

E-ISSN: 2395-1958
P-ISSN: 2706-6630
IJOS 2020; 6(2): 148-154
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www.orthopaper.com
Received: 01-01-2020
Accepted: 05-02-2020

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A clinical study of fractures of patella treated with modified tension band wiring

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DOI: <https://doi.org/10.22271/ortho.2020.v6.i2c.2029>

Abstract

Background & Objectives: In a country like India where the social habits and needs, require full range of knee flexion, the patella plays an important role. The most significant effect of patella fracture are loss of continuity of extensor mechanism of knee and potential incongruity of patello-femoral articulation. So it is necessary to preserve the patella and extensor apparatus.

Hence the main objectives of this study are: To study the functional outcome by early mobilization, to study the complications of tension band wiring, to clinically evaluate the tension band wiring technique for fracture patella, to study the mode of injury for fracture patella.

Methods: The present study consists of 30 selected cases of fractured patella treated by modified tension band wiring at Shri B M Patil Medical College Hospital and Research Centre, Vijayapur from December 2014 to March 2016.

Results: In the present study 21 (70%) had excellent results, 7 (23.33%) had good results and 2(6.66%) had poor result.

Interpretation and Conclusion: Early mobilization of the knee restores quadriceps power and range of Kneemotion within a short period. Excellent range of movement was achieved in 70%of cases, which is comparable to previous literature.

Keywords: Patella, Kirschner wire, tension band

Introduction

The patello-femoral joint is the heaviest-loaded joint in the body. Anycompromise of the joint surface is likely to lead to degenerative jointdisease. It is, therefore, highly desirable, in patellar fractures to strive foranatomical reduction of the joint surface and stable fixation. In addition, atreatment goal is restoration of function of the knee extensor mechanism.

Fractures of the patella are common and constitute almost 1% of all skeletalinjuries. Several methods of internal fixation of fractured patella have been advocated. This study is directed towards the clinical evaluation of the modified tension and wiring technique for the fractured patella.

Objectives of the study

To study the functional outcome of modified tension band wiring in fracturepatella and its associated complications.

Materials and Methods

The present study consists of 30 selected cases of fractured patella treated by modified tension band wiring at the Shri B M Patil Medical College Hospital and Research Centre, Vijayapur. from December 2014 to March 2016.

Standard preoperative protocol was followed

Treatment: After the X-rays the limb was immobilized by an above knee POP posterior slab. Operations were done at a later date. If abrasions were present in the skin they were cleaned, dressed and antibiotics given. Patients were prepared for surgery during this period. On the day before the surgery the part was prepared and antibiotics started. Patients were taught static quadriceps drill and straight leg raising exercises.

Technique of operation

Operative Procedure The operation was performed under spinal anaesthesia. Tourniquet was applied to the upper part of the thigh and the part was painted with iodine and spirit and draped. A vertical lazy 'S' incision was put over the anterior aspect of the knee. The skin and fascia were retracted to expose the fracture site. The knee was flexed to 20 and positioned on a roll. The fracture surface was cleaned of all bloodclots. The extent of retinacular tears was explored and the joint inspected for any damage to the femur. The joint was then thoroughly lavaged. About 5mm from the anterior surface of the patella, one hole is drilled with a 2 mm drill bit, from the fracture surface. A 1.5 mm K wire is inserted in the first hole and is used as a guide to drill the second hole parallel to the first. To ease drilling the proximal fragment is held with reduction clamps and the fragment tipped so that the fracture surface faces the surgeon.

Now the fracture is reduced with reduction clamps. The accuracy of the reduction is checked by inspecting and palpating the anterior and posterior surface in case of retinacular tear. Now the K wires are removed and two holes are drilled in to the distal fragment from the proximal fragment. The drill bit is removed and replaced with 1.5 mm K wires which are hooked at the tip. A 20 gauge wire is passed around the K wire in a figure of 8 pattern so that the knot comes to lie next to the proximal end of the lateral K wire. This facilitates future metal removal. The wire is then tightened with the A.O tightener. After tightening the wire the tightener is tipped 90° and cut about 1 cm long and the cut end buried in the soft tissues.

The K wires are adjusted so that the curved ends face backwards, pulled down and hammered into bone. The distal portions are cut off about 1 cm from where they exit from bone. The joint capsule and quadriceps retinaculum are meticulously repaired and the fascia repaired with plain sutures. The skin is closed with interrupted mattress sutures and a compression bandage given.

Operative Procedure



Fig 1: Instruments



Fig 2: Painting and draping



Fig 3: Skin incision



Fig 4: Exposure of fracture fragments



Fig 5: Fracture reduction and k-wire fixation



Fig 6: Cerclage wiring



Fig 7: Skin closure



Fig 8: Intra operative image

Post-operative management

The patient is advised to do quadriceps exercises from the first postoperative day onwards and is allowed full weight bearing from the 3rd day after removal of the compression bandage. Later knee flexion was started with the quadriceps board, and continued with the continuous passive motion machine. The patients were then taught dynamic quadriceps exercises which they could do themselves at home, advised to do them regularly and discharged on the 14th day.

Follow up

The patients on discharge were advised to report for follow up after 1 month in the first instance and then after every 2 months for 6 months. During each follow up patients were questioned about subjective complaints like pain, difficulty in walking, squatting, climbing and stepping down stairs and inability to perform normal work.

For objective assessments patients were examined for

1. Extension lag
2. Range of knee motion
3. Circumference of thigh
4. Efficiency of the quadriceps
5. X-ray examination of knee joint.

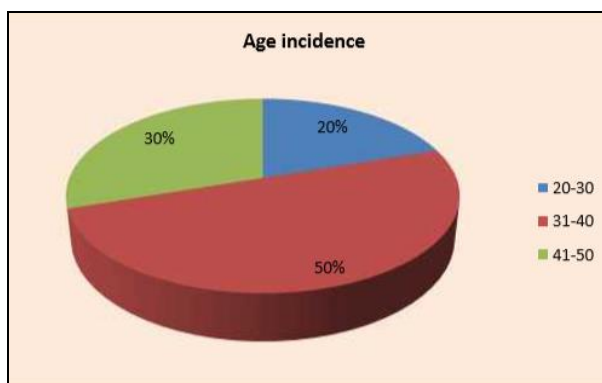
Observation and results

Since the advent of surgical treatment of the fracture patella, opinion has changed from one advocating removal of the patella to on preserving either part or preferably whole of the

patella. If the fragments can be realigned and fixed in such way that once it heals, it is in no way different from its pre-fractured status, it would be the ideal treatment. In this series 30 cases of fractured patella were treated inpatients between the age group of 20-50 years by the modified tension band wiring technique, special attention was given to mobilize the knee early as it helps to regain the quadriceps power.

Table 1: Age incidence

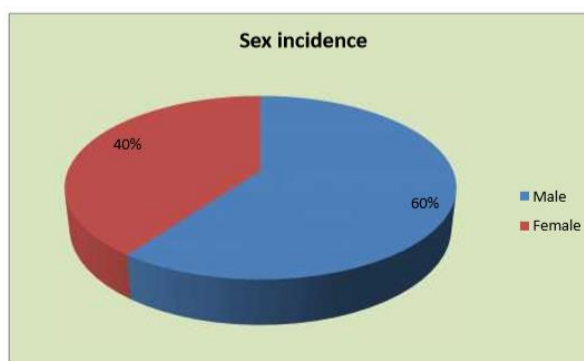
| Age in years | Number of cases | Percentage |
|--------------|-----------------|------------|
| 20-30 | 6 | 20 |
| 31-40 | 15 | 50 |
| 41-50 | 9 | 30 |



The mean age was 40 years and maximum incidence was between 31 to 40 years.

Table 2: Sex incidence

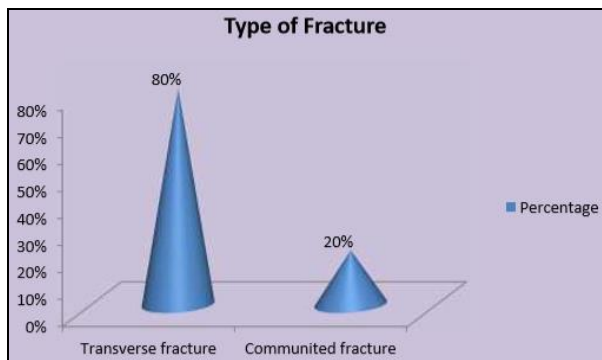
| Sex | Number of cases | Percentage |
|--------|-----------------|------------|
| Male | 18 | 60 |
| Female | 12 | 40 |



In this series male sex predisposition was observed.

Table 3: Type of Fracture

| Type of fracture | Number of cases | Percentage |
|-----------------------|-----------------|------------|
| Transverse fracture | 24 | 80 |
| Communitated fracture | 6 | 20 |



Follow Up

Patients were followed up one month after discharge and then every 2months. In this series the follow up period ranged from 2 months to 9 months.

The mean time was 5 months. During each follow-up the patients were questioned about the following subjective complaints and examined for the followings deficiencies.

Table 4: Subjective Complaints following Modified Tension Band Wiring

| Complaints | Number of Cases | Percentage |
|---|-----------------|------------|
| Pain | 9 | 30 |
| Mild Difficulty In Squatting | 9 | 30 |
| Difficulty In Climbing Stairs | - | - |
| Difficulty In Stepping Down Stairs | - | - |
| Sense Of Weakness Or Giving Way Of Knee | - | - |

Pain

All the cases had pain during the first 2 weeks. In the present study 21

cases gave excellent results were in they complained of no pain after 2 months. 7

cases considered to be good cases with mild pain at the end of 2nd month. 2

cases complained of persistence of pain even after the end of 2nd month is graded as poor.

Table 5: Objective deficiency after modified tension band wiring

| Deficiency | Number of cases | Percentage |
|-----------------------------|-----------------|------------|
| Limitation of flexion | 9 | 30 |
| Quadriceps wasting of 1cm | 9 | 30 |
| Quadriceps power of grade-4 | 9 | 30 |
| Extension lag | - | - |

Movements

In this series 8 cases had limitation of flexion of only terminal

20° offlexion and one case had only 40° of flexion and so 9 cases had limitation of knee flexion. All the other 21 cases had complete range of knee movement.

Wasting of Thigh:

In this series 9 cases had one centimeter wasting. Early and effective physiotherapy is essential in obtaining an excellent result.

Power of the Quadriceps

Quadriceps strength was graded 0-5 from no muscle activity to full strength. It was assessed by comparing with the normal side. In this series only 9cases had grade-4 strength. All the other cases had grade-5. Patient cooperation and physiotherapy are very important for the recovery of muscle power and function of knee joint.

Results

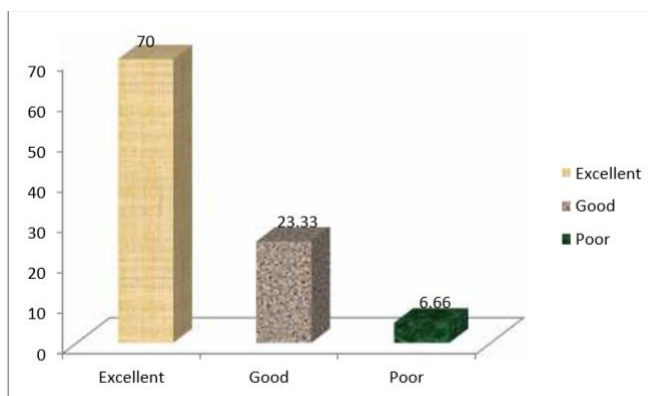
In this 18 cases were male and 12 cases were female, 18 cases were having indirect injury and 12 were having direct injury. 21 cases graded as excellent, 7cases graded as good and 2 cases as poor.

Criteria to grade the cases mentioned below

1. Excellent: This knee was functionally normal. The patient has no subjective complaints like pain, difficulty in squatting and climbing steps and objective deficiencies like quadriceps wasting and limitation of flexion and extension and normal quadriceps power.
2. Good: There was occasional pain. Patient can squat and climb steps with some difficulty. Limitation of flexion less than 20°, quadriceps wasting less than 1 cm, and reduction of quadriceps power from grade-5 to grade-4.
3. Poor: Cases which failed to attain the above standards.

Table 6: Results in this study

| Results | Number of cases | Percentage |
|-----------|-----------------|------------|
| Excellent | 21 | 70 |
| Good | 7 | 23.33 |
| Poor | 2 | 6.66 |



Case illustration**PRE-OPERATIVE****INTRA OPERATIVE****IMMEDIATE POST-OPERATIVE****FINAL FOLLOW-UP****Discussion**

Since the advent of surgical treatment of the fractured patella, opinion has changed from one advocating removal of the patella to one preserving either part or preferably whole of the patella. If the fragments can be realigned and fixed in such a way that once it heals, it is in no way different from its pre-fractured status, it would be the ideal treatment.

In this series 30 cases of fractured patella were treated by the modified tension band wiring technique. Special attention was given to mobilize the knee early as it helps to regain the quadriceps power. The findings, the end results and various

other data will be analysed and compared in the following discussion.

Fracture patella can occur at any age. But the frequency in children and adolescents under 20 years of age is low. In this series the range of age was taken between 20 to 50 years. The mean age was 45 years and maximum incidence was between 31 to 40 years. In Bostrom (1972) series, the mean age was 48 years ranging between 16 to 89 years. 28 S.K. Basu Ray and M.S. Ghosh in their series of 24 cases found the range of age between 18 years and 62 years. In R.E. Peoples *et al.* (1977) series, the average age was more than 20 years.

Table 7: Different of male and female study

| Study | Male | Female |
|-----------------------------|------|--------|
| S.K.Basu Roy and M.S. Ghosh | 71% | 29% |
| Jonathan Wilkinson | 68% | 32% |
| Present study | 60% | 40% |

In general it can be said that the patella fracture commonly occur in males because of an active and vigorous life style. In present series also male sex predisposition was observed.

Type of Fracture

Two types of fractures were found to have occurred in the present series 20% were comminuted and 80% were transverse fracture.

Subjective Complaints following Modified Tension Band Wiring:

In the present study subjective complaints like pain was observed in 9(30%) patients and difficulty in squatting was observed in 9(30%) patients.

Objective deficiency after Modified tension band wiring:

In the present study 9(30%) patients had flexion limitation, quadriceps wasting was observed in 9(30%) patients a quadriceps power of grade IV was observed in 9(30%) patients. There was no extension lag in any of the cases.

Table 8: Result comparison

| Study | No of cases | Excellent | Percent | Good | Percent | Poor | Percent |
|---------------------------------------|-------------|-----------|---------|------|---------|------|---------|
| Marya, Bhan, Dave ¹⁴ | 30 | 24 | 80 | 4 | 13.33 | 2 | 6.66 |
| Levack, Flannagan Hobbs ³⁰ | 14 | 7 | 50 | 5 | 35.71 | 2 | 14.28 |
| Dudani, Sancheti ¹² | 15 | 11 | 73.33 | 4 | 26.66 | 0 | 0 |
| Present study | 30 | 21 | 70 | 7 | 23.33 | 2 | 6.66 |

In the present study 21 (70%) had excellent result, 7 (23.33%) had good results and 2(6.66%) had poor results.

Dudani, Sancheti¹² in their study also found similar results 11(73.33%) had excellent result and 4(26.66%) had good result.

Marya, Bhan, Dave¹⁴ found 24(80%) had excellent result, 4(13.33%) had good result and 2(6.66%) had poor result.

But Levack, Flannagan, Hobbs³⁰ found 7(50%) had excellent result, 5(35.71%) had good result and 2(14.28%) had poor result.

Conclusion

Fractures of the patella are common though rare below the age of 20 years. Fall in the same plane is the most common cause of fractures of the patella.

Vertical incision is more helpful to mobilize the patient early. Early mobilization of the knee restores quadriceps power and range of knee motion within a short period.

Excellent range of movement was achieved in 70% of cases.

Early and continuous physiotherapy following the modified tension band wiring technique is of paramount importance in determining the end results.

Modified tension band wiring is therefore the choice of treatment for the fracture patella.

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