

Tension Band Wiring through Cannulated Cancellous Screw for Closed Displaced Transverse Patellar Fracture

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Abstract

Background: One of the commonest orthopedic injuries is Patellar fracture. We frequently get and treat it. Different modalities of treatment are available for it. Tension band wiring through two 4mm partially threaded cannulated cancellous screw is an option for patellar fracture stabilization.

Objective: To assess the outcome of tension band wiring through two 4mm partially threaded cannulated cancellous screw for closed displaced transverse patellar fractures.

Methods: A total of 30 patients with displaced transverse patellar fractures were selected. It is a prospective, observational study and was conducted in National Institute of Traumatology & Orthopaedic Rehabilitation (NITOR), Dhaka during the period from January 2017 to December 2018. We performed ORIF with tension band wiring through cannulated cancellous Screw (4 mm partially threaded cannulated cancellous screw) for all patients. The Iowa knee evaluation score was used for functional assessment.

Results: According to Iowa knee evaluation score, 27 patients had excellent results and 3 patients had good results. Two patients had skin & soft tissue infection (SSTI) and 28 Patients had no complication. Knee stiffness, loss of fracture reduction, implant migration, implant failure were nil.

Conclusion: Tension band wiring through cannulated cancellous screw can be considered as an effective method to treat closed displaced transverse patellar fractures. Outcome may be excellent to good with few complications.

Keywords: Modified Tension Band Wiring, Cannulated Cancellous Screw, Transverse Patellar Fracture, Iowa.

Introduction

The largest sesamoid bone in human body is Patella and a part of extensor mechanism of knee. It connects the quadriceps tendon with the patellar ligament. It frequently gets injury due to its subcutaneous location. One percent of all skeletal fractures are fracture of patella.¹

So, fixation is needed to stabilize it. Patellar fractures may be displaced (65%), non-displaced (35%), transverse (52%). Others are comminuted, apical, vertical or longitudinal and osteochondral fracture. Two osteochondral fractures result from comminuted fractures or after patellar dislocation.³

Displacement \geq 2mm needs surgery. Mostly used options are ORIF with MTBW (modified tension band wiring with Kirschner wires) or Tension Band Wiring through Cannulated Cancellous Screw, circumferential cerclage wiring and cannulated screws alone. Other options are non-operative method and partial or complete patellectomy. Non-operative treatment for displacement $<$ 2mm is done by LLBS (long leg back slab) for 4 to 6 weeks.^{1,4} MTBW has the risk of postoperative pain, loosening and migration of Kirschner wires, skin adhesions, skin loss, hardware irritation with exposed implant, infection, delayed or nonunion and long hospital stay.^{4,5}

Tension band wiring through Cannulated Cancellous Screw is the best option for the treatment. Two separate studies have demonstrated that among the three methods for patella fixation (MTBW, Tension Band Wiring through Cannulated Cancellous Screw, cannulated screws alone), Tension Band Wiring through Cannulated Cancellous Screw provided the most efficient stability.^{5,9} In this study, we investigated and analyzed the functional and radiological outcomes of tension band wiring through cannulated cancellous screw for the management of closed displaced transverse patellar fracture.

Materials and Methods

This prospective observational study was conducted in NITOR, Dhaka from January 2017 to December 2018. Enrollment period started from February 2017 to September 2018. Prior permission was taken from Institutional Review Board, NITOR, Dhaka. Total 30 patients arriving at emergency & casualty ward and out-patient department (OPD) in NITOR with definitive inclusion & exclusion criteria were taken. Adult patients of 18 years and above, both male and female patients with closed & displaced transverse fractures of the patella within 14 days and medical fitness for surgery were the inclusion criteria. Open, comminuted, vertical, non-displaced fractures with

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more than 14 days of duration, pathological fractures other than osteoporotic fracture, unstable medical illness not permitting operative treatment and polytrauma were excluded.

The patients' selection were done by purposive sampling from the study population. A pretested structured questionnaire (History, physical examination, radiological assessment; per-operative & post-operative follow up) was used. To reveal questionnaire error, a pretest involved conducting a dry run of the surveys on a small representative set of respondent. Total 12 weeks follow up were done.

Functional outcome was assessed by the Iowa knee evaluation score (Merchant & Dietz, 1989). Collected data were analyzed with SPSS (Statistical Package for the Social Sciences).

With proper preoperative assessment and under spinal anesthesia, patella was exposed by an anterior longitudinal incision. After reduction of fracture surface, two 4 mm partially threaded cannulated cancellous screw were introduced as per guidance of guide wire & tension band wiring procedure was performed. Jones bandage was applied for 24 hours. Cylinder cast immobilization was performed for soft tissue healing and immediate postoperative pain relief. Postoperative supervised physiotherapy was started for every patient 14 days after removal of cast.

Results

Out of 30 patients, highest peak 10(33%) of patients were between 41-50 years. The mean age of the patients was 38.67±11.642 years. Maximum number of affected age was 45 years which were 7 (Table-I).

Table-I: Age of the patients (n=30)

Age in years	Frequency	Percentage (%)
11-20	2	7
21-30	6	20
31-40	8	27
41-50	10	33
51 -60	4	13
Total	30	100

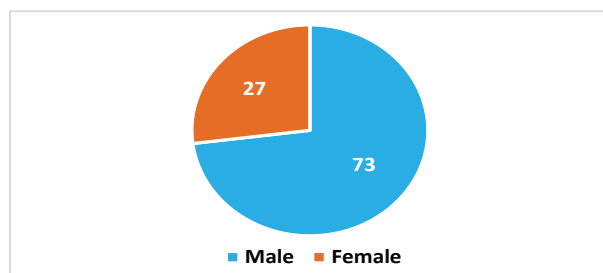


Figure-1: Gender of the patients (n=30)

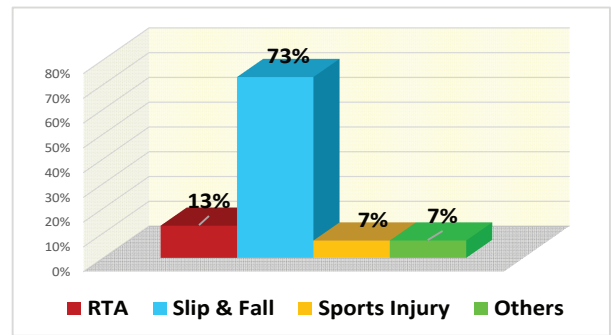


Figure-2: Cause of injury of the study population (n=30)

Above figure shows the cause of injury. The most common cause of injury was fall on slippery ground, 73% (22). The next cause was RTA, 13% (4); 7% (2) were sports injury and the rest 7% (2 patients) were other injuries. Maximum 11(37%) patients were service holder, housewives were 6(20%), businessmen & students were 4(13%) each. Farmers & laborers were 2(7%) each and others were 1(3%) only. Fourteen (47%) patients had right patella and 16(53%) had left patella involvement. Twenty (67%) operations were done between 6-10 days. Seven (23%) were done between 1-5 days and only 3(10%) were done between 11-14 days. Most of the fractures 19 (63%) got united between 9-10 weeks. Eleven (37%) got united between 7-8 weeks radiologically.

Table-II: Radiological union in weeks (n=30)

Union (weeks)	Number of patient	%
≤6 weeks	0	0
7- 8 weeks	11	37
9- 10 weeks	19	63
11- 12 weeks	0	0
Total=30		100

Two (7%) patients had SSTI and rest of the patients 28(93%) had no postoperative complication. None had Knee stiffness as because postoperative supervised physiotherapy was started for every patient just after removal of cast.

None faced loss of fracture reduction, implant migration and implant failure. According to the Iowa knee evaluation, 19(63%) patients got score of 31, 5(17%) patients got that of 32, 4(13%) patients got that of 29 and 2(7%) patients got that of 30. Mean functional score was 30.83±0.874. Mode was 31. Minimum score 29 and maximum score 32. Twenty three (77%) patients got score of 30 for mild pain with fatigue whereas 7(23%) patients got that of 35 for no pain. None got below 30. Mean score was 31.17±2.151. Median was 30. Twenty five (83%) patients got score of 10 for no limp, no support whereas 5(17%) patients got that of 8 for limp, no support. Mean score is 9.67±0.758. Median is 10. Twenty six (87%) patients got the score of 3 for no fixed flexion of >10 degrees with wt. bearing whereas 4(13%) patients got that of 2 for no fixed flexion of >20 degrees

with wt. bearing. 22(73%) patients got the score of 10 for flexion/extension up to 150° whereas 8(27%) patients got that of 9 for flexion/extension up to 135°. Mean score is 9.73±0.45. The final results on the basis of Iowa Knee Evaluation, 27(90%) patients had excellent outcome, 3(10%) patients had good outcome and no patient had fair or poor result.

Table-III: The Iowa knee evaluation results (n=30)

Lowa Knee Score	Number of Patients	%
Excellent (90-100)	27	90
Good(80-89)	3	10
Fair(70-79)	0	0
Poor(69 or less)	0	0
Total	30	100

Discussion

The objectives of operation for the patella fracture are accurate anatomical reduction, rigid internal fixation and early mobilization. Use of lag screws applies compression across the fracture site. Shortcomings of MTBW technique can be minimized with this procedure. Moreover, the probability of cannulated screw tension band loosening is very low.¹⁰ Berg EE¹¹ shows that radiographic union were at a mean of 13 weeks postoperatively. This study finds that radiologically 63% were united between 9-10 weeks and 37% were united between 7-8 weeks.

Tension band wiring through Cannulated Cancellous Screw is the best option for the treatment. Two separate studies have demonstrated that among the three methods for patella fixation (MTBW, Tension Band Wiring through Cannulated Cancellous Screw, cannulated screws alone), Tension Band Wiring through Cannulated Cancellous Screw provided the most efficient stability.⁵⁻⁹ Carpenter et al compared the MTBW technique with Tension Band Wiring through partially threaded Cannulated Cancellous Screw and found that combined use of lag screw and tension band principles provided more stable fixation of closed displaced transverse patellar fracture than MTBW. Moreover, the fracture site showed less displacement during knee extension.¹²

Tian et al⁵, Lalithkumar et al⁷ and Reddy DP et al¹ took the transverse patella fractures treated with cannulated cancellous screws with tension band wiring. The Iowa score was excellent in majority of the cases and had a good functional outcome. In this study, a series of 30 cases of fracture patella have been studied. No patient had loss of fracture reduction, implant migration, implant failure or soft tissue irritation. Only 2 patients had superficial wound infection. The wound healed following irrigation and wound debridement and secondary suturing without removal of implant. The Iowa knee score was excellent in 27(90%) patients and 3(10%) patients had good results. No patient had fair or poor result. Similar results were

observed by Tian et al⁵ out of 49 cases, 45(91.84%) had excellent and 4(8.16%) had good results.

Conclusion

For effective quadriceps function and for proper knee biomechanics, patellar fracture stabilization is required. So, it should be reduced and fixed anatomically. Cannulated screw tension band technique provides more secure fixation than MTBW in transverse patellar fractures. It can be considered as an alternative to other procedures. Result is excellent to good with very few complications.

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