



RESEARCH ARTICLE

REVERSE SUTURING TECHNIQUE IN PARTIAL PATELLECTOMY

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ABSTRACT

Fractures of the patella constitute almost 1% of all skeletal injuries[1], resulting from either direct or indirect trauma. Most patellar fractures are caused by a combination of direct and indirect forces. The most significant effects of fracture of the patella are loss of continuity of the extensor mechanism of the knee and potential incongruity of the patellofemoral articulation. Opinions differ as to the optimal treatment of patellar fractures. Accepted methods include a variety of wiring techniques, screw fixation, partial patellectomy, and total patellectomy. The aim of present study was to analyze the result of partial patellectomy by reverse suturing technique, complications associated with the procedure and restoration of range of motion and function of knee and to evaluate the results clinically regarding pain, activities of daily living, range of motion, power, radiologically regarding failure of procedure. A total of 35 cases of inferior pole patella fracture which were comminuted, extra-articular, closed and fresh were included. They were treated by partial patellectomy (reverse suturing technique). The age of patients in this study ranged from 20-50 yrs. Males formed 68.5% of the patients. Most common cause of fracture in this was direct blow to patella due to fall (62.8%). Duration from injury to surgery was an average of 3.56 days and hospital stay was an average of 4.44 days. Time taken to return to previous level of activity ranged from 8 to 12 weeks. Overall excellent results were obtained in 28 patients and good in 7 patients.

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INTRODUCTION

Patella fractures account for approximately 1% of all skeletal fractures (Bostrom, 1992) and are seen frequently in the age range of 20 to 50 years more often in males. The majority of patella fractures occur from direct injuries such as a blow to the patella from a fall, a motor vehicle crash, or some combination of these. Indirect injuries occur from a near fall, a fall from a height, or as a combination injury. The diagnosis of a patella fracture is made by performing a complete history and physical examination, and obtaining appropriate X-ray studies. Most of the patients present with painful swelling and inability to perform a straight-leg raise (Carson, 1984). Anteroposterior (AP), lateral, and sunrise views are routinely used in evaluation of patella fractures (Insall, 1984). Other specialized studies such as arthrography, CT, magnetic resonance imaging (MRI), and standard tomography are rarely used for the evaluation of a patella fracture (Weber, 1976; Sanders, 1992 and Arnoczky, 1985).

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A basic treatment-directed approach classifies the fracture as either nondisplaced or displaced. Descriptive geometric terms such as transverse, stellate or comminuted, longitudinal or marginal, proximal or distal pole, and osteochondral can be used to classify patella fractures. The treatment of patella fractures is based on the type of fracture and clinical presentation found on physical examination. The overall goals of patella fracture surgery are to preserve patella function, restore continuity of the extensor mechanism, and reduce complications associated with an articular fracture (Andrews, 1977; Ashby, 1975; Black, 1969; Bostman, 1981; Bostman, 1983; Bostrom, 1972; Chiroff, 1977; Dowd, 1982; Insall, 1972; Korner, 1905; Lotke, 1981; Noble, 1984; Nummi, 1971; Seligo, 1971 and Stern, 1980). Treatment options include the Non-operative treatment; Tension band wiring techniques; Partial patellectomy; Partial patellectomy combined with tension band wiring and Total excision or patellectomy. Comminuted patellar fractures in which only the distal pole of the patella is fragmented, leaving a substantial and relatively normal proximal fragment are treated by partial patellectomy with repair of the patella tendon using heavy Mersilene or Ethibond (Bostrom, 1972; Depalma, 1958; Reider, 1981; Siwek, 1981; Pritchett, 1997; Nathan, 2011 and Klassen, 1997)

Conventional method of partial patellectomy involves drilling three parallel holes just anterior to the articular surface of proximal fragment using 2mm K-wire or 2.5mm drill bit from distal to proximal direction. Two heavy nonabsorbable sutures through the patellar tendon, one through the medial and one through the lateral half of the tendon using a suture passer placing one suture end each through the medial and lateral holes and two through the central hole. With the knee slightly hyperextended, tie the sutures securely over the superior pole of the patella (Depalma, 1958; Reider, 1981; Siwek, 1981; Pritchett, 1997; Nathan, 2011; Klassen, 1997; Anderson, 1971; Magnuson, 1933; Payr, 1917; Miskew, 1980; Muller Me, 1979; McGreal, 1999; Lotke, 1981; John, 2007; Gosal, 2001; Gardner, 2005; Baran, 2009; Benjamin, 1987; Burvant, 1994; Carpenter, 1997; Chen, 1998; Scilaris, 1998; Weber, 1980; Schauwecker, 1974; Wright, 2009 and Wu, 2001). Reverse suturing technique used in our study involves minor modifications of conventional technique with regard to use of suture passer and order of weaving of patellar tendon.

## MATERIAL AND METHODS

This prospective study was conducted in the Post Graduate Department of Orthopedics Government Medical College, Jammu during the period from 1<sup>st</sup> August 2014 to 31<sup>st</sup> July 2015 with a mean follow up of 1 year. Both male and female patients were included in the study.

**Inclusion Criteria:** Age group (20 to 50 yrs), Distal fragment comminution, closed fractures, fresh injuries (less than 7 days), isolated fractures, negative SLR test.

**Exclusion Criteria:** Proximal fragment comminution, Multiple injured patients, associated neurovascular injuries, open fractures, cancer or severely ill patients which increases the operation morbidity, patients below 20 and above 50 years, fracture more than 7 days old, pregnancy. All the patients were initially assessed in the emergency section of GMC Jammu. They were given first aid in the form of analgesia, long leg splint, and other resuscitation measures. After selection of the patients for surgery, patients were prepared for elective surgery to be conducted in the elective operation theatre.

**Pre-operative evaluation:** Pre-operative evaluation included patients name, age, sex, address, date of injury, associated chronic illness, date of surgery and date of discharge. Every patient was evaluated for swelling, bruising & ecchymosis at the fracture site and visible deformity of the knee joint. Straight leg raising test was done to evaluate the extensor mechanism of the involved knee. A careful neurological and vascular examination of the involved limb was done. All the routine investigations like complete blood count & biochemistry were done. Radiographic evaluation by X-ray of the chest, knee AP & Lat view was done in every patient. Informed and written consent was taken from the patients

**Implants:** Ethibond suture no.5, 2mm K-wires, 2.5mm drill bit.

**Operative Technique:** The patient was positioned in supine position with a bolster under the knee to keep it in about 30 degrees of flexion. Knee and involved limb were draped under all aseptic conditions. A midline longitudinal skin incision was made centered over the patella. Skin and subcutaneous tissue were reflected medially and laterally to expose the entire

anterior surface of the patella and the quadriceps and patellar tendons. Preserving the intact proximal third of the patella, comminuted distal fragments were removed, joint was cleared of loose segments of bones and cartilages. Small flecks of bone were left within the patellar tendon to make anchorage easier. Articular edge of the proximal fragment was trimmed, and smoothed with a rasp. Beginning on the fracture surface of the proximal fragment just anterior to the articular cartilage, a 2-mm Kirschner wire or 2.5-mm drill bit was used to drill three parallel holes in a proximal direction (one hole in the center and one each in the medial and lateral thirds) (Zhao, 1999; Marder, 1993; Mishra, 1971; Kaufer, 1971; Duthie, 1958; Albanese, 1992). Reverse Suturing Technique used in our study involves the following modifications as compared to conventional technique.

- Straightening the Ethibond suture needle with two needle holders.
- Insertion of straightened needle through the lateral hole from distal to proximal with rear end of needle facing upwards (reverse), holding the needle near the tip with a needle holder.
- Keeping the needle held within the hole pull out the thread from the proximal end, then remove the needle from the distal hole.
- Insertion of same needle through central hole from distal to proximal in conventional manner.
- Repeating the above technique through the medial hole with another ethibond suture needle.
- The patellar tendon was then sutured with the patella with the above ethibonds at the front upper surface of patella on a fully extended knee.
- The stability of this system was checked at 30°, 60° and 90° of flexion.
- Finally, the medial and lateral ratinaculla of patella and capsule were sutured and the joint was closed.
- Light immobilization was provided with Robert-Jones bandage.

**Follow-up:** All patients were encouraged to engage in non-static quadriceps exercises from the first post operative day. On the third post operative day the passive movements/exercise system (CPM) was applied. Patients were discharged with instructions for a continuation of non-weighted physiotherapy. An extension brace is applied and partial weight bearing with crutch assistance is maintained for 6 weeks postoperatively. Gradual active and active-assisted range of motion is implemented at 6 weeks from surgery. Early gradual range of motion in a hinged brace, not to exceed 90°. Twenty eight patients followed the above program, whereas seven patients with accompanying skin and soft tissue complications had a splint applied. The onset of mobilization for these seven patients were delayed by a week. The patients were examined at regular interval of 1,3,6 and 12 months. For the clinical and x-ray evaluations, the Cincinnati/Noyes evaluation scales (Crenshaw & Wilson, 1954) was preferred as the best way of rating patellofemoral findings. The results were therefore characterized as follows: 90-100 excellent, 80-89 good, 70-79 as moderate and fewer than 70, as poor. The x-ray examinations included the usual anteroposterior (AP) and lateral (L) radiograph and Merchant's tangent radiograph. Insall-Salvati ratio was used for the assessment of patellar height.

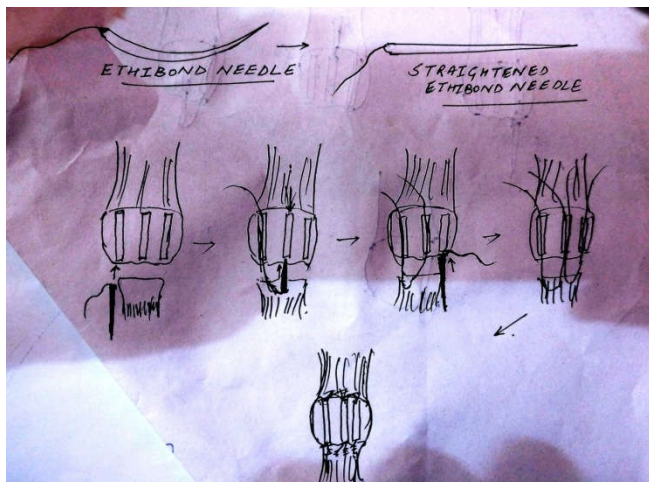


Figure 1. Showing Reverse Suturing Technique



Figure 2. Fracture lower pole of patella and partial patellectomy done Via Reverse Suturing Technique

Muscle atrophy was observed with measurement of the perimeter of the quadriceps muscles using the healthy muscle as a comparison.

## RESULTS

**Subjective evaluation:** Using the Cincinnati evaluation scale in the 3 months re-evaluation, 15 patients showed excellent results (42.9%), 8 showed good results (22.9%), 8 showed moderate results (22.9%), and 4 showed poor results (11.4%). These results showed a significant improvement at 6 months. At 6 months reevaluation 21 patients (60%) reported knee discomfort, 17 of which after medium exertion, 4 with continuous pain and reduction of activity. 6 patients (17.1%)

complained of knee swelling and a certain amount of movement restriction while working, taking part in sports, or during everyday activities. At the last follow-up examination, 6 patients (17.1%) complained of a "giving way" sensation.

**Objective evaluation:** Range of Motion (ROM): For 28 patients ROM was above 90% of the norm at a very early stage (3 months examination). This resulted till the end of the evaluation period. For 5 patients, the final ROM was 80-90% and for 2 patient less than 70%, who also had a 10% loss of extension and an obvious limp.

**Muscle atrophy:** 7 patients had quadriceps atrophy at 1 and 3 months re-evaluation.

**Grind Test:** From the total of 35 patients that were examined, 16 patients (45.7%) showed a positive patella pressure point.

**Complications:** In the immediate complications were included 7 superficial infections, which were treated successfully with antibiotics.

## DISCUSSION

The reduction of muscle strength in total patellectomy reaches 50% (Watkins, Harris, Wender, Zarins & Rowe, 1983), whereas only 15% in partial patellectomy (Saltzman, Goulet, McClellan, Schneider & Matthews, 1990). For the development of osteoarthritic changes, the results of our series are comparable to those of Saltzman *et al.* (1990) in which, nevertheless, the early mobilization was not introduced. It would seem that early mobilization does not play a role in producing osteoarthritic changes. Probably, the nature and position of cartilage is a significant factor in the development of secondary changes (Hung *et al.*, 1993). When appropriate selection criteria are utilized, partial patellectomy can yield functional outcomes that are equivalent to open reduction and internal fixation. Multiple authors have reported nearly normal functional outcome when large fragments of the patella and articular congruity are preserved. Retention of small, nonviable fracture fragments or those devoid of cartilage did not improve function, while retention of large fragments provided a lever arm for improved extensor mechanism function. With extensive inferior pole comminution, superior results have been reported with partial patellectomy compared to internal fixation. Bostrom reported 88% good to excellent results with partial patellectomy for transverse patellar fracture with inferior pole comminution, compared to only 74% good to excellent results with internal fixation.

## Conclusion

In conclusion, if the above conditions, in relation to the large abutment size, placement and anterior tendon placement on the abutment are met, then partial patellectomy gives satisfactory results. Otherwise an attempt of osteosynthesis should be made, maintaining the patella. In any case, disorders of the articular surface. And this reverse suturing technique in partial patellectomy can be used when curved guide wire is not available without any difficulty.

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