



INTERNAL FIXATION OF TRANSVERSE PATELLA FRACTURES USING CANNULATED CANCELLOUS SCREWS WITH ANTERIOR TENSION BAND WIRING: A PROSPECTIVE STUDY

Orthopaedics

Dr Mohit Dhanda*	Post Graduate Trainee Orthopaedics, Department of Orthopaedics, Jawaharlal Nehru Institute of Medical Sciences, Porompat *Corresponding Author
Dr O. Guneshwar Singh	Professor, Department of Orthopaedics, Jawaharlal Nehru Institute of Medical Sciences, Porompat
Dr L Labango Singh	Assistant Professor, Department of Orthopaedics, Jawaharlal Nehru Institute of Medical Sciences, Porompat
Dr Pankaj Mazumder	Post Graduate Trainee Orthopaedics, Department of Orthopaedics, Jawaharlal Nehru Institute of Medical Sciences, Porompat
Dr Shashikanta Sharma Bramha-charimayum	Post Graduate Trainee Orthopaedics, Department of Orthopaedics, Jawaharlal Nehru Institute of Medical Sciences, Porompat
Vengadasalabadhy. E	Post Graduate Trainee Orthopaedics, Department of Orthopaedics, Jawaharlal Nehru Institute of Medical Sciences, Porompat

ABSTRACT

Background: Patella fractures accounts for about 1% of all fractures. Modified tension band wiring using two parallel kirschner wires through patella and anterior tension band loop with stainless steel wire as treatment of displaced transverse patella fracture but has been reported with complications, use of cannulated screws cause less irritation to the soft tissues, provides a stable fixation with compression at the fracture site. **Materials and Method:** This is a prospective study of 35 cases of displaced transverse patella fractures treated by internal fixation using cannulated cancellous screws with anterior tension band wiring done from July 2020 to June 2022 at our Institution and followed for 1 year. **Results:** Road traffic accident was main mechanism of injury. Radiological union was achieved in 91.4% by the end of 13 weeks. In our study we observed that 54.3% patients had good outcome, 40.0% patients had excellent outcome and 5.7% patients had unsatisfactory outcome according to Bostman knee scoring system. **Conclusion:** Cannulated cancellous screws with figure of eight tension band wiring is safe and reliable for management of displaced transverse patella fractures with good functional outcome as union is faster and full range of motion is achieved early. It also has less chance of implant failure and soft tissue irritation.

KEYWORDS

INTRODUCTION

Patella is the largest sesamoid bone which augments the quadriceps function acting as a lever arm for knee extension.^{1,9} Patella is prone to injuries due to its subcutaneous location, fractures accounts for about 1% of all fractures.² The AO foundation³ recommends modified tension band wiring using two parallel kirschner wires through patella and anterior tension band loop with stainless steel wire as treatment of displaced transverse patella fracture but has been reported with complications of hardware irritation(k-wire), implant loosening, breakage and migration thereby causing loss of reduction and failure of fixation⁴. Use of cannulated screws cause less irritation to the soft tissues, provides a stable fixation with compression at the fracture site even in osteopenic bones and tension band principle can also be applied by passing the tension band wire through the cannulated cancellous screws⁵. In this study we aim to evaluate the functional outcome and complications of using cannulated cancellous screws with tension band wiring in displaced transverse patella fractures.

MATERIALS AND METHOD

This study is a prospective hospital based study conducted in Jawaharlal Nehru Institute of Medical Sciences (JNIMS), Imphal for a period of 2 years (Jul 2020 to Jun 2022) among 35 cases of displaced transverse fractures of patella who fulfilled inclusion and exclusion criteria. Informed consent was obtained from all patients and research ethics committee approval was taken.

Preoperative planning: Detailed history was taken including particulars of patient, date and time of injury, involved side, associated injuries, type of fracture, comorbidities, activity level of patient.

Surgical Approach

Surgery is performed under general or spinal anesthesia, part was painted, prepared and draped. After incising skin and subcutaneous tissues, fracture site is exposed and cleared of hematoma extent of

retinacular tears was explored and the joint inspected for any damage to the femur. Articular surface is exposed by either working through fracture site or retinacular rents, medial and lateral retinacular rents is extended if needed to allow finger access to the articular surface. The fracture is then reduced with reduction clamps. Two parallel 1.25mm guide wires are passed longitudinally through the patella and their position checked under image intensification. Cannulated drill bit of 2.7 mm size was used to prepare patella through the guide wires and two 4mm partially threaded cannulated cancellous screws are inserted with or without a washer, ensuring that threaded portion of screws completely cross beyond fracture. Guidewires are removed and 18G stainless steel wire is passed through cannulated screws and cross over anterior surface of patella in figure of 8 pattern. Wire ends are tightened with knee in full extension with A.O wire tightener. Stability of construct is tested by taking knee through full range of motion, extensor retinaculum is repaired, the fascia and subcutaneous tissue are repaired and skin closure done.

Post-operative management: The operated limb was placed in 30 degree of knee flexion in plaster of paris cylindrical slab. Early physiotherapy comprising of static quadriceps and hamstring setting exercises were started on the second post-operative day. Slab was removed after one week of operation and active and active assisted knee ROM exercises were started from 1 week post operation. Gradually the ROM was increased up to 90 degrees by the third week and increased further as tolerated by the patient. Both clinical and radiological assessments were done for fracture healing and functional recovery at 2 weeks, 4 weeks, 8 weeks, 6 months and 1 year. Patients were evaluated using the Bostman scoring. A score of 28 to 30 points was taken as excellent, 20 to 27 points as good and less than 20 points taken as failure. Unrestricted activity was resumed when full quadriceps strength had returned, at approximately 16-20 weeks. In patients with less stable fixation or extensive retinacular tears, active motion was delayed until fracture healing had occurred

RESULTS AND OBSERVATIONS

The mean age was 39 years. Twenty-nine (84.6%)(p value 0.074) patients were operated within one week, 4 cases (11.4%) operated within 2 weeks and 2 cases (4%) treated after 2 weeks. Road traffic accident was main mechanism of injury comprising 62.9%(p value 0.002) of patients followed by fall. ROM at 1 year is >120 degree for 30 patients and 90-120 degree for 4 patients and less than 90 degree in 1 patient.(p value 0.001) Full ranges of movements achieved in 97.5% patients in 6 months and 1 patient developed knee stiffness with ROM <90. In our study 29 patients had no pain, rest had mild to moderate pain on exertion. Radiological union was achieved in 91.4% by the end of 13 weeks.(p value 0.003) Quadriceps muscle atrophy measured as difference of circumference of thigh measured 10cm proximal to patella as <12mm in 65.7%(p value 0.002) patients, between 12-25mm in 31.4% patients and >25mm in 2.9% patients. In our study we observed that 54.3% patients had good outcome, 40.0% patients had excellent outcome and 5.7% patients had unsatisfactory outcome according to Bostman knee scoring system.(p value 0.001).

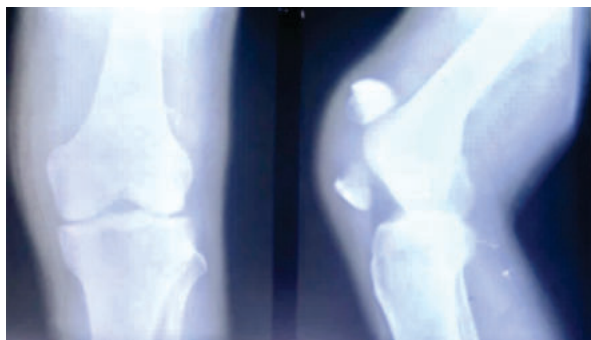


Fig 1: Displaced Transverse Patella Fracture, Ap And Lateral View

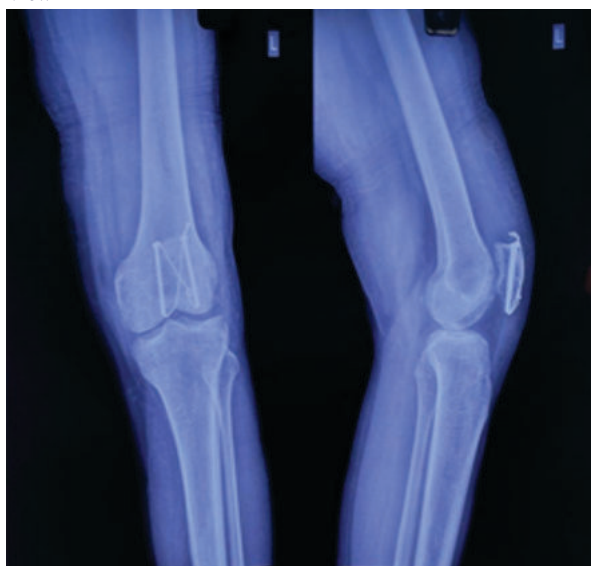


Fig 2: United Patella Fracture At 12 Weeks



Fig 3: Knee Flexion >120 Degree At 1 Year

DISCUSSION

In our study 85.7% patients had more than 120 degrees of knee motion while 11.4% had ROM between 90-120 degrees and 2.9% patients had ROM <90 degree at the end of 1 year. Full ROM was achieved in 3 months in 44% of patients, another 44.5% achieved in 3-6 months and remaining 9% in 6-9 months, 2.5% patients developed knee stiffness with ROM <90 in both patients. Chinna JPS et al⁶ found that 56% of their patients regained greater than 120 degrees of knee motion, 32% patients between 110-130 degree and 8% patients between 90-110 degree at 1 year, compare to this study the time taken to achieve full ROM was lesser in our study.

Bostman O et al⁷ reported in his studies that 75% patients treated by tension band wiring using screws had minimal or no pain on exertion similarly we found 82.8% patients had no or minimal pain. In our study we have found Quadriceps muscle atrophy, difference of circumference of thigh measured 10cm proximal to patella as <12mm in 65.7% patients, Bostman et al⁷ also observed that muscle atrophy was less than 12 mm in average. Clinical and radiological union was achieved in 91.4% patients 11-13 weeks and 8.6% patients in 13-15 weeks, Berg EE⁸ reported that 70% patients achieved clinical and radiological union between 12th-14th week and Chinna JPS et al obtained radiological union in their series between 12th-16th weeks. Two patients (5.8%) treated by cannulated screws with tension band wiring complained of prominent implant. They had mild pain on exertion and good range of knee motion. Other studies also found transverse patellar fractures using cannulated screws and reported less soft tissue irritation in this procedure. In our study one patient developed superficial skin infection which was managed by intravenous antibiotics and patients had uneventful recovery and one patient developed knee stiffness with ROM <90 degrees due to delay in initiation of range of motion exercise as the patient had associated femur fracture.

CONCLUSION

Cannulated cancellous screws with figure of eight tension band wiring is safe and reliable for management of displaced transverse patella fractures with good functional outcome as union is faster and full range of motion is achieved early. It also has less chance of implant failure and soft tissue irritation.

REFERENCES

1. Scolaro J, Bernstein J, Ahn J (2011) In brief: Patellar fractures. *Clin Orthop Relat Res* 469(4): 1213-1215.
2. Bostrom A (1972) Fracture of the patella. A study of 422 patellar fractures. *Acta Orthop Scand Suppl* 143: 1-80.
3. Müller ME, Allgöwer M, Allgower M, Schneider RWH (1991) Manual of internal fixation: techniques recommended by the AO-ASIF group. Springer Science & Business Media, Germany.
4. Mao N, Liu D, Ni H, Tang H, Zhang Q (2013) Comparison of the cable pin system with conventional open surgery for transverse patella fractures knee. *Clin Orthop Relat Res* 471(7): 2361-2366.
5. Berg EE (1997) Open reduction internal fixation of displaced transverse patella fractures with figure-eight wiring through parallel cannulated compression screws. *J Orthop Trauma* 11(8): 573-576.
6. Chinna JPS and Wadhwa M: Cannulated screws and tension band wiring in fractures of patella, *Orthopaedics today*; 3: 81-84, 2001.
7. Böstman O, Kiviluoto O, Nirhamo J. Comminuted displaced fractures of the patella. *Injury* 1981;13:196-202.
8. Berg EE (1997) Open reduction internal fixation of displaced transverse patella fractures with figure-eight wiring through parallel cannulated compression screws. *J Orthop Trauma* 11(8): 573-576
9. Carpenter JE, Kasman R, Matthews LS (1994) Fractures of the patella. *Instr Course Lect* 43: 97-108.
10. Benjamin J, Bried J, Dohm M, McMurty M. Biomechanical evaluation of various forms of fixation of transverse patellar fractures *J Orthop Trauma*. 1987;1:219-22
11. Tian Yi, Zhou F, Ji H, Zhang Z, Guo Y. Cannulated screw and cable are superior to modified tension band in the treatment of transverse patella fractures. *Clin Orthop Relat Res*. 2011;469(12):3429-35.
12. LeBrun CT, Langford JR, Sagi HC. Functional outcomes after operatively treated patella fractures. *J Orthop Trauma*. 2012;26(7):422-6.