

A Prospective Clinical Study of Patellar Fractures Treated by Modified Tension Band Wiring

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Abstract

Background: The Management of Patellar fractures is varied from simple excision to reconstruction of patella by various procedures. The restoration of the patella to normal alignment & retaining its function would be the ideal treatment for the effective function of quadriceps mechanism and the knee joint. **Aim & Objective:** To evaluate the clinical outcome of modified tension band wiring for fractures of patella. **Methodology:** In our study, 20 cases of fracture patella treated by modified tension band wiring at Govt Medical College, Nalgonda, between November 2018 to October 2020 have been studied. **Results:** A total of 20 cases of fracture of patella were included in the study. Fracture of patella can occur at any age, but it occurs very rarely below 20 years. In our series the range of age was between 19 - 57 years, the mean age was about 47.5 years and the incidence was high in the age group of 41-50 years. In our study, fall was the main mode of injury in 12 cases which constitutes 60% and RTA was reported in 8 cases constituting 40%. Of the 20 cases 16 (80%) were simple transverse fractures where as 4 (20%) cases were comminuted. Cases were regularly followed up and findings have been recorded. The results were evaluated based on "WEST CRITERIA". 16 out of 20 cases were excellent, 3 cases were good and 1 was poor. **Conclusion:** Finally we conclude that, modified tension band wiring is a good procedure for fracture patella if done properly on a selected case.

Keywords: Tension band wiring, Fracture, patella, West criteria, transverse fracture.

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Introduction

Patellar fractures are common and it constitutes about 1% of all skeletal injuries. The patella is a sesamoid bone in quadriceps tendon whose main function is to improve the efficiency of quadriceps muscle by increasing the mechanical leverage of the quadriceps tendon. Fracture of patella is one of the important group of injuries responsible for considerable disability and consequent morbidity. The gravity of the problem assumes greater proportions due to its higher incidence in active adult life and disruption of quadriceps mechanism which is so often associated with this fracture. Any improper and inadequate treatment would inevitably lead to a great deal of disability which would be most perceptibly felt in a country like India, where squatting is so often resorted to in our daily life. The treatment of fracture patella has always been a matter of controversy since the earliest of times. Controversy mainly centers round repair versus excision of patella. It is believed that complete and accurate reconstruction of patella is likely to give a joint which will tolerate the stresses and strains better than one in which the normally anatomy is disturbed by total excision[1-4].

Every type of treatment advocated has its own merits and demerits. In this study a series of 20 cases of fracture patellae has been studied and the results obtained after treatment by MODIFIED TENSION BAND WIRING have been assessed and analyzed.

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Aims

To evaluate the clinical outcome of modified tension band wiring for fractures of patella.

Objectives

The objectives of the study are

1. To assess the roll of early mobilization of knee in preventing complication
2. To assess quadriceps wasting and subsequent reduction in power.
3. To find out the incidence of complications.
4. To assess the results of modified tension band wiring of patellar fractures.

Materials and Methods

This prospective study done in Department of Orthopedics at Govt Medical College, Nalgonda during the period from November 2018 to October 2020. This study consists of 20 cases of fracture patella treated by modified tension band wiring. The cases were selected based on inclusion and exclusion criteria.

Inclusion Criteria

1. Acute fractures
2. Transverse fractures (including upper pole and lower pole)
3. Isolated fracture with displacement of more than three millimeters and an articular step of more than two millimeters.
4. Type I Gustilo Anderson compound fracture
5. Comminuted fractures where reconstruction and fixation by modified tension band wiring is possible.

Exclusion criteria

1. Old fractures (More than 3 weeks)
2. Severe comminution where reconstruction is very difficult
3. Fracture patella associated with other ipsilateral other fractures which prevent early knee mobilization.
4. Un-displaced fractures.

- 5. Longitudinal or vertical fractures.
- 6. Type II or Type III Gustilo-Anderson compound fracture.

Method of Collecting Data: Once the patient was admitted to the hospital, the details of the case regarding the name, age, sex, occupation, and address were recorded. All the patients are personally interviewed for mode of injury and duration is recorded, thorough general and clinical examination was carried out and radiographs were taken. The patients were selected according to the protocol & Routine laboratory investigations were carried out. The limb was immobilized by an aboveknee plaster of paris posterior slab and operation was done at a later date. Patients were prepared for surgery during this period, on the day before surgery the parts were prepared and antibiotics started.

Operative Procedure: The fracture site was exposed through transverse incision in front of the knee; the fragments was reduced and held in position with the help of patellar clamp or towel clips. Two “K” wires of 2mm thickness were passed parallel to each other from above down wards starting at its superior border till lower pole of patella is reached. 18 G stainless steel wire was taken and passed deep to ligamentum patellae inferiorly and behind the quadriceps tendon superiorly making a figure of 8 in front of the patella, sufficient tension is given. Tear in the quadriceps expansion was sutured with Vycril and wound closed in layers. A slab or pressure bandage was given as a temporary immobilization.

Post Operative Management: The operated knee was immobilized in extension in an above knee posterior slab, and advised to do straight leg raising and weight bearing started from 3rd post op day. Sutures and POP were removed between 12th to 14th day, later on, knee flexion was started with quadriceps board and with continuous passive motion machine. They were advised to do dynamic quadriceps (isometric) which they could do themselves at home regularly.

Follow Up: The discharged patients were advised to report for follow up on every month, during each follow up the patients were examined for both subjective symptoms and objective signs and were 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 patients objective assessment was done for Extensor lag, Range of knee movement Circumference of thigh (wasting) and Efficacy of quadriceps (power).

Results

A total of 20 cases of fracture of patella were included in the study. Fracture of patella can occur in any age, but it occurs very rarely below 20years, In Our series the range of age was between 19 - 57years, the mean age was about 47.5 years and the incidence was high in the age group of 41-50 years.

Table 1: Age distribution

Age in Years	No.of Cases	Percentage
0-10	0	-
11-20	1	5
21-30	2	10
31-40	4	20
41-50	8	40
51-60	5	25

Sex Distribution

In our study of 20 cases 13 patients (65%) were males and 7 patients (35%) were females.

Table 2:Sex distribution

Sex	No. of patients	Percentage
Males	13	65
Females	7	35

Side of Fracture

In our study 13 patients had fracture on the right side and 7 patients on the left side. There were no cases of bilateral fractures reported

Table 3:Showing Side of Fracture

Side	No.of cases	Percentage
Right	13	65%
Left	7	35%

In our study, fall was the main mode of injury in 12 cases which constitutes 60% and RTA was reported in 8 cases constituting 40%.

Table 4:Showing Mode of Injury

Mode of Injury	No. of Cases	Percentage
Fall on same plane (indirect)	12	60%
RTA (direct)	08	40%

Table 5: Showing Fracture Pattern

Of the 20 cases 16 (80%) cases were simple transverse fractures where as 4 (20%) cases were comminuted.

Fracture pattern	No.of cases	Percentage
Transverse	16	80%
Comminuted	4	20%

The results of our study was assessed based on WEST’S CRITERIA (peoples et al 1978) which is graded as

Excellent

Patient cannot 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 Extensor 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 & weakness.

Marked quadriceps wasting and power <3.Extensor lag >10 degrees.

Flexion loss not >30 degrees.

In our study the results were as follows.

Table 6:Post operative assesment

Results	No.of cases	Percentage
Excellent	16	80%
Good	3	15%
Poor	1	5%

Discussion

The Management of Patellar fractures is varied from simple excision to reconstruction of patella by various procedures. The restoration of the patella to normal alignment & to retain its function would be the ideal treatment for the effective function of quadriceps mechanism and the knee joint.The Modified tension band technique is currently the most widely accepted and several studies have shown a high percentage of good results. The application of AO tension band principles in the operative management of patella fracture has gained great popularity and in many trauma and orthopedic centers this method is the treatment of choice (Leung et al 1983) .The AO tension band method of fixation of fractures patella has given excellent results of internal fixation because it is a simple, effective means of immobilizing the fracture, has very sound biomechanical

background theory, and allows early mobilization of the knee joint[5].

In our study, 20 cases of fractured patella were treated by modified tension band wiring, the findings and the end results of our study and others various data will be analyzed and compared in the following discussion.

Age Distribution (Age Incidence)

In Our series the range of age was between 19 - 57years, the mean age was about 47.5 years and the incidence was high in the age group of 41-50 years.In Einolas et al series (1976) the average age is 47 years, which can be compared with age incidence of our study.

There were various other studies showing similar results of age incidence, few of the studies have been noted here. Yuag-Zhang series (1984)[6] the average age is 54 years which ranged from 14-83 years, in people et al series (1977)[7] the average is 56 years[8]

Table 7:Comparison of age

Study	Range	Average Age	Maximum Incidence (in age groups)
Our study	18-65	47.5	41-50
Einolas et al[8]	NDA	47	NDA
Yuag-Zhang[6]	14-83	54	-do-
Peoples et al[7]	NDA	56	-do-

Sex Distribution:Of 20 cases 13 patients (65%) were males and 7 patients (35%) were females. Our study results are comparable with the study by Dudani et. al which showed near results with 67% of

males and 33% female patients[9].The sex distribution in various studies which were comparable to our study are.

Table 8: Sex distribution comparison with other studies

Series	Males	Females
Our series	65%	35%
Einolas et al[8]	75%	29%
Dudani et al[9]	67%	33%

Side of Fracture:In our study 13 patients had fracture on the right side which equals to 65% and 7 patients on the left side which is 35%. Among other studies Einolas et al shows 63% on right side and 37% on left side and Dudani et al[9] shows 60% on the right side and

40% On the left side. which are very much near to the our study results. Our study correlates with others study i.e., right side slightly higher than left, except Yuag in which fractures on right side were 37% and 67.5 on the left side.

Table 9: Side of fracture comparison

Series	Right	Left
Our study	65%	35%
Einolas et al	63%	37%
Dudani et al	60%	40%
Yuag et al	37%	63%

Mode of Injury:In all series the incidence of patellar fracture are more in males due to their active life style. In our study, fall was the main mode of injury in 12 cases which constitutes 60% and RTA was reported in 8 cases constituting 40%.

Fracture Pattern: In our study, out of 20 cases of fracture patella, 18 cases were transverse (90) % and 2 cases were comminuted (10%). In the study of Dudani et al (1981) out of 15 cases 11 (73%) were transverse and 4 (27%) were comminuted, hence our study correlated with Dudanis study.

Results Compared With Other Studies:In our study 16 (80%) cases had excellent results which were assessed based on WEST ‘S CRITERIA (peoples et al 1978). Our results were comparable with study by Marya et al which reported that 80% of the cases had excellent results.Among other studies the results were excellent with, 11(73%) in Dudani et al, 24(88.88%). Good with 02(9.53%) in 04(26.66%) in Dudani et al.

Associated Injuries: In our study, three cases of patellar fractures had other associated injuries one had fracture clavicle which was treated with clavicular brace, other was a case of head injury which

was managed by general surgeon and the third had undisplaced fracture of the 3rd metacarpal of Rt hand which was treated conservatively.

Hospital Stay: In our study we have observed that, the average duration between injury to the hospital admission was about 18.9hrs. The average duration between the day of admission to day of surgery was about 2.3 days and the average duration of total stay in hospital was about 16.25days. (Ranged from 10 days to 27days). In two of the cases there was infection at the wound site which were kept for more than 16 days under direct observation with antibiotics even though sutures were removed on 12th day we have kept the patient in hospital for the purpose of physiotherapy under our direct observation.

Post-Op Complications: Various complications following surgery have been described in literature early complications like infection and loss of reduction. Late complications like delayed union, refracture, nonunion, malunion, avascular necrosis and loss of knee movement. In our study, two cases had superficial infection (stitch abscess) which was treated with antibiotics so we have not noticed any case with loss of reduction and among the late complications.

Mobilization: In our series, all the cases were immobilized in an above knee slab post operatively for a period of 2 weeks, as all the cases had extensor retinacular tear which was repaired during surgery, after which sutures were removed, patients were taught Quadriceps exercises and knee was also mobilized passively using CPM machine.

Follow Up: Patients were discharged post operatively after teaching them quadriceps exercises, they were followed up every month for a period of 3 months and later on once in three months. During the follow up, the patients were enquired about subjective symptoms and objective signs were elicited and recorded. In our series the follow up period ranged from 2 months to 21 months and the mean time was 12.5 months.

Conclusion

For effective function of quadriceps preserve the patella by doing internal fixation whenever possible.

Conflict of Interest: Nil

Source of support: Nil

Of all the methods of internal fixation for patella by Modified Tension Band Wiring was found to be advantageous because:

1. It provides rigid internal fixation.
2. No need for prolonged external splintage post-operatively.
3. Early mobilization of the knee can be done, thereby preventing knee stiffness.
4. Able to secure the dynamic and static function of the knee at an earlier period than other methods of fixation.
5. So modified tension band wiring is a good procedure for fracture patella if it is done properly on a selected case.

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