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A COMPARATIVE STUDY BETWEEN DIFFERENT TREATMENT MODALITIES OF FLOATING KNEE INJURY AT ASWAN UNIVERSITY HOSPITAL

Mohamed Salman[1], Ahmed M.Gamal[1], Ebeed Yassen Ebrahim[2], Hesham Hamed Refae[3]

[1]Orthopedic Lecturer, Orthopedic Department Aswan University, Egypt
[2]Assistant Professor, Orthopedic Department, Aswan University, Egypt
[3]Head Of Orthopedic Department, Aswan University, Egypt

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Corresponding Author:
Mohamed Salman

ABSTRACT

Purpose: *The study aimed at presenting a comparison between the modalities of treatment different of floating knee injury at Aswan University Hospital.*

Materials and Methods: *This study is a prospective study including all of our 20 cases of floating knee injuries who were treated utilizing various treatment modalities at Aswan University Hospital between December 2018 and September 2019 with a follow-up period of 12 months*

Results: *Based on the data analysis, nailing is a better modality in floating knee injury (especially with diaphyseal long bone). Moreover, plating is a good choice for distal fractures, the external fixator is considered a choice for limb saving(as in popliteal ischemia, open fractures(OG3), and compartment syndrome).*

Conclusion: *Management of floating knee injury is critical as floating knee injury is not like other fractures. Floating knee injuries are serious injuries with a high rate of complications. Besides being caused by high-energy trauma with extensive skeletal and soft tissue damage, they are also associated with potentially life-threatening injuries of the head, chest, and abdomen. There are multiple controversies in surgical management starting from choosing suitable fixation for each patient according to variable conditions. Floating knee injury remains a challenging orthopedic problem in which regaining good knee function outcome is a major concern. Stable osteosynthesis to achieve rigid fixation and early mobilization should always be attempted.*

INTRODUCTION

Blake and McBryde described the term ‘floating knee’ for such injuries in the year1975 (Blake & McBryde, 1975; Karlström & Olerud, 1977). A floating knee is a flail knee joint resulting from fractures of the shafts or metaphyses of the femur and ipsilateral tibia (Vives et al., 2016). Floating knee injuries are complex And are further classified into shaft fractures of both bones without the involvement of either fracture into the knee, Type II fractures extended into the knee and were further sub-divided. Type IIa involved the tibial plateau, Type IIb included the

distal femur into the knee, and type IIc involved both the tibial plateau and the distal femur within the knee joint (Fraser et al., 1978). The floating knees were classified with modified Fraser classification as three types: type I, extra-articular fracture; type II, articular surface involved; and type III, patella involved. Type II injuries were subdivided into type IIA injury (articular simple) and type IIB injury (articular complex) (Ran et al., 2013). This disruption of the skeletal integrity of the knee is usually the result of a high energy trauma explaining the high rate of associated lesions and complications (Feron et al., 2015).

Some of the published reports mention unsatisfactory outcomes in the floating knee but few studies have reported good to excellent outcomes after surgical intervention (Fraser et al., 1978; Feron et al., 2015; Rethnam et al., 2009; Kao et al., 2010; Hung et al., 2007; Hegazy, 2011; Veith et al., 1984; Vives et al., 2016; Hee, et al., 2001). The complex fracture pattern compromised soft tissue and ligament injuries along with associated life-threatening visceral injuries may affect the functional outcome (Kumar, 2011; Bertrand & Andrés-Cano, 2015; Joshi et al., 2007; Ran et al., 2013; Chalidis et al., 2006; Paul et al., 1990; Dwyer et al., 005). This injury most commonly occurs in younger patients (Veith et al., 1984; Behr et al., 1987). Most floating knee injuries are caused due to high-velocity mechanisms and are often associated with other injuries to other parts of the body, including severe soft tissue injury. These high-velocity mechanisms include: motor vehicle accidents, falls from height, pedestrian vs. auto accidents, cyclist vs. auto accidents. blunt trauma is a rare cause) (Adamson et al., 1992; Gregory et al., 1996). The floating knee may be associated with damage to the vessels (mainly the popliteal and posterior tibial arteries). Vascular and neurological injuries are common and may be limb-threatening if not recognized and addressed complete resolution cannot (eg, peroneal nerve) (Jain et al., 2014; Weinberg et al., 2016).

In connection to this purview, the present study aims to present a comparison between the different treatment modalities of floating knee injury at Aswan University Hospital. A prospective design was adopted to achieve the stated aim.

METHODOLOGY

This study is a prospective study including all of our 20 cases of floating knee injuries who were treated utilizing various treatment modalities at Aswan University Hospital between December 2018 and September 2019 with a follow-up period of 12 months. Among our cases, 5(25%) cases underwent temporary external fixation followed by definitive management,5(25%) cases underwent femoral and tibial plating, 6(30%) cases underwent femoral and tibial nailing and 4(20%) cases underwent combined internal fixation (nailing and plating). Modified Cincinnati knee score is used as a guidance for knee function outcome assessment (Noyes et al., 1989).

Table 1. Function Outcome Assessment

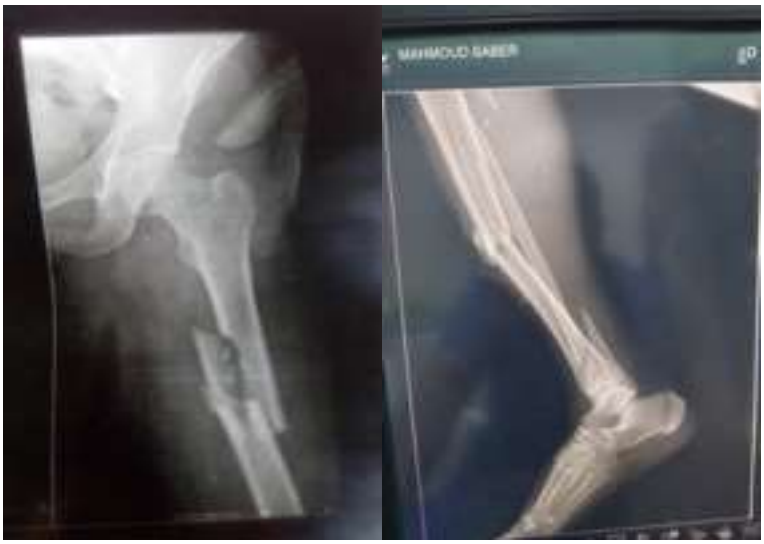
Measure	Ability	Points
Walking	normal unlimited	**40**
	walking some limitations	**30**
	only 3-4 blocks possible 20	**20**
	less than 1 block possibl 0	**0**
Stairs	Normal unlimited	**40**
	some limitations	**30**
	only 11-30 steps	**20**
	only 1 – 10 steps possible	**0**

Squatting and Kneeling	normal unlimited	**40**
	some limitations	**30**
	only 6 – 10 possible	**20**
	only 0 – 5 possible	**0**
Straight Running	full competitive	**100**
	some limitations guarding 80	**80**
	half-speed definite limitations	**60**
	not able	**40**
Jumping and Landing	fully competitive 100	**100**
	some limitations guarding 80	**80**
	half-speed definite limitations 60	**60**
	not able 40	**40**
Hard Twists Cuts Pivots	fully competitive	**100**
	limitations guarding	**80**
	some half-speed definite limitations	**60**
	not able	**40**

Mean modified Cincinnati score in our study group was 54.75±26.48. There was a significant difference between different treatment modalities (temporary external fixation, platting, nailing and combined internal fixation) as regard modified Cincinnati score (30±14.14 , 42±26.6 , 79.17±9.70 and 65±21.21 respectively) P-value 0.002 in case of primary femoral and tibial nailing indicating better knee function outcome than other treatment modalities.

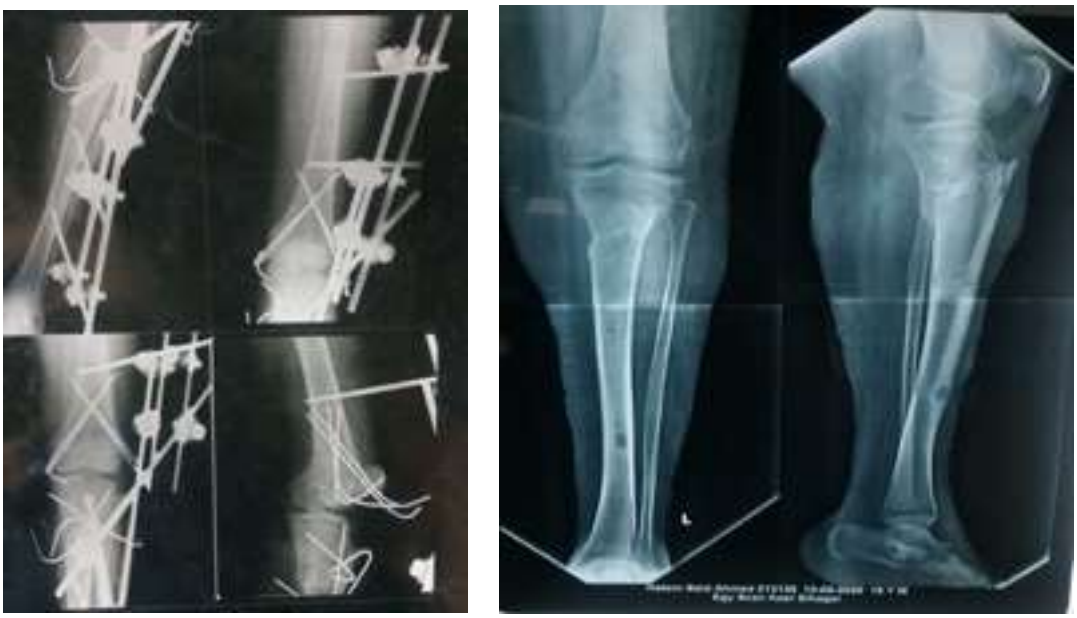
Table 2. Different Treatment Modalities

Methods of fixation	NO.	%
Temorary external fixation	5	25
Platting	5	25
Nailing	6	30
Combined internal fixation	4	20

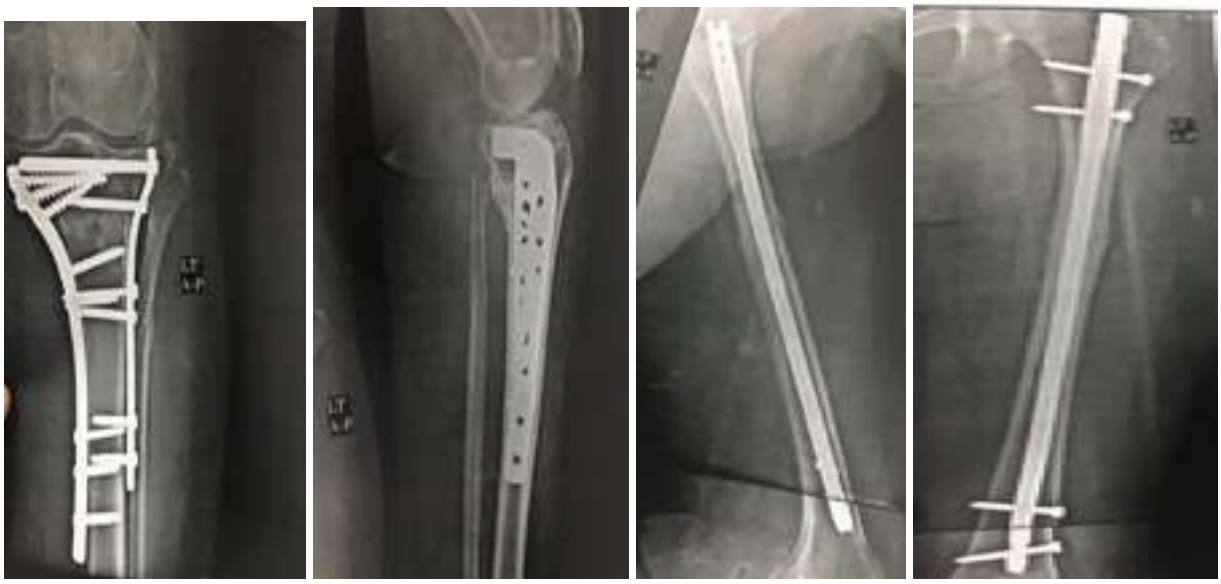


Male patient 18y old, Roat traffic accident floating knee injury, associated vascular injury(popliteal artery) fixed by external fixator and K- wires

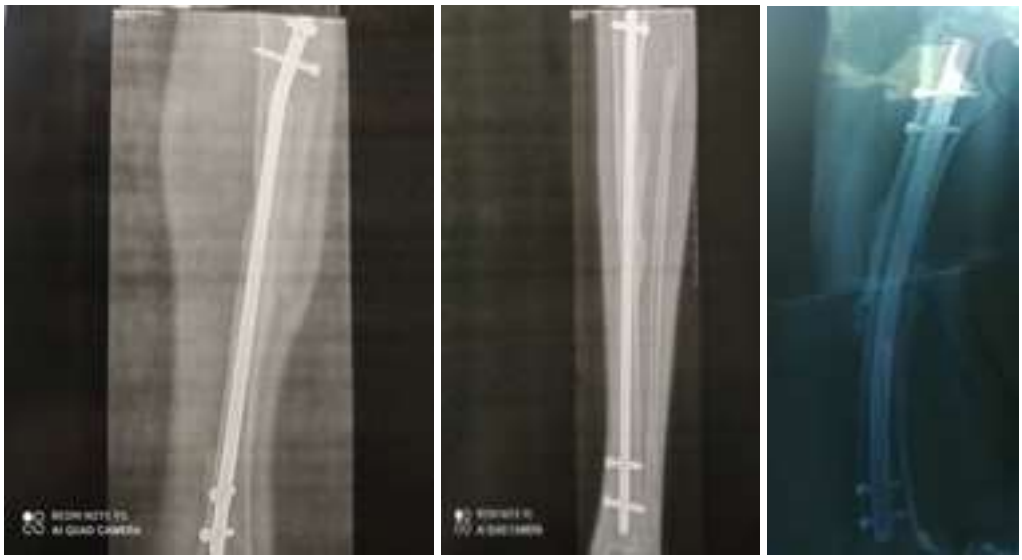
Postoperative x rays



Male pt,30y ,FFH, Floating knee injury, No history of comorbidity



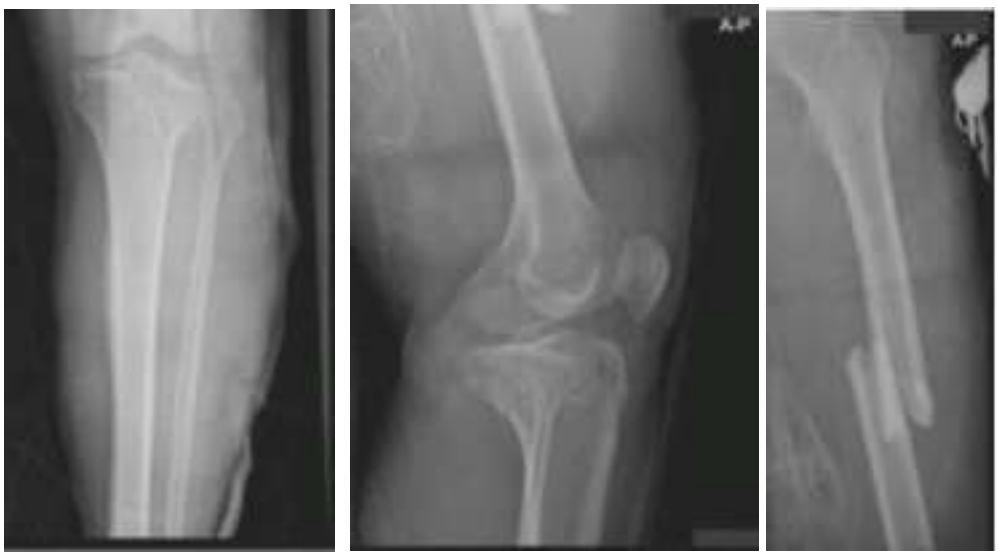
Fixed by nail



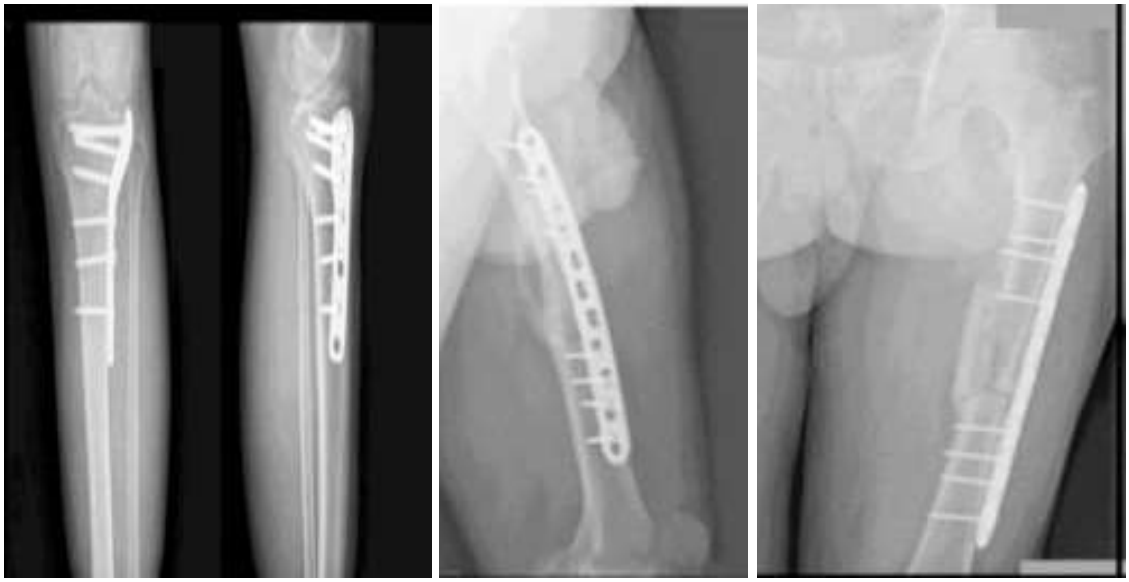
Post operative x rays

Female pt ,55y ,RTA, Floating knee injury ,no history of comorbidity fixed by combined fixation.

post operative x rays after 6 months



Male pt 28y, MCA ,floating knee injury ,no history of comorbidity fixed by plating



Post x rays after 8months

RESULTS AND DISCUSSION

The mean age between our study group was found to be 38.75 ±11.35. Twelve males and eight females were included in our study. Among our cases, 3 cases were diabetic, 1 case was hypertensive and 1 case was renal dialysis, 12 (60%) cases had their injuries as a result of motor car accidents while 8(40%) cases had their injuries as a result of fall from height, 10 (50%) cases had open fractures femur and tibia and 10 (50%) cases had closed femoral and tibial fractures. Mean operative time among our cases was found to be 90± 15.50 min and mean blood loss was found to be 220 ±60.55 CC.

A number of sessions were found to be 1.35± 0.35, ranging from (2 to 3) sessions among cases treated with temporary external fixation while other treatment modalities were performed in the same session. In our study, the postoperative complication rate was found to be 40%. Between different treatment modalities, patients treated with femoral and tibial nailing had the lowest complication rate (16.67%) only 1 case with the delayed tibial union more than 4 weeks, patients treated with acute femoral and tibial plating had a complication rate of (40%);1 case had knee stiffness and 1 case had delayed femoral union, patients treated with combined internal fixation had a complication rate of (50%);1 case had knee stiffness and 1 case had delayed tibial union, patients treated with temporary external fixation were associated with the highest complication rate (80%);1 case had knee stiffness,1case had an infection, 1 case had non united femur and 1 case had lower limb DVT

Table 3. Relation between the method of fixation and Cincinnati knee score

Relation between method of fixation and Cincinnati knee score	Excellent	Good	Fair	Poor
Temporary external fixation	0	1	0	4
Platting	1	0	2	2
Nailing	5	1	0	0
Combined internal fixation	2	1	1	0

Table 4. Treatment Modalities

Treatment modalities	Cincinnati score	P value
Temporary external fixation	30±14.14	0.002
Platting	42±26.6	
Nailing	79.17±9.70	
Combined internal fixation	65±21.21	

Table 5. Comparison As Regard Complication Rate

Comparison As Regard Complication Rate	Infection	Knee Stifness	Non Union	Delayed Union	Dvt	Complication Rate
Temporary External Fixation	1	1	1	0	1	80%
Platting	0	1	0	1	0	40%
Nailing	0	0	0	1	0	16.67%
Combined Internal Fixation	0	1	0	1	0	50%

There are multiple controversies in surgical management starting from choosing suitable fixation for each patient according to variable conditions. Floating knee injury remains a challenging orthopedic problem in which regaining good knee function outcome is a major concern. There is no single ideal method of treating a patient with a floating knee injury. The surgical sequence should be individualized for each patient and it depends on fracture pattern, location, soft tissue injury, available resources, surgical capability, and preference. Stable osteosynthesis to achieve rigid fixation and early mobilization should always be attempted. This depends on the general conditions of the patient, age, weight, normal activity of the patient before the injury, types, and classifications of fractures, and Available procedures and surgical experiences.

All of our 20 cases with floating knee injuries were included in our study who were treated utilizing various treatment modalities. Among our cases, 5(25%) cases underwent temporary external fixation followed by definitive management,5(25%) cases underwent femoral and tibial plating, 6(30%) cases underwent femoral and tibial nailing and 4(20%) cases underwent combined internal fixation (nailing and plating) . 60% of our cases were as a result of motor car accidents 106 while 40% of cases were as a result of fall from height. Mean operative time among our cases was found to be 90± 15.50 min and mean blood loss was found to be 220 ±60.55 CC. Modified Cincinnati knee score is used as guidance for knee function outcome assessment. The mean modified Cincinnati score in our study group was 54.75±26.48. There was a significant difference between different treatment modalities (temporary external fixation, platting, nailing, and combined internal fixation) as regard modified Cincinnati score (30±14.14 , 42±26.6 , 79.17±9.70 and 65±21.21 respectively) P-value 0.002 which indicates that using femoral and tibial nailing is associated with better knee function.

Mohammed Hadi (2013), in his large retrospective study which included 220 patients of which 35.9% were treated with plating, 34.1% treated with nailing, 11.8% treated with hybrid fixation and 5% treated with Hybrid fixation reported that the most common early complication during 3 months after injury was knee hemarthrosis in 14% of cases and the most common late complication was knee osteoarthritis in 13.6% of cases after 3 months.

CONCLUSION

The study aimed at presenting a comparison between the modalities of treatment different of floating knee injury at Aswan University Hospital. Based on the data analysis, nailing is a better modality in floating knee injury (especially with diaphyseal long bone). Moreover, plating is a good choice for distal fractures, the external fixator is considered a choice for limb saving(as in popliteal ischemia, open fractures(OG3), and compartment syndrome).

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