Original Article

Functional Outcome of Operatively Treated Floating Knee Injuries in Adults

Aher D, Sonkar D, Sharma P, Maravi D S.

Study performed at Department of Orthopaedics, Gandhi Medical College, Bhopal, Madhya Pradesh, India

Abstract

Background: Floating knee injuries result from high velocity trauma and are associated with high morbidity. There are no clear guidelines for their management. This study evaluated the functional outcomes of operatively treated floating knee injuries in adults and the factors affecting them.

Methods: Thirty patients (29 men, 1 women; mean age30.7 years; range, 15 to 70 years) were included in the study. The fractures were classified according to the classification by Blake and McBrydes.Femur fractures were treated using intramedullary interlocking nails either antegrade or retrograde or locking compression plate and tibia fractures were treated with either external fixator, locking compression plate or intramedullary interlocking nails. Follow up was done at 4 weeks, 8 weeks, 6 months and 1 year.

Results: The functional outcome was accessed using Karlstrom And Olerued Criteria and was: Excellent in 3, Good in 9, Acceptable in 10 and Poor in 8 patients.

Conclusion: The factors which determine the functional outcomes were type of fracture (open or closed), pattern and site of fracture, presence of intra articular extension and method of fixation used. The best management of these injuries involves intramedullary nailing of both the fractures.

Keywords: Ipsilateral, Fracture, Femur, Tibia, Floating knee

Address for Correspondence: Dr. Deepak Aher **,** Department of Orthopaedics, Gandhi Medical College, Bhopal, M. P. 462001, India

Email:deepakaher07@gmail.com

How to site this article: Aher D, Sonkar D, Sharma P, Maravi D S.Functional Outcome of Operatively Treated Floating Knee Injuries in Adults. OrthopJMPC 2016;22(2):11-15.

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. They usually occur due to high energy trauma. These are always associated with high morbidity. There are no clear guidelines for the management, as per the available literature. The implant of choice needs to be determined depending on nature of fracture and soft tissue injuries. The incidence of floating knee injuries was reported as 2.6 % of all fractures by Letts et al[1]. These injuries were associated with life threatening injuries such as head injuries, chest injuries and abdominal injuries as shown by Veith [2]. 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 planning of management.

Material and Methods

A prospective study was conducted in Department of Orthopedics and Traumatology, Gandhi Medical College and Hamidia Hospital, Bhopalfrom Sept 2014-Sept 2016. Thirty non-consecutive patients with ipsilateral femur and tibia fractures who fulfilled the inclusion criteria were included in the study.

The patients were classified according to Blake and Mcbryde'sClassification for floating knee injuries [3].

Inclusion criteria:

1.Patients with age >15 and <70

2.Recent history of trauma (within 1 week)

Exclusion criteria:

1.Patients with age <15 and >70

2.Pathological fractures

3.Associated contralateral hip and ankle injuries.

All patients were managed in emergency department as per ATLS protocol. In Open fractures wound wash and irrigation was done with minimum of 5L of sterile normal saline. Broad spectrum antibiotics were given and prophylactic tetanus toxoid was given. Open fractures were classified according to Gustilo and Anderson classification [4].

Once the patient was stable the femur fracture was fixed prior to the tibia fracture. Thromboprophylaxis was initiated in all patients during the postoperative period. Physiotherapy was started as soon as the pain subsided. Non weight bearing walking using crutches was permitted after 2 weeks, followed by partial weight bearing. Full weight bearing was allowed only after clinical and radiological union had been confirmed.

Follow up was done at 4 weeks, 8 weeks, 6 months and 1 year to evaluate the functional outcome and the radiological signs of union.Functional assessment was measured using the Karlstrom's and Oleruedcriteria [5].

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

Results

The age of the patients ranged from 15 years to 70 years. There were 29 males (96.66%)and 1 female(3.3%).

Right sided injury was more common - 18 (60%). Road traffic accident was the commonest cause – 30(100%). Open fractures were seen in 12 femurs (40%) and 18 tibias (60%).There were 6 femur intraarticular fractures(20%) and 11 tibia intraarticular fractures (36.66%). Comminuted fractures were present in 20 femur fractures(66.66%) and 24 tibia fractures(80%). Type I Blake and McBryde's floating knee injuries were the commonest 20 cases(66.66%). External fixators were applied to and 2 tibias(6.6%). Plating was done in 12 femurs(40%) and 12 tibias(40%). Antegrade intramedullary nailing was done in 16 femur fractures (53.33%).Retrograde intramedullary nailing was done in 2 femurs(6.6%). Tibial Nailing was done in 16 patients(53.33%). Infection was seen in 5 patients (33.33%) and Malunion in 3 patients(26.6%).

All the three patients with excellent outcome had tibial nailing done.Among the eight Poor outcome patients, six patients had comminuted fractures of the femur and tibia.Infection was the most dreaded complication in our study. There were 5

cases (16.6%) with infection, 2 of them underwent implant removal, 3 underwent wound debridement . Poor outcomes were seen in 3 patients with infection. The Initiation of knee mobilization ranged from one week to seventeen weeks with a mean of 5.17 weeks.The initiation of weight bearing range from 4 weeks to 25 weeks with the mean of 10.47 weeks.The overall Average knee range of motion was 5 to 1000. The average knee range of motion in Excellent outcome group of patients was 0 – 170^0. Good outcome group of patients had 0 – 160^0. Acceptable outcome group of patients had 0 - 140^0 and Poor outcome group of patients had 15 – 60^0.

Discussion

Floating knee injury occur due to high velocity trauma. There is an increase in the occurrence of floating knee injuries due to the increase in number of road traffic accidents. Most of these injures results in permanent disability if not treated appropriately.In our study the most common mechanism of injury was road traffic accidents (100%).The more number of road traffic accident cases were due to the fact that our hospital is a tertiary referral centre. Hayes JTsuggested 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 [6]. In a study of 222 cases in 1978 , of floating knee by Fraserall cases were involved in road traffic accidents [7]. In the present study also, road traffic accidents was the cause in all 30 patients (100%). Adamson et al in their study encountered 71% major associated injuries with 21% vascular injuries [8]. Hee et al described similar results in their study [9]. In this study right sided injuries (60%) were more common than left sided injuries (30%). Among the femur fractures 18 (60%) were closed, open grade II were 2 (6.6%), open grade III A were 5 (16.6%) and grade III B were 5 (16.6%). Among the tibia fractures, closed were 12 (40%), open grade II were 5(16.6%), open grade IIA were 3 (10%), open grade III B were 8 (26.6%) and grade IIIC were 2 (6.6%). Hee et al had described that comminuted and segmental fractures were poor predictors of the functional outcome [9]. Fraser found that poor functional outcome was seen in intraarticular fractures [7]. Similar results were shown by Bansal et al [10]. In our study, 17 (28.3%) cases had intraarticular fractures and 13 cases had extrarticular fractures.Blake and McBryde [3] were one of the pioneers to classify floating knee injuries. After an extensive study, they had classified floating knee injuries as Type I fractures involving both shafts, Type II A- fractures involving the knee joint, Type IIB- fractures involving the hip or ankle joints. In this study we had 20 (66.66%) of type-I, 10 (33.33%) of type-IIA and none (0%) cases were type-IIB injuries as per Blake and McBryde.

There are only few studies in literature which shows specific treatment for floating knee injuries. Initially non operative management was described by Ul-Haque et al in 1983 [11]. In 1984 Katada et al described that both femoral and tibial fractures, must be fixed rigidly [12].. In 1986 Letts et al 1described that at least one fracture should be rigidly fixed either internally or externally, usually the femur. Femoral fixation and non operative management for associated ipsilateral tibial fractures by plaster of paris was described by Bansal et al 10 in 1984. Flexible intramedullary nails were described by Behr et al in 1987 [13]. Soft tissue sparing surgery like percutaneous plating was described by Lobenhoffer 1996 [14]. Single incision nailing for both tibia and femur was described by Rethnam et al in 2006 [15]. Dwyeret al 2005 described that the

preferred method of fixation in both femoral and tibial diaphyseal fracture was intramedullary nailing [16]. In study done by Gregory et al in 1996, he described retrograde nailing of the femur and undreamed nailing for the tibia [17]. In our study, all fractures were fixed rigidly Retrograde intramedullary nailing was done in 2 (6.6%) antegrade nailing in 16 cases and plating in 12 cases of femur fractures. Among the tibial fracture 2 (6.6%) were fixed with External fixators out of which both had poor outcome. 12 patients were treated with plating and they had good outcome. 16 patients were treated with intramedullary nailing and out of which 9 patients had either excellent or good outcome.

Infection was the most common complication seen in 33% patients .The complications were found to be more in open fractures. Scheidts et al conducted similar study for malunion [18].

Knee mobilisation was started depending upon the type of fractures and the implant used. Knee mobilization period ranged from 1 week to 17 week. Weight bearing depended upon the type of fracture, implant used and associated other injuries. Full weight bearing was done after complete bony union. The knee range of motion was an important criterion for the functional outcome [19]. In our study,the maximum range recorded was $0\text{-}170^0$. The minimum range recorded was $20 – 80^0$.

Name ofStudy	**n**	**Excellent**	**Good**	**Acceptable**	**Poor**
Fraser et al1978	**63**	**3**	**15**	**30**	**15**
Schiedts etal 1994	**18**	**4**	**7**	**-**	**7**
Hee et al2001	**89**	**6**	**53**	**25**	**4**
AnoopKumar et al2006	**42**	**7**	**14**	**14**	**7**
UlfinRethnam etal 2007	**29**	**15**	**9**	**2**	**3**
THISSTUDY2016	**30**	**3**	**9**	**10**	**8**

Table 1: Comparison of functional outcome of this study with other studies

Conclusion

Floating knee injuries are due to high velocity trauma. Poor outcomes were seen in open fractures, comminution and intraarticular extension. Excellentoutcome wasseen in Blake And Mcbrydes type I fractures and whereboth femur and tibia fractures were either close or transverse or both.Intramedullary nailing of both femur and tibia gave excellent outcome. As per the site of fracture,diaphyseal fractures or fractures at the diaphyseal metaphyseal junction had excellent outcomes.Performing early operative intervention gave good outcomes in this study.Further studies are needed in future to strengthen this conclusion.

References

1. Letts M, Vincent N, Gouw G. The "floating knee" in children. J Bone and Joint Surg Br 1986 May;68(3):442-46.
2. 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

3. Blake R, McBryde A Jr . The floating knee: Ipsilateral fractures of the tibia and femur.South Med J 1975 Jan;68(1):13-6.

4. Gustilo RB, Anderson JT. Prevention of infection in the treatment of one thousand and twenty-five open fractures of long bones: retrospective and

   prospective analyses. J Bone Joint Surg Am 1976 Jun;58(4):453-58.

5. Karlstrom G, Olerud S . Ipsilateral fracture of the femur and tibia. J Bone Joint Surg Am 1977 Mar;59(2):240-43.

6. Hayes JT: Multiple fractures in same extremity: Some problems in their management. Surgical Clinics of North America 1961;41:1379-88.

7. Fraser RD, Hunter GA, Waddell JP. Ipsilateral fracture of the femur and tibia. J Bone Joint Surg Br 1978 Nov;60-B(4):510-15.

8. 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):333-39.

9. Hee HT, Wong HP, Low YP, Myers L. Predictors of outcome of floating knee injuries in adults: 89 patients followed for 2-12 years. Acta OrthopScand 2001 Aug;72(4):385-94.

10. Bansal VP, Singhal V, Mam MK, Gill SS The floating knee. 40 cases of ipsilateral fractures of the femur and the tibia. IntOrthop 1984;8(3):183-87.

11. Ul-Haque I. A floating knee treated conservatively: a case report. Injury 1983May;14(6):554-57.

12. Katada S, Ando K, Nakagawa K, Yamada T, Sasamoto H, Kawabe N et al. Floating knee fracture (ipsilateral fracture of the femur and tibia)--treatment by closed Ender nailing. Nippon Seikeigeka Gakkai Zasshi 1984 May;58(5):475-83.

13. Behr JT, Apel DM, Pinzur MS, Dobozi WR, Behr MJ . Flexible intramedullary nails for ipsilateral femoral and tibial fractures. J Trauma 1987 Dec;27(12):1354-

14. Lobenhoffer P, Krettek C, Tscherne H. Complex knee joint trauma Orthopade. 1997 Dec;26(12):1037-45.

15. Rethnam U . Single incision nailing of the floating knee-do we ignore the knee ligaments?. IntOrthop 2006 Aug;30(4):311.

16. Dwyer AJ, Paul R, Mam MK, Kumar A, Gosselin RA. Floating knee injuries: long-term results of four treatment methods. IntOrthop 2005 Oct; 29(5):314-18

17. 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.

18. Schiedts D, Mukisi M, Bouger D, Bastaraud H . Ipsilateral fractures of the femoral and tibial diaphyses. Rev ChirOrthopReparatriceAppar Mot 1996; 82(6):535-40.

19. Kumar A, Mam MK, Paul R. Ipsilateral fracture of femur and tibia, treatment and functional outcome. J K Science: Journal of Medical Education and Research 2006;8 (1):42-44.