ORIGINAL ARTICLE

Post Operative Functional Outcome of Modified Tension Band Wiring in Patients with Transverse Fracture of Patella

NOUMAN MAQBOOL, ADNAN YAQOOB, SHAHID MAHMOOD, IRAM BATOOL NADEEM, MUHAMMAD SIKANDAR ASLAM
Foundation University Medical College Rawalpindi
Correspondance to: Dr Nouman Maqbool, Consultant Orthopaedic Surgeon, Fauji Foundation Hospital Rawalpindi.

ABSTRACT
Aims and Objectives: To determine the post operative functional outcome in patients with transverse fracture of patella managed with modified tension band wiring.
Study Design: It was a prospective descriptive randomized control trial study.
Duration: From 01st July 2009 to 31st September 2010.
Material and Method: 45 patients with displaced transverse fracture of patella, treated by modified tension band wiring were studied with rehabilitation program to determine the functional outcome, according to Goodfellow grading. Study was carried out in the department of Orthopaedic & General Surgery, Fauji Foundation Hospital (FFH), Rawalpindi.
Result: Total of 45 patients were included in study, age ranges between 20 years to 67 years. 38(84.45%) 38(84.45) were male and 07(15.55%) 7 (15.55) were female patients. Right knee was involved in 29 cases (64.44) (64.44%) where as left knee was involved in 16(33.33%). There was gradual increase in Goodfellow grading in each follow up and more than 70% of the patients had a good Good, fellow grade after 03 month. months of I.F. However female patients had a slow recovery as compare to **male patients**. Regarding the range of motion 39 (87%) patients had a range of motion more than 90 degrees at the end of three months period, which can be regarded as acceptable function of knee.
Conclusion: Following the post operative rehabilitation program properly followed after modified tension band wiring in transverse fractures of patella, good functional outcome can be achievedwithin 3 months of fixation.

Key Words: Fracture patella, Goodfellow grading.

INTRODUCTION
The Patella, or knee cap, is a triangular seasamoid bone about 5 cm in diameter, which is embedded in the tendon of insertion of quadriceps femoris muscle. The tendon of quadriceps femoris in continuation from lower pole is inserted to upper tibia.[1] Patella is an important component of extensor mechanism of knee.[2]

Facture of patella was known since Hippocratic time, which constitutes approximately 1% of all fractures. Fracture patella got a higher prevalence within the age group of 20 to 50 years old and males are twice more affected than females.[3,4] The anterior subcutaneous location of the patella makes it vulnerable to direct trauma, such as the knee striking the dashboard of an automobile or from a fall on the anterior knee. Fracture of the patella can occur either by direct or by indirect force. The direct force often results in comminuted or displaced fractures, whereas the indirect force such as sudden violent contraction of quadriceps muscles with knee flexion causes transverse fracture of patella. Usually the fracture patella results from combination of both direct and indirect violence.[5]

The treatment of fracture patella is a subject of controversy. Options available are conservative management & open reduction with internal fixation by different methods. If fracture fragment shows less than 3 mm separation and no displacement in articular surface, it can be treated conservatively in Plaster of Paris cylinder cast. While in communited fracture of patella where repair is not possible, patellectomy is an option. Fragments displaced more than 3 mm should be fixed by a choosen surgical technique in patella fractures.[3] Different options are available but anterior tension band wiring has been proven effective of all[3,6]. The significance of this study is that when properly following the rehabilitation protocol post operatively after modified tension band

wiring in transverse fractures of patella, outcome is better and earlier function are achievable.

METHODOLOGY

Objective of the study: This study was conducted to determine the functional outcome (range of motion) in patients coming to our hospital, with transverse fracture of patella managed with tension band wiring.

Study design: This was a prospective, descriptive clinical trial conducted at the Department of Orthopaedic & General Surgery, Fauji Foundation Hospital (FFH) Rawalpindi from 1st July 2009 to 31st September 2010 i.e. 14 months, after the approval of ethical committee of this hospital.

MATERIAL & METHODS

Present study consisted of 45 cases of transverse fracture of patella. We included closed displaced transverse fracture of patella with intraarticular incongruity of more than 2 mm and displacement of more than 3 mm. Age between 20-67 years of both sexes who are fit for spinal anesthesia were included in the study.Exclusion criteria was open fractures, i.e., Gustillo type 1, II and III, comminuted fractures, fracture involving other ligamentous and bony injuries in the knee region and any other established knee deformities prior to fracture. After confirming the inclusion/exclusion criteria informed consent was obtained from the patient or guardian. History was taken in detail, all preliminary general, local and radiographic evaluations were done. Patients were counseled to follow strictly post operative rehabilitation protocols. Quadriceps strengthening exercise, progressive straight leg raising (SLR) with and without weight, range of motion (ROM), exercise and partial or full weight bearing and walking without crutches were explained. Patients were asked to do Stairmaster (forward / retro) exercise. The patients were followed in 2nd week, 4th week, 8th week (2nd month), 12th week (3rd month) & at 06th month. In each follow up, range of motion was recorded, Good fellow's grading of range of motion was used to determine the range of motion. Check x-ray was taken to assess fracture union. All the information was recorded on pre-designed proforma. Data was analyzed using computer software SPSS version 11. Frequency and percentages were calculated for demographic information (age, sex), mean and S.D was calculated for age.

RESULTS

Total 45 patients, with age ranges between 20 to 67 years with a mean age of 33.45+3.74 were included in the study,

Majority of the patients had the history of fall from height/stairs and road side accidents. No bilateral knees were found in this study, majority of the patients had the history of right knee injury 31(64.58%). Most of the patients came to the emergency department and only 3 cases (6.7%) were admitted from outpatient. The interval between the time of the injury and the surgical intervention ranged from 0 to 10 days. The complication noted was superficial infection in two cases (4.44%) during 1st follow up at 2nd weeks, which was managed with oral antibiotics and local dressing. No other complications like implant breakage, loss of joint congruity were noted.

The maximum incidence of the injury was observed during 3rd and 4th decade of life. Frequency of age is explained in table 1.

Table 1: Frequency of age.

Age (in years)	No. of patients	%
20-30	08	17.77
31-40	20	44.44
41-50	14	31.11
51-55	03	6.67
Total	45	100

Table 2: Goodfellow's grading of range of motion12

Excellent	Painless full range of motion and able to squat
Good	Full flexion/extension but painful squat
Fair	Painless movement with 10-20 degree limitation of flexion.
Satisfactory	Painless movement with limitation of 20-40 degrees
Poor	Limitation of >40 degree flexion

Only 07 females were found in this study and 38 were males. We categorized our results according to the Goodfellow grading. Most of the patients (38 out of 45 patients) 84.45% had poor result during 1st follow up at 2nd week These results were found gradually improved later on. At 2nd months follow up,

68.9 % (31 out of 45) had good result. At 3rd month follow up, 23 out of 45 (51.11%) had excellent and 11 patients (24.44%) had good results.

Table 3: Improvement in the range of motion at each follow up.

criteria	2nd week	4th week	2nd month	3rd month
Excellent	-	-	07	23
Good		04	31	11
Fair	02	11	01	10
Satisfactory	05	27	04	01
Poor	38	03	02	00
Total	45	45	45	45

DISCUSSION

Fracture of patella is a common injury in adults and constituting approximately 1% of all skeletal injuries[7]. Treatment of transverse fracture of patella may be either operative or non operative but in most reports non operative treatment has been limited to fracture that showed less than 2 mm of separation and no significant displacement of articular surface. If there is displacement of more than 3 mm it should be reduced and internally fixed[8]. We also followed the same criteria in this study i.e. operative fixation of all fracture which are displaced more than 3 mm. Several methods for operative fixation of patella are practiced but Weber technique of modified tension band wiring was used in this study as it is commonly used to treat transverse patella fractures[9]. Early mobilization is important. Adequate rehabilitation for return of quadriceps strength and knee motion is absolutely necessary after surgery. In this study range of motion was assessed according to Goodfellow's criteria (Table-2) supported with quadriceps strengthening and Stairmaster exercise, these exercises were done properly and accordingly in all patients. On 4th week we found only 03 patients with poor range of motion who recovered in 2nd month and this outcome was improved gradually in next month and no patient was found with poor range of motion in the 3rd month while 23 patients achieved the target of excellent range of motion at 3rd month's follow-up. Our follow up period was only three months, while if these exercises continue for next month follow-up, the outcome may be further improved. Only 2 (4.44%) cases of superficial infection were seen, Awais et al in one of his studies reported no infection in his 16 patients study.[10]

Our results regarding improvment of range of motion following quadriceps strengthening and Stairmaster exercise are in accordance with a study conducted by Shrestha B, Bajracharya A, Rajbhandari A, Singh N[11] who also found gradually improved outcome in patients treated with modified tension band wiring in patients with transverse fracture of patella.

The total functional outcome for the patients with transverse fracture of patella with modified tension band wiring developed on around 3rd post operative month if the proper rehabilitation protocols are followed.

CONCLUSION

This study shows a significantly satisfied functional outcome in case of transverse fracture of patella with modified tension band wiring with proper rehabilitation protocols in our population. Furthermore, the sample size is too small and the period of follow up is shorter in this present study. Further studies including a large sample and a longer period of follow up is desirable to added support the result of this study.

REFERENCE

1. Harris R M. Fractures of the Patella and injuries to the extensor mechanism. In: Rockwood and Green's Fractures in Adults: Rockwood, Green, and Wilkins' Fractures. Ed. Bucholz R W, Heckman J D, Court Brown C M. 6th Edition Lippincott Williams and Wilkins, 2006; 1969-1998.
2. Humail SM, Haq N, Ishtiaque M, Qureshi MA. Management of transverse fracture of patella by tension band wiring. Pak J Surg 2009; 25: 33-6.
3. Pailo AF, Malavolta EA, Mendes MR, Rezende MU. Patellar fractures: a decade of treatment at IOT-HC-FMUSP – Part I: functional analysis. Acta Ortop Bras 2005; 13(5): 221-4.
4. Karim MRU, Rahman M, Howlader MAR, Shahidullah M, Mollah AR. Fracture patella - outcome of early movement of knee after stable fixation. JAFMC Bangladesh 2009; 15: 11-3.
5. Shrestha B, Bajracharya A, Rajbhandari A, Singh N. Functional Outcome of Modified Tension Band Wiring in Transverse Fracture of Patella. Journal of GMC-Nepal 2009; 3: 22-9.
6. John J, Wagner WW, Kuiper JH. Tension-band wiring of transverse fractures of patella. The effect of site of wire twists and orientation of stainless

steel wire loop: a biomechanical investigation. Int Orthop 2007; 31(5): 703–7.
7. Karim MRU, Rahman M, Howlader MAR, Shahidullah M, Mollah AR. Fracture patella - outcome of early movement of knee after stable fixation. JAFMC Bangladesh 2009; Vol 5, No 1: 11-3.
8. Rabalais R D, Burger E, Yun Lu, Mansour A. Comparison of Two Tension-band Fixation Materials and Techniques in Transverse Patella Fractures: A Biomechanical Study. Orthopaedics 2008; 31: 128.
9. J John, WW Wagner, and JH Kuiper. Tension-band wiring of transverse fractures of patella. The effect of site of wire twists and orientation of stainless steel wire loop: a biomechanical investigation. Int Orthop 2007; 31(5): 703–707.
10. Awais S. A. Removal of Hardware after fracture fixation. Retrospective study at Liaquat Medical College Jamshoro. Journ Pak Ortho Assoc 1999; 11(2): 23-29.
11. Shrestha B, Bajracharya A, Rajbhandari A, Singh N. Functional Outcome of Modified Tension Band Wiring in Transverse Fracture of Patella. Journal of GMC-Nepal 2009; 3: 22-9.
12. Goodfellow j, Hungerford D S Zindel M. Patello-femoral joint mechanics and pathology JBJS 1976; 58B; 287-99.