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RESEARCH ARTICLE

A PROSPECTIVE STUDY OF PATELLAR FRACTURE COMPLICATIONS

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ABSTRACT

Patellar fractures are common and constitute about 1% of all skeletal injuries and results because of direct trauma, which causes more comminution whereas indirect injury leads to more displacement with transverse fracture pattern1, 2. Modified tension-band wiring (TBW) technique 6,7,8 is the most widely used technique and has give best results in the operative group. We carried out a prospective study of displaced fracture patella by modified tension band wiring in adults with an objective of evaluating the functional outcome and associated complications. The mean age was 38 years and the incidence was high in the age group of more than 40 years. Mostly indirect injuries came with close type of wound but there were 5 cases of Gustillo-Anderson type 1 of open injuries due to direct injury. In our study we had 23 cases of direct injuries and 7 cases of indirect injuries to patella. Our study included patella fracture from 34C1.1 [transverse] to 34C3.1 [communited] with maximum cases in 34C1.1. The complications are minor which commonly includes hardware prominence due to subcutaneous patellar location but implant removal due to exposed hardware is not common. As for the delayed complications all the fractures united so we had no cases of delayed union or malunion of fracture. But we had a case of migration of pin through the skin after 11 weeks for which K-wire had to be removed. Most of the patellar fractures treated with TBW have good to fair results.

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INTRODUCTION

Patellar fractures are common and constitute about 1% of all skeletal injuries resulting from either direct or indirect trauma (Böstman *et al.,* 1983). Fractures resulting from indirect injury tend to be less comminuted than those from direct trauma, but they are displaced and are often transverse (Thompson, 1935). Various factors like age, bone quality and knee flexion angle at the time of injury also influences the fracture pattern apart from the mechanism of injury (Ashesh *et al.,* 2010; Whittle, 2008; Baran *et al.,* 2008). Modified tension-band wiring (TBW) technique (Carpenter *et al.,* 1997; John *et al.,* 2007; Weber *et al.,* 1980) is the most widely used technique and has give best results in the operative group. Symptomatic hardware due to subcutaneous location represents the most common complication ranging upto 60 % which might necessitate implant removal prematurely (Petrie *et al.,* 2013; Kumar *et al.,* 2010). We carried out a prospective study of displaced fracture patella by modified tension band wiring in adults with an objective of evaluating the functional outcome and associated complications.

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Objectives

- To study the functional outcome of knee joint after patellar fracture treated with modified TBW.
- To study the complications of tension band wiring in patella fracture.

MATERIALS AND METHODS

This prospective study was done in a tertiary care centre during the period from June 2013 To September 2015.This study consists of 30 cases of *displaced* fracture patella treated by modified tension band wiring. The cases were selected based on inclusion and exclusion criteria.

Inclusion criteria

- Transverse and comminuted fracture of patella. according to AO classification Type 34-C1 to 34-C3.1
- Fracture patella between the age of 20-45 years
- Fracture patella not associated with ipsilateral femur and tibia fracture
- closed fracture and open fracture Gustilo Anderson type I or II

Exclusion criteria

- AO Classification type 34A, 34B and 34-C3.3
- Pre-existing fixed flexion deformity of knee joint
- Pathological fractures.
- Patient not consenting for surgery
- Patient not consenting to participate in the study
- Open fractures Gustilo Anderson type III

Method of collecting data

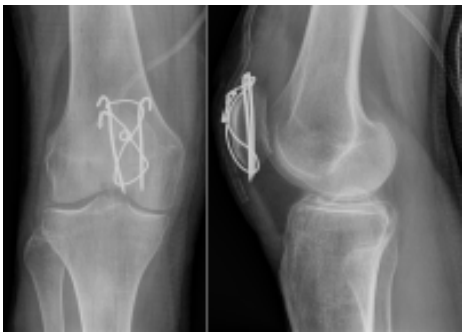
Apart from personal data, all the patients were personally interviewed for mode of injury and the duration since injury was recorded. Standard anteroposterior, lateral, skyline view radiographs were taken. The limb was immobilized by an above knee plaster of Paris posterior slab or long knee brace. Fracture was classified according to AO classification and patient was selected for study if he/she met the inclusion criteria after consent.

Operative procedure

The fracture site was exposed through midline longitudinal. Inspection of femoral cartilage for any injury was done and the fragments were reduced and held in position with the help of patellar clamp or towel clips. Two Kirschner wires of 1.8 mm thickness were passed in the anterior one third of patella and confirmed under image intensifier. Wire is guided to prevent from engagement in the quadriceps tendon with help of osteotome or broad periosteum elevator while it is coming out of upper pole, 18 gauge stainless steel pre-tensioned wire was taken and passed deep to ligamentum patellae inferiorly and behind the quadriceps tendon superiorly as close to bone making a figure of '8' in front of the patella.

Figure 1. Preoperative clinical and radiographic pictures

(a)



(b)

Figure 2: Post-operative radiographic pictures. (a)Immediate Post-Op X-Rays (b) at final 1 year followup.

Figure 3. Clinical functional recovery at the end of 3 months

(a)

(b)

Figure 4. Complications encountered included (a) exposed K-wire and (b) K-wire migration

The upper end of wire was bend 90 degrees then cut and rotated 180 degrees and impacted in the upper border of patellae to prevent slippage of the SS wire, the lower end of wire was hammered in reverse manner to prevent any quadriceps impingement and was cut 2mm from the lower pole. Tear in the quadriceps expansion was sutured and wound closed over a negative suction drain. Long Knee brace and pressure bandage was given as a temporary immobilization. Check X-rays were done postoperatively. The patient was advised to do static quadriceps strengthening exercises and range of motion active assisted as tolerated. X-rays were taken postoperatively, at 6 weeks,3 months, 6 months and 1 year. Follow up was advised at 2 weeks, 6 weeks, 3 months, 6 months and 1 year. The patients were questioned about subjective complaints like pain, difficulty in walking, squatting, climbing and getting downstairs and ability to perform routine work. The patient's objective assessment was done for extensor lag, range of knee movement, circumference of thigh (wasting) and efficacy of quadriceps (power).West criteria was recorded for each patient.

RESULTS

In our series the range of age was between 21 to 45 years, the mean age was 38 years and the incidence was high in the age group of more than 40 years. In a total of 30 cases, 21 fractures were in men and 9 fractures were in females. Mostly indirect injuries came with close type of wound but there were 5 cases of Gustillo-Anderson type 1 of open injuries due to direct injury. In our study we had 23 cases of direct injuries and 7 cases of indirect injuries to patella. Our study included patella fracture from 34C1.1 [transverse] to 34C3.1[communited] with maximum cases in 34C1.1. The average duration between the day of admission to the day of surgery is about 2.93 days and the average duration of stay in hospital is about 13.2 days (ranging from 11 to 22 days) 22 days in a patient due to superficial infection of the wound and this was healed by 3rd week under antibiotic cover and sterile dressings. Operative time was noted from skin incison to skin closure. range was taken from 35-70 minutes. Mean operating time was 50.5 minutes. Out of 30 patients 22 patients had no extensor lag and 8 patients had extensor lag ranging from 0`-15` with mean of 2.3. Thigh girth preoperatively ranged from 51-66 with mean preoperative thigh girth of 57 cm.postoperatively thigh girth range from 49- 65 with of mean 55.8. Wasting of thigh ranging from 0-3cm with mean of 0.39cm.

Table 1. Results based on WEST`S CRITERIA

Results	No. of cases	Percentage
Excellent	22	73.3%
Good	5	16.7%
Poor	3	10%

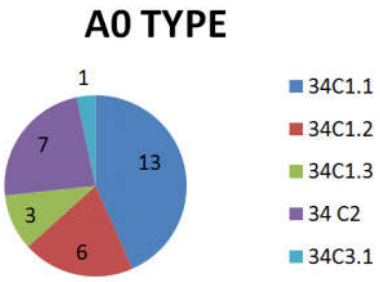


Figure 5. Graph showing distribution of patients according to AO classification

No intraoperative complications like fragmentation at wiring, difficulty in closure were encountered .In the immediate post operative period we had a case of wound gaping with infection and a case of superficial infection of the wound. As for the delayed complications all the fractures united so we had no cases of delayed union or malunion of fracture. But we had a case of migration of pin through the skin after 11 weeks for which K-WIRE was removed.

DISCUSSION

Modified tension-band wiring is the most widely used technique and has give best results in the operative group (Carpenter *et al.,* 1997; John *et al.,* 2007; Weber *et al.,* 1980). In our series the range of age was between 21 to 45 years, the mean age was 38 years and the incidence was high in the age group of more than 40 years. Levack *et al.,* 1985 conducted study on patellar fracture and observed 49 years was average age for patellar fracture In a total of 30 cases, 21 fractures were in men and 9 fractures were in females. The males were more prone to trauma due the obvious more outdoor activities. Mostly indirect injuries came with close type of wound but there were 5 cases of Gustillo-Anderson type 1 of open injuries due to direct injury. In our study we had 23 cases of direct injuries and 7 cases of indirect injuries to patella. Maini *et al.,* 1986 found 65% direct trauma was associated with patellar injury. Our study included patella fracture from 34C1.1 [transverse] to 34C3.1 [communited] with maximum cases in 34C1.1. Maini *et al.,* 1986 observed 70 % of transverse fractures in their study which was similar to 34C1.1 fractures as per AO classification. One case of superficial infection was found which turned out to be a stitch abscess which settled with vicryl removal and antibiotics. Out of 30 patients 22 patients had no extensor lag and 8 patients had extensor lag ranging from 0`-15` with mean of 2.3.The extensor lag is common after any knee surgery which suggests quadriceps especially vastus medialis obliquus weakness . The lag settled down with aggressive physiotherapy and some short faradic stimulation. Srinivasulu *et al.,* 1986 reported 10.5% cases with restriction of movements more than 20 degrees. Although the physiotherapy protocol and early mobilization with weight

bearing in our study resulted in fair range of motion and better results due to early functional rehabilitation. As for the delayed complications all the fractures united so we had no cases of delayed union or malunion of fracture. But we had a case of migration of pin through the skin after 11 weeks for which K-wire had to be removed (Figure 4). Hoshino *et al.,* 2013 performed a retrospective study of surgically treated patellar fractures. In this study, elective implant removal was performed in 37 % and 23 % of patients treated respectively with K-wires and cannulated screws. In a case series of 27 patients, Le Brun *et al.,* 2012 reported a hardware removal rate of approximately 52% at a mean of 6.5 years of follow-up Le Brun *et al.,* 2012). Maini *et al.,* 1986 observed 11% cases' wound infected post operatively. Out of 48 cases studied, they reported 36.6% cases as excellent, 38.4% cases as good, 35.4.% cases as fair and 14.3% cases as poor. We had 10% cases classified as having poor results specially due to the pin migration and superficial infection. The reason of pin migration could be our aggressive rehabilitation protocol with early weight bearing to aid in early functional recovery and early assisted range of motion exercises. The stable fracture which undergoes functional protected loading facilitates early union (Kubiak *et al.,* 2013).

Conclusion

Modified tension band wiring is a simple, low-cost, time tested technique, requiring minimal instrumentation and allows early mobilization in displaced patella fractures. The complications are minor which commonly includes hardware prominence due to subcutaneous patellar location but implant removal due to exposed hardware is not common. Most of the patellar fractures treated with TBW have good to fair results. This prospective study had limitations with respect to its relatively small size and only 1 year of follow-up. The long term follow would be needed to evaluate the osteoarthritis implications.

Ethical Clearance: All patients gave informed consent before inclusion into the study. The study was permitted by the university ethical committee and was carried with the ethical standards of the revised Helsinki declaration.

Conflict of interest: Nil.

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