RESEARCH
www.commprac.com
ISSN 1462 2815

A PROSPECTIVE OBSERVATIONAL STUDY ON ANALYSIS OF FUNCTIONAL OUTCOME IN FLOATING KNEE INJURY IN A TERTIARY CARE HOSPITAL

Dr. Rachamalla Siva Shankara Krishna Vamsi [1]*, Dr. Hari Sivanandan [2], Dr. Soundararajan K [3], Dr. Shebin Christin I [4], Dr. Nanthivarman KS [5], Dr. Chereddi Maheswara Reddy [6] and Dr. Vignesh Ilangovan [7]

[1,6,7] Post Graduate Resident, Department of Orthopaedics, Vinayaka Mission's Kirupananda Variyar Medical College & Hospitals ,Vinayaka Mission's Research Foundation (Deemed to be University) Salem, Tamil Nadu, India.
[2,3] Professor, Department of Orthopaedics, Vinayaka Mission's Kirupananda Variyar Medical College & Hospitals ,Vinayaka Mission's Research Foundation (Deemed to be University) Salem, Tamil Nadu, India.
[4,5] Senior Resident, Department of Orthopaedics, Vinayaka Mission's Kirupananda Variyar Medical College & Hospitals ,Vinayaka Mission's Research Foundation (Deemed to be University) Salem, Tamil Nadu, India.
*Corresponding Author Email: krishnavamsi620@gmail.com

DOI: 10.5281/zenodo.11195488

Abstract

Background: A simultaneous ipsilateral tibia and femur fracture that separates the knee from the remainder of the limb is referred to as a "floating knee." The treating orthopaedic physician continues to face significant challenges as a result of the injury's intricacy and related sequelae, which include compartment syndrome, vascular injury, collateral damage, and meniscal injuries. **Materials and methods:** The study was carried out in Department of Orthopaedics Vinayaka mission Kirupananda Variyar Medical college and hospital, Salem. We included patients in our research who were hospitalised throughout the study period with floating knee injuries. Patients' comprehensive medical histories, clinical examinations, investigations, treatment, and complications related to floating knee injuries were all used to collect patient data. The functional outcome was analysed using Karlstrom and Olerudu criteria. **Results:** A total of 30 patients with floating knee injuries were recruited in our study; 66.6% of the patients were male, and 40% of the patients were in the younger age below 30 years. Sixty percent of the patients featured a right side fracture, with RTA accounting for 73.3% of all injuries. 40% were Type I fractures, while 80% were open fractures. Associated injuries were seen in 73.3% of the patients. Complications from floating knee injuries were shown to be common in shock (30%), delayed union (23.3%) and local infection (18.1%). Results ranged from excellent to good in 41% of instances. **Conclusion**: The result of high-energy trauma (RTA) is the complicated injury known as floating knee, which has several comorbidities. The fracture type, pattern, and placement were the criteria that dictated the functional results.

Keywords: Floating Knee Injury, Road Traffic Accidents (RTA), Complications, Functional Outcome.

INTRODUCTION

A simultaneous ipsilateral fracture of the femur and tibia that separates the knee from the remainder of the limb is referred to as a "floating knee" [1]. It consists of a mix of tibia and femur intra-articular, metaphysical, and diaphyseal fractures [2]. Adults with floating knee injuries can be categorised using the Fraser classification, Blake and McBride classification, or Letts and Vincent classification. The kind of fracture (open, intra-articular, commutation) and other injuries are prognostic markers for the complicated condition known as floating knee [3]. Because floating knee injuries are largely caused by severe trauma from high velocity motor vehicle collisions, they are becoming more and more prevalent as a result of increased industrialization and the

number of cars on the road. The primary cause of these occurrences is road traffic accidents (RTA), which is followed by falls from height [4-5].

Patients with floating knees are often hemodynamically unstable since the majority of these injuries are complex and frequently coexist with potentially fatal head injuries, spinal cord injuries, thoracic and abdominal (visceral) injuries. [6-7]. The patients who are hemodynamically stable are the ones who receive immediate final reduction and fixation. To attain the best outcomes, each fracture should have a unique treatment approach [9]. When comparing diaphyseal or extra articular fractures to intra articular fractures, the outcomes will be better and the comorbidities will be lower. The management of floating knee injuries is a difficult issue. Complications linked to floating knee injuries include meniscal injuries, compartment syndrome, infection, excessive blood loss, fat embolism, prolonged hospitalisation, incapacity to bear weight, malunion, delayed or nonunion, heamarthrosis ligaments, and knee stiffness [10].

The principles of damage control orthopaedics ought to direct the course of therapy. External fixation and traction were used to temporarily stabilise femur and tibial fractures. Patients who are hemodynamically stable are eligible for immediate final reduction and fixation. The primary goals of early internal fixation of the femur and tibia in cases with floating knee injuries are to minimise problems including delayed union, non-union, and stiffness in the knee and to achieve union of the fractures at anatomical positions consistent with the maximal functional return of the limb.

Aims and Objectives

The aim of the study to analysis the functional outcome in floating knee injury in a tertiary care hospital.

Objectives:

To assess the functional outcome of the patients with floating knee injury in a tertiary care hospital.

To determine the complication if any among the patients with floating knee injury in a tertiary care hospital.

MATERIALS AND METHODOLOGY

Study Area: After institutional ethical committee approval, the present study will be conducted in the Department of Orthopaedics Vinayaka mission Kirupananda Variyar Medical College and hospital, Salem.

Study Period: This study was conducted from March 2023 to March 2024. This period includes data collection period till the desired sample was obtained

Study Population: The study group includes all the patients with floating knee injury admitted at Department of Orthopaedics, Vinayaka mission Kirupananda Variyar Medical college and hospital.

Study Design: Prospective observational study.

Sample Size Calculation:

The sample size is calculated using the proportion of patient who had excellent Harris Hip score was about 8.6% from the previous study by Sethi C et al[12]. Using the finite

sample size formula, considering the precision as 4%, estimated proportion as 8.6% and finite population as 30, which was the number of Neck of femur fracture reported in the previous year in our Department. Using these data sample size is calculated as 26, rounded off to 30.

$$n \geq \frac{NZ^2_{1-\alpha/2}p(1-p)}{d^2(N-1)+Z^2_{1-\alpha/2}p(1-p)}$$

Alpha (α) = 0.05

Estimated proportion (p) = 0.86

Estimated error (d) = 0.05

Population size (N) = 30

Sample size is calculated as 26, rounded off to **30**.

Inclusion Criteria:

- Patients with age 18 to 70
- Recent history of trauma (within 1 week)
- Ipsilateral fracture Shaft of femur and tibia.
- Ipsilateral fracture shaft of femur and tibia extending into knee joint.

Exclusion Criteria:

- Patients with age <18 and >70
- Pathological fractures
- Associated contralateral hip and ankle injuries.
- Ligamentous / IDK injury

Study Procedure: On arrival, every patient was undergo assessment and conventional protocol-based resuscitation. For intra-articular fractures, routine lateral and anteroposterior x-rays as well as a 3D CT scan was performed. When a complex fracture occurs, the wound be debrided right away, an external fixator was used, and the wound was closed either primary or secondary depending on the kind of fracture. After an accident, the majority of patients will have surgery within a week. In patients with osteoporosis and extensive comminution, the majority of femur fractures was treated with intramedullary interlocking nailing, and those with intraarticular extension was mended with condylar buttress plates and locking compression plates. In a similar manner, T and L buttress plates and locking compression plates was used to treat tibial plateau fractures and intramedullary interlocking nailing for diaphyseal tibial fractures. IV antibiotics was administered for five days as part of the routine postoperative protocol, and on the twelfth postoperative day, skin sutures was taken out. As soon as the discomfort has decreased, physiotherapy using the active range of motion for the knee and ankle was begin. When the x-ray indicates that there is enough callus at the fracture site, partial weight bearing was begin. Every patient will have a follow-up every month for the first four months, then every three months for complications, knee range of motion, and clinical and radiological fracture union. The functional outcome was analysed using Karlstrom and Olerudu criteria[11].

Ethical Considerations:

The study was started after obtaining Institute Ethical Committee clearance. Written informed consent was obtained before collecting information from the participant. Privacy and confidentiality was ensured.

Statistical Analysis

The collected data was analysed with IBM.SPSS statistics software 20.0 Version. To describe about the data descriptive statistics frequency analysis, percentage analysis was used for categorical variables and the mean & S.D was used for continuous variables. To find the significance, Chi -Square test/ t- test was used.

RESULTS

Table 1: Distribution of Study Participants as Per their Socio Demographic Variable

Age group	**No of persons**	**%**
Below 30	12	40.00
30-40	8	26.67
40-50	6	20.00
Above 50	4	13.33
Total	30	100.00
Gender	**No of persons**	**%**
Female	10	33.3
Male	20	66.6
Total	30	100

From the table-1 it is evident about majority of the study participants of about 40% were below the age of 30 years had fracture. And about least number of about 13.3% were belong to above the age of 50 years. Also, from our study it had been found that more male participants had fracture when compared to female population among our study participants.

Table 2: Distribution of Study Participants as Per Characteristics of Fracture

Site of fracture	**No of persons**	**%**
Right	18	60
Left	12	40
Total	30	100
Open/closed fracture	**No of persons**	**%**
Open	24	80
Closed	6	20
Total	30	100
Types of fractures	**No of persons**	**%**
Type I	12	40.00
Type IIA	8	26.67
Type IIB	6	20.00
Type IIC	4	13.33
Total	30	100

In our study it had been found that more participants had right side fracture of about 60% when compared to left side with respect to site of fracture. Among our study participants it is also evident that majority had open fracture of about 80% when compared to closed fracture of about 20%. Also with regarding to the types of fracture,

majority of about 40% had type-I fracture and least of about 13.3% had type II-C fracture among our study participants.

Table 3: Distribution of Study Participants as Per Characteristics of Injury

Mode of injury	**No of persons**	**%**
Runover injury	5	16.67
Fall from height	3	10.00
RTA	22	73.33
Total	30	100.00
Associated injury	**No of persons**	**%**
Yes	22	73.33
No	8	26.67
Total	30	100

The above table determines the distribution of study participants as per their characteristics of injury. Most of the patients of about 73.3% had road traffic accident and least of about 10% had fracture through fall from height. Also about 73.3% had associated other injuries apart from fracture among our study participants.

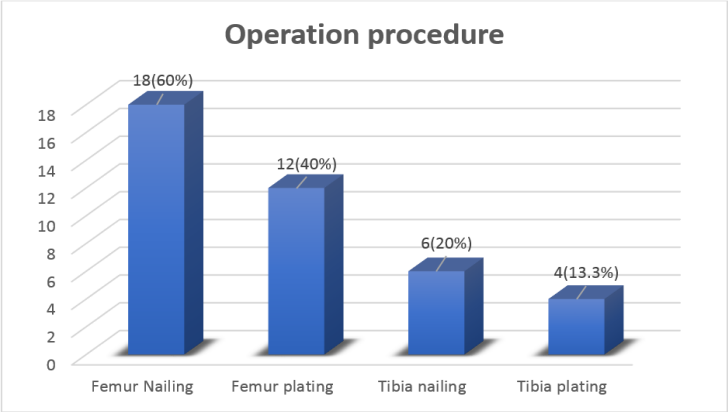


Figure 1: Distribution of Study Participants as per the Operation Procedure Performed

The above figure shows the distribution of study participants as per the operation performed among our study participants. Majority of the study participants had femur nailing 60% followed by femur plating of about 40%. Then about 20% had tibia nailing and least amount of about 13.3% had tibia plating.

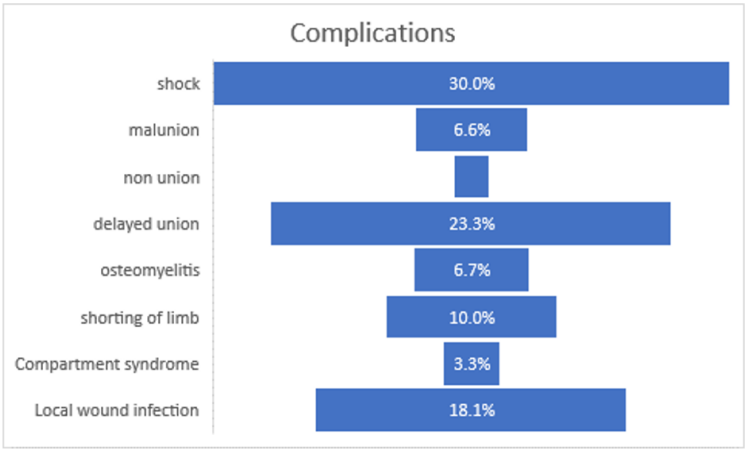


Figure 2: Distributions of Study Participants as Per their Complications

The above figure shows the distribution of study participants as per their complications. Majority of our study participants of about 30% had shock. Followed by delayed union of about 23.3% and 18.1% had local infection. Least amount of about 3.3% had compartment syndrome among our study participants.

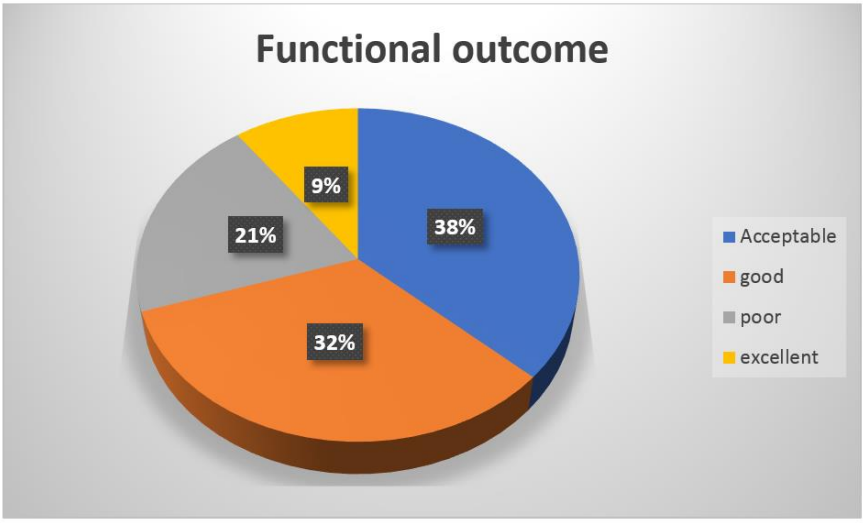


Figure 3: Distributions of Study Participants as Per their Functional Outcome

The above figure shows the distribution of study pariticpants as per their **functional outcome** using Karlstrom and Olerudu criteria. among our study participants about 38% were had acceptable outcome, followed by 32% had good outcome and about 21 % had poor outcome and least of about 9% had excellent outcome.

DISCUSSION

Rising population rates, a rise in the number of motor vehicles in most developing country cities (like India), and an increase in road traffic accidents are all contributing factors to the rise in floating knee injuries. Knees that float are a result of high impact trauma. Because of the significant mortality rate associated with related injuries, floating knee is crucial.

In accordance with the findings of Panigrahi et al. [13] and Mohamadean A et al. [14], the age group of below 30 years old had a higher prevalence of floating knee injuries in our research (30%).

The current study revealed a male preponderance, with 66.6% of the patients being male.

In the Study by Dwyer et al. [4] , Rethnam U et al. [15], Sagar et al. [16], and revealed similar results. Due to their erratic and rapid driving styles, guys below the age of 30 are more likely to be engaged in RTAs and are consequently especially susceptible to traffic accidents that result in injuries.

In our investigation, RTA accounted for 73.3% of all injury modes. The research conducted by Kulkarni et al. [17], Andrade-Silva et al [18], and Aher D et al. [19] is similar to our findings. The number of cars on the road rises daily due to population growth, increasing the likelihood of floating knee injuries.

The study found that 60% of injuries were on the right side, which is consistent with the findings of Veerappan et al. [20]. The majority usage of the right leg for braking, which absorbs greater stress in high-speed traffic accidents, and collisions with cars approaching from the other side account for the prevalence of right-sided fractures. As reported by S. Malhotra et al.[21] and Nicola et al. [22]. The majority of patients with floating knee injuries (73.3%) had other related injuries. These studies' reported rates of associated injuries were 85% and 89%, respectively.

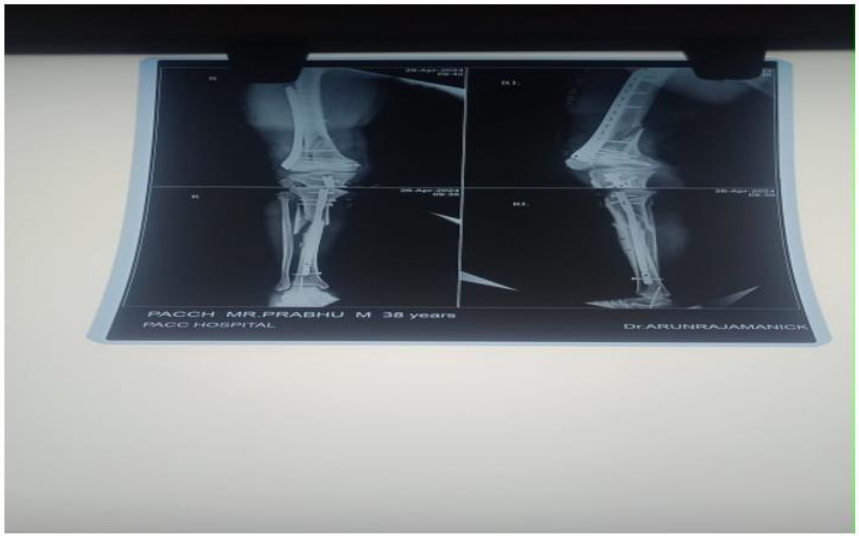
The majority of the fractures in this study were Type I fractures, and the probability of open fractures is greater than that of closed fractures. These findings are comparable with those published by Srikanth et al. [23].

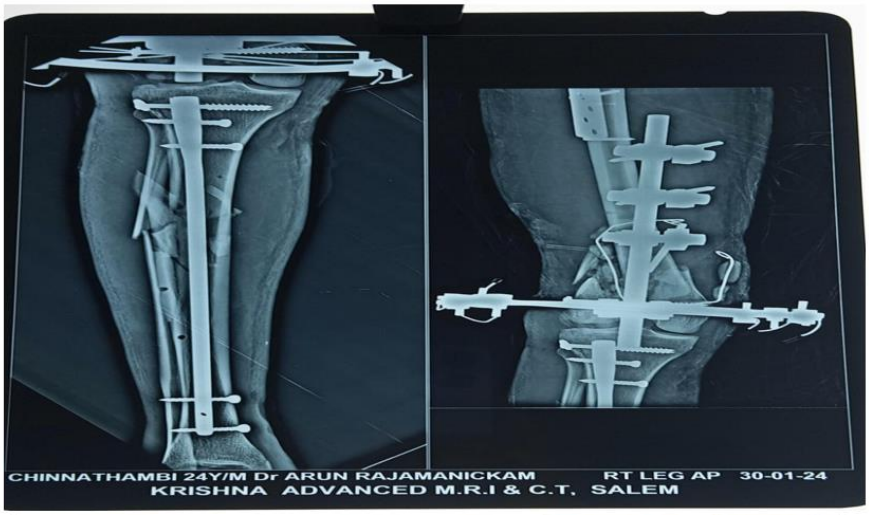
Our findings were consistent with those of Chavda et al. [24], showing that the therapy of femur and tibia fractures by intramedullary nailing considerably influenced the functional results in patients with floating knee injuries.
In the study done by Meena A et al. [25], shock, local infections, and delayed union were the most frequent consequences of floating knee injuries which is similar in this research.

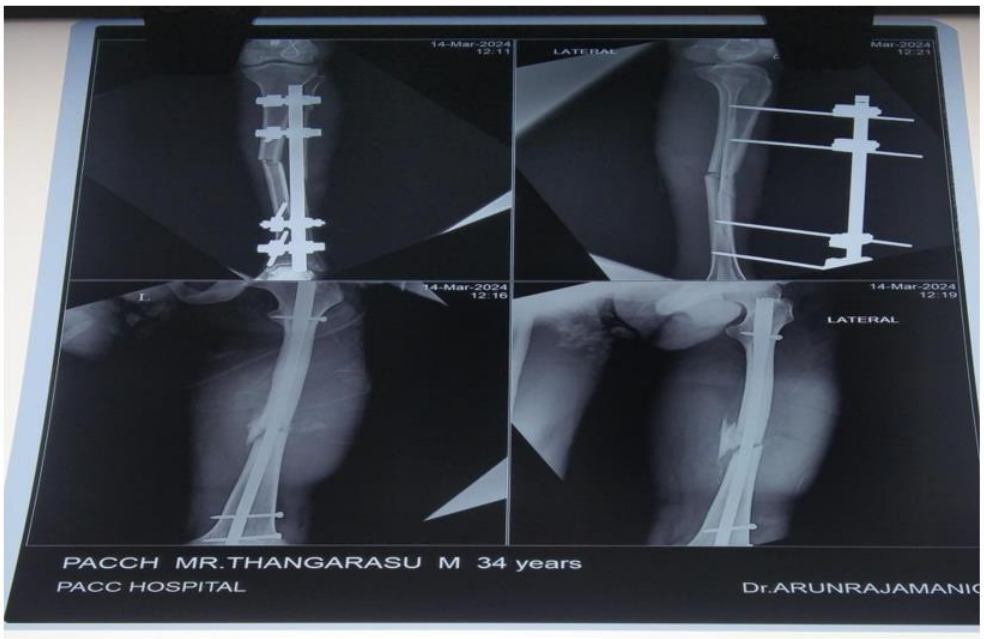
According to Karlstrom and Olerud's criterion [11], the end results were good to excellent in 41% of the instances and acceptable to bad in 59% of the cases. Our results were correlated with those of Shukla R et al. [26]. On the other hand, lower rates of good to excellent outcomes (24%) was reported by Kaliamoorthy M et al. [30]. According to the current floating knee suggestion, the patient's clinical condition, the existence of a fat embolism, the kind of fracture (open or closed), the degree of communition, and any segmental, metaphyseal, or intrarticular extension will all influence the surgical choice of implants. Every patient has a different surgical sequence that should be customised based on factors such as fracture pattern, location, soft tissue injury, surgical capability, available resources, and patient desire. It is usually best to try stable osteosynthesis in order to get early mobilisation and stiff fixation.

Pre-operative

Post -operative







CONCLUSION

Motor vehicle accidents with speeding vehicles are the cause of floating knee injuries. Younger men are typically impacted. Injuries to the right side occur more frequently than to the left. The majority of injuries related to floating knees were open fractures with accompanying injuries.

Delay in union, local infections, and shock were common problems. In this study, only 43% of patients had an excellent to high functional result, while 57% had an acceptable to poor functional outcome. Time to union, local infection, shortening, and knee stiffness are common factors that impact the functional result.

Reference

1) Yadav S, Rawal G. Advances in Understanding and Managing Floating Knee Injuries: A Comprehensive Review. Cureus. 2024 Mar 28;16(3).

2) Tomar L, Govil G, Dhawan P. Bilateral periprosthetic knee fracture with the right floating total knee and left periprosthetic patella fracture management strategy: A case report. Journal of Orthopaedic Case Reports. 2021 Feb;11(2):1.

3) Vallier HA, Manzano GW. Management of the floating knee: ipsilateral fractures of the femur and tibia. JAAOS-Journal of the American Academy of Orthopaedic Surgeons. 2020 Jan 15;28(2):e47-54.

4) Dwyer AJ, Paul R, Mam MK, Kumar A, Gosselin RA. Floating knee injuries: long-term results of four treatment methods. International orthopaedics. 2005 Oct;29:314-8.

5) Philip PJ, Georgekutty DM, Sultan AS. Functional outcome of floating knee injuries after fixation: A follow up study. Int J Orthop Sci. 2020;6:336-9.

6) Veith RG, Winquist RA, Hansen Jr ST. Ipsilateral fractures of the femur and tibia. A report of fifty-seven consecutive cases. JBJS. 1984 Sep 1;66(7):991-1002.

7) Vallier HA, Manzano GW. Management of the floating knee: ipsilateral fractures of the femur and tibia. JAAOS-Journal of the American Academy of Orthopaedic Surgeons. 2020 Jan 15;28(2):e47-54.

8) Piedra-Calle CA, García-Sánchez Y, Teixidor-Serra J, Tomás-Hernández J, Selga-Marsá J, Porcel-Vázquez JA, Molero-García V, Andrés-Peiró JV. Challenges and outcomes in the treatment of floating knees. A case series of ipsilateral femur and tibia fractures around the knee. European Journal of Orthopaedic Surgery & Traumatology. 2022 Feb:1-7.

9) Giannoudis VP, Ewins E, Taylor DM, Foster P, Harwood P. Clinical and functional outcomes in patients with distal tibial fracture treated by circular external fixation: a retrospective cohort study. Strategies in Trauma and Limb Reconstruction. 2021 May;16(2):86.

10) Bansal VP, Singhal V, Mam MK, Gill SS. The floating knee. 40 cases of ipsilateral fractures of the femur and the tibia. International orthopaedics. 1984 Sep;8:183-7.

11) Karlstrom G, Olerud SV. Ipsilateral fracture of the femur and tibia. JBJS. 1977 Mar 1;59(2):240-3.

12) Sethi C, Agrawal S, Chadha C. Analysis of functional outcome in floating knee injury. Journal of cardiocascular surgery research. 2023, VOL14(2).

13) Panigrahi RG. An Analysis of Functional Outcome and Factors Influencing the Outcome in Floating Knee Injuries. Odisha Journal of Orthopaedics and Trauma. 2022 Jan;03:20-22.

14) Mohamadean A, Beeh HA. Floating knee injuries: treatment with a single approach. The Egyptian Orthopaedic Journal. 2017 Jan 1;52(1):6-12.

15) Rethnam U, Yesupalan RS, Nair R. Impact of associated injuries in the floating knee: a retrospective study. BMC musculoskeletal disorders. 2009 Dec;10:1-8.

16) Sagar V, Kumar N, Kumar A, Kumar S. Outcomes of surgical management of floating knee injuries. International Journal of Contemporary Medical Research. 2020;7(7):G4-7.

17) Kulkarni MS, Aroor MN, Vijayan S, Shetty S, Tripathy SK, Rao SK. Variables affecting functional outcome in floating knee injuries. Injury. 2018 Aug 1;49(8):1594-601.

18) Andrade-Silva FB, Carvalho A, Mansano C, Giese A, de Camargo Leonhardt M, Barbosa D, Kojima KE, Silva JS. Functional results and isokinetic muscle strength in patients with Fraser type I floating knee treated with internal fixation. Injury. 2017 Oct 1;48:S2-5.

19) Aher D, Sonkar D, Sharma P, Maravi DS. Functional Outcome of Operatively Treated Floating Knee Injuries in Adults. Orthopaedic Journal of MP Chapter. 2016 Dec 31;22(2):11-5.

20) Veerappan J. Functional Outcomes of Floating Knee Injuries after Surgical Management: A Comprehensive Study and Treatment Results. Acta Scientific Orthopaedics. 2020;3(3):16-22.

21) Suhail Malhotra, Anil Gupta, Manish Singh. Study of Functional Outcome of Surgical Management of Floating Knee with Intramedullary Nailing, Annals of International Medical and Dental Research E-ISSN: 2395-2822 | P-ISSN: 2395-2814. 2021;Sep-Oct;7(5):129-136.

22) Nicola M, Alsafi Z, Sohrabi C, Kerwan A, Al-Jabir A, Iosifidis C, Agha M, Agha R. The socio-economic implications of the coronavirus pandemic (COVID-19): A review. International journal of surgery. 2020 Jun 1;78:185-93.

23) Sreekanth K C, Badavath R R, Kethan Kumar T, Suvarna Rekha K J, Raju I. A study of functional outcome of ipsilateral femur and tibia fractures (FRASER'S TYPE II). European Journal of Molecular & Clinical Medicine. 2022 Nov Vol. 9(3).

24) Chavda AG, Lil NA, Patel PR. An approach to floating knee injury in Indian Population: An analysis of 52 patients. Indian Journal of Orthopaedics. 2018 Dec;52:631-7.

25) Meena A, Talesra A, Karan R. Analysis of functional outcome in floating knee injury. International Journal of Orthopaedics. 2020;6(2):689-93.

26) Shukla R, Jain A, Jain RK. Long-term study of functional outcomes of floating knee injuries. Journal of Orthopaedics, Traumatology and Rehabilitation. 2020 Jan 1;12(1):23-30.

27) Kaliamoorthy M, Padmanabhan K, Doddihithlu S. Functional outcome analysis in floating knee injury. Indian J Orthop Sur. 2018 Apr;4:178-86.

28) Kenmegne GR, Zou C, Lin Y, Yin Y, Huang S, Fang Y. The current issues and challenges in the management of floating knee injury: a retrospective study. Frontiers in Surgery. 2023 May 3;10:1164032.

29) Bozgeyik B, Büyükbebeci O, Güner S, Mert A. Comparative analysis of open and closed floating knee injuries. Acta Ortopédica Brasileira. 2023 Jul 31;31:e262810.

30) Radhakrishnan E, Paramasivam M, Narayanan AR. Floating knee injuries-An Analysis of Outcome in Surgically Treated Patients in a Tertiary Care Institution. The Journal of The Bulgarian Orthopaedics And Trauma Association. 2023 Dec 12;60(03):153-61.