

Original Research Article

Intraoperative mobilisation of knee and its effect on the final functional outcome in patella fractures: a clinical study

Deepak Aher*, Ajay Dandotiya, Dharmendra Raghuvanshi, Abhishek Pathak

Department of Orthopaedics, Gandhi Medical College, Bhopal, Madhya Pradesh, India

Received: 23 March 2018

Revised: 28 April 2018

Accepted: 30 April 2018

*Correspondence:

Dr. Deepak Aher,

E-mail: deepakaher07@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Treatment of patellar fractures depends on its type, integrity of extensor mechanism and fragments size. Operative measures are tension band wiring and partial or total patellectomy. Early weight bearing and then gradual mobilization and finally quadriceps strengthening remains the crux of physiotherapy. Aim of this study was to see for the effect of intraoperative mobilisation of knee on functional outcome of tension band wiring in patella fractures.

Methods: 30 patients were included in this study from January 2016 to February 2018. Tension band wiring was performed in all the patients. Intraoperative mobilisation of knee as allowed was done when patient was under effect of anesthesia. Final functional outcome was assessed as per the modified knee-rating scale of the Hospital for Special Surgery and also range of motion noted. Patients were evaluated at 1 month, 2 month, 6 month and 12 months.

Results: Patients aged from 25-65 years with mean age of 40 years. 26 patients were male and 4 female. In 20 cases, Right knee was involved. All had trauma due to road traffic accident. Mean operation time was 1 hour. At the end of 1 year follow up only 2 patients had range of motion <90, 4 patients had range of motion 90-120 degrees and 24 patients had range of motion >120 degrees. After 1 year, functional outcome was, excellent in 24, good in 4, fair in 1 and poor in 1.

Conclusions: Intraoperative mobilisation of knee after a stable fixation with tension band wiring of patella can prove to a very effective method for increasing postoperative range of motion and improving functional outcome.

Keywords: Patella, Tension band wiring, Intraoperative mobilisation

INTRODUCTION

Being the largest sesamoid bone in the body, patella is an important component of the extensor mechanism of knee.¹ The extensor mechanism plays an important role to stabilise the knee when extended as in case of erect posture. Patella increases the lever arm of the extensor apparatus and thus enhances quadriceps power.² These fracture constitute about 1% of all fractures in the body.³ Patellar fracture generally leads to stiffness and loss of knee movements.⁴ Even after bone healing, functional outcome deteriorates due to Stiffness of joints, continued

swelling, muscle wasting and bone atrophy.⁵ This study was conducted to see for the effect of intraoperative mobilisation of knee on range of motion in postoperative period and functional outcome of tension band wiring in patella fractures.

METHODS

This prospective study was conducted in our tertiary care centre. We had 30 patients with transverse patella fracture from January 2016 to February 2018. 26 out of 30 were males.

Inclusion criteria

Inclusion criteria were age >25 and <65; transverse patella fractures.

Exclusion criteria

Exclusion criteria were open fractures; associated other fractures in the same limb.

When the patients presented to us, x rays were done, both anteroposterior and lateral views. Average duration of injury to surgery was 7 days. Tension band wiring was performed in all the patients.



Figure 1: Midline patellar incision for tension band wiring.



Figure 2: Intraoperative mobilisation of knee up to as allowed.

Technique

Patient placed in supine position. Midline longitudinal incision (Figure 1) given over patellar area. Skin and subcutaneous tissue were reflected. Joint was thoroughly irrigated and blood clots removed. Reduction achieved with Clamps. Articular surface of patella was checked for any loss of reduction. Two Kirschner wires of 2 mm inserted from superior to inferior poles, in parallel, about one finger breadth deep to anterior surface of patella. With an 18 gauge stainless steel wire, passed transversely through the quadriceps tendon, figure of eight configuration of tension band wiring done. At the superolateral side, the wire was tightened.

Table 1: The modified knee-rating scale* of the hospital for special surgery.

Variables scores	Item
Pain	(30 points)
During walking	
None	15
Mild	10
Moderate	5
Severe	0
At rest	
None	15
Mild	10
Moderate	5
Severe	0
Function	(22 points)
Walking and standing	
Unlimited	12
5–10 blocks, standing >30 mins	10
1–5 blocks, standing 15–30 mins	8
<1 block	4
Cannot walk	0
Stairs	
Normal	5
With support	2
Transfer	
Normal	5
With support	2
Range of motion	(15 points)
80°	10
90°	11
100°	12
110°	14
120°	15
Muscle strength	(15 points)
Grade 5	15
Grade 4	12
Grade 3	9
Grade 2	6
Grade 1	3
Grade 0	0

Continued.

Variables scores	Item
Flexion deformity	(10 points)
None	10
0°-10°	8
10°-20°	5
>20°	0
Instability	(5 points)
None	5
0°-5°	4
6°-15°	2
>15°	0
Total (97 points) - subtractions	
Walking aid	
One cane	1
One crutch	2
Two crutches	3
Extension lag	
5°	2
10°	3
15°	5
Deformity (5°=1 point)	
Varus -	
Valgus -	

*Scores ≥85 are excellent, 70-84 good, 60-69 fair, and <60 poor.



Figure 3: Preoperative X-ray of fracture patella lateral view.

The under surface of patella was checked for any loss of reduction. Upper ends of k wires were bent and buried into superior margin of patella posterior to wire loop. When the fixation was seemingly stable, then knee bending was done as much as the knee allowed, at least up to 90 degrees (Figure 2). The tears in the retinaculum were repaired thorough wash given. Sutures applied. After sterile dressing, the limb was immobilized in a rigid knee brace. Preoperative and postoperative X rays compared (Figure 3 and 4). Patients were evaluated at 1 month, 4 month, 6 month and 1 year. Physiotherapy and

touch down weight bearing started on 2 postoperative day. On final follow up, functional outcome seen with hospital score for special surgery knee (Table 1).⁶ Range of motion was also recorded.

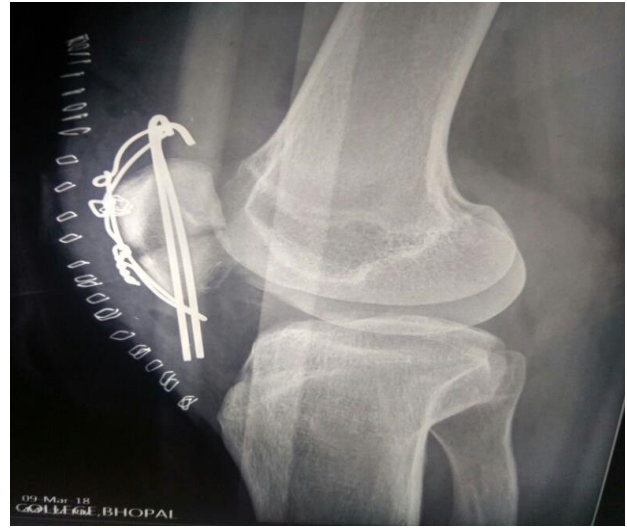


Figure 4: Postoperative X-ray of fracture patella after tension band wiring, lateral view.

RESULTS

This prospective study was conducted in our tertiary care centre from January 2016 to February 2018 with mean age being 40 years (ranged from 25-65 years). Of the 30 patients, 26 (86.66%) patients were male and 4 (13.33%) patients were female. 20 (66.66%) patients had injury on right side. All had fracture due to road traffic accident. Mean duration of operation was 1 hour (30 minutes to 2 hours). At the end of 1 year follow up only 2 patients had range of motion <90, 4 patients had range of motion 90-120 degrees and 24 patients had range of motion >120 degrees (Table 2) and as per the hospital score for special surgery, functional outcome was, excellent in 24, good in 4, fair in 1 and poor in 1 (Table 3).

Table 2: Range of motion after tension band wiring patella and intraoperative mobilisation.

Range of motion knee(degrees)	Patients
<90	2
90-120	4
>120	24

Table 3: Functional outcome with modified knee hospital score for special surgery.

Functional outcome	Modified knee hospital score for special surgery	Patients
Excellent	≥85	24
Good	70-84	4
Fair	60-69	1
Poor	<60	1

DISCUSSION

Our patients were mostly in the age group 20-40 years (range 20-65) with an average of 30 years. Both Smith and Bostrom mentioned the mean age as 48 years in their respective series.^{7,8} Surgical treatment aims anatomic reduction; restoration of articular congruity, preservation of patella and extensor mechanism to get repaired. Surgical indications are displacement >2 mm, articular step off, or active extension loss.⁹ In a study by Mehdi et al shows excellent and good results in 203 patellar fractures treated by TBW.¹⁰ Decreased range of motion (ROM) is the commonest complication after patellar fractures. Improper rehabilitation is reported to be one of the main reasons. Also, the soft tissue damage leads to subcutaneous and intraarticular adhesions that may lead to decreased range of motion in knee. Nikiforidis et al, in his study found that mostly, only the terminal degrees of flexion range of motion are affected which patients usually tolerate well.¹¹ In such cases, intense physiotherapy is the well-known standard method. If physiotherapy fails to improve range of motion then partial or total hardware removal with arthroscopic arthrolysis of intra-articular adhesions can be done.¹² Lotke in his study found that those who had more prolonged immobilisation had experienced more diminished range of motion.¹³ Hung et al studied the effectiveness of early range of motion exercise after stable fixation and found a similar satisfactory results.¹⁴ So we can say that after stable fixation of patellar fractures early knee movement gives better functional outcomes. We can try to generalise similar results of knee movements intraoperatively, that may break some intraarticular adhesions and give good results. Muller et al noted that stable fixation by tension band wiring allows early knee mobilization and optimum return of knee flexion.¹⁵ In contrast, Phieffer et al concluded in their study that despite appropriate surgical management, some loss of knee flexion is usually evident.¹⁶

In the final follow up, our functional outcome was assessed according to the modified hospital for special surgery knee score as excellent in 24 (80%), good in 4 (13.33%), fair in 1 (3.3%) and poor in 1 (3.3%). Schimitschh et al mention that operatively fixed patellar fractures give good results but lack outcome measures with proven validity.¹⁷ However, in their study, Gardner et al differ and say that long term outcomes from different clinical series have been modest.¹⁸ We can say that intraoperative mobilisation of knee joint brings similar effect as early range of motion exercises of knee, though more studies are needed to support this.

CONCLUSION

Intraoperative mobilisation of knee after a stable fixation with tension band wiring of patella can prove to a very effective method for increasing postoperative range of motion and improving functional outcome as patient is under the effect of anesthesia and manipulation can be

easily done which couldn't be that easy afterwards. That also leads to ease in postoperative physiotherapy.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the institutional ethics committee

REFERENCES

- O'Donoghue DH, Tompkins F, Hays MB. Strength of quadriceps functions after patellectomy. *J Surg Gynecol Obstet.* 1952;60:159.
- Kaufer H. Mechanical functions of the patella. *J Bone Joint Surg (Am).* 1971;53:1551-60.
- Bostrom A. Fracture of the patella. *Acta Orthop Scand.* 1972;143:1-80.
- Nummi J. Fracture of the patella: a clinical study of 170 patellar fractures. *Ann Chir Gynaecol Fenn.* 1971;60(179):1-85.
- Wilson JN. Joint stiffness and traumatic ossification. In: Watson-Jones fracture and joint injuries. 6th ed. Edinburgh: Churchill Livingstone; 1992: 45-75.
- Insall JN. Surgery of the knee. New York: Churchill Livingstone; 1984.
- Smith ST, Cramer KE, Karges DE, Watson JT, Moed RR. Early complications in the operative treatment of patella fractures. *J Orthop Trauma.* 1997;11(3):183-7.
- Bostrom A. Fracture of the patella. *Acta Orthop Scand Suppl.* 1972;143:1-80.
- Perry CR, McCarthy JA, Karin CC, Pearson RL. Patellar fixation protected with a load-sharing cable: a mechanical and clinical study. *J Orthop Trauma.* 1988;2:234-40.
- Mehdi M, Husson JL. Treatment results of fractures of the patella using pre-patellar tension wiring. Analysis of a series of 203 cases. *Acta Orthop Belg.* 1999;65(2):188-96.
- Nikiforidis P, Babis G, Tsarouchas J, Koudis G, Korres DS. Patellar fractures: contemporary approach to operative treatment, using different types of the tension band principles. *Eur J Orthop Surg Traumatol.* 1999;9:21-6.
- Kim YM, Joo YB. Prognostic factors of arthroscopic adhesiolysis for arthrofibrosis of the knee. *Knee Surg Relat Res.* 2013;25(4):202-6.
- Lotke PA, Ecker ML. Transverse fracture of the patella. *Clin Orthopaedics Related Res.* 1981;158:235-41.
- Hung LK, Chan KM, Chow YN, Leung PC. Fractured patella: operative treatment using the tension band principle. *Injury (Br).* 1985;16:343-7.
- Muller ME, Allgower M, Schneider R, Willenegger H. Technique recommended by the AO group. In: Manual of internal fixation New York: Springer-Verlag; 1991.
- Phieffer LS, Kyle RR. Treatment of patellar fractures. *Techniques Knee Surg.* 2003;2(3):153-9.

17. Schemitsch Eh, Weinberg J, Mckee MD, Stephen DIG, Kreder HJ, Waddell JP. Functional outcome of patella fractures following open reduction and internal fixation. *J Orthop Trauma*. 1999;13(4):279.
18. Gardner MJ, Griffith MH, Lawrence BD, Lorch DG. Complete exposure of the articular surface for fixation of patellar fractures. *J Orthop Trauma*. 2005;19(2):118-23.

Cite this article as: Aher D, Dandotiya A, Raghuvanshi D, Pathak A. Intraoperative mobilisation of knee and its effect on the final functional outcome in patella fractures: a clinical study. *Int J Res Orthop* 2018;4:642-6.