

A Study of Surgical Management of Floating Knee in AdultsAnjit Kumar¹, S.K. Sinha², S. K. Mallik³¹Assistant Professor, Department of Orthopaedics, PMCH, Patna²Professor, Department of Orthopaedics, NMCH, Patna³Assistant Professor, Department of Orthopaedics, NMCH, Patna**Received: 16-02-2024 / Revised: 20-03-2024 / Accepted: 28-04-2024****Corresponding Author: Dr. S. K. Sinha****Conflict of interest: Nil****Abstract:**

Background: Floating knee injury is a term used to denote ipsilateral femoral and tibial metaphyseal injuries. But recent literature has however expanded this term to include most ipsilateral fractures of the femur and tibia. These are extremely heterogeneous groups of injuries. They usually occur due to very high energy trauma. These are relatively uncommon injuries. These are always associated with high morbidity. Most of these injuries result in some permanent disability. There are no specific guidelines for the management. The implant choice needs to be determined depending on nature of fracture and soft tissue injuries. A specific pattern of management can often not be determined. In view of the high complications rate and the unavailability of a specific treatment guideline, there is a need for undertaking such a study.

Materials and Methods: This study is about the Functional Outcome of Surgical Managements of Floating Knee. For this study 17 consecutive patients with ipsilateral femur and tibia fractures who presented to NMCH casualty from 2015- May 2019. All cases of ipsilateral tibia and femur fractures were included. Detailed history will be obtained using Performa with special attention to mechanism of injury. Evaluations including base line clinical features. Examination of other associated symptoms will be based on history and physical examination. The plan of management for the given patient was made depending on the nature of fracture, location of fracture, associated soft tissue injuries. Follow up study was done at 6 weeks, 12 weeks, 6 months and 1 year. Serial x-rays and functional assessment were carried out at each visit in outpatient clinic itself using the Karlstorm and Oleruds criteria.

Conclusion: Patients who undergo primary nailing will have Excellent or Good results. The most important factors which determine the functional outcomes were the type of fractures (open or closed), nature of comminution including intraarticular extensions, timing of fixations and post operative infections.

Keywords: Floating Knee; Primary Nailing; Intraarticular Extension; Comminution; Metaphysis.

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Introduction

Floating knee injury is a term used to denote ipsilateral femoral and tibial metaphyseal injuries. But recent literature has however expanded this term to include most ipsilateral fractures of the femur and tibia. These are extremely heterogeneous groups of injuries. They usually occur due to very high energy trauma. These are relatively uncommon injuries. These are always associated with high morbidity. Most of these injuries result in some permanent disability. There are no specific guidelines for the management. The implant choice needs to be determined depending on nature of fracture and soft tissue injuries. A specific pattern of management can often not be determined. The incidence of floating knee injuries was reported as 2.6 % of all fractures by Letts et al in 1986. [1] These injuries were associated with life threatening injuries such as head injury, chest injury and abdominal injuries as shown by Veith. [2] Other skeletal injuries were also seen in these patients. Injuries were often a combination

of different fracture patterns. There was extensive soft tissue damage of the limb as well. The soft tissue injuries can also be variable from minor abrasions to grade III open injuries. Injuries to the neurovascular structures add a treacherous component to the whole picture. This often perplexes even the most experienced clinicians in the choice of management. For this study 17 patients with ipsilateral femur and tibia fractures were managed surgically, were included. This study is a Prospective study with a minimum of 1 year follow up.

Objectives

To study the new cases, patterns and morphology of ipsilateral femur and tibia fractures, their management modalities and results.

To identify any modifiable factor affecting the eventual functional result.

Materials and Methods

This is a prospective study conducted in Department Of Orthopedic Surgery, at Nalanda Medical College and Hospital Patna, Bihar. Study duration of Two years. This study is about the Surgical Management of Ipsilateral Femur & Tibia Fractures [Floating Knee] in adults. For this study 17 consecutive patients with ipsilateral femur and tibia fractures who presented to NMCH who fulfilled the criteria were included. The patients were classified according to Blake and McBryde's Classification for floating knee injuries.

Inclusion Criteria

- All ipsilateral femur and tibia fractures in adults.
- Both closed and open fractures.

Exclusion Criteria

Children with ipsilateral femur and tibia fractures – skeletally immature patients. Associated neurological injuries such as paraplegia or quadriplegia resulting from spinal injuries.

When the patients presented in casualty primary survey of airway breathing and circulation was done. The patients were resuscitated accordingly. Once the patient was hemodynamically stable necessary primary investigations were done. All fractures were splinted in Thomas splint or plaster of

paris slab. Open fractures and wounds were documented properly. Cultures were sent. Adequate wound wash and irrigation was done with minimum of 5L of sterile normal saline. Appropriate antibiotics and prophylactic tetanus toxoid were started.

The subject was included into the study once a diagnosis of floating knee injury was made in the Emergency room. Floating knee was classified according to Blake and McBryde's Classification. Open fractures were classified according to Gustilo and Anderson classification. The plan of management for the given patient was made depending on the nature of fracture, location of fracture, associated soft tissue injuries.

A primary survey was made and x-rays were taken to image the entire femur and tibia with the adjacent articulations of the knee hip and ankle. Primary care was given to all these patients and then they were operated. The patient was subjected to mobilization schedule according to associated injuries and general condition. The 17 patients were classified according to Blake and McBryde's classification. Of these 8 were type 1, 9 were type 2A and none were type 2B. Follow up study was done at 6 weeks, 12 weeks, 6 months and 1 year. Serial x-rays and functional assessment were carried out at each visit in outpatient clinic itself using the Karlstorm and Ole-ruds criteria.

Results

Table 1: Mean and standard deviation of age, knee mobilization, weight bearing, bony union femur, bony union tibia, duration of surgery and knee range of motion

Variables	Minimum	Maximum	Mean	Standard deviation
Age	20	67	36.76	15.39
Knee Mobilisation	3	14	7.24	3.07
Weight Bearing	6	20	13.88	3.84
Bony Union Femur	12	48	24.00	14.69
Bony Union Tibia	12	48	25.41	13.99
Duration Of The Surgery	80	160	110.00	21.51
Knee-Range of Motion	60	120	99.41	17.49

Out of 17 femur fractures in this study classified according to Gustillo and Anderson classification 11 were closed fractures constituting 64.71 %, 2 were type 1 open (11.76%), 2 were type 2 open (11.76%) 1 was type 3 A open (5.88%) and 1 was type 3 B open (5.88%). Level of femur fractures in this study as observed were, 7 patients had Femur fractures at the level of diaphysis accounting for 41.18%, 7 had intra articular (knee) fractures of Femur (41.18%), 2 patients had fractures at diaphysis metaphyseal

junction (11.76%) and one had intertrochanteric fracture (5.88%). All the open tibia fractures were classified according to Gustilo and Anderson classification, in this study 10 patients had closed fractures accounting for 58.82%, 3 patients had grade 1 open (17.65%), 2 patients had grade 2 open (11.76%) and 2 had grade 3 B open (11.76%). None of them had grade 3A and grade 3 C fractures of Tibia.

Table 2: Blake and McBryde classification

Blake and McBryde classification		
Type 1	8	47.1
Type 2A	9	52.9
Type 2 B	0	0.0

In this study 47.1% of patients had Blake and McBryde class 1 fractures, that is 8 patients whereas 9 patients had Blake and McBryde class 2A fractures (52.9%) and none had type 2B fractures.

Table 3: Associated injury in the same limb

Associated injury in the same limb		
Attributes	n=17	%
None	15	88.2
Vascular injury	0	0.0
Nerve injury	0	0.0
Crush injury of foot	1	5.9
Metatarsal fractures	0	0.0
Calcaneal fractures	1	5.9
Pelvis and sacral injury	0	0.0

Out of 17 patients in this study one patient had crush injury of the foot accounting for 5.9%, another patient had calcaneal fracture of same limb (5.9%) and 15 patients did not have any associated injury in the same limb (88.2%).

Table 4: Order of fixation, Deformity at fracture site femur, Deformity at fracture site tibia

Order of fixation		
Femur First	17	100.0
Tibia First	0	0.0
Deformity at fracture site femur		
Yes	0	0.0
No	17	100.0
Deformity at fracture site tibia		
Yes	0	0.0
No	17	100.0

In this study all the fractures were fixed in the same order, that is, Femur fractures were fixed first and then tibia fractures were addressed. There was no deformity seen at the fracture site of femur fractures after fixation and follow up. There was no deformity at the fracture sites of tibia after fixation and on follow up in our subjects. 2 patients underwent implant removal, 1 patient had excellent outcome with intramedullary nailing for both tibia and femur had achieved bony union underwent implant

removal at 40 weeks. Another patient who underwent plating of femur and nailing for tibia underwent implant removal at 42 weeks as the bone was united. This patient had good functional outcome. 2 patients underwent bone grafting in this study, both of them had comminuted supracondylar femur fracture which was bone grafted in a later date for achieving bony union, one of these patients had acceptable outcome and one had poor outcome.

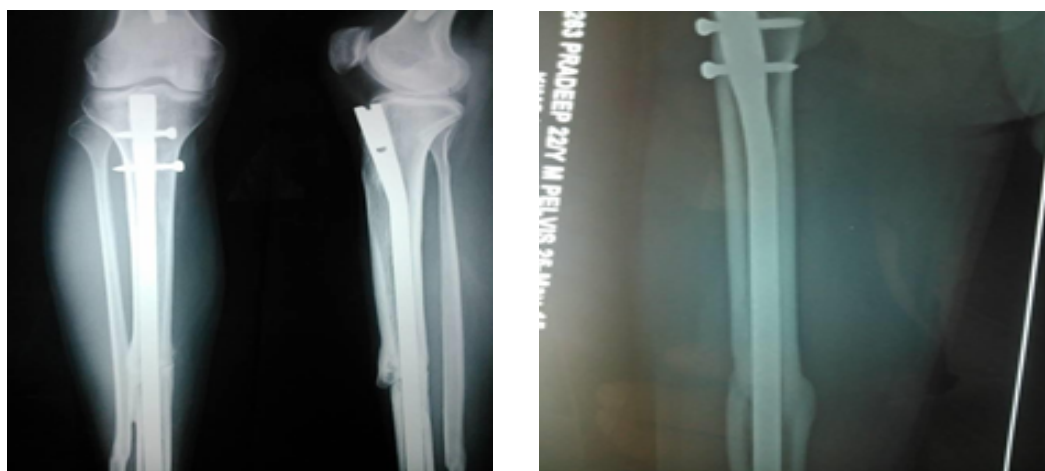


Figure 1: Union At 28 Weeks Follow Up

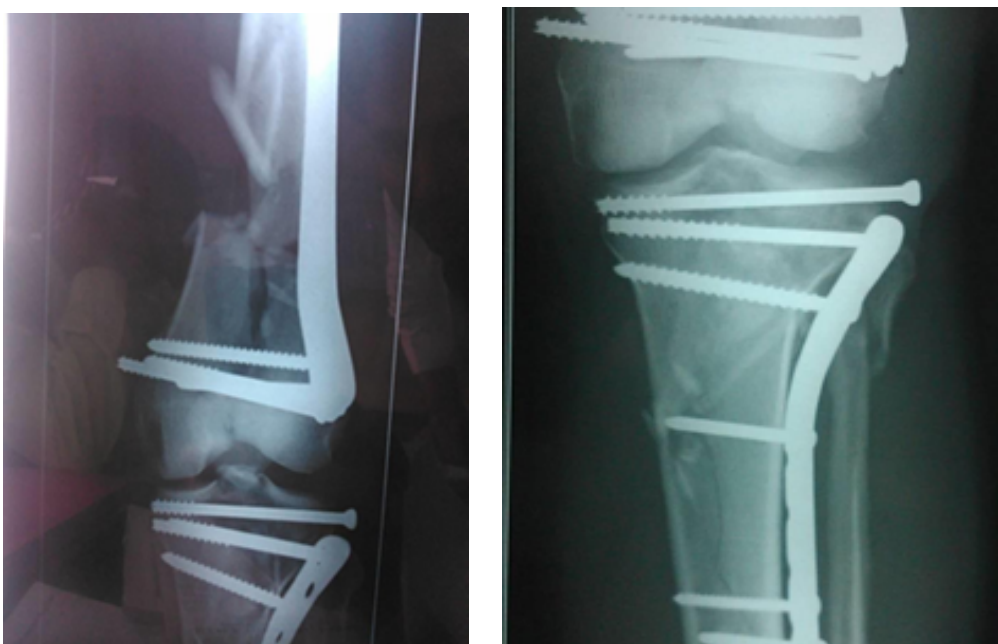


Figure 2: Immediate Post-Operative



Figure 3: 48 Weeks Follow Up

Discussion

Floating knee injury occur usually due to high velocity trauma. There is an increase in the occurrence of floating knee injuries due to the increase in more number of road traffic accidents. These are always associated with high morbidity. Most of these injuries results in some permanent disability. In our

study the most common mechanism of injury was road traffic accidents (100%). Among the road traffic accidents motor cycle accidents (Two wheeler accidents) (52.9%) accounted the most. Four wheeler accidents accounted to about 23.5% and 23.5% were pedestrians. The more number of road traffic accident cases were due to the fact that our hospital is a tertiary referral centre.

Table 5: Incidence of Motor cycle accidents in comparison with other studies

Sl No.	Study	Percentage of patients with motorcycle accident
1.	Kumar a et al.[6]	72.5
2.	Kao et al.[7]	63.5
3.	This study	52.9

Hayes JT [8] suggested that automobile passengers with floating knee injury, braced their feet firmly against the sloping floor of the front seat just prior to the collision, their legs getting crumpled under the massive decelerating forces produced by the impact. Pedestrians were frequently catapulted some distance from the point of impact and were further injured by striking the pavement. In a study of 222 cases of floating knee by Fraser [6] all cases were involved in road traffic accidents.

There are many studies showing the association of other injuries like head injuries, chest injuries, abdominal injuries and contralateral limb injuries. Many of these injuries are often life threatening. Adamson et al [9] in their study encountered 71% major associated injuries with 21% vascular injuries. There were 3 patients with poor outcome (17.6%), 1 patient had been fixed with plating for both tibia and femur fracture had 0-80° of knee motion complained of severe knee pain and bony union of femur occurred at 48 weeks this patient left the job which he used to do before accident, another patient had subtrochanteric fracture femur fixed with long proximal femoral nail and grade 3 B open tibia fracture fixed with external fixator developed implant infection and complained of pain and could not walk without assistance and another patient with poor outcome had both his femur and tibia fracture fixed with plating also couldn't walk without assistance and could achieve 0-60° knee motion [10].

Conclusion

Floating knee injuries are due to high velocity trauma. Road traffic accidents particularly two wheeler accidents is the commonest cause. Males are affected more. There are many post operative complications like, infection, delayed union and implant failure. Poor outcomes are mainly due to open fractures, comminution and intraarticular extensions. Patients who undergo primary nailing will have Excellent or Good results. The most important factors which determine the functional outcomes were the type of fractures (open or closed), nature of comminution including intraarticular extensions,

timing of fixations and post operative infections. Karlstrom and Olerud criteria is an effective scoring system to grade the functional outcome of floating knee injuries.

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