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A STUDY ON THE MANAGEMENT OF DISPLACED FRACTURES OF PATELLA USING MODIFIED TENSION BAND WIRING

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ABSTRACT: INTRODUCTION: Patella is an important component of the extensor mechanism of the knee. A patella fracture constitutes 1% of all skeletal fractures resulting from either direct or indirect trauma. 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. The goal of treatment is to regain the continuity of the extensor mechanism and congruity of patellofemoral articulation so that the normal function of the knee can be restored. Several techniques have been described for internal fixation of fractures of patella. The ideal fixation for the fracture patella is that it should be strong enough to allow early mobilization, reduce posttraumatic stiffness and perhaps help the healing of the articular surface. **AIMS:** To analyze the functional outcome of displaced transverse fractures of the patella treated by Modified Tension Band Wiring principle (Muller) using A. Dutta & S. K. Gupta Scoring System. To extend the application of Modified Tension Band wiring for minimally comminuted fractures of patella and assesses the results. **CONCLUSION:** The present study shows that modified tension band wiring (Muller) is an effective procedure in the management of displaced transverse patellar fractures, with excellent to good results. Minimally comminuted patellar fractures also yielded excellent to good results with Modified tension band wiring as an extended application. The results in the present study are comparable to other modifications of Tension Band Wiring principle. The surgery of Modified Tension Band Wiring gives rigid fixation and helps in early mobilization. Regular and scheduled post-operative physiotherapy plays an important role in the functional outcome.

KEYWORDS: Patella, Modified Tension Band Wiring.

INTRODUCTION: Patella is an important component of the extensor mechanism of the knee. The presence of the patella increases the radius from the centre of the rotation of the knee; it potentiates quadriceps mechanism and makes knee extension more efficient. The most significant effects of fracture of the patella are loss of continuity of the extensor mechanism of the knee and potential incongruity of the patellofemoral articulation.

Throughout the history of fracture care, the treatment of patella fracture has undergone many changes in methods by various surgeons. Historically the need to salvage or excise a fractured patella has been debated by many surgeons.

A patella fracture constitutes 1% of all skeletal fractures resulting from either direct or indirect trauma. The incidence in men is almost twice that in women. The majority of patella fractures occur from direct injuries. The plane of the patella— anterior subcutaneous location makes it vulnerable to direct trauma as in dashboard injuries or a fall on the flexed knee. Indirect injuries occur when the forces from the extensor mechanism exceed the intrinsic strength of the

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patella, resulting from violent contraction of the quadriceps. Most of transverse fracture patterns resulting from excessive longitudinal forces. Polar fractures are avulsion fractures of either the base or the apex. Indirect injuries cause a greater amount of retinacular damage than found in direct injuries. 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.

The patella fracture was initially treated conservatively or by patellectomy. According to one school of thought, led by Brooke (1936) and supported by Watson Jones (1945) favoured patellectomy. And another school of thought led by Haxton (1945) believed in complete, accurate and anatomical reduction of patella fracture. The first open reduction of patellar fracture was performed by Sir Hector Cameron of Glasgow in 1877, using silver threads. Later Joseph Lister and Trendelenburg performed a similar operation in the same year.

The goal of treatment is to regain the continuity of the extensor mechanism and congruity of patellofemoral articulation so that the normal function of the knee can be restored. Several techniques have been described for internal fixation of fractures of patella. The ideal fixation for the fracture patella is that it should be strong enough to allow early mobilization, reduce posttraumatic stiffness and perhaps help the healing of the articular surface. As of now during the past two decades all transverse fractures of patella had been treated by modified tension band wiring. A comminuted fracture of patella uniformly had been taken for patellectomy. Though the studies elaborated on results of both the procedures, various patterns of comminuted and irregular fracture of patella have not been thrown light in present day increasing incidence of direct trauma.

Keeping these aspects in view this study has been undertaken and present study was conducted to determine the efficacy of tension band wiring in displaced patellar fractures. In this study 34 cases of fracture patellae were analyzed. The results obtained after treating with Modified Tension Band Wiring

AIMS AND OBJECTIVES:

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1. To analyze the functional outcome of displaced transverse fractures of the patella treated by Modified Tension Band Wiring principle (Muller) using A. Dutta & S. K. Gupta Scoring System.
2. To extend the application of Modified Tension Band wiring for minimally comminuted fractures of patella and assesses the results.

OBJECTIVES:

1. To study the advantages of modified tension band wiring (Muller) fixation in patellar fracture.
2. To compare and contrast with studies adapting other modifications of Tension Band Wiring principle.
3. To assess the role of this technique in early mobilization of the knee and rehabilitation of the patient.
4. To analyze complications developed during this study.

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OBSERVATIONS AND RESULTS: The present study consisted of 34 cases of displaced fractures of the patella including minimally comminuted fracture patella treated by modified tension band wiring at S. V. R. R. G. G. Hospital, S. V. Medical College, Tirupati from the time of approval from IEC till September 2014. Average time between injury and hospitalization was 11 hours. All these patients were operated within 1 to 7 days of injury. The following observations were made.

Age in Years	No. of Patients	Percentage
1-10Y	0	0
11 -20Y	3	8.8
21-30Y	3	8.8
31-40Y	6	17.6
41-50Y	15	44.3
51-60Y	5	14.7
61-70Y	1	2.9
71-80Y	1	2.9
TOTAL	34	100

TABLE 1: Age distribution of patients With fracture Patella

Sex	No. of Patients	Percentage
Male	23	67.7
Female	11	32.3
Total	34	100

Table 2: Gender Distribution of Patients with Fracture Patella

Mode of injury	No. of patients	Percentage
Slip/ Accidental fall	25	73.6
Rta	9	26.4
Assault	0	0
Total	34	100

Table 3: Distribution of patients based on Mode of Injury

Mechanism of injury	No. of patients	Percentage
Indirect	23	67.7
Direct	11	32.3
Total	34	100

Table 4: Distribution of Patients based on Mechanism of Injury

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Side of Fracture	No. of Patients	Percentage
Right	19	55.9
Left	15	44.1
Total	34	100

Table 5: Distribution of patients with respect to side of Fracture

Fracture Pattern	No. of Patients	Percentage
Transverse	27	79.4
Minimally comminuted	7	20.6
Total	34	100

Table 6: Distribution of patients based on fracture pattern

FUNCTIONAL RESULTS:

Functional Result	No. of Patients	Percentage
Excellent	23	67.7%
Good	9	26.5%
Fair	1	2.9%
Poor	1	2.9%
Total	34	100

Table 7: Functional results of the study

Functional Results	No. of Patients	Percentage
Excellent	19	70.40%
Good	7	25.90%
Fair	0	Nil
Poor	1	3.70%
Total	27	100.00%

Table 8: Functional Results In Transverse Patellar Fracture

Functional Results	No. of Patients	Percentage
Excellent	4	57.10%
Good	2	28.60%
Fair	1	14.30%
Poor	0	Nil
Total	7	100%

Table 9: Functional results in minimally comminuted fractures

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Complications	No. of Patients	Percentage
Superficial Infection	1	2.90%
Deep Infections	0	0
K-wire Slipping	1	2.90%
Loss of Fixation	0	0

Table 10: Complications

DISCUSSION: The present study included a total of 34 patients with displaced transverse fracture patella taken up for modified tension band wiring technique as per the inclusion and exclusion criteria. The usually practiced methods of treatment did not change significantly over the past few decades. This study included comminuted fractures of patella for osteosynthesis rather than patellectomy. The mechanical advantage of an intact quadriceps mechanism with a reconstructable patella has been utilized for a near normal functional outcome of the patient. Absence of patella results in significant decrease in the power of quadriceps muscle. This emphasizes the fact that patella transmits tensile forces generated by the quadriceps to the patellar ligament and increases the effective lever arm of the knee extensor mechanism from the axis of the knee flexion and extension.

Fixation technique in the present study included two parallel Kirschner wires and figure of eight SS wire loop as a modified tension band principle. This method has been adopted for compression at fracture sight and optimal rigidity in holding the fragments in position. Interfragmentary compression screws were not adopted as the reduction of fragments achieved and stabilization on Kirschner wires with tension band loop was satisfactory. As same technique of fixation was adopted, the results are expected to reflect its efficacy in transverse and minimally comminuted fractures of patella.

Functional outcome of the knee joint has been the primary concern in all of the contemporary literature. Various authors adopted evaluation and scoring systems of their choice in assessing the post-operative recovery of knee function. Radiological union of the fracture was not given a major concern in many of standard knee scoring systems.^{1,2,3,4,5} In the present study also radiological union has not been given a place in evaluating results.

In this study A. Dutta and S.K. Gupta scoring system is adopted for evaluation of post-operative functional outcome.¹ This scoring system addressed three distinct areas of recovery to normal function of the knee joint. A subjective feeling of pain was given due consideration in the assessment. Improvement in the efficiency of the lever mechanisms has also been elaborately scrutinized. Socio cultural and occupational demands such as squatting, sitting cross leg on the floor faced by the patient in the Indian subcontinent were also been addressed.

SUMMARY: From September 2012 to September 2014, 34 patients with fracture patellae were treated, after fulfilling inclusion and exclusion criteria. Out of these 34 cases 27 cases were displaced transverse fractures, 7 cases were minimally comminuted fracture.

The present study included 76.4% of patients in their mid and late adulthood (31-60 years). Peak incidence is between 31 to 60 years which indicates active age group more prone for the fracture. The common modes of injury in the present study were slip/accidental fall (73.5%)

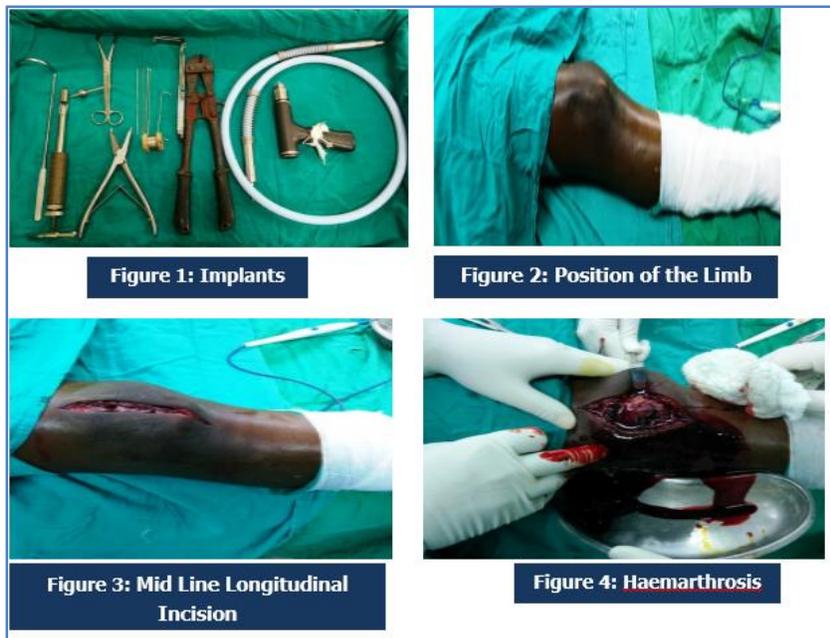
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and RTA (26.4%). Most of the fractures were due to indirect mechanism of injury in the domestic environment. The incidence of patellar fracture was higher in males (67.7%) than females (32.3%).

Modified tension band wiring was done in displaced patella fractures within a period of one week from their admission, after thorough examination, preoperative evaluation and written informed consent. In this study 94.2% had excellent to good results. Only 5.8% had fair to poor results. Modified tension band wiring is also effective in treating minimally comminuted fractures of the patella with 57.1% excellent, 28.6% good and 14.3% fair results. Minimal quadriceps wasting was seen in most of the patients without decrease in the power of the quadriceps. One patient had poor result due to poor compliance to physiotherapy and poor follow ups. One patient developed superficial wound infection which was treated with oral antibiotics and another patient had k-wire slippage who is asymptomatic without any functional compromise.

CONCLUSION:

1. The present study shows that modified tension band wiring (Muller) is an effective procedure in the management of displaced transverse patellar fractures, with excellent to good results.
2. Minimally comminuted patellar fractures also yielded excellent to good results with Modified tension band wiring as an extended application.
3. The results in the present study are comparable to other modifications of Tension Band Wiring principle.
4. The surgery of Modified Tension Band Wiring gives rigid fixation and helps in early mobilization.
5. Regular and scheduled post-operative physiotherapy plays an important role in the functional outcome.



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Figure 5: Fracture Fragments



Figure 6: Modified tension Band Wiring



Figure 7: Transverse Incision



Figure 8: Modified Tension Band Wiring



Sitting Cross Legged



Squatting Position



Full Range of Flexion



No Extensor Lag

Figure 9: Case No. 1 Functional Outcome



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