Section: Orthopaedics

Original Research Article

EVALUATION OF MODIFIED TENSION BAND TECHNIQUE IN THE MANAGEMENT OF PATELLAR FRACTURES

S Khaderulla Basha[1], Uma Maheshwar Reddy[2], T Naveen Babu[3], Madamanchi Harsha[4]*

[1]*Assistant Professor, Department of Orthopaedics, Apollo Institute of Medical Sciences & Research, Chittoor, Andhra Pradesh, India.*
[2,3]*Associate Professor, Department of Orthopaedics, Sri Balaji Medical College Hospital & Research Institute, Renigunta, Tirupati, Andhra Pradesh, India.*
[4]*Assistant Professor, Department of Orthopaedics, Sri Balaji Medical College Hospital & Research Institute, Renigunta, Tirupati, Andhra Pradesh, India.*

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Corresponding Author:
Dr.T.Naveen Babu,
Associate Professor, Department of Orthopaedics, Sri Balaji Medical College Hospital & Research Institute, Renigunta, Tirupati, Andhra Pradesh, India.
Email: naveen782@gmail.com

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ABSTRACT

Background: Patella fractures are common and it constitutes about 1% of all skeletal injuries resulting from either direct or indirect trauma. The subcutaneous location of the patella makes it vulnerable to direct trauma as in dashboard injuries or a fall on the flexed knee, whereas violent contraction of the quadriceps results in indirect fractures of patella. These fractures are usually transverse and are associated with tears of medial or lateral retinacular expansions. In this study a series of 30 cases of fracture patella were studied after treating with Modified Tension Band Wiring technique.

Material and Methods: This prospective study was done in Department of Orthopaedics at Sri Balaji Medical College Hospital & Research Institute, Tirupati, who were enrolled between July 2024 - June 2025.This study consists of 30 cases of fracture patella treated by modified tension band wiring. Cases were selected based on inclusion and exclusion criteria.

Inclusion Criteria: 1. All closed and type I and type II open displaced transverse patellar fractures.
2. Transverse fracture with displacement of more than 2 to 3 mm and articular step of more than 2mm.
3. Comminuted fractures where reconstruction and fixation by modified tension band wiring is possible.

Exclusion Criteria: 1. Type III compound fractures.
2. Grossly comminuted, vertical or marginal fractures.
3. Old fractures (more than 2-3 weeks).
4. Pathological fractures.

Conclusion: Our study shows that modified tension band wiring is a definitive procedure in management of displaced transverse patellar fracture with least complications and also helps for early mobilization post-operatively. In our study we observed excellent result in 86.6% and good in about 10% and poor in 3.3% of cases. 4 Out of 30 cases had complications. Early post-operative Physiotherapy is a very essential tool of success in the management of these fractures, which helps in reducing complication like stiffness of knee and in providing good function. Long-term follow up is necessary to assess late complications like osteoarthritis and late functional outcome.

Keywords: Patellar fractures, modified tension band technique, West's criteria

INTRODUCTION

Patella fractures are common and it constitutes about 1% of all skeletal injuries resulting from either direct or indirect trauma. The subcutaneous location of the patella makes it vulnerable to direct trauma as in dashboard injuries or a fall on the flexed knee, whereas violent contraction of the quadriceps results in indirect fractures of patella. These fractures are usually transverse and are associated with tears of medial or lateral retinacular expansions. Any improper and inadequate treatment would inevitably lead to a disability which would be most perceptibly felt in a country like India, where squatting is important activity in daily life. In this study a series of 30 cases of fracture patella were studied after treating with Modified Tension Band Wiring technique.

MODIFIED TENSION BAND WIRING

Technique: Patellar fracture approached in the usual fashion. Carefully clean the fracture surfaces of blood clot and small fragments. Explore the extent of the retinacular tears and inspect the trochlear groove of the femur for any articular damage. Thoroughly lavage the joint. If the major proximal and distal fragments are large, reduce them accurately, with special attention to restoring a smooth articular surface. With the fracture reduced and held firmly with clamps, drill two 2- mm Kirschner wires from inferior to superior through each fragment. Place these wires about 5 mm deep to the anterior surface of the patella along lines dividing the patella into medial, central, and lateral thirds. Insert the wires as parallel as possible. In some cases, it is easier to insert the wires through the fracture site into the proximal fragment in a retrograde manner before reduction.

This is made easier by tilting the fracture anteriorly about 90 degrees. Then withdraw the wires until they are flush with the fracture site, accurately reduce the fracture and hold it with clamps, and drive the wires through the distal fragment.

Leave the ends of the wires long, protruding beyond the patella and quadriceps tendon attachments to the inferior and superior fragments. Now pass a strand of 18-gauge stainless steel wire transversely through the quadriceps tendon attachment, as close to the bone as possible, deep to the protruding Kirschner wires, then over the anterior surface of the reduced patella, then transversely through the patellar tendon attachment on the inferior fragment and deep to the protruding Kirschner wires, then back over the anterior patellar surface; tighten it at the upper end. Alternatively, place the wire in a figure-eight fashion (figure no 11). Check the reduction by palpating the undersurface of the patella with the knee extended. If necessary, make a small longitudinal incision in the retinaculum to allow insertion of the finger. Bend the upper ends of the two Kirschner wires acutely anteriorly and cut them short. Once they are cut, rotate the Kirschner wires 180 degrees and, with an impactor, embed the bent ends into the superior margin of the patella posterior to the wire loops. Cut the protruding ends of the Kirschner wires short inferiorly. Repair the retinacular tears with multiple interrupted sutures.

MATERIALS AND METHODS

This prospective study was done in Department of Orthopedics at Sri Balaji Medical College Hospital & Research Institute, Tirupati, who were enrolled between July 2024 - June 2025. This study consists of 30 cases of fracture patella treated by modified tension band wiring. The cases were selected based on inclusion and exclusion criteria.

Inclusion Criteria

1. All closed and type I and type II open displaced transverse patellar fractures.
2. Transverse fracture with displacement of more than 2 to 3 mm and articular step of more than 2mm.
3. Comminuted fractures where reconstruction and fixation by modified tension band wiring if possible.

Exclusion Criteria

1. Type III compound fractures.
2. Grossly comminuted, vertical or marginal fractures.
3. Old fractures (more than 2-3 weeks).
4. Pathological fractures

Postoperatively, patients are advised to do straight leg raising (SLR), quadriceps strengthening exercise, weight bearing started from third post-operative day. Sutures were removed on 14th post op day; later knee flexion was started with quadriceps board and with continuous passive motion (CPM) machine. They were advised to do dynamic quadriceps exercises (isometric) which they could do themselves at home regularly and patients were discharged on 14th post-operative day.

Follow Up

The discharged patients were advised to report for follow up every month, during each follow up the patients were examined for both subjective symptoms and objective signs which was recorded.

The patients were questioned about subjective complaints like pain, difficulty in walking, squatting, climbing and getting down stairs 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). All the cases were assessed based on West's Criteria26which is graded as:

Excellent

- Patient does not have any limitation of activities
- No loss of flexion
- No extensor lag
- No subjective complaints
- No quadriceps wasting or subsequent reduction in power

Good (1 or >1 criteria)

- Moderate limitation of activity

- Extensors lag of 5-10 degrees
- Minimal wasting of quadriceps and power of Grade 4
- Some subjective symptoms
- Flexion loss not >30 degrees

Poor (1 or >1 criteria)

- Marked limitation of activities with significant complaints of pain and weakness
- Marked quadriceps wasting and power <3
- Extensor lag >10 degrees
- Flexion loss >30 degrees

Table 1: Based on West's Criteria our results were graded as

Results	No. of cases	Percentage
Excellent	26	86.6%
Good	3	10%
Poor	1	3.3%

RESULTS

1-month follow-up

Post op

1-month follow-up

5 months follow-up

DISCUSSION

In this study a series of 30 cases of fracture patellae have been studied where the results were obtained after treating with Modified Tension Band Wiring. Age of the patients was ranging from 19 years of minimum to 70 years of maximum with an average age of 42years. In the present study there were 26 males (80%) and 6 females (20%).

The present study showed the involvement of right side in 17 cases (56%) and 13 cases on (44%) left side. In the present study 22 fractures (73%) were as a result of indirect mechanism as in forceful flexion of the knee against the contracted quadriceps, and 8 cases (27%) were due to direct trauma (RTA) to the patella.

In the present study we have included transverse pattern of patellar fractures which were displaced and for comminuted fractures where reconstruction and fixation by modified tension band wiring is possible. The transverse fracture pattern showed excellent results with modified tension band wiring irrespective of the age of the subject.

In the present study 2 out of 30 cases had associated injuries and this was attributed to the road traffic accidents. These associated injuries did not influence the end result of the treatment. In this study the average follow up was five months. In all the cases, fractures were anatomically reduced and were internally fixed. We had four cases with complications, among which one case had wound gaping for which secondary suturing was done,

another with superficial skin infection which was controlled by 3rd week post operatively. The 3rd case had terminal 250 of flexion restriction. And in the fourth case there was migration of the pin through the skin, for which implant removal was done and the limb was immobilized in a cylindrical cast for 4 weeks. The results of the present study are similar to that in the literature. This study showed 86.6% excellent, 10% good and 3.3 % poor results.

CONCLUSION

1. Anatomical reduction and stable fixation in patellar fracture is necessary for the normal integrity and stability of the joint.
2. Our study shows that modified tension band wiring is a definitive procedure in management of displaced transverse patellar fracture with least complications and also helps for early mobilization post-operatively.
3. In our study we observed excellent result in 86.6% and good in about 10% and poor in 3.3% of cases. 4 Out of 30 cases had complications.
4. Early post-operative Physiotherapy is a very essential tool of success in the management of these fractures, which helps in reducing complication like stiffness of knee and in providing good function.
5. Since most cases of patellar fractures are associated with extensor retinacular tear, repair of the tear is necessary for early mobilization. Our outcome was not influenced by the associated injuries.
6. Long-term follow up is necessary to assess late complications like osteoarthritis and late functional outcome.

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