



## A STUDY OF MANAGEMENT OF FLOATING KNEE INJURY BY VARIOUS MODALITIES

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**ABSTRACT** **BACKGROUND** - Floating knee is a flail knee joint which results from the fractures of the shafts or adjacent metaphysis of the femur and ipsilateral tibia which leads to disconnection of knee joint from the rest of the limb. The fractures might range from simple diaphyseal to complex articular types. These injuries are first described by John T. Hyez in 1964. Later on, in 1974 Blake and McBryde were the first to label these injuries as "Floating knee injuries". They also described this injury is generally caused by high-energy trauma hence local trauma to the soft tissues is often extensive, especially to the vascular plane of the knee. **OBJECTIVE** - To study the various modalities of management of floating knee injury, various complications associated with floating knee injury and to assess the outcome using Karlstrom and Olerud Criteria for functional recovery of patients with floating knee injury in tertiary care hospital, Secunderabad. **MATERIALS AND METHODS** - This is a prospective clinical study conducted in 30 subjects with Ipsilateral Femur & Tibia Fractures [Floating Knee] treated by various modalities in Gandhi medical college and hospital. **RESULTS** - Males are affected in 28 out of 30 patients (93%) with right lower limb was involved in 22 out of 30 patients (73%). 16 out of 30 patients (53%) had type I floating knee injury and 14 out of 25 (47%) had type II floating knee injury. **CONCLUSION**- Ipsilateral fractures of femur and tibia is a complex injury with increased incidence of associated injuries. The associated injuries, type of fracture (open, intra-articular, comminution) and associated patellar fractures are prognostic indicators and functional outcome in Frasers Type IIC is poor compared to the other types.

**KEYWORDS** : Floating knee, trauma, outcome, Frasers

### INTRODUCTION

Floating knee is a flail knee joint which results from the fractures of the shafts or adjacent metaphyses of the femur and ipsilateral tibia which leads to disconnection of knee joint from the rest of the limb. The fractures might range from simple diaphyseal to complex articular types. These injuries are first described by John T. Hyes<sup>[1]</sup> in 1964. Later on, in 1974 Blake and McBryde<sup>[2]</sup> were the first to label these injuries as "Floating knee injuries".

They also described this injury is generally caused by high-energy trauma hence local trauma to the soft tissues is often extensive, especially to the vascular plane of the knee. Life-threatening injuries to the head, chest, or abdomen may also be frequently associated with such injuries. Therefore, managing such injuries are very challenging as there is increased risk of morbidity and mortality associated with these type of injuries.

Previous papers regarding floating knee injuries have discussed about the risk of complications, disabilities associated with these fractures (Hayes 1961<sup>[1]</sup>; Omer, Moll and Bacon<sup>[3]</sup> 1968; Ratliff 1968<sup>[4]</sup>; Winston 1972<sup>[5]</sup>; Gillquist et al 1977<sup>[6]</sup>; McBryde and Blake 1974<sup>[2]</sup>). Also other research papers showed that early surgical stabilization and knee mobilization showed better results.

### OBJECTIVES

Objective of this study is to evaluate the various modalities of management and to access the outcome using Karlstrom and Olerud Criteria for functional recovery of patients with floating knee injury.

### MATERIALS AND METHODS

This is a prospective clinical study conducted in Department of Orthopaedic Surgery, Gandhi medical college and hospital, Secunderabad. The study is mainly to assess the Functional Outcome of Ipsilateral Femur & Tibia Fractures [Floating Knee] treated by various modalities. For this study, after taking written informed consent, 30 patients with ipsilateral femur tibia fractures who presented to the casualty from June 2021- Dec2021 who fulfilled the criteria were included and followed up the patient for next 1 year

### INCLUSION CRITERIA

1. Patients having ipsilateral shaft tibia and femur fracture
2. Patients having ipsilateral fractures of femur and tibia with extension into knee joint
3. Both open and closed injuries

### EXCLUSION CRITERIA

1. Floating knee injuries involving children
2. Ipsilateral fracture of femur and tibia with extension into the hip and

ankle joints

3. Patients who lost to follow up or follow up of less than 4 months and deaths were also excluded from the study.

4. Associated neurological injuries such as quadriplegia or paraplegia resulting from spinal injuries

### METHODOLOGY

A detailed history, mode of injury, anthropometric data, comorbidities, fracture classification, neuro vascular status, open wounds status and management, associated injuries, surgical approaches, fixation methods, complications and outcome were observed and recorded. The Investigations include part radiographs, Computed tomography Scan of knee with joint reconstruction (if joint involved). Surgical profile and other investigations as per the requirement of patient. The patients were classified according to Frazer classification for floating knee injuries. Karlstrom and Olerud Criteria was used to measure the functional outcome of floating knee injury treated by various modalities. The surgical management included tibial and femoral nailing/plating/external fixator.

**Table 1 : Karlstrom Olerud criteria for functional recovery of floating knee injury**

#### KARLSTROM AND OLERUD CRITERIA

For Functional recovery of patient with floating knee injury

Criteria	Excellent	Good	Acceptable	Poor
Subjective Symptoms of thigh or leg	0	Intermittent Slight Symptoms	More Severe Symptoms impairing function	Considerable functional impairment pain at rest.
Subjective symptoms from knee or ankle joints	0	Intermittent Slight symptoms	More Severe Symptoms impairing function	Considerable functional impairment pain at rest.
Walking ability	Unimpaired	Intermittent Slight symptoms	Walking distance restricted	Uses cane, crutch or stick
Work & Sports	Same as before injury	Give up some sports. Work same as before injury.	Change to less strenuous work	Permanent disability
Angular or rotational deformity or both	0	<10°	10° - 20°	> 20°
Shortening	0	< 1 cm	1- 3 cm	> 3 cm
Restricted Joint movements				
Hip	0	<20°	20° - 40°	>40°
Knee	0	<20°	20° - 40°	>40°
Ankle	0	<20°	20° - 40°	>40°

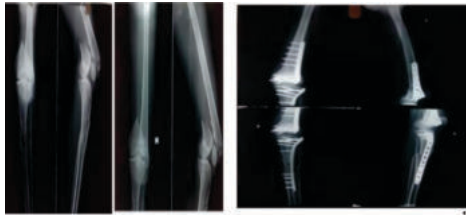


Fig 2 Preop Radiograph

Fig 3 Post op radiograph

## RESULTS

### In our study the following results were obtained:

Males are affected in 28 out of 30 patients (93%). Right lower limb was involved in 22 out of 30 patients (73%). Majority of the patients were of young age group between 16-40 years (70%). 29 patients suffered injury because of road traffic accidents. Only 1 patient aged 55 years is injured due to slip and fall. Femur fractures were closed in 22 (73%) patients and open in 8 (27%) patients whereas tibia fractures were closed in 18 (60%) patients and open in 12 (40%) patients. In our study 3 cases of tibia had grade 1 injuries, 7 cases had grade 2 injuries. While all the cases of femur had a grade 3b open injuries. Sixteen out of 30 patients (53%) had type I floating knee injury and 14 out of 25 (47%) had type II floating knee injury. Intramedullary nail fixation was done in more number of patients both for femur (22) and tibia (18). Most of the type 1 injuries involving diaphysis of both tibia and femur, Intramedullary nailing was done. External fixation (4- tibia, 6- femur) and plating are the next commonly treatment modality for floating knee injuries. Distal femoral locking plate (8) is most commonly used plate in femur. Proximal tibial locking plate used in 2 tibia fractures, T-buttress used in one tibia fracture. Conservative management was done only for tibia of one case. In most of the cases (72%) surgery was performed within 1 week of trauma. The following complications were observed and Circulatory shock is the most common complication involving in 73% patients presenting in the emergency room. 40% patients encountered knee stiffness, 23 % of the patients had malunion 3 in femur and 4 in tibia.

## DISCUSSION

Due to increase in motor vehicle accidents, patients with multiple system involvements are increasing in number. During the treatment of such patients, there are two major considerations. First is a systemic injury with body response to injury complicating the situation and second is problem associated with concomitant fractures.

Our study included 30 cases of floating knee injuries admitted in Gandhi medical college hospital, Secunderabad. The main aim of treating such fractures in floating knee is to ambulate the patient and rehabilitate him as early as possible so that the incidence of morbidity is reduced which is caused by complications such as delayed union, non-union, infection, knee stiffness etc. In this study, majority of patients were male – 28 patients (93%) and 2 were female (97%). Majority of the patients aged between 20 – 30 years age group with mean age of 22.6. Right side was the most commonly affected side, 22 patients with 73%. In our study, 18 femur fractures were treated with intra medullary interlocking nail, 6 cases with External fixator and 8 cases with plating/DCS. 2 cases of femur showed delayed union. These cases of delayed union were badly comminuted open Gr 3b fractures. 22 tibial fractures were treated with intramedullary interlocking nail, 4 cases with External fixator, 2 cases with proximal tibial locking plate, 1 case with buttress plating and one case is treated conservatively. In our study 17 fractures united in average 4 months period (Range 3-5 months) and three cases showed delayed union. Recent studies showed that aggressive operative treatment has been suggested for floating knee injuries by several investigators. They emphasized that the operative treatment has resulted in lesser hospitalization period, fewer complications and better functional outcome when compared to non-operative treatment.

**Knee Joint Motion :** In our study 21 patients (70%) achieved excellent to acceptable knee range of motion of 0-100°. Poor results were seen in 2 patients (7%). Knee stiffness, that is loss of more than 30 degrees of knee flexion is developed in 4 cases out of the total 5 Fraser Type IIA floating Knee cases, whereas 5 patients out of 16 Fraser Type I floating knee developed knee stiffness.

**Functional Recovery -** As per the Karlstrom & Olerud criteria [7], the functional outcome assessed in our study showed excellent

results in 11 patients (37%) patients; good in 7 (23%) patients; acceptable in 10 (33%) patients and poor in 2 (7%) patients. Karlstrom and Olerud [7] reported healing time of around 20 weeks whereas according to Adanson et al [8] it was 39 weeks for femur and 37.5 weeks for tibia.

## CONCLUSIONS

Ipsilateral fractures of femur and tibia is a complex injury with increased incidence of associated injuries. The associated injuries, type of fracture (open, intra-articular, comminution) and associated patellar fractures are prognostic indicators. Functional outcome in Frasers [9] Type IIC is poor compared to the other types. Early stabilization and aggressive rehabilitation are key elements for good functional outcome. Interlocking nailing in both femur and tibia has better results compared to other modalities if management

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