Functional Outcome of Modified Tension band wiring in Transverse Fracture of Patella

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ABSTRACT

INTRODUCTION: Because of its subcutaneous location and attachment of strong muscles and ligaments the patella is eccentrically loaded and predisposed to both direct and indirect injuries. Fractures of the patella are one of the most common fractures encountered by an orthopedic surgeon. Various internal fixation techniques have been described like, circumferential wiring, tension band wiring and modified tension band wiring with K wire. Despite modified tension band wiring being most commonly performed surgery for patella fracture, there are few studies performed in our context. We suppose that modified tension band wiring will be as effective as published studies even in our country like Nepal where squatting is important in daily activities.

METHOD: This was prospective interventional study done in Bir hospital and Birendra Army hospital. This study consists of 30 cases of displaced transverse fracture treated by modified tension band wiring. Study consisted of patients above 19 to 55 years both male and female have been included. Patients with comminuted fractures, open Gustilo type 2 and 3, open fractures, established knee deformity, associated ligamentous injury and bilateral patella fractures were excluded from this study. A uniform operative and postoperative protocol was followed for each patient. They were followed up at 4th weeks, 8th weeks, 12th weeks and 24th weeks to record Reich and Rosenberg grading, pain score, range of motion and features of radiological union.

The analysis was done using SPSS, for parametric data student t test was used and Chi-square test was used to analyze nonparametric data. The significance value was set as<0.005

RESULT: Initially 32 patients were enrolled in this study. Two patients were lost during follow up, so thirty patients were available for final analysis. The age ranged between 19 to 55 years with mean age of 35.77 years.

Based on the Reich & Rosenberg criteria at the end of 24th weeks, our results were graded as excellent in 20 cases (66.7%), good in 8 (26.7%), fair in 2 (6.7%) and none had poor outcome. Similarly 28 patients (93.3%) had no pain and 2 patients (6.7%) had mild pain.

CONCLUSION: The functional outcome of modified tension band wiring in transverse fracture of patella in NAMS can be considered as good to excellent. Our results are comparable to the published studies. Modified tension band wiring has lesser complication rate in our study.

KEY WORDS: Modified tension band wiring, VAS score, patella

INTRODUCTION

The patella is the largest sesamoid bone. The mechanical function of the patella is to hold the entire extensor strap away from the center of rotation of the knee, thereby lengthening the anterior lever arm and increasing the leverage and efficiency of the quadriceps.1
Because of its subcutaneous location and attachment of strong muscles and ligaments the patella is eccentrically loaded and predisposed to both direct and indirect injuries. Fractures of the patella are one of the most common fractures encountered by an orthopedic surgeon. They continue to pose vexing problems as this being intraarticular is subjected to continuous deforming forces from muscles. It is also difficult to restore the desired anatomical continuity and congruity of the articular surfaces after reduction and thereby causing complication like osteoarthritis, stiffness of joint, non-union etc.

Various internal fixation techniques have been described like, circumferential wiring, tension band wiring and modified tension band wiring with K wire. The goal of treatment is to reestablish the continuity of extensor mechanism and to restore the normal function of knee.

Despite modified tension band wiring being most commonly performed surgery for patella fracture, there are few studies performed in our context. We suppose that modified tension band wiring will be as effective as published studies even in our country like Nepal where squatting is important in daily activities. The activities of daily living in our country differ from that of the western world. Nepalese people have to squat, sit crossed legged and walk up and downhill more often others because of various terrains and cultural behaviour. Despite these variations I still believe that modified tension band wiring technique is equally good in our populations, because of the mechanical advantage of modified tension band wiring principle. So, the aim of study was to evaluate the effectiveness of modified tension band wiring technique for the transverse fracture of patella in Nepalese population.

**METHOD**

This was prospective interventional study done in Bir hospital and Birendra Army hospital between October 2010 to February 2012. This study consists of 30 cases of displaced transverse fracture treated by modified tension band wiring. Study consisted of patients above 19 to 55 years both male and female have been included. Patients with comminuted fractures, open Gustilo type 2 and 3, open fractures, established knee deformity, associated ligamentous injury and bilateral patella fractures were excluded from this study. A uniform operative and postoperative protocol was followed for each patient. They were followed up at 4th weeks, 8th weeks, 12th weeks and 24th weeks to record Reich and Rosenberg grading, pain score, range of motion and features of radiological union. The variable used in study was age, sex, side of injury, mechanism of injury, time taken for surgery, radiological union, range of motion pain score and complications.

The analysis was done using SPSS, for parametric data student t test was used and Chi-square test was to analyze nonparametric data. The significance value was set as <0.005.

**RESULT**

Initially 32 patients were enrolled in this study. Two patients were lost during follow up, so thirty patients were available for final analysis. The age ranged between 19 to 55 years with mean age of 35.77 years. The incidence was high in the age group 31-40 years. There were 18 male and 12 female with the male and female ratio 3:2. The mechanism of injury was indirect in 19 cases and direct in 11 cases. Majority of patients (93.3%) had their clinical union in less than 8 weeks. Out of 30 patients only two had complications, 1 (3.3%) had superficial infection and another had k-wire prominence.

Based on the Reich & Rosenberg criteria at the end of 24th weeks, our results were graded as excellent in 20 cases (66.7%), good in 8 (26.7%), fair in 2 (6.7%) and none had poor outcome. Similarly 28 patients (93.3%) had no pain and 2 patients (6.7%) had mild pain according to Reich & Rosenberg criteria.

**DISCUSSION**

Modified tension band wiring is commonly used method to treat transverse patellar fracture. In this study, open reduction and internal fixation was done by modified tension band wiring. Early knee movement
was initiated in all the cases post operatively along with other physiotherapy measure.

In this series 30 cases of transverse patella fracture with modified tension band wiring was analyzed. Majority of patients (50.0%) fell in the age group of (31-40). Mean age of our patients was 35.77 years. Hang et al in their study showed the mean age 59.8 years. Levach B et al showed the mean age 49 years and 39.5 years respectively.

There were 18 male (60%) and 12 female (40%) with the male and female ratio of 3:2 in our study. In the study of Levack B et al, out of 64 patients 42 were male and 33 were female. The reason for male dominance was due to their active participation in daily activities. As in our context both male and female are equally engaged in farming activities. This may be the reason of slightly higher incidence of patella fracture in female in our series.

Left patella was involved slightly frequently than right one (17 vs 13). None of the published studies have described and explained about the side affected.

Majority of fractures (63.3%) had injuries due to indirect. Ndiiaya et al in their study showed that direct injuries were common, mainly due to RTA. Gumula J et al in their study showed common mechanism of injury were direct injury as heavy traffic and speed could be their cause of direct injury. In Nepalese context, there are few people who drive a vehicle and chance of road traffic accident is less which reflects less number of direst injuries.

Mean range of motion at 4th weeks was 86±5.00 degree. Mean range of motion at 8th weeks, 12th weeks and 24th weeks were 114.67±10.42 degree, 131.00±10.29 degree and 134.00±10.37 degree respectively. There was significant improvement in range of motion while comparing with the previous follow.

K srinivas et al performed modified TBW of patella in 10 cases. In their results 8 out of 10 patients had knee range of movement greater than 110 degree. Similarly Chang SM et al evaluated the treatment outcome of displaced inferior pole patella fracture with anterior tension band wiring to have average range of motion 122.5 degree. Petersen KK et al performed modified tension band to treat displaced fracture of patella and evaluated their functional results. In our study majority of patients (93%) had range of motion more than 120 degree. This could be due to early start of motion and extensive physiotherapy. Majority of our patients were satisfied with range of motion gained particularly necessary for the oriental habits of squatting and sitting crossed legged.

The mean pain score (VAS) at 4th weeks follow up was 2.30±0.92 the pain score gradually improved in successive follow up at 8th weeks, 12th weeks, and 24th weeks with mean of 1.53±0.86, 0.27±0.69 and 0.13±0.51 respectively. Gumila J et al in a study of 45 patients found more than 75% patients had no pain. In our study, 93% had experienced none pain at 6 months follow up.

Out of 30 patients who were followed for complete 6 months, only two patients developed complication. One had superficial infection which was treated with antibiotics and other one (3.3%) had hardware prominence which was later removed after the radiological union. No infection was reported by
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Srinivas et al13 where as Peterson KK et al23 found 4 cases of infection out of 45 operated patellar fracture. Similarly Eggink et al30 reported 9 cases of failures due to migration of k – wires. Miller et al29 in his series of 173 patellar fracture, found 12% of complication rate. Lower complication rate in our series may be small number of sample sizes.

According to Reich & Rosenberg grading, 20 (66.7%) had excellent results, 8 (28.7%) had good results and 2 (6.7%) had fair results at 24thweeks of follow. Similarly 28 (93.3%) had excellent pain score and 2 (6.5%) had good pain score. In consecutive follow up at 4th weeks, 8th weeks, 12th weeks and 24th weeks Reich & Rosenberg grading for range of motion and pain score was improved. In a study done by Srinivas et al13 80% of cases treated with modified tension band wiring showed to excellent to good results and 20% showed poor results. Hung LK et al48 in their 100 cases of patella found 81.3% excellent results. Similarly Neumann HS et al14 studied 135 fractures of patella which were treated with modified tension band wiring found 64.7% excellent to good results, 18.8% fair and poor in 16.5%. Ozdemir H et al15 did modified tension band wiring in 10 cases of patella fracture where he found 55% good and 10% poor.

In our study we had excellent to good results in 93.3% of cases. This may be because of careful and strict inclusion and exclusion criteria. We have involved only transverse fracture and excluded comminuted one. In most of studies mentioned above, they had included all types of patella fracture which may be the reason for relatively poor results as compared to ours.

The study had some pitfalls as study consists of only 30 patients. More over there was selection bias for the inclusion of patients and follow up was only six months.

CONCLUSION

The modified tension band wiring is safe and effective in transverse fracture of patella because of good stability of implant and easier postoperative rehabilitation.

Our results of clinical union of transverse fracture with modified tension band wiring is comparable to similar other studies. In our study the mean knee range of motion was 134.00±10.37 degree, which allows person to have full knee function with squatting for daily activities. Out of 30 patients excellent results were found in 20 patients (66.7%), eight patients (26.7%) had good results and two patients (6.7%) were found to have fair results.

Our study supports that modified tension band is effective means of fixing fracture of patella with minimum complication.

REFERENCES


