

Original research article**Analysis of functional outcome in floating knee injury****¹Dr. Chirag Sethi ²Dr. Swati Agrawal, ³Dr. Chirag Chadha**¹Assistant Professor, Department of Orthopaedics, AFSMS and RC, Dhauj, Faridabad, Haryana, India²Assistant Professor, Department of Paediatrics, AFSMS and RC, Dhauj, Faridabad, Haryana, India³Assistant Professor, Department of Dermatology, AFSMS and RC, Dhauj, Faridabad, Haryana, India**Corresponding Author:**Dr. Chirag Sethi (Chiragsethi7713@yahoo.com)**Abstract**

Background: Floating knee injuries result from high velocity trauma, are usually associated with multiple injuries making it challenging to treat and lead to high morbidity and mortality. There are no clear guidelines for their management. The aim of this study to evaluate the functional outcomes of operatively treated floating knee injuries in adults and the factors affecting them.

Methods: The study was conducted in the Department of Orthopedics in a tertiary care hospital, northern India. Patients who were admitted with Floating Knee Injuries during the study period were enrolled in our study. Data collection of the patients was detailed history, clinical examination, investigations, management and complications of floating knee injury patients.

Results: A total of 35 floating knee injury patient was enrolled in our study, predominantly male patients (91.5%), majority of the patients were of young age group between 18-40 years (48.6%). Right side fracture was involved in 60% of cases; RTA was the most common mode of injury (94.5%). 77.2% were open fracture, 62.9% were Type I. The majority of the patients (88.6%) had associated injuries. Common complication of floating knee injuries were shock (51.4%), local wound infection (40%), delayed union (28.5%). Excellent to good outcomes were found in 43% of cases.

Conclusions: Floating knee is a complex injury caused by high energy trauma (RTA) with many associated injuries. The factors which determined the functional outcomes were type of fracture, pattern and, site of fracture.

Keywords: Floating knee injury, tibia, femur, road traffic accidents (RTA), functional outcome

Introduction

The term floating knee is defined as a simultaneous ipsilateral fracture of the femur and tibia that disconnects the knee from the rest of the limb ^[1]. It includes a combination of diaphyseal, metaphyseal, and intra-articular fractures of the tibia and femur ^[2]. The injuries of the floating knee can be classified according to Fraser classification or Blake and McBride classification in adults and by Letts and Vincent classification in children. The floating knee is a complex injury and the prognostic indicators are injuries and the type of fracture (open, intra-articular, comminution) ^[3]. Floating Knee Injuries are becoming more and more common as a result of increasing industrialization and increase in number of vehicles as these injuries are caused by high energy trauma primarily involving high velocity motor vehicle accidents. Road traffic accidents (RTA) are the major cause for these cases followed by falls from height ^[4-5]. Most of these floating knee injuries are compound and often accompanied with potentially life threatening head injuries, spinal cord injuries, thoracic and abdominal (Visceral) injuries, hence patients suffering from floating knees are usually hemodynamically unstable. ^[6-7]. Complications attributed to floating knee injuries include compartment syndrome, infection, excessive blood loss, fat embolism, prolonged hospitalization, inability to bear weight, malunion, delayed or nonunion, heamarthrosis ligaments, meniscal injuries and knee stiffness, the management of floating knee injuries is a challenging problem ^[8]. The treatment should be guided according to the concept of damage control orthopedics. Femoral and tibial fractures temporarily stabilized by external fixation and traction. Immediate definitive reduction and fixation is reserved for haemodynamically stable patients. The treatment plan for each fracture should be considered individually to achieve optimal results ^[9]. The results will be better and the complications will be less if the fractures are diaphyseal or extra articular than compared to intra articular fractures ^[10].

Aims and Objectives

The aim of the study was to determine the outcome of patients after surgical management of the Floating Knee and identify prognostic factors for this injury.

Material and Methods

This prospective study was conducted in the Department of Orthopedics, in a tertiary care hospital,

Northern, India. Duration of the study was one year from January 2021 to December 2021. All patients with floating knee injuries who were admitted under the department of Orthopedics during the time period were enrolled in the study. Detailed history of patient was taken particularly the demographic parameters and the mode of injury, along with clinical examination. The patients were classified according to Blake and McBride’s Classification for floating knee injuries [11].

Inclusion criteria

- Patients with age 18 to 70
- Recent history of trauma (within 1 week)

Exclusion criteria

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

The patients were carefully evaluated to detect and manage the life-threatening conditions. All patients were managed in emergency department as per ATLS protocol

The statistical analysis was done using the chi square test and the P value

Results

Total of 35 diagnosed patients with floating knee injuries with age ranged from 18 years to 70 years were enrolled in our study. Majority of the patients were of young age group between 18-30 years (28.6%), predominantly were males (91.5%) and females were 8.5%. Right sided injury was more common 21 (60%). Road traffic accident was the commonest cause (94.3%). [Table:1]

Table 1: Socio-demographic variables of the floating knee injuries patients

Socio-demographic variables		Frequency (N=35)	Percentage (%)
Age group (in years)	18-30	10	28.6%
	31-40	7	20%
	41-50	9	25.7%
	51-60	5	14.3%
	61-70	4	11.4%
Gender	Male	32	91.5%
	Female	3	8.5%
Site of fracture	Left	14	40%
	Right	21	60%
Mode of injury	RTA	33	94.3%
	Runover injury	1	2.8%
	Fall from height	1	2.8%

Open fractures were seen in 77.2% of cases, predominantly (62.9%) fracture was Type I. In most of cases (88.6%) floating knee injuries was associated with the other body injuries. Nailing (82.8% in femur and 54.35 in tibia) was the most common surgical procedure performed in the study [Table: 2].

Table 2: Fractures associated variables of the cases

Fractures variables		Frequency (N=35)	Percentage (%)
Open/closed fracture	Open	27	77.2%
	Closed	8	22.8%
Types of fractures	Type I	22	62.9%
	Type IIA	7	20%
	Type IIB	4	11.4%
	Type IIC	2	5.7%
Associated injury	Yes	31	88.6%
	No	4	11.4%
Operation performed	Femur Nailing	29	82.8%
	Femur plating	6	17.2%
	Tibia nailing	19	54.3%
	Tibia plating	16	45.75%

Common complication of floating knee injuries were shock (51.4%), local wound infection (40%), delayed union (28.5%) and shortening of limb in 11.4% cases [figure:1]

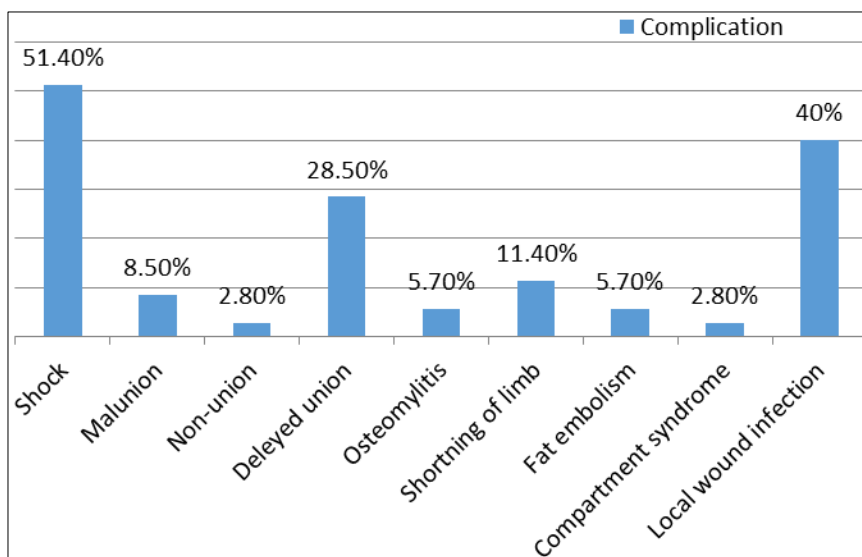


Fig 1: Complication in the floating knee injuries patients

The ultimate functional outcomes were as follows: good in 34.3% cases, acceptable in 31.4% cases, poor in 25.7% and excellent in 8.6% cases [Figure: 2].

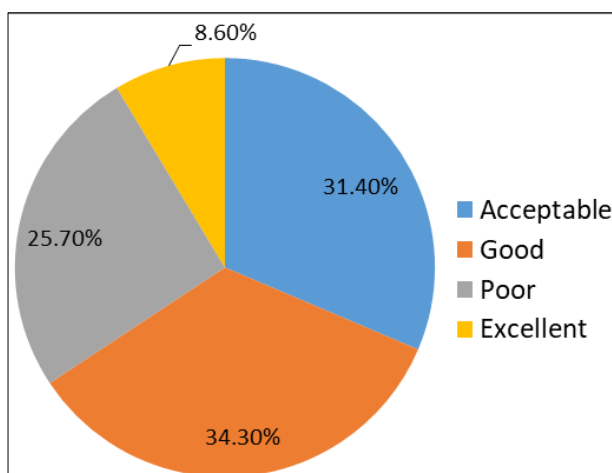


Fig 2: Functional outcomes in floating knee injuries patients

Discussion

There is an increase in the occurrence of floating knee injuries due to rising population, increase in the number of motor vehicles in most cities of the developing countries like India and therefore increase in number of road traffic accidents. High impact injuries results in floating knees. Floating knee is important because of the high mortality with associated injuries.

In our study floating knee injuries were more common among 18 to 40 years age group (48.6%), concordance with the Panigrahi RG *et al*,^[12] and Mohamadean A *et al*,^[13].

Male preponderance was seen in the present study with 91.5% patients being male. Similar findings were observed in the study done by Sagar, *et al*,^[14], Rethnam U *et al*,^[15] and Dwyer *et al*,^[16], Younger age (18-40 years) males are most commonly involved in RTAs because of their fast and rash driving habits therefore highly vulnerable to an road traffic events resulting in this injury.

In our study, the most common mode of injury was RTA (94.5%). Our findings are comparable to the studies made by Aher D *et al*,^[17], Hwan T *et al*,^[18], Andrade-Silva *et al*,^[19] and Kulkarni *et al*,^[20]. Road traffic accidents are increasing day by day because of raising population increases the number of vehicles thus more chances of floating knee injuries.

Right sided injury dominance was seen in the study (60%), which is in accordance to Goel SA *et al*,^[21] and J Veerappan *et al*,^[22]. The preponderance of right sided fractures is explained by collision with vehicles coming from the opposite side and predominant use of right leg for braking which absorbs more of shock during high speed traffic accidents.

Current study reported majority of the floating knee injury patients (88.6%) had associated injuries, in concordance with Nicola *et al*,^[23], Naureal *et al*,^[24] and S. Malhotra *et al*,^[25], reported rate of associated injuries was 89%, 86% and 85% respectively.

The likelihood of open fractures is higher than closed fractures found in present study, majority of them Type I fractures, consistent finding also reported by Chowdojirao *et al*,^[26] and Paul *et al*,^[27].

In our study the management of femur and tibia fractures done by intramedullary nailing significantly affected the functional outcomes in floating knee injuries patients, our finding was comparable with the Chavda *et al*,^[28] and Ostrum RF *et al*,^[29].

The most common complications of floating knee injuries were shock, local infections and delayed union reported in current study, similar to the Muthukumar *et al*,^[30] and A Meena *et al*,^[31].

The final outcome assessed using Karlstrom and Oleruds criteria^[32] were good to excellent outcome in 43% cases and acceptable to poor outcome in 57% cases. Our finding were correlate with the Shukla R *et al*,^[33] and Feron *et al*,^[34], whereas Anastopoulos *et al*,^[35] and Veith *et al*,^[36] reported very high rate of good to excellent outcome 81% and 72% respectively, but Muthukumar *et al*,^[30] and Adanson *et al*,^[37], reported lower rate of good to excellent outcome 24% and 25% respectively.

Conclusion

Floating knee injuries are due to high velocity motor vehicle accidents. Younger males are commonly affected. The right side injury is more frequent than the left side. Most of the floating knee injuries were open fracture with associated injuries. Common complications were shock, local infections, and delayed union. Only 43% of patients in this study had an Excellent to good and 57% of patients had acceptable to poor functional outcome. Common predictors affecting the functional outcome includes knee Stiffness, local infection, shortening, and time to union.

Conflicts of interest: None

Source of funding: None

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