Original Article

Study of tension band wiring in management of fracture of patella in tertiary care hospital in Vadodara

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ABSTRACT

Background: Patella is the largest sesamoid bone in the body and is situated in front of the knee joint. Patellar fractures are encountered very frequently in day to day clinical practice due to increase in accidents.

Objective: Present study is carried out to know the role of tension band wiring in management of fracture of patella.

Material and Methods: This study was conducted during April 2003 to July 2005. All the patients were following trauma and all were treated, followed up and studied according to a fixed protocol. History of all patients was taken and local, general as well as radiological examinations were done. After confirmation of diagnosis patients were admitted with posterior cylindrical slab. After that preoperative evaluation was done and one the patient was fit for surgery, he was operated on appropriate day. Fracture fragments were reduced and then fixed with k-wire. Reduction was confirmed on IITV (image intensification Television).

Result: In the patients after tension band wire insertion, 120-130 degree flexion was present in 50% patients, quadriceps strength was equivalent to opposite limb in 90% patients, difficulty in sitting cross legged /squatting was present in 50% patients, change of work was observed in 25% patients, infection was observed in 5% patients, non union or mal union was not observed in any patient.

Conclusion: Tension band wiring produces good results when there is minimal or no communication and exact reduction of articular surface is achieved. Our results are comparable with some of studies conducted in India and abroad.

Key words: Tension band wiring, k-wire, fracture of patella

INTRODUCTION

Patella is the largest sesamoid bone in the body and it is situated in front of the knee joint. It is an integral part of the skeleton phylogenetically inherited. Patella develops independently and not in quadriceps tendon as it was believed. It develops behind the quadriceps tendon. Quadriceps tendon subsequently attains attachment to patella [1].

Patellar fractures constitute 1% of total body fractures [2]. Broadly patellar fractures can be classified in open and closed categories and then subsequently can be classified according to their pattern of fractures like vertical, transverse, comminuted fractures of upper pole and fractures of lower pole. As patella is critical for extensor mechanism of knee to function normally and total patellectomy always fails in preserving normal extensor mechanism of knee joint, patella should be preserved as far as possible. The results have shown that total patellectomy causes various post patellectomy symptoms and significant disability or instability [3].

A tension band is a device which will exert a force equal in magnitude but opposite in direction to the bending force. The tension band must be made up of a material which resists tensile forces and which can be pre-stressed. The bone must be able to withstand compression. This means that the bone must not be comminuted either under or on the opposite side from the tension band [4].

Pauwel first used this principle in the management of displaced patellar fractures. Initially tension band wiring was done directly through the patellar and quadriceps tendon. Here the fracture was exposed and reduced and then a stainless steel wire was passed under the quadriceps tendon then over the patella and then beneath the patella tendon and then the loop was tightened over the patella to get and maintain the reduction. Later this method was modified and the two k-wires were passed parallel through the fracture and then over it the tension band figure of eight loop was made with wire. This method works with the principle that this anterior tension band neutralizes the large distraction force that occurs across the anterior surface with contraction of the quadriceps and also with flexion of the knee. As tension is resisted by this wire, compressive forces are generated at the posterior aspect of the fracture gap, improving stability at the articular surface [4].

MATERIAL AND METHODS

Study duration & sample size: This study was conducted at department of Orthopedics at S.S.G. Hospital, Vadodara from April 2003 to July 2005. This is a study of 20 cases of closed fracture of patella treated by tension band wiring. It is a study of subjective assessment and objective analysis of the quadriceps and knee function after treatment of fracture of patella.

Patients were followed up in the period from 01/04/03 to 01/07/05. Only those cases were included in analysis that had a minimum follow up period of five months. All the patients were following trauma and all were treated, followed up and studied according to a fixed protocol.

Methodology: As soon as the patients arrived in OPD (outpatient department) or casualty department, patient's history was taken, general & local examination were done, radiological examination was done and once the diagnosis was confirmed after x-ray then the patient was shifted to admitting ward with posterior cylindrical slab. Once the patient was admitted in the ward all pre operative blood investigations were done and once patient was fit anaesthetically for surgery, he was posted for elective surgery on appropriate day.

The fracture was approached via a midline longitudinal incision. The fracture site was irrigated to remove the blood clots and debris, and the integrity of the fragments was evaluated. Once the fracture was reduced, two parallel kirschner wires were passed from the superior pole of the patella to the inferior pole across the fracture site, 5mm posterior to the anterior cortical surface. Then an 18G wire was passed transversely through the quadriceps tendon attachment, then across the anterior surface of reduced patella, then the wire was passed transversely deep to the patellar tendon attachment on the inferior fragment and deep to the protruding Kirschner wires, then back over the anterior patellar surface to form a knot.

In follow up we have seen for knee ROM (range of movement) by extensor leg, flexion restriction and quadriceps strength. Functional activity was checked by walking, squatting, sitting cross legged, ascending stairs leading with affected leg first, descending stairs leading with affected leg first & standing on affected limb. Final follow up was done with x-ray to see union at fracture site.

Ethical clearance: Ethical clearance was taken by ethical committee of our institute.

RESULTS

In our study the male to female ratio was 4:1, 16 (80%) patients were males & 4 (20%) were females as shown in table-1.

Table 1: Sex & age wise distribution of patients

Variable	Numbers	% (n=20)
Sex		
Male	16	80
Female	4	20
Age (years)		
21-30	4	20%
31-40	3	15%
41-50	4	20%
51-60	6	30%
61-70	3	15%
Total	20	100%

Table 1 shows that highest number of patients in 51-60 years age group, decrease in number in 21-30 & 41-50 years age groups & lowest number of patients in 31-40 and 61-70 years of age groups. Mean age was 48 years.

Table 2: Activities examined after surgery

Activity	Possible with ease (%)	Possible with difficulty (%)	Not possible (%)
Can walk without pain or support	20 (100)	00	00
Sitting cross legged	10 (50)	5 (25)	5 (25)
Squatting	10 (50)	5 (25)	5 (25)
Ascending stairs with affected leg first	20 (100)	00	00
Descending stairs with affected leg first	20 (100)	00	00
Standing without support	20 (100)	00	00
Lifting /carrying weight	20 (100)	00	00
Climbing slopes	20 (100)	00	00
Walking on uneven ground	20 (100)	00	00
Standing on affected leg	20 (100)	00	00

Table 3: knee ROM (range of movement)

Max flexion possible	Numbers	% (n=20)
120-130 degree	10	50
90-120 degree	5	25
<90 degree	5	25
Total	20	100

Table 2 shows activities examined after surgery. Walking without pain or support was seen in 100% patients which was possible with ease. Sitting cross legged was possible with ease in 50% patients, was possible with difficulty in 25% patients & was not possible in 25% patients. Squatting was possible with ease in 50% patients, was possible with difficulty in 25% patients & was not possible in 25% patients. Ascending stairs with affected leg first, Standing without support, Lifting /carrying weight, Climbing slopes, Walking on uneven ground & Standing on affected leg was possible with ease in 100% patients. Table 3 shows that 50% of patients had full flexion of the knee joint (120-130 degrees), 25 % of patients had restriction of flexion and in 25% of patients flexion was less than 90 degrees.

DISCUSSION

In our study 80 % patients were male and 20% patients were female , while in Levack et al [5] & in Mehdi [6] study 72% patients were male & 28% patients were female, in Siddaram N Patil [7] study 70% patients were male and 30% patients were female & in Mugadlimath et al [8] study 60% patients were male and 40% patients were female. This can be explained by the working habits prevalent in our country where most of the outdoor work & manual labour is done by males, hence high preponderance of male patients.

The fracture of patella is common in all age groups with no age specificity. In our study age varied from 22 years to 65 years with mean age of 48 years, while in Levack et al [5] study mean age was 49 years, in Mehdi [6] study mean age was 36 years & in Siddaram N Patil [7] study mean age was 42.05 years.

Difficulty in sitting cross legged & squatting was observed in 50% patients in Levack et al [5], in 17% patients in Mehdi [6], in 30% patients in Mugadlimath et al study [8] & in 50% patients in present study. Quadriceps strength was comparable to opposite limb in 50% patients in Levack et al [5], in 83% patients in Mehdi [6], in 70% patients in Mugadlimath et al [8] & in 90% patients in present study.

120-130 degrees flexion was observed in 50% patients in In Levack et al [5], in 83% patients in Mehdi [6], in 70% patients in Mugadlimath et al [8] & in 50% patients in present study as shown in table 3.

CONCLUSION

Based on our study we have reached to the conclusion that tension band wiring produces good results when there is minimal or no comminution and exact reduction of articular surface is achieved. Supervised physiotherapy plays pivotal role in final outcome of treatment. So tension band wiring is the gold standard treatment for fracture of patella producing excellent results.

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