

Original Research Article

Patellar Fractures Treated by Cannulated Cancellous Screw and Tension Band Wiring - A prospective study in a Teaching Hospital, Sangareddy

Devanatha Reddy P¹, Madan Mohan Rao GV^{1*}, Nagababu Pyadala²

¹Assistant professor, Department of Orthopedic, MNR Medical Collage, Sangareddy, Telangana, India

²Assistant professor, Department of Biochemistry, MNR Medical Collage, Sangareddy, Telangana, India

*Corresponding author email: vmmohang@yahoo.com

	International Archives of Integrated Medicine, Vol. 3, Issue 10, October, 2016. Copy right © 2016, IAIM, All Rights Reserved. Available online at http://iaimjournal.com/ ISSN: 2394-0026 (P) ISSN: 2394-0034 (O)
	Received on: 30-09-2016 Accepted on: 10-10-2016 Source of support: Nil Conflict of interest: None declared.
How to cite this article: Devanatha Reddy P, Madan Mohan Rao GV, Nagababu Pyadala. Patellar Fractures Treated by Cannulated Cancellous Screw and Tension Band Wiring - A prospective study in a Teaching Hospital, Sangareddy. IAIM, 2016; 3(10): 199-203.	

Abstract

Background: Country like India patellar fractures is more common due to the activity of daily life. 1% of all skeletal injuries due to patellar fracture by direct or indirect mechanism.

Aim: This present study focus on advantages and complications associated with fixation technique for the management of patellar fracture.

Material and Methods: 50 patients with patellar fractures treated by cannulated cancellous screw with tension band wiring.

Result: The most common age group in our study was 41-50 years. Among 50 patients 37 were male and 13 were female. Fracture due to indirect injury was 64% and direct trauma was 36%. Outcome of our study was 90% as excellent, 8% as good and 2% poor.

Conclusion: According to our study management and early mobilization of displaced transverse patellar fracture by cannulated cancellous screw and tension band wiring showed better result.

Key words

Patellar fracture, Tension band wiring, Cannulated cancellous screw, WEST's Criteria, Displaced transverse patellar fracture.

Introduction

Patella has important role in knee extension mechanism and it is the largest sesamoid bone, located subcutaneously [1]. Patella and patellofemoral joint is subject to high-tension forces due to its position and function, quadriceps is also weaker without patella [2]. Patellar fracture due to direct, indirect or combined forces and it's account 1% of all skeletal fractures. Due to subcutaneous location of patella, it is more vulnerable to injury from direct force, which leads comminute fracture. Indirect injuries due to heavy forces from contracted quadriceps with knee in flexed position. Patellar fracture is not only depending on the injury mechanism, other factors also responsible such as patient age, quality of bone and degree of knee flexion [1, 3, 4]. Patellar fractures commonly associated with concomitant injuries, 80% associated injury mainly with open patellar fracture [5, 6]. For the clinical usefulness patellar fractures are divided as displaced and non-displaced. Based on the geometric configuration further classified as transverse or horizontal, comminuted, apical, vertical or longitudinal, and osteochondral [7]. Approximately 52% displaced patellar fractures are transverse type [8, 9, 10, 11] 35% are non-displaced type [11, 12]. Comminuted type of patellar fractures 65% and vertical type of non-displaced fracture accounts for 12-22% [13, 14, 15]. Osteochondral fractures due to the comminuted fractures or after patellar dislocation [16, 17]. The management of patellar fracture is based on the physical examination, fracture classification and extensor mechanism. Operative and non-operative procedures can be used to treat patellar fracture. Most common treatment options are open reduction and internal fixation with cannulated screw tension band or tension band wiring, non-operative management, and partial or complete patellectomy [1]. Non-operative treatment for minimally displaced

fractures done by extension splinting or branching for 4 to 6 weeks. Operative procedure carried out by internal fixation techniques such as circumferential cerclage wiring [1], cerclage wiring for patellar fracture fixation [18], screw fixation for transverse and longitudinal fractures [19, 20, 21], tension band wiring with Kirschner wire (K-wires). According to various studies tension band wiring has shown better results for the management of patellar fracture in many orthopaedic clinic [22, 23]. Therefore the present study aimed to assess the complications and advantages associated with cannulated cancellous screw with tension band wiring technique for the management of patellar fracture.

Materials and methods

This prospective study was conducted in Department of Orthopaedics at MNR Medical College and Hospital, Sangareddy during the period of 2 years April 2014 to May 2016. Cannulated screw with tension band wiring treated 50 cases of transverse patellar fracture.

Inclusion criteria

Closed and open type I displaced transverse patellar fractures, acute fractures and patients medical fitness for operative treatment.

Exclusion criteria

Comminuted, vertical fractures type II and type III compound fractures, non-displaced transverse fracture and patients not medically fit for surgery.

Method of data collection

Institutional ethical committee approved the study. Patients were included in this study after taking proper consent form. The details of the case such as name, age, sex, socio-economic status, mode and duration of injury were collected. Clinical and radiographs with routine

laboratory investigations data were recorded for all the cases.

Operative procedure

The surgery was performed under supine position. The fracture site was exposed through transverse or longitudinal midline incision in front of the knee. All debris and clots were cleared after exposure of the fracture site. One screw placed perpendicularly to the fracture line to fix the longitudinal fracture. Two guide wire were inserted in parallel from the lower pole to the superior pole of the patella with 5-10 cm distance from the patellar articular surface. Screwed a 4 mm cannulated cancellous compression screw along with wire. The proximal end of the screw should be embedded within the patella and the screw head remained proud of the patella cortex. Then screwed the second cannulated cancellous screw and alternately tightened the screws. Replaced the guide wire with 18G stainless steel wire and tightened the wire anterior to the patella to form the tension band. Knee plaster was applied for the temporary immobilization.

Post-operative procedures

Post-operative X ray report was collected. After 2 weeks patient was examined for straight leg raising test, and weight-bearing test. 14th to 20th post-operative day patients were discharged from the hospital. Patients were taught to do dynamic quadriceps exercise after 5 weeks.

Follow-up

All the follow-up cases were graded depend on the WEST's CRITERIA. In every follow-up the patients were asked about any complaints like pain, walking difficulty, climbing and getting down from stairs. During follow-up patients were examined for knee movement, power of quadriceps, and circumference of thigh.

Results

Patellar fracture happen in any age group, most common age group in our study was 41-50 years (58%) (Table – 1). In this study 37 (74%)

fractures were in male and 13 (26%) patellar fractures in female (Table – 2). 32 (64%) fractures due to indirect injury and 18 (36%) patellar fractures because of road accident (direct) (Table – 3). Right side patellar fracture had in 21 (42%) patients and left side fracture in 29 (58%) patients (Table – 4). All the patients were immobilized in an above knee posterior slab for almost 14th days. After that patients were advised to do knee flexion and quadriceps exercise. There were no cases with intra operative complications. During follow-up all patients were questioned about complications (subjective and objective symptoms) and data were recorded properly. We found 45 cases (90%) excellent during followed up study, 4 cases (8%) good and only 1 case (2%) showed poor result (Table – 5).

Table - 1: Age distribution.

Age (years)	No. of cases	%
10-20	5	10
21-30	3	6
31-40	7	14
41-50	29	58
51-60	5	10
61-70	1	2

Table - 2: Sex distribution.

Sex	No. of cases	Percentage (%)
Male	37	74
Female	13	26

Table - 3: Mode of injury.

Mode of injury	No. of cases	%
Indirect	32	64
Direct	18	36

Table - 4: Site of fracture.

Fracture side	No. of cases	%
Right	21	42
Left	29	58

Discussion

Patellar fractures are one of the rarest fractures resulting in loss of knee function due to direct or

indirect trauma. Patellar fracture accounts only 1% of all skeletal injuries. Majority of the displaced transverse patellar fractures need reduction and internal fixation. Fixation of this type of fracture it is important to address biomechanics of the construct. Recently cannulated cancellous screw and tension band wiring is widely used technique in many orthopaedic clinic for such fracture fixation. This is a prospective study of 50 patellar fracture cases were treated with cannulated screw and tension band wiring and the results were recorded after treatment. According to our study most common age group with patellar fracture was 41-50 (58%). Siddaram N Patil reported 40% of patients in the age group of 41-50 years [23]. Another study by Sudheendra P. R. showed 69.8% patients belong to age group of 20-49 [24]. In this study majority of patients were male accounting for 37 (74%) and female patients were 13 (26%). I. Lalithkumaret.al. reported 75% male patients and 25% female patients [25]. Another study by Sudheendra et al. recorded 69.8% male and 30.2% female patients and Siddaram N Patil study showed 70% male and 30% female patients [23, 24]. 36 (72%) cases were due to fall from height followed by road traffic accidents 14 (28%) cases. I. Lalithkumar et al. reported 50% cases due to RTA and 45.83% cases because of self-fall [25]. Siddaram N Patil, et al. and Sudheendra, et al. showed higher number of cases due to indirect mechanism [23, 24]. In our study 21 (42%) cases were right-sided fracture and 29 (58%) cases were left sided fracture. I. Lalithkumar, et al., Siddaram N Patil, et al. and Sudheendra, et al. reported in their study, right sided injury 41.6%, 56% and 60.5% respectively and left sided fracture 58.33%, 44% and 39.5% [23, 24, 25]. In all the cases fractures were decreased anatomically and internally. We had 2 cases with complications after fixation, one of the case had wound gapping and it was mobilized by secondary suturing and 2nd case was superficial skin infection controlled by 3-5 week post operatively. According to our study outcome was 90% excellent, 8% good and 2% poor result. Sudheendra, et al. reported 58% excellent, 16%

good and 4.7% poor [24]. I. Lalithkumar, et al. showed 75% excellent and 25% good outcome [25]. According to Siddaram N Patil, et al. outcome was 86.6% excellent, 10% good and 3.3% poor [23].

Table - 5: Grading of results based on WEST'S CRITERIA.

Results	No. of cases	Percentage (%)
Excellent	45	90
Good	4	8
Poor	1	2

Conclusion

In this prospective study, the management of patellar fracture by cannulated cancellous screw with tension band wiring increases the anatomical reduction and interfragmentary compression. WEST's score was excellent in most of the cases and has good functional outcome. Long term follow up is recommended to overcome the late complications.

Acknowledgements

We are thankful to Dean of MNR Medical College and Hospital for their invaluable help and support.

References

1. Ashesh B, Madhav A. Karunakar. Patellar fracture and extensor mechanism injuries in: Rockwood and green's fractures in adults 7th edition, Volume 2, Lippincott, 2010, p. 1756-1767.
2. Huberti HH, Hayes WC, Stone JL, Shybut GT. Force ratios in the quadriceps tendon and ligamentum patellae. J Orthop Res., 1984; 2: 49-54.
3. Painge A Whittle. Fractures of the lower extremity in: S. terry canale, James H. Beaty; campbell's operative orthopaedics, 11th edition, Mosby: Philadelphia; 2008, p. 3161-6165.
4. Barano, Manisali M, Cecen B. Anatomical and biomechanical evaluation of the tension band technique

- in patellar fractures. *Int Orthop Epub.* 2009; 33(4): 22.
- Nummi J. Fracture of the patella: a clinical study of 707 patellar fractures. *Ann. Chir Gynaecol. Fenn.*, 1971; 60(Suppl): 179-87.
 - Anand S, Hahnel JCR, Giannoudis PV. Open patellar fractures: High-energy injuries with a poor outcome? *Injury*, 2008; 39: 480-484.
 - Catalano J, Iannacone W, Marczyk S, et al. Open fractures of the patella: Long-term functional outcome. *J Orthop Trauma*, 1995; 39: 439-444.
 - Lotke PA, Ecker ML. Transverse fractures of the patella. *Clin Orthop Relat Res.*, 1981; 158: 180-184.
 - Böstman O, Kiviluoto O, Nirhamo J. Comminuted displaced fractures of the patella. *Injury*, 1981; 13: 196-202.
 - Böstman O, Kiviluoto O, Santavirta S, et al. Fractures of the patella treated by operation. *Arch Orthop Trauma Surg.*, 1983; 102: 78-81.
 - Boström A. Fracture of the patella. A study of 422 patellar fractures. *Acta Orthop Scand.*, 1972; 143(suppl): 1-80.
 - Andrews JR, Hughston JC. Treatment of patellar fractures by partial patellectomy. *South Med J.*, 1977; 70: 809-813.
 - Nummi J. Operative treatment of patellar fractures. *Acta Orthop Scand.*, 1971; 42: 437-438.
 - Black JK, Connors JJ. Vertical fractures of the patella. *South Med J.*, 1969; 62: 76-77.
 - Dowd GS. Marginal Fractures of the Patella. *Injury*, 1982; 14: 287-291.
 - Yu JS, Petersilge C, Sartoris DJ, et al. MR imaging of injuries of the extensor mechanism of the knee. *Radiographics*, 1994; 14: 541-551.
 - Kaufer H. Mechanical function of the patella. *J Bone Joint Surg Am.*, 1971; 53: 1551-1560.
 - Anderson LD. *Campbell's Operative Orthopaedics*. 5th edition, St. Louis, MO: Mosby; 1971.
 - DePalma A, Flynn J. Joint changes following experimental partial and total patellectomy. *J Bone Joint Surg Am.*, 1958; 40-A: 395-413.
 - Weber M, Janecki C, McLeod P, et al. Efficacy of various forms of fixation of transverse fractures of the patella. *J Bone Joint Surg Am.*, 1980; 62-A: 215-220.
 - Miskew DBW, Pearson RL, Pankovich AM. Mersilene strip suture in repair of disruptions of the quadriceps and patellar tendons. *J Trauma*, 1980; 20: 867-872.
 - Iame's E Carpenter, et al. Fracture of patella. *JBJS*, 1993; 75A: 1550-1561.
 - Siddaram N. Patil, Sankar Rao P. A prospective clinical study of Patellar Fractures Treated By Modified Tension Band Wiring. *Open Science Journal of Clinical Medicine*, 2014; 2(2): 54-58.
 - Sudheendra P.R, Krishnaprasad S. Functional Outcome of Patellar Fractures Treated by Internal Fixation: A Retrospective Study. *Journal of Evolution and Dental Sciences*, 2014; 3(29): 8126-8141.
 - I. Lalithkumar, B. Kanthimathi, Santhoshkumar, Manikandarajan. Functional outcome of transverse patella fractures treated with cannulated cancellous screw and tension band wiring. *Int. J. Modn. Res. Revs.*, 2015; 3(10): 1023-1028.