

COMPARISON OF OUTCOME OF FRACTURES OF INFERIOR POLE OF PATELLA

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ABSTRACT

Background: Fractures of patella are common and it constitutes about significant proportion of all skeletal injuries resulting from either direct or indirect trauma. **Objective:** To evaluate the outcome of inferior pole fractures of patella treated with tension band wiring and resection of avulsed fragment and re-attachment of ligament to patella. **Methodology:** This was an comparative study, carried out in Department of Orthopaedic surgery of Lahore General Hospital, Lahore from 16th June 2012 to 15th June 2014. A total of 20 patients were included in this study. These patients were randomly divided into two groups. In Group-A patients were treated with open reduction and internal fixation with tension band wire and in Group-B patients were treated by resection of the avulsed fragment and reattachment of the patellar ligament to the patella. Patients were followed up for surgical site infection and functional outcome at 1st, 7th, 15th, day one month, three months and six months post operatively. Final outcome was assessed by using Bostman criteria. Data entry and analysis was done by using SPSS version 17. **Results:** Mean age of all 20 patients was 34.20±12.13 years. Although both treatment groups had statistically same rate of surgical site infection from 1st day till 15th day post operatively. From 1st month till 6th months follow up time period none of the patients had surgical site infection in both treatment groups. At 1st month and 6th month post operatively in Group-B outcome was statistically better as compared to Group-A patients. But at 2nd month outcome of patients was statistically same in both treatment groups. **Conclusion:** Resection of the avulsed fragment and reattachment of the patellar ligament to the patella had good outcome according to the Bostman criteria as compared to open reduction and internal fixation with tension band wire.

Key Words: Fracture patella, Avulsion fracture, Patella, Tension band wiring, Open reduction

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INTRODUCTION

Patella is largest sesamoid bone in human body and connects the quadriceps tendon with the patellar ligament. The major part of quadriceps muscle attaches into the superior pole of patella and the ligament of patella attaches to the inferior pole of patella.¹ The distal end of the patella is non articular while the proximal end of the patella is articular.² Due to its subcutaneous location, patella frequently faces injury.³ Fractures of patella result from a direct blow, a sudden hyperflexion of the knee while the quadriceps is fully contracted and fall or a high energy dash board injury. In most of the patients, fractures of patella are transverse.⁴

The incidence of inferior pole fractures of patella forms significant proportion of the total patellar fractures. Various treatment options include tension band wiring, circumferential wiring or use of screws.⁵ The traditional method of treatment for displaced comminuted inferior pole fractures is excision of the comminuted pole followed by reattachment of the patellar tendon with transosseous suture.^{6,7} The reattachment of the ligament of patella to the proximal cancellous rough surface

of fractured patella is controversial. Some trauma surgeons recommend attachment of the ligament of patella near the articular surfaces and others advocate reattachment near the anterior cortex. Fractures of the distal pole of patella usually are less than 15mm in vertical height.⁸ There are few studies which mention the use of suture anchors for fractures of the inferior-pole of patella.⁹ In this study the attachment will be done in the center of proximal remaining patella because this will reduce the chance of tilt in the patella. Second advantage of central attachment is that this will give the maximum purchase for the patella ligament.^{10,11} The objective of this study was to evaluate the results of inferior pole fracture of patella treated with tension band wiring and with resection of avulsed fragment and Reattachment of patellar ligament

METHODOLOGY

This comparative study was conducted in Department of Orthopaedic Surgery, Lahore General Hospital, Lahore from 16th June 2012 to 15th June 2014. A total of 20 patients of fracture of inferior pole of patella over the period of two years were included

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in the study. All the patients with close fractures of inferior pole of patella of either sex in the age between 18-50 years were included in the study. Patients with open fractures, knee deformity, associated articular surface injury, multiple injuries and unfit for surgery were excluded from the study. Each patient was followed for 6 months till the completion of study. Twenty patients were divided in two equal groups; group A and group B. Group A fractures were treated with open reduction and fixation with tension band wiring. Group B fractures were treated by resection of the avulsed fragment and reattachment of the patellar ligament to the patella. Prophylactic antibiotics and tourniquet was used in both groups. Patients received two more doses of antibiotic at 08 and 12 hours in the post-operative period. All the patients were operated by longitudinal incision under general or regional anaesthesia. Patients were placed in knee immobilizer in full extension for four weeks to allow for healing of soft tissue including retinaculum repair as well as allowing healing of ligament to bone. Patients were followed on 1st, 7th, 15th days and 1st, 3rd and 6th months for post operative infection and functional outcome. Infection was graded as 0, normal healing, as I, normal healing with mild bruising or erythema and as II erythema plus other signs of inflammation. The functional outcome of all the patients was assessed by using Bostman criteria.¹¹ The following scale was used; excellent = symptom-free, motion range equal to the intact side; good = slight pain on exertion and/or 20°-30° knee flexion lag; poor = pain on rest and 40°-60° knee flexion lag. The demographic information regarding age, sex, duration of injury and mechanism of injury was noted. The data was analyzed by using SPSS version 17. P value of less than 0.5 was taken as statistically significant.

RESULTS

In this study twenty patients with avulsion fracture of inferior pole of patella in age range of 18 years to 50 years, who fit in the inclusion criteria were enrolled. The patients were randomly distributed in two groups. Group A; Ten fractures were treated with open reduction and internal fixation with tension band wiring and group B; Ten patients with the resection of the avulsed fragment and reattachment of the ligamentum patellae to the patella. Mean age in group A was

30± 26 years and in group B, 38± 28 years. 90% in group A and 20% in group B were having injury to right patella. Surgical site infection in both groups is shown in table I.

Table I: Surgical site infection in groups at different follow up duration.

Post Operative Followup	Surgical Site Infection					
	Grade 0		Grade I		Grade II	
	A	B	A	B	A	B
1 st Day	6(60%)	7(70%)	4(40%)	3(30%)	0(0%)	0(0%)
7 th Day	2(20%)	5(50%)	8(80%)	5(50%)	0(0%)	0(0%)
15 th Day	3(30%)	6(60%)	7(70%)	4(40%)	0(0%)	0(0%)
1 Month	10(100%)	10(100%)	0(0%)	0(0%)	0(0%)	0(0%)
3 Months	10(100%)	10(100%)	0(0%)	0(0%)	0(0%)	0(0%)
6 Month	10(100%)	10(100%)	0(0%)	0(0%)	0(0%)	0(0%)

Functional outcome was assessed and recorded in table no: II

Table II: Functional outcome in treatment groups at different follow up duration.

Functional Outcome	1 Month		3 Months		6 Months	
	A	B	A	B	A	B
Excellent	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	6(60%)
Good	2(20%)	9(90%)	8(80%)	10(100%)	10(100%)	4(40%)
Unsatisfactory	8(80%)	1(10%)	2(20%)	0(0%)	0(0%)	0(0%)
Total	10	10	10	10	10	10
P-value	0.002		0.136		0.003	

Table II shows that at one month follow up 20% in group A, and 90% in group B have good functional outcome. At 3 months, 80% of group A and 100% of group B have good functional outcome. At 6 months 60% of group B have excellent outcome and 40% good, as compared to 0% excellent and 100% good results in group A.

DISCUSSION

This study was conducted to compare outcome of the open reduction with internal fixation and resection of avulsed fragment and reattachment. Ultrabraid suture offers special advantages over traditional polyester suture, including higher knot breaking strength, increased lubricity, and a stronger resistance to fraying. This is preloaded on to Twin-Fix suture anchor which has two ultrabraid sutures.^{6,12,13}

In present study over all mean age of patients was 34.20±12.years. Final outcome was assessed by using Bostman clinical grading scale. According to the scale patients in group-B who were treated with re-attachment had better outcome as compared to group-A patients in which patients were treated with tension band wiring. These results were consistent with the results reported by study of Anand et al.⁶ The

site of reattachment of the patellar ligament following partial patellectomy is a controversial area with some proposing attachment near the articular surface while others advocating attachment near the anterior cortex.^{14,15,16} We chose to insert the anchors in the centre of the proximal remnant as this would have theoretically the least chance of causing the tilt in the patella and also give us a maximum purchase in the cancellous bone (thickest area of the bone).¹⁷ It is important to protect the repair because the powerful forces are generated by the quadriceps mechanism. This is usually accomplished by figure of eight, load sharing wire or cable. The cable protects the patellar tendon repair by transmitting loads directly from the quadriceps tendon or proximal pole of the patella to the tuberosity of tibia. The disadvantage of using cable wire is that they require removal one to two years after surgery.¹⁸ Since the concept of the anterior tension band technique was introduced. This allowed for stable fixation, early motion, and improved rates of bony union.¹⁹ Study from India evaluated outcome of percutaneous tension band wiring for transverse fractures of the patella. At the latest follow-up, all patients had regained full extension. The objective score was excellent in 20 patients and good in 3, whereas the subjective score was excellent in 17, good in 5, and fair in one. Percutaneous tension band wiring is a viable option for transverse fractures of the patella.²⁰

In another study about patellar fracture, treatment was assessed by using tension band wiring. Results indicate that the tension band wiring is associated with acceptable results and the patients who have undergone surgery had no complaint with specific restrictions in regular activities. The main problem was related to pin irritation, particularly at the top and bottom ends of the bone with bent edge, and had caused localized bursitis in one patient.²¹ Another study compared the results of wiring (TBW) and modified tension band wiring in the patients of transverse fractures of patella. The study group consists of 20 patients, 10 patients each from both groups. Union was seen in all the 20 patients, but the union was faster in patients of TBW. The results of patients treated with tension band wiring are excellent in 40% of patients, good in 50% of patients and poor in 10% of patients. In patients of circular wire, excellent results were found in 20% of patients, good in 60% and poor in 20% of patients.²²

To the best of our knowledge, there has been no previous documented use of suture anchor for fracture patella. Part of it may be attributed to the absence of concrete laboratory data which can confirm its use for comminuted fracture of inferior pole of patella. Theoretically inserting the suture anchors in cancellous bone without rim of cortex could be a weak point where the repair might fail.

CONCLUSION

The result of our study showed that reattachment of patella ligament to patella showed better clinical results. Although this study was done with a small sample size, as well as in literature no such comparative study was found so it is suggested to conduct further large scale randomized trials to validate this technique.

REFERENCES

1. Mussa M, Bhat R, Yasin M and Muzaffar N. Patellar Tendon Ossification or Reformation of Patella after Partial Patellectomy? A Case Report. *Global Journal of Surgery*; 2014; 2 (1):16-18.
2. Saragalia D, Pison A. Rubens-Duval BA, Rubens-Duval B. Acute and old ruptures of the extensor apparatus of the knee in adults (excluding knee replacement). *Orthop and Trauma Surg and Research*; 2013; 67-76.
3. Mehdi Nasab SA, Sarrafan N, Tabatabaei S. Comparison of displaced patellar fracture treatment by two methods: Circular circumferential wiring versus tension band wiring. *Pak J Med Sci* 2012; 28 (5):787-790.
4. Gao GX, Mahadev A, and EH. Sleeve fractures of the patella in children Department of Orthopaedic Surgery, KK Women's and Children's Hospital. *Singapore Journal of Orthopaedic Surgery* 2008; 16 (1):43-6.
5. Patil N, lee K, Huddleston JI. Harris AH. and Goodman SB. Patellar Management in Revision Total Knee Arthroplasty: Is Patellar Resurfacing a Better Option? *The Journal of arthroplasty*; 2010; 25: 589-593.
6. Anand A, Kumar M, Kodikal G. Role of suture anchors in management of fractures of inferior pole of patella. *Indian J Orthop*. 2010 Jul-Sep; 44(3): 333-335.
7. Singh RP, Shah RK, and Srivastava MP. Treatment of inferior patellar pole avulsion fractures with pole resection and patellotibial cerclage wire. *Nepal Med Coll J*; 2007 Jun; 9 (2) : 93-95.
8. Cary Fletcher. Comminuted Fractures of The Lower Pole of The Patella - To Fix or Resect? A Case Report and Review of the Literature. *EC Orthopaedics* 2;1 (2015): 54-59.
9. Egol K, Howard D, Monroy A, Crespo A, Tejwani N, Davidovitch R. Patella Fracture Fixation with Suture and Wire: you Reap what you Sew. *Iowa Orthop J*. 2014; 34: 63-67.
10. Shi-Min Chang and Xiang-Ling JI. Open Reduction and Internal Fixation of Displaced Patella Inferior Pole Fractures With Anterior Tension Band Wiring Through Cannulated Screws. *J Orthop Trauma*. 2011; 25 (6):534-

11. Böstman O, Kiviluoto O, Santavirta S, Nirhamo J, Wilppula E. Fractures of the patella treated by operation. *Archives of orthopaedic and Traumatic Surgery*; November 1983; 102(2): 78-81.
12. Christian, Robert et al. Patellar Tendinopathy: Recent Development Towards Treatments.” *Bull Hosp Jt Dis* 2014; 72(3): 217–224.
13. Chang SM1, Ji XL. Open reduction and internal fixation of displaced patella inferior pole fractures with anterior tension band wiring through cannulated screws. *J Orthop Trauma*. 2011 Jun; 25(6):366-70.
14. Saltzman CL, Goulet JA, McClellan RT, Schneider LA, Matthews LS. Results of treatment of displaced patellar fractures by partial patellectomy. *J Bone Joint Surg Am*. 1990; 72: 1279-1285.
15. Duthie H, Hutchinson J. The results of partial and total excision of the patella. *J Bone Joint Surg [Br]*, 1958; 40: 75-81.
16. Marder RA, Swanson TV, Sharkey NA, Duwelius PJ. Effects of partial patellectomy and reattachment of the patellar tendon on patellofemoral contact areas and pressures. *J Bone Joint Surg* 1993; 75-A(1):35-45.
17. Lu H, Qin L, Lee K, Wong W, Chan K, Leung K. Healing compared between bone to tendon and cartilage to tendon in a partial inferior patellectomy model in rabbits. *Clin J Sport Med*. 2008; 18: 62–69.
18. Lu H, Qin L, Fok P, Cheung W, Lee K, Guo X, et al. Low-intensity pulsed ultrasound accelerates bone-tendon junction healing: a partial patellectomy model in rabbits. *Am J Sports Med*. 2006; 34: 1287–1296.
19. Alexander J, Solomkin JS, Edwards MJ. Updated recommendations for control of surgical site infections. *Annals of Surgery*, 2011; 253:1082-1093.
20. Rathi A, Swamy M, Prasantha I, Consul A, Bansal A, Bahl V. Percutaneous tension band wiring for patellar fractures. *J Orthop Surg (Hong Kong)*. 2012 Aug; 20(2):166-169.
21. Mehdinasab SA, Sarrafan N, Fakoor M, Tabatabaei S, Shalamzari S. Assessment results of patellar fracture treatment by method of tension band wiring. *Zahedan J Res Med Sci (ZJRMS)* 2013; 15(4): 60-62.
22. Jabshetty AB. A comparative study of modified tension band wiring and cerclage wiring in management of transverse fractures of patella. *Indian Journal of Science and Technology*, 2011; 4 (10): 1314-1321