

Functional outcome of minimally invasive modified tension band wiring in transverse fracture of patella fracture

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ABSTRACT

Introduction: Patella fractures are one of the most common types encountered by an orthopedic surgeon. It continues to pose problems being intra articular, and subjected to continuous deforming forces from muscles. The study is aimed to assess the functional outcome of minimally invasive modified tension band wiring in transverse patella fracture.

Methods: This was a prospective observational study, done at a tertiary care hospital. This study included adult patients in the age group 18 to 60 years, with displaced transverse fracture of patella treated by minimally invasive modified tension band wiring. Patients with comminuted fractures, open fractures, established knee deformity, and associated ligamentous injury were excluded from this study. They were followed up at 2nd, 4th, 8th, 12th and 24th weeks post-operatively to record Reich and Rosenberg grading, pain score, range of motion and features of radiological union.

Results: Total of 30 patients were enrolled in this study. The incidence was high in the age group of 31-40 years. The mechanism of injury was indirect in 21 cases and direct in 9 cases. Majority of patients 28 (93.3%) had their clinical union in less than 8 weeks and only one (3.3%) had complication with superficial wound infection. Based on the Reich and Rosenberg criteria for movement at the end of 24th weeks, our results were graded as excellent in 16 cases (53.3%), good in 8 (46.7%) cases, and none had fair or poor outcome. Similarly, mean pain score at 2nd, 4th, 8th, 12th and 24th weeks of follow up is 3.04 ± 0.54 , 2.1 ± 0.56 , 0.87 ± 0.27 , 0.49 ± 0.18 and 0.14 ± 0.1 , respectively. Mean range of motion at 2nd, 4th, 8th, 12th and 24th weeks of follow ups are 65.83 ± 7.08 , 83.66 ± 9.6 , 133.83 ± 6.4 , 135.83 ± 5.03 and 137.33 ± 3.13 degrees, respectively with significant improvement in range of motion. A total of 93.3% (28) of patients had radiological union before 8 weeks and 6.66% (2) patients had radiological union after 8 weeks.

Conclusion: Fixation of transverse patella fracture with modified tension band wiring gives good union within 2 months with low complication rates.

Keywords: cerclage, outcome, patellar fracture, tension band wiring.

INTRODUCTION

Patella fractures are one of the most widely recognized ones experienced by an orthopedic surgeon.¹ Different fixation strategies have been implemented like, circumferential wiring or tension band wiring using the Kirschner wire, wires with variable results.² The tension band wiring (TBW) is considered a treatment of choice; however, it requires large surgical incision, making it higher risk of postoperative complications like wound

complications or pain.² The utilization of modified technique with use of buried fragmentary screws and wires may give better outcomes in term of union time and decreased wound complications with better patient compliance overcoming the limitations of the TBW.³ This minimally invasive method provides stable fixation, allows early motion, with less injury to extensor mechanism, less hospital stay and reduced cosmetic problem in the scar.⁴ Hence, the aim of this study is to assess the functional outcome of minimally invasive modified Tension Band

Wiring (mTBW) in transverse fracture of patella among patients.

METHODS

It was a prospective observational study conducted at National Academy of Medical Sciences (NAMS), Kathmandu Nepal after ethical clearance taken from the Institutional review board of NAMS (Reference number: 761/082/083). The informed consent was obtained from the patient. Total sampling of the cases who underwent minimally invasive mTBW were taken. The duration of study was one and half year from July 2016 to January 2018, with six months of follow up. This study included adult patients in the age group 18 to 60 years, with displaced transverse fracture of patella treated by minimally invasive modified tension band wiring. Patients with comminuted fractures, open fractures, established knee deformity, and associated ligamentous injury were excluded from this study. The surgical technique used was according to the description of Cho et al in 2015.³ (Figure 1) Patients were immobilized with knee brace for two weeks. Regular dressing was advised with suture out on end of second week. They were followed up at 2nd, 4th, 8th, 12th and 24th weeks to record Reich and Rosenberg grading⁴, Visual Analogue Scale(VAS)⁵ score, range of motion and features of radiological union. The radiological union was considered when there was continuity of cortices and evidence of the trabecular bone growing across the fracture line seen on the X ray image with patient with clinically no pain or tenderness as defined by Tian et al.⁵ The union was confirmed by at least two orthopedic surgeons if there was dispute it was resolved by a third senior orthopedic surgeon.

Data was collected on proforma, afterwards was entered on the MS Excel 2010. Descriptives were reported with the use of mean, standard deviations and percentages which was also calculated on MS Excel 2010.

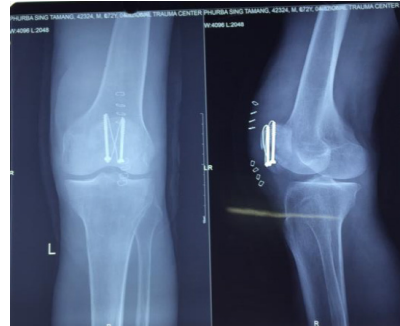


Figure 1: The picture of the surgical procedure performed with the intraoperative, fluoroscopic and postoperative X ray image.

RESULTS

Total 30 cases fulfilling the inclusion criteria were studied, where 19 (63.33%) were male and 11 (36.67%) were female with male to female ratio approximately 3:2. The mean age was 33 ± 3.2 years.

Pain score Pain score (VAS) was recorded at each follow up. The mean pain score at first follow up at 2 weeks was 3.04 ± 0.54 and at 4 weeks was 2.1 ± 0.56 . The pain score gradually improved in successive follow up at 8th, 12th and 24th weeks with mean of 0.87 ± 0.27 , 0.49 ± 0.18 and 0.14 ± 0.1 respectively. (Table 1) There was significant improvement in range of motion while comparing with the previous follow up.

Table 1: The VAS score and range of motion(ROM) in different follow up periods.

Follow up (Weeks)	Visual Analogue Scale Score (mean + SD)	Range of Motion (degrees) (mean + SD)
2	3.04 ± 0.54	65.83 ± 7.08
4	2.1 ± 0.56	83.66 ± 9.6
8	0.87 ± 0.27	133.83 ± 9.64
12	0.49 ± 0.18	135.83 ± 5.03
24	0.14 ± 0.1	137.33 ± 3.13

There was significant improvement in grading in terms of range of motion. Out of 30 patient excellent results were found in 20 patients (66.7%). (Table 2) Eight patients (26.7%) had good results at various follow up. And 2 patients (6.7%) were found to have fair results. 28 patients (93.3%) did not complain of pain at 24th week follow up. Only two patients (6.7%) found to have mild pain.



Table 2: Reich and Rosenberg Grading in Terms of Range of Motion and VAS score.

Reich & Rosenberg grading		Follow ups			
		4 weeks n (%)	8 weeks n (%)	12 weeks n (%)	24 weeks n (%)
Range of motion	Excellent	0	9(30%)	11(36.7%)	16(53.3%)
	Good	0	20(66.7%)	19(63.3%)	14(46.7%)
	Fair	25(83.3%)	1(3.3%)	0	0
	Poor	5(16.7%)	0	0	0
VAS score	None	0	0	28(93.3%)	30(100%)
	Mild	4(13.3%)	8(26.7%)	2(6.7%)	0
	Moderate	26(86.7%)	22(73.3%)	0	0
	Severe	5(16.7%)	0	0	0

A total of 28 (93.3%) of patients had radiological union before 8 weeks. Only 2 (6.66%) patients had radiological union after 8 weeks. One (3.3%) case superficial wound infection, which subsided with regular dressing and topical antibiotics.

DISCUSSION

Patella fracture is a common in the adults and with prevalence of around 1% of every trauma patient. In 30 cases of our study 93.3% had radiological union before post operative 8th week and with all cases achieving good to excellent range of motion by last follow up.

The commonest age group was 31-40 years accounting for 50.0%. Mean age of our patients was 33 + 3.2 years. The findings were similar to study by Naveen et al., Cho et al and Chiang et al, the mean age were 44.6 +13.6, 45 and 56.6 ±14.7 years respectively.^{3,6,7} Majority of the patients (93.3%) had features of radiological union before 8 weeks. The study by Rath et al reported radiological union by 8 weeks, comparable to our study.⁸ In the study by Muller et al, all fractures united within 8 weeks (mean 7.2 weeks).⁹ In study done by Naveen et al, union time was 10.1 .77 ±1.9 weeks, which though is longer than ours but does not vary largely.⁶ In the study done by Cho et al, radiological union was within 7.3 weeks.³ The union time was 10.8 ±1.3 weeks in the study done by Chiang et al.⁷

The functional outcome as given by Reich and Rosenberg, 16 (53.3%) patients had excellent outcomes, 14 (46.7%) had good outcome at 24th week follow up in our study. In the investigation done by Rath et al, 102(out of 107) had excellent outcomes which is higher than our study which may be due to larger number of cases enrolled in their study.⁸ In the examination done by Mao et al 30 (out of 31) accomplished excellent outcomes.⁹

Sharma et al studied on percutaneous tension band wiring for minimally displaced fractures of the patella.

Good outcome was observed in their study too, showing effectiveness of the percutaneous method.⁶ Turgut et.al did percutaneous, arthroscopic-assisted osteosynthesis of patellar fractures associated with skin abrasions and lacerations in 11 patients.¹⁰ Good outcome was achieved showing the use of these techniques even in the open fractures, but we had excluded the compound fractures so further study with open fracture is needed. Good outcome was reported using minimally invasive technique by Levack et al also.¹¹ Curtis et al. compared modified tension band technique with the combination of cerclage wiring and tension band in cadaveric experiments in 10 knees to study the strength of two methods of internal fixation for a fractured patella. The repairs were stressed to failure. He concluded that the combination of cerclage and tension band wiring proved to be significantly stronger and was recommended its use.¹²

However, there were some limitations like small sample size and single center study. The outcome was not compared to normal open methods usually employed which could have given better understanding of the effectiveness of the procedure.

CONCLUSIONS

Fixation of transverse patella fracture with modified tension band wiring gives good union within two months with low complication rates.

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Conflict of interest: None

REFERENCES

1. Melvin JS, Mehta S. Patellar fractures in adults. *J Am Acad Orthop Surg*. 2011 Apr;19(4):198-207. [[PubMed](#) | [DOI](#)]
2. Cantin S, Laroche C, Lavallée P, Lessard JM. Patellectomie: résultats à long terme [Patellectomy: results of a long-term follow-up]. *Can J Surg*. 1993 Oct;36(5):461-3. French. [[PubMed](#)]
3. Cho JH. Percutaneous cannulated screws with tension band wiring technique in patella fractures. *Knee Surg Relat Res*. 2013 Dec;25(4):215-9. [[PubMed](#) | [Full Text](#) | [DOI](#)]
4. Tian Y, 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 Dec;469(12):3429-35. [[PubMed](#) | [Full Text](#) | [DOI](#)]
5. Gould D, Kelly D, Goldstone L, Gammon J. Examining the validity of pressure ulcer risk assessment scales: developing and using illustrated patient simulations to collect the data. *J Clin Nurs*. 2001 Sep;10(5):697-706. [[PubMed](#) | [DOI](#)]
6. Sharma N, Chaturvedi H, Singh SP, Rakesh AA. Minimally invasive tension band wiring fixation for patella fractures: A study of 19 cases. *Int J Res Health Sci*. 2014; 2(3):761-8. [[Full Text](#)]
7. Chiang CC, Chen WM, Jeff Lin CF, Chen CF, Huang CK, Tzeng YH, Liu CL. Comparison of a minimally invasive technique with open tension band wiring for displaced transverse patellar fractures. *J Chin Med Assoc*. 2011 Jul;74(7):316-21. [[PubMed](#) | [Full Text](#) | [DOI](#)]
8. Rathi A, Swamy MK, Prasantha I, Consul A, Bansal A, Bahl V. Percutaneous tension band wiring for patellar fractures. *J Orthop Surg (Hong Kong)*. 2012 Aug;20(2):166-9. [[PubMed](#) | [Full Text](#) | [DOI](#)]
9. Mao N, Ni H, Ding W, Zhu X, Bai Y, Wang C, Zhao Y, Shi Z, Li M, Zhang Q. Surgical treatment of transverse patella fractures by the cable pin system with a minimally invasive technique. *J Trauma Acute Care Surg*. 2012 Apr;72(4):1056-61. [[PubMed](#) | [Full Text](#) | [DOI](#)]
10. Turgut A, Günal I, Acar S, Seber S, Göktürk E. Arthroscopic-assisted percutaneous stabilization of patellar fractures. *Clin Orthop Relat Res*. 2001 Aug;(389):57-61. [[PubMed](#) | [DOI](#)]
11. Levack B, Flannagan JP, Hobbs S. Results of surgical treatment of patellar fractures. *J Bone Joint Surg Br*. 1985 May;67(3):416-9. [[PubMed](#) | [DOI](#)]
12. Curtis MJ. Internal fixation for fractures of the patella. A comparison of two methods. *J Bone Joint Surg Br*. 1990 Mar;72(2):280-2. [[PubMed](#) | [DOI](#)]

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