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Original Research Paper

Orthopaedics

"FLOATING KNEE" - OUTCOMES IN THE MANAGEMENT OF IPSILATERAL FEMUR AND TIBIA FRACTURES

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ABSTRACT **Background:** Floating knee injuries are more common with increasing road traffic accidents. Surgical stabilization with early rehabilitation produces the best outcomes. The aim of the present study is to study the clinical outcome and various challenges faced during the treatment of these injuries. **Methods:** Cases were selected based on inclusion and exclusion criteria admitted to our hospital from June 2018 to October 2022. Data was collected regarding clinical union, radiological union, and functional outcome and analysed using Microsoft Excel. **Results:** In our study, 64% of patients returned to their pre-injury functional status with or without some modification in the work pattern, 12% of patients never returned to their pre-injury functional status due to permanent disability. **Conclusion:** Early surgery with aggressive physiotherapy even though results in more infections, and complications and needs a long hospital stay gives good overall functional results.

KEYWORDS : floating knee, outcome, ipsilateral femur, and tibia fractures

INTRODUCTION

Ipsilateral fractures of the tibia and femur that disconnect the knee from the rest of the limb are known as floating knee injuries. It includes both intra-articular and extra-articular fractures.

John T. Hayes first described these injuries in 1964.[1] In 1974 Blake Robert and McBryde named floating knee injury and moved attention to the vascular plane from the skeletal plane as these complications are dreadful and more frequent.[2]

With the increase in high-energy trauma cases as a result of an increase in the number of vehicles and industrialization incidence of these injuries is increasing.

Due to the complex nature of the injury and associated complications such as compartment syndrome, vascular injuries, collateral ligament, and meniscus injuries, management of these types of fractures is a challenging therapeutic problem. Most often these kinds of ipsilateral fractures are compound and associated with severe damage of soft tissues.

The combined femoral and tibia fractures are frequently accompanied by life-threatening head injuries, injuries to the spinal cord, and thoracic and abdominal (Visceral) injuries.

Surgical stabilization of both femur and tibia fractures and early rehabilitation of the patient produces the best clinical outcome. Although treatment planning for each fracture in the extremity should be considered individually to achieve optimal results, the effect of that decision must be considered in light of the overall injury status of the entire extremity and the general condition of the patient.

The results will be better and the complications will be less if the fractures are diaphyseal or extra-articular than intra-articular fractures. These injuries are operated on early with internal fixation to achieve the best anatomical position compatible with maximum functional return and fewer complications such as non-union, delayed union, and stiffness.

Earlier papers pointed out permanent disability and higher chances of complications with these injuries (Gillquist et al 1973;[3] McBryde and Blake 1974[2]).

Blake and McBryde in the year 1975 suggested a Classification system for floating knee injuries in adults which is still widely used. [2] Another classification system in adults was suggested in the year 1978 by Fraser. [4]While another classification system for these injuries in children was suggested by Bohn and Durbin and Letts et al.[5]

In 1977 Karlstorm and Olerud reviewed thirty-two patients and stressed the importance of surgery with rigid fixation of both fractures and suggested a universal system for assessing the functional results following these injuries.[6]

The aim of the present study is to observe the clinical, radiological, and functional outcomes and various challenges in the treatment of floating knee injuries.

MATERIALS AND METHODS

This study was conducted in the Department of Orthopaedics in a tertiary care hospital after taking Ethical committee approval from the institutional ethical committee. All patients with floating knee injuries aged between 18 to 85 and who underwent surgery were included in the study after taking informed consent. Those with neurovascular injuries and pathological fractures were excluded from the study. We reviewed the medical records of all patients selected for the study and collected information regarding clinical union, functional outcome, and radiological union. For some patients

who came for follow up data collected directly. Data is entered in Microsoft Excel and presented as tables and graphs with percentages.

RESULTS

The present study includes 25 cases of ipsilateral femur and tibia fractures, treated in the Department of Orthopaedics at a tertiary care hospital. The Patients were followed up for a minimum period of three months and a maximum of 24 months. The following observations were made in the present study.

The majority of patients were between ages twenty and forty (56%), the youngest patient was 18 years old and the oldest was 70 years. The majority of the patients were males 96% (24 patients) and only four percent were (one patient) females. The right side was involved in 18 patients (72%) in our study whereas only seven (28%) patients had left side injuries. Femur fractures were closed in 20 patients and open in five patients whereas tibia fractures were closed in 15 patients and open in ten patients. Both fractures were closed in 15 patients and opened in five patients.

13 out of the total 25 patients were having an extension of either femoral or tibial or both fractures into the knee joint and the rest 12 patients were purely diaphyseal fractures. Among 25 patients who suffered an injury, 20 patients had road traffic accidents and five patients had fallen from height.

Intramedullary nail fixation was done in more patients in the femur and external fixator in the fractured tibia as compared to other modalities. Various modalities used are as follows in Table 1

One patient need flap cover for wound coverage while four patients needed skin grafting. Five patients needed bone grafting for delayed and nonunion fractures.

Various complications are shown in Table 2 The incidence of Knee Stiffness is 36% in Type II floating knee injuries as compared to 16% in Type I floating knee injuries. In our study, five out of 25 cases developed more than three centimetres shortening. All five cases were due to severe comminution and soft tissue injury. These were managed with footwear modification.

We used Karlstrom and Olerud Criteria-For assessing the Functional outcome of patients with floating knee injuries. Results are shown in Table 3

In our study, 64% of patients returned to their pre-injury functional status with or without some modification in the work pattern. 12% of patients never returned to their pre-injury functional status due to permanent disability. Thus floating knee injuries result in a significant amount of morbidity and permanent disability.

Case: A 22-year-old male patient met with a road traffic accident, was hit by a car while walking on the road, and sustained an injury to the right lower limb. Figures 1 to 4 serial radiographs show a gradual union of fractures. Figure 5 clinical photos showing a good range of motion at twelve months.

DISCUSSION

Winston M.E recommended conservative treatment for floating knee injuries to be a safe method producing acceptable results without dangers of infection, which is present with internal fixation. [7] In our study, four undisplaced tibial fractures were treated conservatively with an above-knee cast and patellar tendon bearing cast. There was a local infection in eight cases of tibial fractures out of 25 and two infections associated with femoral fracture. Only four fracture tibia and one fracture femur developed chronic osteomyelitis which was open Grade IIIB according to Gustilo – Anderson classification.

Yue et al., Chirchill R.S. in a comparative study of operative and non-operative treatment of ipsilateral fractures of the femur and tibia concluded that operative stabilization was associated with less leg length discrepancy, angular malunion, and secondary procedures from conservative treatment. [8]

While in our study of 25 cases, four femur fracture cases showed delayed union, three tibial fracture cases had delayed union, and five tibial fractures developed Nonunion that healed after secondary surgeries, in comparison to Boscher, Fouque, and Le Nay's study of 26 cases of the floating knee in which 26 cases were treated by internal fixation, 13 healed with no complications and other six healed after treating complications. [9] The results of our study are in line with this study.

In our study average hospital stay was 40 days. When both the fractures were closed and treated with early internal fixation, the total hospital stay of the patient was 14-21 days. In a study by Anastopopulous. G 32 cases of floating knee were treated. [10] The femoral fracture was fixed with closed intramedullary nailing, and the time spent in the hospital ranged from 12 to 105 days (mean 30 days). In contrast, in our study of 25 cases of the floating knee, all femur fractures were treated surgically, 21 out of 25 tibia fractures were treated surgically, and four fractures were treated conservatively. The time spent in the hospital ranged from 30 to 50 days (mean 40 days).

In our study, 15 patients (60%) had knee ranges of motion between excellent and acceptable (0-100 degrees). In contrast, only four patients out of 13 with McBryde and Blake Type I floating knee experienced knee stiffness, which is defined as a loss of knee flexion of more than 30 degrees. Seven out of 12 cases with McBryde and Blake Type II floating knee experienced knee stiffness.

Compound fractures of the femur and tibia which developed complications such as delayed union, nonunion, or osteomyelitis lead to knee stiffness even when extra-articular. Thus intra articular extension of either one or both fractures into the knee joint was associated with a markedly higher incidence of knee stiffness. Internal fixation and aggressive early physiotherapy were more effective treatments for Type I floating knee injuries than delayed fixation and protracted immobilization.

Results of Type IIA fractures are poor than that of fractures without involvement of knee joint. Rethnam V. concluded that the prognostic fractures in floating knee injuries include the associated injuries and the type of fracture whether it is open, intra-articular, or comminuted. [11] In comparison to results of type II floating knee injuries, had 24% excellent to good in series by Adanson et al our results are excellent to good in 25% of cases; whereas Hung et al had 23.8% excellent to good results in their study. [12, 13]

Yokoyama et al concluded that involvement of knee joint, and the severity grade of soft tissue injury represent significant risk factors of poor outcome of floating knee injuries. [14]

According to Karlstrom and Olerud, when both fractures were surgically treated, the average hospital stay was 11.5 weeks. [6] In our study, the typical length of stay in the hospital was 40 days.

Omer et al reported a 31% incidence of infection in non-

operatively treated patients. [15] Fraser et al reported a higher infection rate in those treated with stabilization of both fractures surgically than those treated non-operatively (20% Vs. 8%). [4] Veith et al reported that when any fracture was surgically stabilized, the infection rate was only 5%. [16] Veith et al reported only a 5% infection rate when any one of the fractures was surgically stabilized. [16] McAndrew and Gregory et al respectively reported deep infection in 22% of tibial fractures and 11% in femur fractures. [17, 18] In our series deep infection rate was 16% in tibial fractures and 4% in femur fractures and is comparable to previous studies.

Karlstrom and Olerud estimated a healing time of 20 weeks, whereas Adanson et al estimated a healing time of 39 weeks for the femur and 37.5 weeks for the tibia. [6, 12] In our series average healing time was around 24 weeks for the femur and 25 weeks for the tibia which is comparable to previous studies. By using Karlstrom and Olerud criteria the functional outcome was excellent in ten patients (40%), good in five patients (20%), acceptable in three patients (12%), and poor in seven patients (28%). In contrast to the 86% in the Karlstrom and Olerud series, 72% in the Veith series, and 81% in the Anastropopulas series, excellent to good results were attained in 60% of patients. [6, 16, 10] These results are better when compared to non-operative treatment according to Fraser et al (29%). [4]

CONCLUSION

From our study, we conclude that early surgery with aggressive physiotherapy even though results in more infections, and complications and needs long hospital stays gives good overall functional results. With further improvements in surgical practices like fixation methods and better infection control measures results are going to improve further. Further studies to focus on better fixation techniques that enable an early active range of motion of joints with lesser infections are recommended.

Tables: Table 1 showing various treatment modalities

Treatment Modality	Femur	Tibia
Conservative	0	4
Intramedullary nailing	16	8
Plating	3	3
External fixator	6	10

Table 2 showing various complications and percentage

S No	Complication		Number	Percentage
1	Shock		17	68%
2	Compartment Syndrome		1	4%
3	Mal Union	Femur	0	0%
		Tibia	4	16%
4	Delayed union	Femur	4	16%
		Tibia	3	12%
4	Non Union	Femur	0	0%
		Tibia	5	20%
5	Chronic osteomyelitis	Femur	1	4%
		Tibia	4	16%
6	Knee Stiffness		15	60%
7	Shortening > 3 cm		5	20%
8	Local infection	Femur	2	8%
		Tibia	8	32%

Table 3 showing functional outcome and range of motion

Criteria	Excellent	Good	Acceptable	Poor
Subjective Symptoms of thigh or leg	(9)	(7)	(4)	(5)
Subjective symptoms from knee or ankle joints	(10)	(6)	(4)	(5)
Walking ability	(10)	(10)	(2)	(3)
Work &Sports	(10)	(6)	(6)	(3)
Angular or rotational deformity or both	(11)	(8)	(2)	(4)
Shortening	(13)	(5)	(2)	(5)
Restriction of Joint movements				
Hip	(16)	(5)	(4)	(0)
Knee	(10)	(4)	(4)	(7)
Ankle	(20)	(2)	(3)	(0)

Figure legends:

Figure 1: pre-operative radiographs

Figure 2: post-operative radiographs

Figure 3: three months follow up radiographs

Figure 4: one year follow up radiographs

Figure 5: clinical images showing good range of motion

REFERENCES

1. Hayes J.T. Multiple fractures in the same extremity: some problems in their management, Surg Clin North Am 1961 Oct; 41: 1379-88. Doi:10.1016/s0039-6109(16)36499-4.
2. Blake R, McBryde A Jr. The Floating knee: Ipsilateral fractures of tibia and femur. South Med J. 1975 Jan; 68(1):13-6. PMID: 807974.
3. Gillquist J, Rieger A, Sjodahl R., Bylund P. Multiple fractures of a single leg. A therapeutic problem. Acta Chir Scand. 1973; 139(2):167-172. PMID: 4718168.
4. Fraser R.D, Hunter GA, Waddell JP. Ipsilateral fracture of the femur and tibia. J Bone Joint Surg Br 1978 Nov; 60-B (4):510-5. Doi: 10.1302/0301-620X.60B4.711798. PMID 711798.
5. Letts M, Vincent N, Gouw G. The "floating knee" in children. J Bone Joint Surg Br. 1986 May; 68(3):442-6. doi: 10.1302/0301-620X.68B3.3733812. PMID: 3733812.
6. Karlström G, Olerud S. Ipsilateral fracture of the femur and tibia. J Bone Joint Surg Am. 1977 Mar; 59(2):240-3. PMID: 845210.
7. Winston ME. The results of conservative treatment of fractures of the femur and tibia in the same limb. Surg Gynecol Obstet. 1972 Jun; 134(6):985-91. PMID: 5032396.
8. Yue JJ, Churchill RS, Cooperman DR, Yasko AW, Wilber JH, Thompson GH. The floating knee in the pediatric patient. Nonoperative versus operative stabilization. Clin Orthop Relat Res. 2000 Jul; (376):124-36. doi: 10.1097/00003086-200007000-00018. PMID: 10906867.
9. Boscher Y, Fouque PA, Le NayP, Pidhorz L: Diaphyseal fractures of the lower extremity, Int Orthop. 1987;11(4):353-60
10. Anastopoulos G, Assimakopoulos A, Exarchou E, Pantazopoulos T. Ipsilateral fractures of the femur and tibia. Injury. 1992; 23(7):439-41. doi: 10.1016/0020-1383(92)90058-z. PMID: 1446927.
11. Rethnam U, Yesupalan RS, Nair R. The floating knee: epidemiology, prognostic indicators & outcome following surgical management. J Trauma Manag Outcomes. 2007 Nov 26; 1(1):2. doi: 10.1186/1752-2897-1-2. PMID: 18271992; PMCID: PMC2241764.
12. Adamson GJ, Wiss DA, Lowery GL, Peters CL. Type II floating knee: ipsilateral femoral and tibial fractures with intraarticular extension into the knee joint. J Orthop Trauma. 1992; 6(3):333-9. PMID: 1403253.
13. Hung SH, Chen TB, Cheng YM, Cheng NJ, Lin SY. Concomitant fractures of the ipsilateral femur and tibia with intra-articular extension into the knee joint. J Trauma. 2000 Mar; 48(3):547-51. doi: 10.1097/00005373-200003000-00034. PMID: 10744304.
14. Yokoyama K, Tsukamoto T, Aoki S, Wakita R, Uchino M, Noumi T, Fukushima N, Itoman M. Evaluation of functional outcome of the floating knee injury using multivariate analysis. Arch Orthop Trauma Surg. 2002 Nov; 122(8):432-5. doi: 10.1007/s00402-002-0406-7. Epub 2002 Apr 25. PMID: 12442178.
15. Omer GE Jr, Moll JH, Bacon WL. Combinded fractures of the femur and tibia in a single extremity. Analytical study of cases at Brooke General Hospital from 1961-to1967. J Trauma. 1968 Nov; 8(6):1026-41. PMID: 5722119.
16. Veith RG, Winquist RA, Hansen ST Jr. Ipsilateral fractures of the femur and tibia. A report of fifty-seven consecutive cases. J Bone Joint Surg Am. 1984 Sep; 66(7):991-1002. PMID: 6480657.
17. McAndrew MP, Pontarelli W. The long-term follow-up of ipsilateral tibial and femoral diaphyseal fractures. Clin Orthop Relat Res. 1988 Jul; (232):190-6. PMID: 3383487.
18. Gregory P, DiCicco J, Karpik K, DiPasquale T, Herscovici D, Sanders R. Ipsilateral fractures of the femur and tibia: treatment with retrograde femoral nailing and unreamed tibial nailing. J Orthop Trauma. 1996; 10(5):309-16. doi: 10.1097/00005131-199607000-00004. PMID: 8814571.