



# International Journal of Orthopaedics Sciences

E-ISSN: 2395-1958  
P-ISSN: 2706-6630  
IJOS 2020; 6(4): 820-826  
© 2020 IJOS  
[www.orthopaper.com](http://www.orthopaper.com)  
Received: 18-08-2020  
Accepted: 26-09-2020

**Avadhesh Bhati**  
Senior Resident, Department of  
Orthopaedics, Government  
Medical College, Ratlam,  
Madhya Pradesh, India

**Prateek Girotra**  
Senior Resident, Department of  
Orthopaedics, BPS Government  
Medical College, Khanpur,  
Sonapat, Haryana, India

**Akshay Bhandari**  
Senior Resident, Department of  
Orthopaedics, NDMC Medical  
College and Hindu Rao Hospital,  
Delhi, India

**Harshwardhan Dawar**  
Senior Resident, Department of  
Orthopaedics, Government  
Medical College, Ratlam,  
Madhya Pradesh, India

**Corresponding Author:**  
**Prateek Girotra**  
Senior Resident, Department of  
Orthopaedics, BPS Government  
Medical College, Khanpur,  
Sonapat, Haryana, India

## Treatment of transverse patella fractures by cannulated screws with tension band compared with modified tension band wiring

**Avadhesh Bhati, Prateek Girotra, Akshay Bhandari and Harshwardhan Dawar**

**DOI:** <https://doi.org/10.22271/ortho.2020.v6.i4l.2425>

### Abstract

**Objective:** To analyze and compare the results of modified tension band wiring and cannulated screws with tension band wiring concerning bony union, post-operative complications, range of movements of knee and time of recovery and compare both the modalities.

**Design:** Prospective randomized control trial.

**A study done at:** NDMC medical college and Hindu Rao hospital, Delhi, India

**Material and Methods:** This study is a prospective randomized control, during the period from September 2019 to September 2020. This study consists of 50 cases of fracture patella divided randomized alternatively in two groups, Group A with 25 cases treated by Modified tension band wiring and group B with 25 cases treated by Cannulated screw with tension band wiring. Data for this study were collected in a pre-test proforma and details were included with subsequent pre-planned follow-ups at 1, 3, 6 and 12 months. Data were mainly analysed to assess post-operative interfragmentary gap, Postoperative range of movements, Development of complications and IOWA knee score at the end of 6 months in both the groups and comparing them. Data analysis was based on the statistical parameters like descriptive statistics, Chi-square/Contingency table analysis, T-test using SPSS for Windows version 27.0.0.

**Result:** Loss of reduction was found to be numerically more in Modified TBW group. Comparing both groups statistically, Z-score is 1.222 and p-value is 0.222 ( $p > 0.05$ ) showing no significant difference in loss of reduction. Skin irritation due to hardware was found to be numerically more in Modified TBW group, Z-score is 2.085 and p-value is ( $p < 0.05$ ) showing a highly significant difference. Implant loosening was found to be numerically more in Modified TBW group. Comparing both groups statistically, Z-score is 2.085 and p-value is 0.036 ( $p < 0.05$ ) showing a highly significant difference. Therefore, though the amount of loss of reduction is similar in both the groups, complications like skin irritation and implant loosening is high in Modified TBW group, attributable to K-wire migration, which can be avoided to a certain extent, by bending the ends of K-wire over SS-wire after tensioning it in a figure of 8 and burying its ends in the soft tissue. Comparing each complication individually both groups incidence of superficial wound infection is the same in both the procedures.

**Summary:** Cannulated screw tension band wiring technique combines the principle of lag screw and tension band providing both static and dynamic compression respectively, thus giving better fixation of transverse patellar fractures when compared to modified tension band wiring.

**Keywords:** Transverse patella, cannulated screws, band compared, modified

### Introduction

Fracture of the patella are relatively common injuries and account for approximately 1% of all skeletal injuries [1, 2]. It is one of the important group of injuries responsible for considerable disability and consequent morbidity. The subcutaneous location of the patella makes it vulnerable to direct trauma as in dashboard injuries or a fall on the flexed knee. Whereas violent contraction of the quadriceps during active flexion of the knee results in indirect fractures of the patella. These fractures are mostly transverse and are commonly associated with tears of medial or lateral retinacular tissues. When the extensor retinaculum is torn, the quadriceps muscle tends to pull the superior fragment proximally making an adequate reduction of patella nearly improbable by closed means and proving operative treatment as the only measure [1].

The gravity of the problem assumes greater proportions due to its higher incidence in active adult life and disruption of the quadriceps mechanism. 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. The controversy mainly centers round repair versus excision of the patella. One school of thought, Lead by Brooke (1936) and supported by Watson Jones (1945) contends that excision of the whole patella does not lead to any appreciable weakness of knee joint and gives a strong and asymptomatic knee. The other school of thought lead by Haxton (1945) believed that complete and accurate reconstruction of the patella is likely to give a joint that will tolerate the stresses and strains better than one in which the normal anatomy is disturbed by total excision. However, every type of treatment advocated has its own merits and demerits. The goals of surgical treatment are to obtain an accurate reduction of fracture of the patella, to provide stable fixation, to facilitate an early range of motion of the knee.

Multiple operative methods have been described for fracture patella [3]. Since the 1950s tension band wiring has been used for operative treatment of fracture patella [3]. Skin irritation, Risk of loosening and migration of K-wire are some of the drawbacks of tension band wiring also direct interfragmentary compression cannot be achieved with K-wire [3]. To overcome these shortcomings, Cannulated screw tension band wiring technique was adopted in treating patella fractures.

The advantages of Cannulated screw tension band construct are a lesser degree of implant irritation, interfragmentary compression from screw fixation prevent fracture fragment from sliding apart better fracture union and permit early motion [1, 4].

We aim to analyze the results of modified tension band wiring and cannulated screws with tension band wiring concerning bony union, post-operative complications, range of movements of knee and time of recovery and compare both the modalities.

### Materials and Methods

This study is a prospective randomized control trial done at The Department of Orthopaedics at NDMC medical college and Hindu Rao hospital, Delhi, India during the period from September 2019 to September 2020. This study consists of 50 cases of fracture patella divided randomized alternatively in

two groups, Group A with 25 cases treated by Modified tension band wiring and group B with 25 cases treated by Cannulated screw with tension band wiring.

Data for this study were collected in a pre-test proforma and details were included with subsequent pre-planned follow-ups at 1, 3, 6 and 12 months. Data included personal details, details of the fracture, Mode of injury, type of fracture, Method for internal fixation, post-operative interfragmentary gap, and Postoperative range of movements, Development of complications and IOWA knee score at the end of 6 months. Anticipated complications being infection, wound healing and wound gaping, skin irritation, delayed union, knee stiffness, non-union, implant failure, loss of reduction. Data analysis was based on the statistical parameters like descriptive statistics, Chi-square/Contingency table analysis, T-test using SPSS for Windows version 27.0.0. Results on continuous measurements are presented as Mean. Results on categorical measurements are presented as Percentages. Significance was assessed at a 5% level of significance. ( $P < 0.05$  – statistically significant) Isolated fracture with displacement of more than three millimeters and an articular step of more than two millimeters. Old fractures (More than 3 weeks), Comminuted fractures (AO/OTA 34-C3), undisplaced fractures, longitudinal fractures, compound fractures and cases with ipsilateral lower limb fractures were not included in the study. On the initial presentation, the injured limb was immobilized in an above-knee POP posterior cylinder slab. Operations were done at a later date but within a week. On the day before the surgery, the part was prepared and antibiotics started.

### Procedure

#### Modified tension band wiring

Under sterile conditions, under tourniquet control, in supine position with knee in extension, fracture site is exposed through anterior longitudinal incision, fracture site is exposed, reduced and held in position with the help of patellar clamp or towel clips. Two K-wires of 2 mm thickness are 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 is 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 (Figure 1). Tear in the quadriceps expansion is sutured with absorbable suture, Patellar retinaculum is repaired. Wound closed with non-absorbable sutures or staples. A cylinder slab and pressure bandage is given as a temporary immobilization.



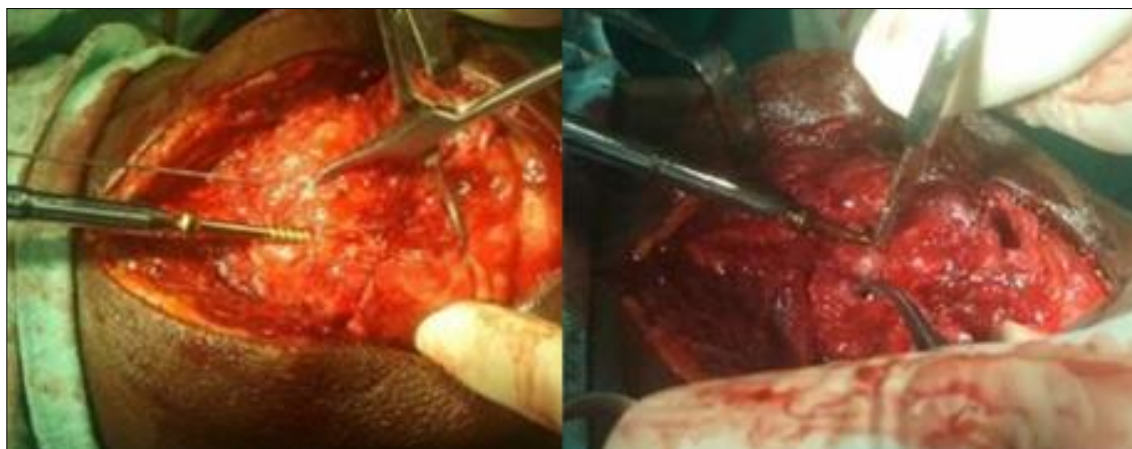
**Fig 1:** SS-wire passing and “figure of 8” formation in modified tension band wiring

Cannulated screw tension band wiring: Performed with the patient under spinal anaesthesia in supine position with a

tourniquet, Longitudinal incision along anterior aspect of knee, subcutaneous tissue dissected, fracture site exposed,

examined, edges were freshened. With the knee in extension, a large towel clip or patella holding clamp was used to reduce the fracture fragments and articular surface congruity was evaluated by palpation. 2 K-wires were drilled from the lower pole to the superior pole of the patella or vice versa in parallel fashion, with 2 cm space between two wires and a 5 to 10 mm distance from the patellar articular surface. A cannulated drill

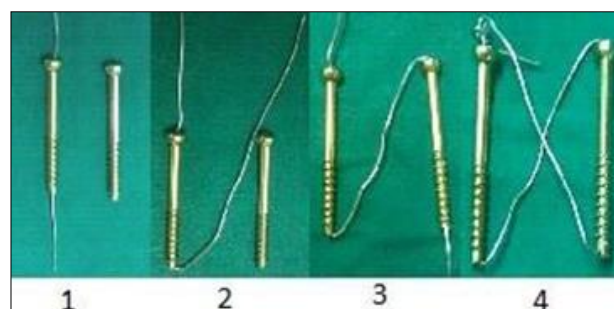
bit was drilled along the K-wire. 4.0 mm cannulated screw was inserted along the K-wire from smaller fragment to the larger fragment. The screw head remained proud of the patella cortex, and the proximal end of the screw should be close to or embedded within the patella. A second cannulated screw was also similarly inserted and the screws were alternately tightened (figure 2).



**Fig 2:** Vertical arrangement of both cannulated screws

The K-wires were removed and an 18 G stainless steel wire is passed in a figure of eight fashion through the two cannulated screws (Figure 3). The wires were tensioned with the help of a wire tensioner and the tip of the wires were buried in soft tissue. It should be noted that the final cannulated screw length should be 5 to 10 mm shorter than the primary measurement. This allows the sharp tip of the screws to remain buried in the proximal patella without direct contact and cutting of the tightened wire. Then extensor tendon and retinaculum were repaired with absorbable sutures with the knee in approximately 45-degree flexion. The tourniquet was let down. Hemostasis was achieved and the wound closed in layers. The knee was bandaged with a sterile dressing and immobilized with a cylinder slab. Figure 4 shows post-

operative x-ray for both groups.



**Fig 3:** Steps for passing SS-wire in cannulated screws for tension band



**Fig 4:** Post-operative x-ray for both A) Cannulated screw tension band B) Modified tension band wiring

The patients were encouraged to perform isometric knee extension and straight leg elevation. Partial weight-bearing was permitted until suture removal. After the incision is stabilized, usually at 3 or 4 days, knee flexion was allowed to less than 45 degrees in the first week and gradually increased to 90 degrees in the 2nd week. The patients were provided

with an exercise chart advised performing regularly at home twice daily.

The patients were reviewed at 1, 3, 6 and 12 months after the operation. At each visit, radiographs of the affected knee joint in anteroposterior and lateral view were taken to observe the fracture healing and range of motion of the knee joint

assessed. Fracture healing was confirmed when a patient had no local pain or tenderness and was able to walk well without help, and an x-ray showed evidence of trabecular bone

growing across the fracture site. At the final follow-up, the knee function was evaluated according to the Iowa knee score criteria (Table 1).

**Table 1:** IOWA knee score

<b>Function (35 points)</b>	
Instructions: Eleven activities of daily living are listed with a value. If the patient can perform the activity easily without restriction, give full value; if the patient cannot (or could not if he/she tried) perform the activity at all, give no points; if the patient can or could perform the activity but with difficulty, give an appropriate number of points between 0 and full value.	
Does most of housework or job, which requires moving about (5)	_____
Walks enough to be independent (5)	_____
Dresses unaided (includes tying shoes and putting on socks) (5)	_____
Sits without difficulty at table or toilet, including sitting down and getting up (reduce if additional aid is necessary) (4)	_____
Picks up objects from floor by squatting or kneeling (3)	_____
Bathes without help (3)	_____
Negotiates stairs foot over foot (3)	_____
Negotiates stairs in any manner (2)	_____
Carries objects, such as a suitcase (2)	_____
Gets into an automobile or public conveyance unaided and rides comfortably (2)	_____
Drives an automobile (1)	_____
Total	_____
<b>Freedom from pain (maximum, 35 points; circle one only)</b>	
Instructions: Circle the value that is over-all most representative of the patient's pain, using the word descriptors. (Scoring should not be based simply on asking the patient the word descriptors in question form.)	
No pain	35
Mild pain with fatigue	30
Mild pain with weight-bearing	20
Moderate pain with weight-bearing	15
Severe pain with weight-bearing, mild or moderate at rest	10
Severe, continuous pain	0
Total	_____
<b>Gait (maximum, 10 points; circle one only)</b>	
No limp, no support	10
Limp, no support	8
One cane or crutch	8
One long brace	8
One brace with crutch or cane	6
Two crutches with or without a brace	4
Cannot walk	0
Total	_____
<b>Absence of deformity or stability</b>	
No fixed flexion of more than 10 degrees with weight-bearing	3
No fixed flexion of more than 20 degrees with weight-bearing	2
No fixed flexion of more than 30 degrees with weight-bearing	1
No varus or valgus deformity of more than 10 degrees with weight-bearing	3
No varus or valgus deformity of more than 20 degrees with weight-bearing	2
No varus or valgus deformity of more than 30 degrees with weight-bearing	1
No ligamentous instability	2
No locking, giving-way, or extension lag of more than 10 degrees	2
Total	_____
<b>Range of motion (10 points)</b>	
Instructions: Total amount of flexion or extension, in degrees (normal, 150 degrees); assign 1 point for every 15 degrees.	
Total	_____

**Observation and Results**

In this study, 50 cases of the displaced transverse fractured patella were treated of which 25 cases are treated by TBW and other 25 cases are treated with cannulated screw with TBW. The findings and the results of this study were analyzed in the following discussion

**Age distribution (Table 2)**

Fracture of the patella occurs in any age, but it occurs very rarely below 30 years. In our series the range of age was between 21 - 66 years, the mean age was 40.48 years and the incidence was high in the age group of 41-50 years.

**Table 2:** Age distribution

Age in years	No. of cases (n = 50)	Percentage
21 – 30	6	12
31 – 40	14	28
41 – 50	21	42
51 – 60	8	16
61 – 70	1	2

**Sex distribution**

In a total of 50 cases, 36 fractures were in men and 14 fractures were in females. In this study, we found a higher

incidence of patella fracture in males compared to females.

were no cases of bilateral fracture patella seen in our study.

**Mode of injury**

In this study of 50 cases, 40 fractures were as a result of slip and fall, 10 cases were due to road traffic accident.

**Laterality of fracture**

In this study of 50 cases, 44 patients had a fracture on the right side and 6 patients had a fracture on the left side. There

**Post-operative complications**

However there was no incidence of non-union or malunion in both procedures. Superficial wound infection, loss of reduction, skin irritation and implant loosening were the complications encountered in both the groups in our study, as shown in table 3.

**Table 3:** Complications in both the groups

Types	No. of cases	Modified TBW (n = 25)	Cannulated screw with TBW (n = 25)
Superficial Wound Infection	2	1	1
Loss of reduction	7	5	2
Skin irritation	4	4	0
Implant Loosening	4	4	0

All the patients were followed up for an average of 7.98 months (range, 3 - 14 months). Few patients lost to follow up were not included in this study.

indicating that, though there is more amount of post-operative interfragmentary gap numerically in Modified TBW group, however, the difference in both the groups is not statistically significant.

**Post-operative interfragmentary gap**

In this study, of the 25 patients treated with Modified TBW, 17 patients had excellent reduction with no interfragmentary gap, 3 patients had 1 mm, 4 patients had 2mm and 1 patient had 3mm post-operative interfragmentary gap. Whereas of the 25 patients treated with Cannulated screw with TBW, 22 patients had excellent reduction with no interfragmentary gap and, 1 patient had 1mm, 1 patient had 2 mm and 1 patient had 3mm post-operative interfragmentary gap. The data was recorded at the end of 6 months.

**Functional outcome**

In the group with Modified TBW, the average range of motion is 0-126.6o (ranging from 100o-135o flexion and with few cases with extensor lag) whereas in Cannulated screw with tension band, the average range of motion is 0-131.4o (ranging from 120o-135o and full extension). Average IOWA knee score in the Modified TBW group is 89.6 showing good results on an average, whereas in Cannulated screw with TBW, the average score is 94.24, showing excellent results on an average. Detailed score statistics are shown in Table 4

Chi square/t-value is 3.441, and p-value=0.328 (p>0.05)

**Table 4:** Functional outcome using IOWA score

Result	No. of cases (n = 50)	Modified TBW (n = 25)	Cannulated screw with TBW (n = 25)
Excellent (90-100)	39	17 (68%)	22 (88%)
Good (80-89)	7	4 (16%)	3 (12%)
Fair (70-79)	2	2 (8%)	0
Poor (69 or <69)	2	2 (8%)	0

But Chi-square value is 4.784 with df = 3, the p-value is 0.188 (p>0.05) showing no statistical significance though having a significant numerical difference. Therefore, Iowa score/Knee functional outcome is similar in both groups.

Carpenter *et al.* compared the modified tension band technique with tension band technique incorporated into Cannulated screws and screws alone in a simulated leg extension models and found that combining lag screw and tension band principles provided more secure fixation of transverse patellar fractures than either method alone, with less displacement at the fracture site as the knee is extended and a higher load to failure of fixation from 554N for screws alone to 732 N for screws plus tension band wiring [1, 5, 8, 9]. Berg *et al.* evaluated clinical result of transverse patella fracture fixation with a tensioned anterior figure of eight wire placed through the parallel Cannulated screw in 10 patients and found this technique has several advantages like low profile construct that caused a lesser degree of implant irritation to local soft tissue structure, compatible with the use of early restricted motion and maintain anatomic reduction even in osteoporotic bone [4, 5, 8, 9]. Chang *et al.* evaluated 10 cases of the displaced inferior pole of patella fractures treated with a tensioned anterior wire passed within paired Cannulated compression screws and found that anterior tension band wiring through Cannulated screws for displaced inferior pole patella fracture is a safe, simple, reliable alternative treatment, stable construct with minimal soft tissue irritation and early range of motion and

**Discussion**

Use of lag screws across the fracture site can apply compression across the fracture site in any knee position if adequate screw fixation can be obtained. Addition of an anterior tension band may help to resist some of the tensile forces across the fracture site with the knee in a flexed position and convert them to compressive forces at the articular surface as the knee flexes. Another advantage is that the tension band is threaded through the Cannulated screws rather than around K-wires, so it can be laid down closer to the poles of the patella with less interposition of the soft tissue, leaving less initial slack in the system than with the modified tension band technique. As the wires exit the ends of the screws, they can be subjected to sharp corners that might increase the risk of breakage. This can be minimized by leaving the screws flush with or short of the end of the patella. Thus in this study we compared the outcomes associated with Modified TBW and Cannulated screw with TBW in the management of patella fractures.

excellent results in knee function [2].

### Age distribution

In the present study, the age of the patients was ranging from 21 years of minimum to 66 years of maximum with an average age of 40.48 years. The incidence was high in the age group of 41-50 years. Similar age incidence was noted in Bostrom (1972) [11] series, the mean age was 48 years ranging between 16 to 89 years and in Cho series 10, the mean age was 45 years ranging between 21 to 86 years. Whereas a study by Tian *et al.*, [3], observed an average age of 57.12 years ranging between 22 to 83 years, and a study by berg 4 also observed an average age of 63 years ranging between 20 to 86 years. Chang *et al.*, [2] also observed an average age of 59.8 years ranging between 50 to 76 years.

### Sex distribution

In the present study there were 36 males (72%) and 14 females (28%). In Bostrom series, 57% were males and 43% females [11]. In the series of S.K.Basu ray the incidence was 71% males and 29% females [12]. In Jonathan Wilkinson series, the incidence was 68% males and 32% females [13]. In Chang *et al.*, series, the incidence of 60% males and 40% females [2]. In Tian *et al.*, series, the incidence was 38.78% males and 61.22% females [3]. Whereas in berg series, the incidence was 30% males and 70% females [4]. In most of the series male predominance was observed. Similar male predominance was observed in the present study also.

### Mode of injury

In the present study of 50 cases, 40 (80%) fractures were as a result of slip and fall, 10 (20%) cases were due to road traffic accidents. In berg series, he observed, out of 10 cases, 3 (30%) fractures were as a result of road traffic accidents, 4 (40%) due to slip and fall and 3 (30%) due to non-contact injuries that occurred after a violent quadriceps contraction. 4 in Tian *et al.*, series, out of 49 cases, 46 (93.88%) fractures due to slip and fall and 3 (6.12%) fractures due to road traffic accident. 3 in Chang *et al.*, series, out of 10 patients, 5 (50%) had slip and fall, 3 (30%) had non-contact injuries due to violent quadriceps contraction and 2 (20%) had road traffic accident. 2 in Cho series, out of 30 patients, 18 (60%) had slip and fall and 12 (40%) had road traffic accident as a mode of injury. 10 slip and fall was the commonest mode of injury in all the series including the present study. In the present study, we have included the only transverse pattern of patellar fractures that were displaced. This type of fracture pattern showed excellent results with cannulated screw tension band wiring and good results with modified TBW irrespective of the age of the subject. All the patella fractures included in the study were of closed type and only unilateral involvement. In the present study 6 out of 50 cases had associated injuries and this was attributed to the slip and fall and road traffic accidents. These associated injuries did not influence the result of the treatment.

### Follow up

In the present study the averages follow-up was 7.98 months (range, 3 - 14 months), whereas in Einola *s et al.*, [7] study and Dudani *et al.*, [9] study the average follow-up was 12 to 18 months. In berg series, the patients were followed for an average of 24 months (range, 12 to 40 months). 4 in tian *et al.*, series, the patients were followed for an average of 12 months (range, 12 to 36 months). 3 in Cho series, mean follow up period was 15 months (range, 12 to 25 months) [10].

### Range of motion/Iowa knee score

The average range of motion is 126.60 flexion (ranging from 100o-135o degree) and full extension in modified TBW group, whereas it is 131.4o flexion (ranging from 120o -135o) and full extension in cannulated screw with TBW group. In the present study out of 25 patients with cannulated screw with tension band wiring, IOWA knee score with 22 patients was excellent (88%) and 3 had good (12%) results. No patient had fair or poor results. Similar results were observed by Tian *et al.*, out of 49 cases, 45 had excellent (91.84%) and 4 had good (8.16%) results [3].

### Complications

Loosening of the implant is considered the main complication of patellar fracture fixation [3]. The surface of a K-wire is smooth, so loosening of K-wire is inevitable with time. The probability of cannulated screw tension band wiring loosening is very low owing to the dense cancellous bone of the patella and the fact that the distal end of the cannulated screw is threaded. In addition, the strong stainless steel wire tightly attaches to the patellar surface to limit the separation of fracture fragments as a tension band [3].

Skin irritation is the main complication of the modified K-wire tension band. K-wire prominence and migration are the primary causes of skin irritation associated with this technique. With the Cannulated screw tension band technique, the tail of the cannulated screw tightly attaches at the superior or inferior pole of the patella, and the screw threads are not exposed to the patellar surface; the stainless steel wire closely attaches to the patellar surface after being tightened reducing the risk of skin irritation and postoperative activity discomfort [3].

In the present study, 5 patients had a loss of fracture reduction, 4 patients had implant migration, and 4 patients with skin irritation, 1 patient had superficial wound infection on the 6th postoperative day with modified TBW, whereas only 2 patients had a loss of reduction, 1 patient had superficial wound infection and no implant migration, no significant loss of reduction or soft tissue irritation with Cannulated screw with TBW.

The advantages of cannulated screw tension band construct are a lesser degree of implant irritation and implant loosening causing good interfragmentary compression from screw fixation which prevents fracture fragment from sliding apart, better fracture union and permit early motion [1,4].

### Conclusion

Patella is essential for the effective function of quadriceps and proper biomechanics of knee joint so it should be preserved wherever possible. Anatomical reduction and stable fixation in the patellar fracture is necessary for the normal integrity and stability of the joint. Modified tension band wiring uses the principle of tension band providing dynamic compression at the fracture site. The Cannulated screw tension band wiring technique combines the principle of the lag screw and tension band providing both static and dynamic compression respectively. It is an improved technique to remedy the shortcomings of the Modified K-wire tension band wiring in treating transverse patellar fractures. Since most cases of patellar fractures are associated with extensor retinacular tear, repair of the tear is necessary for early mobilization. Early postoperative physiotherapy plays an important role in the outcome. Cannulated screw with tension band wiring can be considered as an alternative method to treat transverse patella fracture with excellent to good results and few complications.

## Summary

The results of our study were comparable with other studies in the literature. The outcome of the present study was not influenced by the associated injuries. Long-term follow up is necessary to assess late complications like osteoarthritis and late functional outcome. To summarise, all patella fractures were not same as seen on radiograph and intraoperatively, Cannulated screw tension band wiring technique gave an excellent result in two-part transverse patella fractures, Over drilling the near cortex helps to give further compression at fracture site if the threads do not cross the fracture site. The Cannulated screw tension band wiring technique combines the principle of the lag screw and tension band providing both static and dynamic compression respectively, thus giving a more secure fixation of transverse patellar fractures.

## References

1. Carpenter JE, Kasman RA, Patel N, Lee ML, Goldstein SA. Biomechanical evaluation of current patella fracture fixation techniques. *J Orthop Trauma* 1997;11(5):351-356.
2. Chang, Min SC, Ling XJ. Open reduction and internal fixation of displaced patella inferior pole fractures with anterior tension band wiring through cannulated screws. *J Orthop Trauma* 2011;25:366-370.
3. Tian Y, Zhou F, Ji H, Zhang Z, Guo Y. Cannulated screw and cable are superior to modified tension band wiring through cannulated screws. *Clin Orthop Relat Res* 2011;469:3429-3435.
4. Berg EE. Open reduction internal fixation of displaced transverse patella fractures with figure – eight wiring through parallel cannulated compression screws. *J Orthop Trauma* 1997;11(8):573-576.
5. Bedi A, Karunakar MA. Patella fractures and extensor mechanism injuries. In: Rockwood and Green's Fractures in Adults. Vol.2, 7th Ed. Philadelphia: Lippincott Williams & Wilkins 2010, P1752-1779.
6. Einola S, Aho A, Kallio P. Patellectomy after fracture. *Acta Orthop Scand* 1976;47:441-447.
7. Dudani B, Sancheti KH. Management of fracture patella by tension band wiring. *Indian J Orthop* 1981;15-1:43-48.
8. Rudloff MI. Fractures of the lower extremity. In: Campbell's Operative Orthopaedics. Philadelphia: Elsevier Mosby 2013;3:2681-2688.
9. Melton MN, Liporace F, Di Pasquale T. Fractures of the patella. In: Insall & Scott Surgery of the knee. Philadelphia: Churchill Livingstone Elsevier 2006;2:147-1169.
10. Cho JH. Percutaneous cannulated screws with tension band wiring technique in patella fractures. *Knee Surg Relat Res* 2013;25(4):215-219.
11. Bostrom A. Fractures of the patella: A study of 422 patellar fractures. *Acta Orthop Scand Suppl* 1972;143:1-80.
12. Basu Ray SK, Ghosh MS. Functional end results of patellectomy in fracture of the patella. *Ind J Orthop* 1974;8(2):103-108.
13. Wilkinson J. Fracture of the patella treated by total excision. *J Bone Joint Surg Br* 1977;59B:352-354.