

**Research Article**

## **Clinical evaluation of the modified tension band wiring technique for the fractured patella**

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### **Abstract**

The patella is of importance for the extension of the knee joint. It increases the force of the quadriceps apparatus by improving the leverage. In addition, it protects the anterior articular surface of the distal femur against external violence, but may easily be injured due to its unprotected position.

Several methods of internal fixation of fractured patella have been advocated. This dissertation is directed towards the clinical evaluation of the modified tension band wiring technique for the fractured patella.

**Keywords:** patellar fracture, internal fixation, modified tension band wiring technique.

### **1. Introduction**

Fractures of the patella are common and constitute almost 1% of all skeletal injuries.<sup>1</sup> Opinions differ widely as to the proper treatment of a fractured patella. Haxton<sup>2</sup> in 1945 and Kaufer in 1971<sup>3</sup> on the basis of experimental work showed that the patella was not without importance in the knee joint and was responsible for improving its efficiency. It is because of this that the need to preserve the whole or part of the patella becomes imperative, especially in a country like India where social habits and needs require a full range of knee flexion.

### **2. Aims and Objectives of the Study**

- a) To study the functional outcome by early mobilization.
- b) To study the complications of tension band wiring.
- c) To clinically evaluate the tension band wiring technique for fracture patella.
- d) To assess knee joint motion and stability after the procedure.
- e) To study the mode of injury for fracture patella.

### **3. Materials and Methods**

The present study consists of 20 selected cases of fractured patella treated by modified tension band wiring at the Navodaya Medical College, Raichur from July 2011 to October 2013.

The details of the cases were recorded as follows:

The name, age sex, occupation, address, family history and past history were noted. The history was elicited from the patients. The nature of trauma, whether due to direct or indirect violence was noted. Whether trauma due to Road traffic accidents, assault, fall in the same plane or fall from a height were specifically asked. Enquiry was made to note pain, swelling its rate of increase and if the patient was able to bear weight on the affected limb and was able to do active movements of the affected joint.

General condition was examined as to his build, nutritional status, the condition of respiratory and cardio-vascular systems and for associated injuries.

#### **Local examination was done in the following steps:**

1. On inspection the following points were noted.

- Whether the knee was swollen, if so the size, shape and extent of the swelling, condition of the skin over the swelling and presence of any contusion, abrasion or laceration.
- Whether any sulcus present in the middle of the swelling.

2. On palpation the following points were noted.

- Any local rise of temperature, tenderness over the bone a palpable transverse defect or sulcus, crepitus, fluctuation and broadening of patella.
- Active extension movements of the affected knee noted & compared with normal side. It was also noted whether the patient was able to stand on his injured limb.
  - The circumference of both the thighs were measured to note any reduction in the bulk of the quadriceps.
  - The other knee joint was examined for comparison and to note any anatomical variation.

#### Investigations:

Routine examination of blood and urine were done for haemoglobin percentage, total and differential WBC count, bleeding and clotting time and presence of albumin and sugar in urine and HbsAg, HIV tests.

### 3.1 X-ray Examination

X-rays in lateral and antero-posterior views were taken for confirmation of diagnosis. X-rays in skyline view were taken in cases suspected to have longitudinal and marginal fractures.

#### 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 presents 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.

### 3.2 Operative Procedure

The operation was performed under general or 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 fractured surface was cleaned of all blood clots. 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 1.6 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 into the distal fragment from the proximal fragment. The drill bit is removed and replaced with 1.6 mm K wires which are hooked at the tip. A 20 gauge wire is passed around the K wire in a figure of 8 patterns so that the eye 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 retinaculæ are meticulously repaired and the fascia repaired with plain sutures. The skin is closed with interrupted mattress sutures and a compression bandage given.

### 3.3 Post-operative management

The patient is advised to do quadriceps exercises from the first post operative day onwards and is allowed full weight bearing from the 3<sup>rd</sup> 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 14<sup>th</sup> day.

### 3.4 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. 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.

## 4. Observation and Results

Since the advent of surgical treatment of the fracture 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 20 cases of fractured patella were treated in patients 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: Subjective Complaints following Modified Tension Band Wiring**

Complaints	Number of Cases	Percentage
Pain	6	30
Mild Difficulty In Squatting	6	30
Difficulty In Climbing Stairs	-	-
Difficulty In Stepping Down Stairs	-	-

**Pain:** All the cases had pain during the first 2 weeks. In the present study 14 cases gave excellent results and had not experienced pain after 2 months. Five cases considered to be good cases with mild pain at the end of 2<sup>nd</sup> month. One case complained of persistence of pain even after the end of 2<sup>nd</sup> month is graded as poor.

**Swelling:** During the first month swelling was present in all cases. At the end of 2<sup>nd</sup> month none of the cases had swelling.

**Difficulty in Squatting:** In this series 5 of the patients had mild difficulty in squatting. But getting up from the squatting position was not difficult and one patient was unable to squat.

**Table-2: Objective deficiency after modified tension band wiring**

Deficiency	Number of cases	Percentage
Limitation of flexion	6	30
Quadriceps wasting of 1 cm	6	30
Quadriceps power of grade-4	6	30
Extension lag	-	-

**Movements:** In this series 5 cases had limitation of flexion of only terminal 20° of flexion and one case had only 40° of flexion and so 6 cases had limitation of knee flexion. All the other 14 cases had complete range of knee movement.

**Wasting of Thigh:** In this series 6 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 6 cases 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.

**Extension Lag:** None of the patients had extension lag.

### 3. Results

- In this study, 12 cases were male and 8 cases were female..
- 15 cases were having indirect injury and 5 were having direct injury.
- Fourteen cases graded as excellent, 5 cases graded as good and one case 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-3: Results in this study**

Results	Number of cases	Percentage
Excellent	14	70
Good	5	25
Poor	1	5

### 5. Discussion

The findings, the end results and various other data was analyzed and compared in the following discussion.

#### Subjective Complaints following Modified Tension Band Wiring:

In the present study subjective complaints like pain was observed in 6(30%) patients and difficulty in squatting was observed in 6(30%) patients.

#### Objective deficiency after modified tension band wiring:

In the present study 6(30%) patients had flexion limitation, quadriceps wasting was observed in 6(30%) patients, a quadriceps power of grade IV was observed in 6 (30%) patients. There was no extension lag in any of the cases.

**Table-4: Comparison of Results of present study with other studies**

Study	No of cases	Excellent	Percent	Good	Percent	Poor	Percent
Marya, Bhan, Dave <sup>4</sup>	30	24	80	4	13.33	2	6.66
Levack, Flannagan, Hobbs <sup>3</sup>	14	7	50	5	35.71	2	14.28
Dudani, Sancheti <sup>6</sup>	15	11	73.33	4	26.66	0	0
Present study	20	14	70	5	25	1	5

In the present study 14 (70%) had excellent result, 5 (25%) had good results and 1(5%) had poor results. Dudani, Sancheti<sup>6</sup> in their study also found similar results 11(73.33%) had excellent result and 4(26.66%) had good result. Marya, Bhan, Dave<sup>4</sup> found 24(80%) had excellent result, 4(13.33%) had good result and 2(6.66%) had poor result. But Levack, Flannagan, Hobbs<sup>4</sup> found 7(50%) had excellent result, 5(35.71%) had good result and 2(14.28%) had poor result.

### 6. Summary and Conclusions

Twenty cases of fracture patella treated by modified tension band wiring technique at Navodaya Medical College Hospital & Research Centre, Raichur have been presented.

- Maximum number of cases 10 (50%) were in the age group of 31-40.
- There was male sex predomination, 12(60%) were males and 8(40%) were females.
- 15(75%) cases were due to an indirect trauma to the knee joint, direct injury resulted fracture patella in 5 (25%) cases.
- 16(80%) cases were transverse fractures and 4 (20%) cases had comminuted fractures.
- A subjective complaint like pain was observed in 6(30%) patients and difficulty in squatting was observed in 6(30%) patients.
- 6(30%) patients had flexion limitation, quadriceps wasting was observed in 6(30%) patients, a quadriceps power of grade-4 was observed in 6 (30%) patients.
- There was no extension lag in any of the cases.
- 14 (70%) cases had excellent result, 5 (25%) cases had good results and 1(5%) cases had poor results following modified tension band wiring procedure.

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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