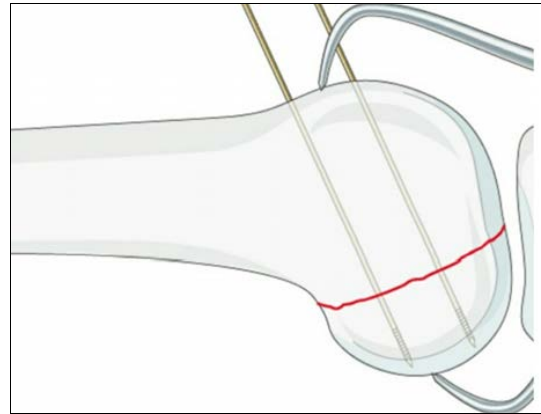


Fig 4: Guide wire placement



Fig 5: Checked in radiography

The guide wire is placed in an anteroposterior fashion and axis of the guide wire must be exactly perpendicular to the fracture site. This should be done under image intensifier control. While inserting guide wire the opposite condylar surface should not be breached.

Post-operative protocol of Static quadriceps and hamstring strengthening exercises started from second day, partial weight bearing at 8- 10 weeks, Full weight bearing started between 12-14 weeks [5]. All the patients are regularly followed up and functional outcome analysis done using knee society score.

Results

In our study, we had 14 male and 4 female patients with 16 lateral side and 2 medial side Hoffa fracture. Out of eighteen, Right side were more involved about 12 patients and left were 6 patients and about 14 patients had letenner type 1 fracture, 3 patients had type II, and one patient with type III fracture.

The Mean surgical delay was 3 ± 2 days (range 2-10days). By 16 weeks, all fractures had united both clinically and radiologically. There was no superficial or deep infection, non-union or

avascular necrosis in any patients till last follow-up.
 The outcome was excellent in 65%, good in 15%, fair in 10% and poor in 10% by Knee society

Knee score		
Finding	Description	Score
Pain		50 (maximum)
Walking	None	35
	Mild or occasional	30
	Moderate	15
	Severe	0
Stairs	None	15
	Mild or occasional	10
	Moderate	5
	Severe	0
Range of motion	8 degree = 1point	25 (maximum)
Stability		25 (maximum)
Medial/Lateral	0 – 5 mm	15
	5 -10mm	10
	> 10mm	5
Anterior/Posterior	0 – 5	10
	5 – 10	8
	> 10	5

Deductions		
Extensor lag	None	0
	< 4 degrees	-2
	5 – 10 degrees	-5
	> 11 degrees	-10
Flexion contracture	< 5 degrees	0
	6 – 10 degrees	-3
	11 – 20 degrees	-5
	> 20 degrees	-10
Malalignment	5 – 10 degrees	0
	(5 degrees)	(- 2)
Pain at rest	Mild	-5
	Moderate	-10
	Severe	-15
	Symptomatic plus objective	0
Knee score	100 (maximum)	



Fig 8: immediate post op



Fig 9: 16 wks

Case 1



Fig 6: pre op x ray



Fig 7: pre op CT



Fig 10: Outcome

Case 2



Fig 11: Pre op x-ray



Fig 12: Pre op CT



Fig 13: Immediate post op



Fig 14: 16 WKS



Fig 15: outcome

Discussion

Hoffa fracture is coronal plane fractures of the femoral condyle [1]. They can be unicondylar or even rare bicondylar type of fracture. Being an intraarticular fracture, their management

requires anatomical reduction and rigid fixation. Hoffa fractures are rare and difficult fractures to manage.

Non-operative treatment has been associated with poor outcomes [6, 7]. The goals of treatment are anatomical reduction of the articular surface with rigid, stable fixation to allow early mobilization in order to restore function [4, 8]. Several fixation methods, including screws and plates, have been utilized in the Hoffa fracture treatment.

Patel and Tejwani [9] published a review describing various techniques and methods used to manage the Hoffa fracture. These not only includes (Medial and lateral parapatellar) approaches but describes different types of implants used ranging from cannulated screws, fragment screws to LISS-DF (Less invasive stabilisation system - distal femur Sun *et al.* conducted a biomechanical analysis of four fixation constructs, and they concluded that a combination of plate and screw fixation could provide greater biomechanical stability than a screw fixation system alone [10].

In spite of its mechanical superiority, the popularity of plate fixation is still low given the requirement for extensive dissection and blood supply disturbance. Meanwhile, the ideal size and number of screws were discussed in a previous study [11]. Screw fixation of the fracture site is the mainstay of the treatment. Two 6.5mm screws placed perpendicular to fracture plane have been found to be more rigid than either single or double 3.5mm screws. Yet a two screw construct is suggested to achieve two points of fixation in order to prevent fragment rotation [12].

Conclusion

We conclude that the early anatomical reduction and rigid fixation with screws provide best results with minimal complications.

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