International Journal of Research in Orthopaedics
Meena S et al. Int J Res Orthop. 2024 Mar;10(2):318-322
http://www.ijoro.org

DOI: https://dx.doi.org/10.18203/issn.2455-4510.IntJResOrthop20240411

Original Research Article

Evaluating the functional outcomes of tibia and ipsilateral femur fracture, which are floating knee injuries, in adults

Satyendra Meena, Ashok Kumar Tiwari, Jitendra Aloria*, Manoj Meena, Lakhan Pratap, Mahaveer Prasad

Government Medical College Kota, Rajasthan, India

Received: 11 September 2023
Accepted: 29 December 2023

***Correspondence:**
Dr. Jitendra Aloria,
E-mail: Jitendra.170@gmail.com

ABSTRACT

Background: High velocity trauma leads to ipsilateral femur and tibia fractures. Despite being very uncommon, they have a significant morbidity rate. Combinations of diaphyseal, metaphyseal, and complicated intra-articular fractures may be present in this kind of injury. Objectives were to assess the functional success of adult patients with ipsilateral femur and tibia fractures treated with various methods.
Methods: The 30 adult patients with floating knee injuries underwent surgical treatment as part of the prospective research at the department of orthopedics, govt. medical college, and affiliated group of institutions in Kota. A combination of implants, such as an intra-medullary nail, locking plates, screws, or external fixators, were used to treat both femur and tibia fractures.
Results: Karlstrom-Olerud criteria were used for the final evaluation. In our study, five patients (16.6%) had excellent outcomes, ten (33.3%) had good results, seven (23.3%), had acceptable results, and eight (26.6%) had poor results.
Conclusions: When the fracture is diaphysis and it is treated with intra-medullary nails for both the femur and the tibia, the results are excellent. In this way, the age of the patient, the kind of fracture, the methods of fracture fixation, and the functional result were all taken into account.

Keywords: Ipsilateral femur and tibia, Floating knee Karlstrom-Olerud criterion, Fraser classification

INTRODUCTION

High velocity trauma leads to ipsilateral femur and tibia fractures. The first to describe these wounds was John T. Hyes in 1961.[1] These wounds were known as "Floating Knee" injuries in 1975 by Blake Robert and McBryde.[2] 'Floating knee' is the phrase used to describe a femoral and tibial fracture that occurs simultaneously in the same leg. Diaphyseal, metaphyseal, and complicated intra-articular fractures may all be present in this. According to Letts et al floating knee injuries account for 2.6% of all fractures, and the rate is rising daily.[3] The majority of the patients are male and in their third decade. The majority of instances involve automobile accidents on the road. These injuries are rare in people with an underdeveloped skeleton. Soft tissue injuries are possible and range in severity from small abrasions to grade 3 Gustilo-Anderson open wounds.[5] Since high intensity trauma causes floating knee injuries, they may be linked to head, chest, and visceral injuries. The reported mortality rate, which reflected the severity of the damage in the floating knee, ranged from 5% to 15%.[6] This injury's immediate complications include profuse bleeding and fat embolism. Infection, malunion, delayed or non-union, knee stiffness, and inability to bear weight, which results in lifelong disability, are examples of late complications. The bony union duration and the re-operation rate are negatively impacted in patients generally by a number of variables, including advanced age, smoking, having a high injury severity score (ISS), and having both open and comminuted fractures.[7]

Early 20th-century therapy consisted of bone traction and POP casts, both of which were considered conservative. Long durations of bed rest and a high complication rate made conservative care difficult for the surgeons. The greatest clinical result is obtained with early patient rehabilitation following surgical stabilization of the patient's fractures of the femur and tibia. The amount of the soft tissue damage, implant availability, surgeon preferences, and fracture geometry may all influence the choice of implant. In contrast to intra-articular fractures, the outcomes and consequences will be better if the fractures are diaphyseal or extra articular.

Our study's objective is to assess the functional result of adult patients who have ipsilateral femur and tibia fractures treated using various methods.

METHODS

Hospital based prospective randomized study conducted from 2017 to 2019, the government medical college and associated institutions in Kota, India, conducted this prospective study after taking ethical clearance from ethical committee of institute. 30 people who fulfill the inclusion criteria for the research and had ipsilateral femur and tibia fractures were included. The patients were categorized using Guillermo-Anderson's classification for open fractures and Fraser's classification for floating knee injuries.[4,5] Fraser type 1 fractures occurred in 14, type 2A fractures in 5, type 2B fractures in 3, and type 2C fractures in 8 individuals in our study.

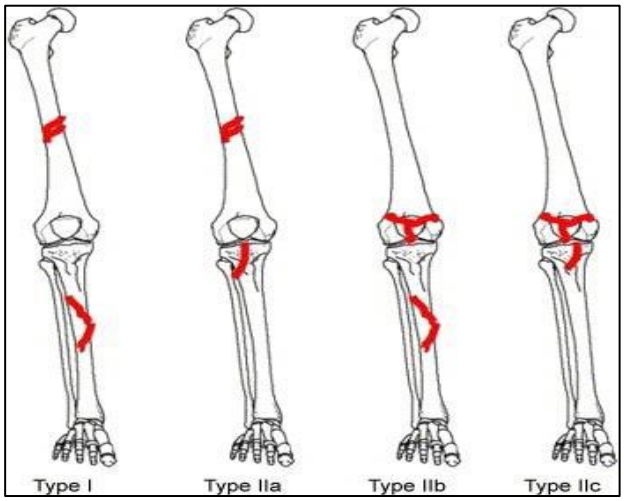

Figure 1: Types of injuries according to Fraser classification.

Inclusion criteria

A patient must be skeletally mature and above 18 to be of any sex, there are no neurological deficits in any ipsilateral fractures of the femur and tibia caused by trauma, a recent traumatizing history. In a week or less and grade 1 and 2 fractures in both closed and open wounds, as well as grade 3 wounds in rare instances were included.

Exclusion criteria

A patient under the age of 18 years, patients who have had vascular damage [open grade 3 C injuries], patients who are not suited for treatment, pathological fractures, joint damage to the opposing hip and knee, incidental ipsilateral hip and ankle fractures, such as femur neck and trochanteric fractures, malleolar fractures, and foot wounds were excluded from the study.

Data analysis

The findings were entered into an MS excel spreadsheet, and statistical analysis was carried out using the statistical package for social sciences (SPSS) version 16.0. Mean mode and median obtained and p value less than 0.05 was deemed significant.

RESULTS

The majority of adult patients in the current research (ages 19-60) belonged to the 19-30 age group, making up 53.33% (16 out of 30). In our research, 35.2 years old was the average age. Patients were split 29:1 in favour of men. Left lower limb fractures were less prevalent, occurring in 5 cases (16.66%) compared to 25 cases (83.33%) of right side injuries. The 28 patients have suffered high-velocity RTA injuries, while two more have fallen onto the building site and been hurt. In our study, there were 20 patients with open wounds and 10 patients with closed fractures, or 33.33% (10 out of 30). There were most type 1 Fraser injuries.

The 19 patients underwent the insertion of a locked intramedullary femur nail, 8 underwent Lc plates, and 3 underwent femoral external fixation. Seven patients received LC plates for their tibias, while six patients had external fixators. For tibia nailing, seventeen patients underwent the procedure, while seven patients received LC plates.

Table 1: Primary procedure done for tibia.

Procedure	N	Percentages (%)
I/L tibia nail	17	56.66
Orif with locking plates	07	23.33
External fixator	06	20
Total	30	100

The most alarming response from our survey was infection. It was necessary to do further surgery in six cases due to infection. A postoperative patient who got oxygen and low molecular weight heparin had fat embolisms. According to our research, the femur and tibia took an average of 30.7 and 17.9 weeks, respectively, to fuse together. Non-union could be seen in both five patient tibias and three patient femurs. All non-unions were handled with a subsequent procedure that included a bone transplant with or without secure fixation.

Table 2: Primary procedure done for femur.

Procedure	N	Percentages (%)
I/L femur nail	19	63.33
Orif with locking plates	08	26.66
External fixator	03	10
Total	30	100

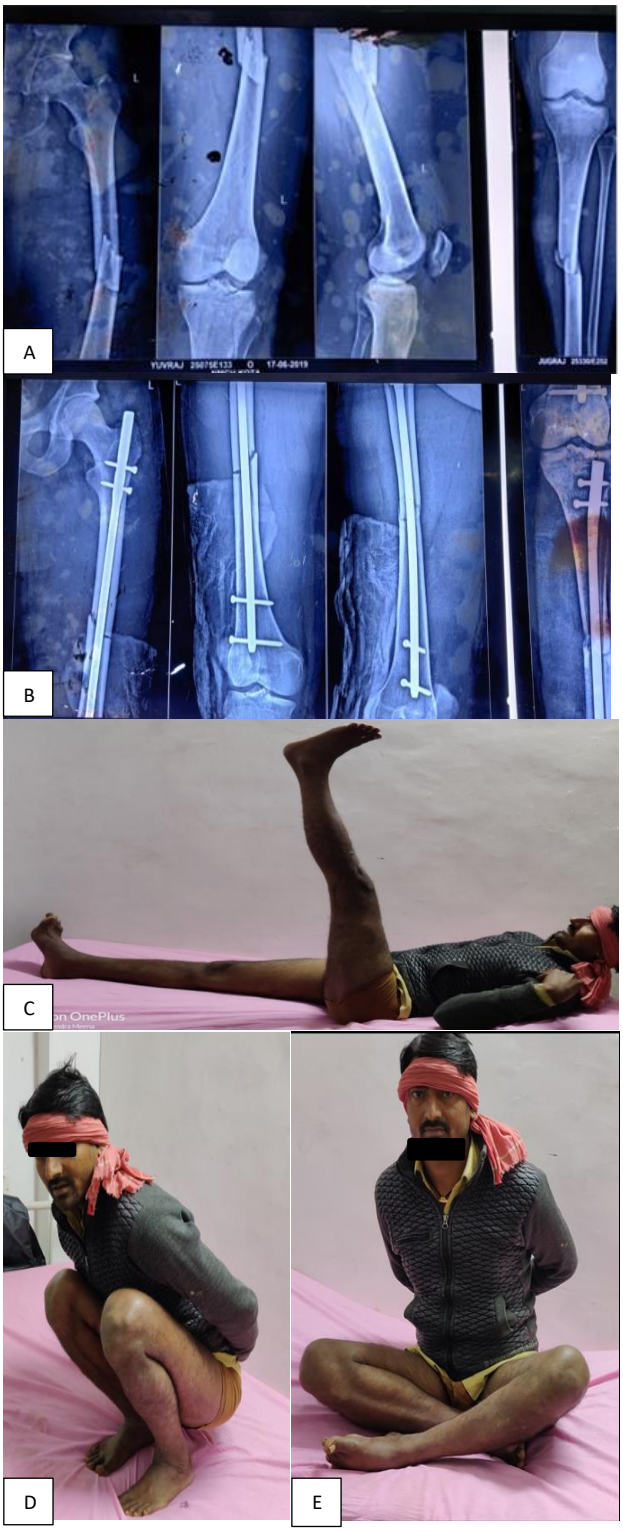

Figure 2 (A-E): Pre-op x-ray, post op x-ray and straight leg rising, knee banding and cross leg sitting.

Table 3: Functional score at final follow up a/c to Karlstrom-Olerud criteria.

Result	Score	N	Percent (%)
Excellent	>32 points	05	16.66
Good	32-30 points	10	33.33
Satisfactory	29-24 points	07	23.33
Poor	23 and below	08	26.66
Total		30	100

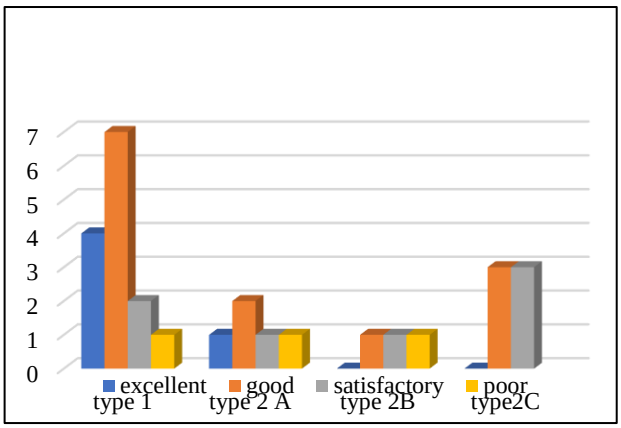

Figure 3: Results according to Fraser classification.

DISCUSSION

When the knee joint is isolated as a result of a femur and tibia fracture, the phrase "floating knee" is employed. In 1975, Blake and McBryde coined the phrase "floating knee." Soft tissue injuries are possible and range in severity from small abrasions to grade 3 Gustilo-Anderson open wounds. Our study's 36.7-year average age is nearly identical to the studies of Hee et al (31.8) and Marco et al (31.2) in terms of years.[10] The male preponderance in the current research was 96.66% (29 out of 30), which is virtually identical to the male preponderance in the studies by Rethanm et al (93%) and Dwyer et al (90%).[11,12] Men are more frequently involved since they partake in outdoor activities more frequently. In our study, motorcycle accidents accounted for 93.33% of all trauma cases (28 patients), which is close to the findings of Rethnam et al (93.1%) and Dwyer et al (71.6%). In our nation, young men who are the family's primary breadwinner most frequently use motorbikes as a form of transportation. Two hundred twenty-two instances of floating knee were studied by Fraser and the patients were grouped according on the nature and mode of therapy.[9] Regardless of the type of therapy, 35% of the patients required a second operation for problems such non-union, osteomyelitis, refracture, delayed union, and malunion. In contrast to the research conducted by Dwyer where 70% of femoral fractures and 37.7% of tibial fractures were closed, according to the Gustilo-Anderson classification, 18 (60%) femur and 15 (50%) tibial fractures were closed. According to Karlstrom-Olerud standards, the study's final result was divided into four categories: excellent, good, satisfactory,

and bad.[8] Excellent outcomes were achieved in five patients (16.66%), good results in ten patients (33.33%), adequate results in seven patients (23.33%), and bad results in eight patients (26.66%).

Table 4: Compression of various study with our study.

Study	Excellent	Good	Satisfactory	Poor
Fraser et al, 1978	-	30%	60%	10%
Bansal et al, 1984	8.3%	50%	33.3%	8.3%
Hee et al, 2001	6.8%	60.2%	28.4%	4.5%
Anoop Kumar et al, 2006	16.66%	33.33%	33.33%	16.66%
Ulfin Rethnam et al, 2007	51.17%	31.03%	6.89%	10.34%
Our study	16.66%	33.33%	23.33%	26.66%

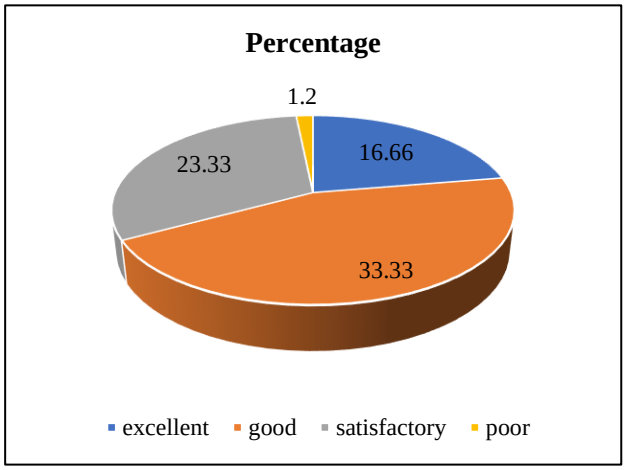

Figure 4: Final results.

According to Jones internal fixation therapy improves outcomes whereas conservative treatment increases complication rates, secondary problems, and healing time.[13] Watson Jones also emphasized the significant risk of complications and poor results in floating knee fractures. Tay and Tong conducted a study on 14 patients with tibial condyle and diaphyseal femur fractures.[14] They found that rigorous internal fixation of floating knee injuries through the shaft of both bones resulted in a favourable functional outcome. Tong recommended proper revilement and closely monitoring of related vascular and knee ligament injuries in these severely damaged individuals. According Veith et al there were 57 occurrences of floating knee injuries; 33 complicated fractures and 21 patients with potentially fatal injuries were recorded.[15] Five weeks was the typical length of hospital stay for femur fractures, which were mostly internal. Fatty embolism syndrome affected 13% of patients, profound infections, ununited fractures, and below-knee amputation. The latest follow-up assessment revealed a mean range of motion of 129 degrees, with 80% of patients having satisfactory or outstanding results.

Rooser and Hansson described the use of external fixators for damage to floating knees in 1985.[16] Hoffman device was used on five patients. The fracture mended without any problems, and the patients were able to walk early. He supported intramedullary nailing for femur fractures and the use of external fixators for tibia fractures. If the patient's overall health is poor or there is a noticeable comminution of the femur fracture, external fixation of the fracture is recommended. A case series with 28 patients and 31 floating knee injuries-classified as type 1 extraarticular, type 2 articular, and type 3 with patella involvement-was carried out by Ran et al.[17] An external fixator was used to support 12 instances temporarily while both the femur and tibia underwent permanent fixation. Karlstrom and Olerud's criteria were used to evaluate the functional outcomes. 29 months was the average follow-up period. Complications such as instability, stiffness in the knee, and infection were seen in seven patients. There were four categories for functional outcomes: outstanding, good, acceptable, and poor, 91% of cases included category 1 injuries. Males (85.5%) and those in the 20-29 age range were more likely to sustain floating knee injuries, according to 2013 research by Nouraei et al.[18] Relatively speaking, pelvic fractures were the most frequent injury sustained in car-motorcycle collisions. Open reduction internal fixation was the predominant form of therapy, although no matter what was done, the complication rate persisted high. In a 2017 research, Shobha, Idris, and Lingaraju examined three patients who had head injuries and twenty patients who had floating knee injuries brought on by high intensity trauma.[19] Nine patients had outstanding results, eight had good results, two had acceptable results, and one had bad results from radiological scans done at five and six months. Our study's ultimate result was categorized as outstanding, acceptable, adequate, mediocre, or bad based on Karlstrom-Olerud criteria. We had good outcomes in 10 (33.33%) patients, satisfactory results in 07 (23.33%) patients, exceptional results in 05 (16.66%) patients, and bad results in 08 (26.66%) patients.

The 50% of the findings were good, and 28.5% had exceptional results, according to the Fraser classification type 1. 37.5% of patients with Fraser type 2C had good results, whereas 62.5% had subpar outcomes.

Three of the ten patients with closed fractures had outstanding results, four had acceptable results, and three had adequate results. Of the twenty patients who had open injuries, only two had good results, six had good results, four had tolerable results, and eight had bad results.

CONCLUSION

Knee injuries that float require thorough evaluation and the right kind of management since they are a complicated category of ailments. Age of the patient, fracture type (open/closed, intra-articular or extra-articular, comminuted/non-comminuted), concomitant injuries, nutritional and immunological condition, associated co-morbidities such diabetes mellitus, smoking, osteoporosis, and post-operative rehabilitation are all prognostic variables. Fraser type 1 injuries with both fractures closed and excellent functional result were treated with intramedullary nailing on the femur and tibia, respectively Fraser type 2C fractures of grade 3 that are open typically have a bad prognosis. Our research demonstrates that, although it varies on the kind of fracture (intra-articular/extra-articular, open or closed), early surgical stabilization of both fractures and early mobilization yields favourable outcomes.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REEFRENCES

1. Hayes JT. Multiple fractures in the same limb: some problems in their management. Surg Clin N Am. 1961;41:1379-88.
2. McBryde A Jr. The Floating knee, Ipsilateral fractures of femur and tibia. J Bone Joint Surg. 1974;56(A):1309.
3. Lett E. Vincent the `Floating Knee' in children. JBJS. 1986;68'(3):442-6.
4. Veith RG, Winquist RA, Hansen ST. Ipsilateral fractures of the femur and tibia. J Bone Joint Surg Br. 1984;66(7):991-1002.
5. Gustilo RB, Anderson JT. Prevention of infection in treatment of fractures study of 1025 open fractures. J Bone Joint Surg, 1976;58(A):453.
6. Rotliff AHC. Fractures of the shaft of the femur and tibia in the same limb. Proceeding Royal Society Med. 1968;61(9):906-8.
7. Bernard F, Meggitt D. Functional cast bracing treatment of femoral fractures. J Bone Joint Surg. 1981;63(B):17-8.
8. Karlstrom G, Olerud S. Ipsilateral fractures of femur and tibia. J Bone Joint Surg. 1977;9(2):240-3.
9. Fraser RD, Hunter GA. Ipsilateral fractures of the femur and tibia. J Bone Joint Surg. 1978;142(B):115-22.
10. Hee HT, Wong HP, Low YP, Predictors of outcome of floating knee H P Wong injuries in adults. Y.P. Low Acta Orthop Scand. Acta Orthop Scand. 2001;72(4):385-94.
11. Dwyer AJ, Paul R, Floating Knee injuries; Long term results of four treatment methods. Int Orthoped. 2005;29(5):314-8.
12. Rethnam V, Study of epidemiology, prognostic indicators and outcome following surgical management of floating knee. J Trauma Management Outcomes. 2007;I(1):2.
13. Watson-Jones R, Wilson JN. Watson Jones Fracture and Joint injuries, 6th Edition, Churchill Livingstone, 1982;1026.
14. Tay BK, Tong GO. Ipsilateral fractures of femur and tibia. Annual Academy Med Singapore. 1982;11(2):139-41.
15. Veith RG, Winquist RA, Hansen ST. Ipsilateral fractures of femur and tibia. J Bone Joint Surg. 1984;66(7):991-1002.
16. Rooser B, Hansson P. External fixation of ipsilateral fractures of femur and tibia. Injury, 1985;16(6):371-3.
17. Ran A. Bilateral floating knee in multiple injured patients: A case report. Orthopedics. 1986;9:1355-58.
18. Nouraei MH, Hosseini A, Zarezadeh A, Zahiri M. Floating knee injuries; Results of treatment and outcomes. J Res Med Sci. 2013;18(12);1087-91.
19. Terry SC, James HB. Campbell‟s operative orthopedics, 11th edition vol 7. Mosby. 2007;1674.

Cite this article as: Meena S, Tiwari AK, Aloria J, Meena M, Pratap L, Prasad M. Evaluating the functional outcomes of tibia and ipsilateral Femur fracture, which are floating knee injuries, in adults. Int J Res Orthop 2024;10:318-22.