



International Journal of Orthopaedics Sciences

ISSN: 2395-1958
IJOS 2017; 3(2): 455-457
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www.orthopaper.com
Received: 10-02-2017
Accepted: 11-03-2017

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Functional outcome with modified tension band wiring for patella fractures

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DOI: <http://dx.doi.org/10.22271/ortho.2017.v3.i2d.40>

Abstract

Background: Patella is the largest sesamoid bone in the body to an integral part of the extensor mechanism of the knee joint. The functional outcome of patella fractures depends on age, severity of injury, treatment modality, anatomical reduction and restoration of articular congruity, post-operative rehabilitation [1]. Aim of the study to assess the functional outcome of modified tension band wiring in patella fractures.

Materials and methods: This is prospective study of 32 patients conducted at Basaveshwara Medical College and Hospital over a period of 2 years. All patients with 32 patellar fractures treated by modified tension band wiring. Functional outcome assessed as per the knee pain score, good fellow grading for range of motion. Patients were evaluated at 2nd week, 4th week, 3rd month and 6th months.

Results: Age of patients ranged from 23-65 years with mean age of 40.6 years. Out of 32 patients, 22 (68.75%) patients were male and 10(31.25%) patients were female. Right knee was involved in 20 (62.5%) cases. About 18 (56.25%) cases attained fracture due to indirect trauma. Mean operation time was 90 minutes. Complications like superficial infection were seen in 2 patients. Average duration of hospital stay was 16 days. At the end of 6th month 2(6.25%) patients had ROM <90, 6 (18.75%) patients had 90-120 degree of motion and 24 (75%) patients had > 120 degrees motion. At 6th month follow up 3(9.4%) patients had mild (30-45) knee pain score. Majority of patients show excellent results according to good fellow grading for range of motion.

Keywords: Patella, fracture, tension band wiring, internal fixation

Introduction

Patella is the largest sesamoid bone in the body situated in front of knee. Fracture patella can occur either by direct or indirect force [1]. The direct force often results in comminuted or displaced fractures. Transverse fracture of patella is usually due to violent contraction of quadriceps muscles with knee flexion [2, 3]. There are various forms of surgical treatment for fracture patella. They are open reduction and internal fixation with inter fragmentary screws, tension band wiring, cerclage wiring, combined tension band wiring and cerclage wiring, partial patellectomy, total patellectomy [4].

Modified tension band wiring is the best treatment for displaced transverse fractures. The principle of TBW is distractive forces at fracture site are converted to compression force. The implant absorbs the tension and bone compression [3, 4, 5]. Weber *et al* [4] reported that modified TBW is the most secured fixation for patella fractures.

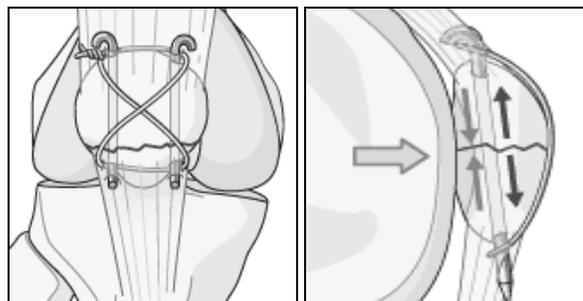


Fig 1: Shows principle of TBW

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This study was taken up with the aim of assessing the functional outcome of modified tension band wiring in patella fractures.

Materials and methods

This is a prospective study of 32 patients undertaken in the Department of Orthopaedics at Basaveshwara Medical College and Hospital over a period of 2 years from July 2014 to June 2016. All patients sustained displaced transverse patella fractures were included. The cases with Open fractures, Comminuted fractures, Patients medically unfit for surgery, Patients not willing for surgery were excluded from the study. A detailed history taken and a systematic examination of the patient was conducted according to Proforma. Radiographs of knee were taken to confirm the fracture. Then splinting of fracture was done with rigid knee brace. All patients were taken for elective surgery as soon as possible after necessary investigations.

Patient was kept in supine position in an operating table after spinal anaesthesia. Midline longitudinal incision put over the mid portion of patella. Skin and subcutaneous tissue were reflected in order to expose fracture surface of patella and retinacular tears. Thorough irrigation of the joint and fracture with saline to remove blood clots and small bone pieces. Fracture fragments reduced anatomically by using patellar clamps and towel clips. Under surface of patella was

evaluated by digital palpation for malreduction. Two 2mm kirschner wires were drilled from superior to inferior borders, about 5 mm deep to anterior surface of patella. The wires were kept as parallel. Then 18 gauge stainless steel wire was passed transversely through the quadriceps tendon attachments as close to the bone as possible, deep to the protruding kirschner wires. Then turn the wire over the anterior surface of reduced patella in figure of 8 fashions. Insert wire transversely through patellar tendon at inferior fragment and deep to protruding k-wires then back over the anterior patellar surface. Wire was tightened at the upper end. Proper reduction of fracture was checked by palpating the under surface of patella while extension. Upper ends of k-wires were acutely bent anteriorly. After they were cut, k-wires were rotated 180° and embedded into superior margin of patella posterior to wire loop. Protruding ends of k-wires inferiorly were cut short. Retinacular tears were repaired bilaterally. Operated site was cleaned thoroughly with saline and wound was closed in layers with drain in situ. The limb was immobilized in a rigid knee brace.

Patients were evaluated at 2nd week, 4th week, 3rd month and 6th months. All patients were taught static quadriceps strengthening exercises. In each follow up knee pain score was recorded. Range of motion, extension lag and good fellow's grading of motion were recorded. Check x- ray of operated knee was taken to assess fracture union.



Fig 2: shows preoperative and postoperative X-rays

Results

This is prospective study of 32 patients conducted in orthopaedics department of Basaveshwara Medical College and Hospital over a period of 2 years from July 2014 to June 2016. Age of patients ranged from 23-65 years with mean age of 40.6 years. Maximum incidence of the injury was observed during 3rd and 4th decade of life.

Out of 32 patients, 22 (68.75%) patients were male and 10(31.25%) patients were female. Right knee was involved in 20 (62.5%) cases, while the left knee involved in 12(37.5%) cases. 18 (56.25%) cases attained fracture due to indirect trauma, 14 (43.75%) cases attained fracture due to direct trauma. Majority of cases attained fracture due to self fall. Mean operation time was 90 minutes. Complications like superficial infection were seen in 2 patients and bursitis at k – wire tip seen in 2 patients at all. Deep infection is not noticed in our series. Average duration of hospital stay was 16 days. Quadriceps wasting (<1cm) was noted in 4 cases at the end of 6th month due to inadequate rehabilitation exercises during follow up. Extension lag was noted in 18(56.25%) cases out of 32 cases in first follow up. At 6th month follow up

extension lag was corrected in all cases. At 1st follow up 24(75%) patients had ROM <90°. At the end of 6th month 2(6.25%) patients had ROM <90, 6 (18.75%) patients had 90-120 degree of motion and 24 (75%) patients had > 120 degrees motion. Modified knee pain score was classified into 4 groups: none (50), mild (30-45), moderate (10-20), severe (<10). At 2nd week follow up 24(75%) patients had mild pain and 8(25%) patients had no pain. At 6th month follow up 3(9.4%) patients had mild (30-45) knee pain score and remain patients had no pain. Radiological union of fracture was seen in all patients by 3rd month.

Table 1: Good Fellows grading of range of motion [6]

Grading	Range of Motion
Excellent	Painless full movement and able to squat
Good	Full flexion and extension, but painful squat
Fair	Painless movement with 10-20 degrees limitation of flexion
Satisfactory	Painless movement with limitation of 20-40 degrees of flexion
Poor	Limitation of >40 degrees flexion

Table 2: shows functional results according to good fellow grading

Good fellow Grading	2 nd week		4 th week		3 rd month		6 th month	
Poor	26	81.3	10	31.3	0	0	0	0
Satisfactory	5	15.6	12	37.5	0	0	0	0
Fair	1	03.1	8	25.0	8	25	2	6.2
Good	0	0	2	6.2	13	40.6	6	18.8
Excellent	0	0	0	0	11	34.6	24	75.0
Total (n)	32	100 %	32	100%	32	100%	32	100%

Discussion

The aim of surgical treatment in patella fracture is anatomic reduction; restore articular congruity, preservation of patellar bone stock, and repair of extensor mechanism. Modified tension band wiring is most widely used technique in patella fracture fixation^[7].

Weber *et al*^[4] compared different types of fixation for patella fractures and found that the most secure fixation was obtained with modified tension band wiring. Ozdemiret *et al*^[8] conducted a study on 20 patellar fractures with modified tension band wiring reported good and fair results 55% and 35% of the patients respectively. Mehdi *et al*^[9] study shows that excellent and good results in 203 patellar fractures which are treated by TBW. Gardner *et al*^[10] concluded that anterior tension band fixation constructs are the main stay of treatment of patella fractures and lead to reliable results with simple transverse fracture patterns. Our study also shows 75% excellent and good results in 18% of patellar fractures treated by modified tension band wiring.

Benjamin *et al*^[11] evaluated modified TBW, Lotke ring, Magnusson wiring, and screw fixation in transverse fractures and found that modified TBW technique to provide the best fixation. Gumala *et al*^[12] reported more results in patients treated by modified TBW. Curtis MJ^[13] *et al* 1990 compared modified AO tension band technique with the combination of cerclage wiring, and tension band. The combination of cerclage and tension band wiring proved to be significantly stronger and is recommended. Berg EE *et al*^[14] shows that radiological union of transverse fracture of patella was seen at a mean age of 13 week. In our study all patients had radiological union at 12th week.

The tension band wiring for transverse fractures of patella yields good results as evident in this study. It is inexpensive; the technique is relatively simple with a short period of learning curve.

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