

Original article:

Comparitive Study of Fracture Patella with TBW alone & TBW with encirclage

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Abstract:

This is study of 38 cases of fracture Patella treated with TBW alone & TBW with encirclage. The aim of the study was to analyze the results achieved by TBW alone & TBW with encirclage. 22 cases were treated with TBW alone while 16 cases were treated with TBW & encirclage. In cases of comminuted fractures of patella wherein the bone purchase for implant was relatively less, the technique of TBW with encirclage was found to be better choice than TBW alone. The quadriceps wasting was common sequelae in both the groups. Also it was observed that in both the groups power quadriceps was weak. Rest all other parameters in both the groups were showing were having identical results.

Key words: Patella, Tension band wiring, K-wires, Encirclage

Introduction:

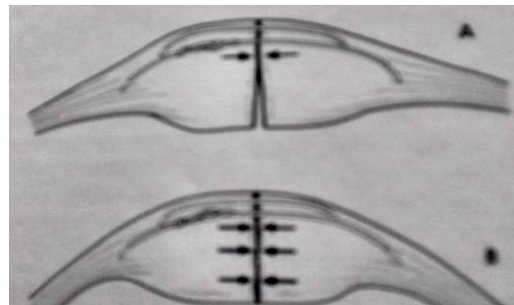
Patella is the largest sesmoid bone in the body. Fracture of patella constitutes 1% of the total skeletal injuries.^[1,2] The mode of injury is either direct trauma, or indirect trauma with violent contraction of Quadriceps muscle resulting in avulsion fracture of Patella from i] body ii] superior or inferior pole of patella. In this type of injury the chief deforming force is avulsion injury.^[3,4]

Direct trauma or combination of avulsion injury with direct trauma or other forces can cause comminuted fracture of Patella. The choice of treatment available is surgical fixation of the fracture patella. It can be done by

- i) Tension band wiring(TBW)
- ii) Tension Band wiring (TBW) with encirclage.^[5,6]

Aims of the surgical fixation are

- i) Precise anatomic reduction of fracture fragments
- ii) Restoration of the articular surface of patella to near normal



A] Tension band wiring B] Tension band wiring with encircle

Tension band wiring prevents not only the avulsion forces thereby preventing the displacement of the fracture fragments but while doing active flexion of knee, the avulsive forces are converted to compressive forces by TBW, thereby opposing the fracture fragments thereby promoting osteoinduction. This is shown in the aforementioned figure.^[5,7,8]

- iii) Stable fixation of fracture of Patella.
- iv) Proper Patellar tracking in the femoral groove
- v) Restoration of the extensor mechanism of Quadriceps apparatus
- vi) Early mobilization of the patient.

The methods of fixation of the fracture of Patella are

- i) TBW
- ii) TBW with encirclage
- iii) Fixation of superior or inferior poles of patella by non absorbable

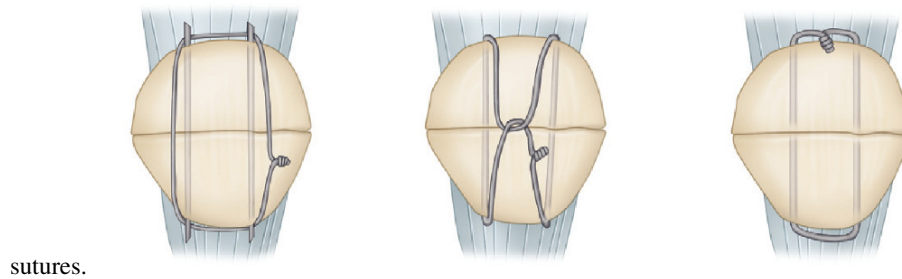


Fig. 1: Different types of TBW

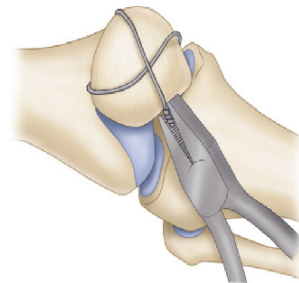


Fig. 2: Shows how to tighten SS wire

Out of these methods mentioned above, TBW is the procedure which is most commonly used.^[9] When there are 2 fracture fragments then TBW alone is sufficient. But when the fracture is comminuted, then the bone purchase of the fracture fragments by k-wire is drastically reduced. In such cases, if it is fixed with TBW alone,

- 1. the incidence of implant cut-out increases,
- 2. restoration of articular surface of Patella is poor,
- 3. There can be maltracking of patella thereby restricting the ROM of knee joint.

Sometime back the treatment of comminuted fracture patella was patellectomy.^[10] But shortly the technique was discontinued because of the better understanding of the biomechanics of the Knee joint. For better extension of knee joint, the lever arm & the moment arm has to be good. The power of extension of the knee joint is directly proportional to i) the lever arm (Distance between patellar tendon & the axis of the flexion of knee joint) & the moment arm. It has been observed that the power required for terminal extension of 15 degrees is double the power required from full flexion to 15 degrees short of full extension.^[11,12] To do this it requires moment arm which will

maintain the torque within quadriceps muscle thereby maintain the power of extension of knee joint. This is accomplished by Patella. By preservation of Patella, the lever arm & moment arm of the knee joint is better, whereas by surgical removal of patella, the lever arm & the moment arm is less than normal. Hence the power of extension of the knee joint is weaker. Now-a-days no one uses the technique of patellectomy.^[13,14]

Hence in such cases where the fracture is comminuted and there is relatively less bone purchase for the implant, Encirclage^[15] with TBW can help in

- a) restoring the normal anatomy of the patella
- b) better apposition of the fracture fragments
- c) relatively better tracking of patella through the femoral groove
- d) Good ROM of the knee joint.

This study is conducted to compare & analyze the results of TBW alone & TBW with encirclage in fracture of Patella.

Material & Methods:

A total of 38 cases of fracture patella treated at Pravara Hospital of Rural Medical College, Loni, Maharashtra were chosen randomly, out of which

22 cases were treated with TBW alone and rest of 16 cases were treated with TBW & encirclage technique.

TBW was done with help of 2 parallel k wire (1.5 mm) & 22 no SS wire.

Encirclage was done by non absorbable suture material 2 no Proline or Sutupack.

Sample Size: 38 cases

Duration of study: 1 ½ years

Inclusion criteria:

- a) The patient between the age group of 18 yrs to 50 yrs.
- b) Comminuted or tranverse fracture of patella,
- c) Simple fracture,
- d) Displaced fractures.

Exclusion criteria:

- a) Fracture of patella before skeletal maturity
- b) Compound fractures
- c) Undisplaced fracture of patella in children
- d) Fracture of patella with other ipsilateral or contralateral injuries (fracture)
- e) Fracture involving superior or inferior pole of Patella.

Results:

Sr No.	Particulars	TBW	TBW with encirclage
1.	Time of fixation from date of injury	6 - 8 days	6 – 8 days
2.	Av. blood loss	100 ml.	100ml
3.	Duration of surgery	45 - 50 min	45 – 50 min
4.	Av. stay in hospital	15 days.	15 days.
5.	Condition of operative scar	Healthy	Healthy
6.	Immediate post op complications	None	None
7.	Mobilisation of knee joint.	3 / 4 post op day	3 / 4post op day
8.	Non weight bearing	4 - 6 weeks	4 – 6 weeks

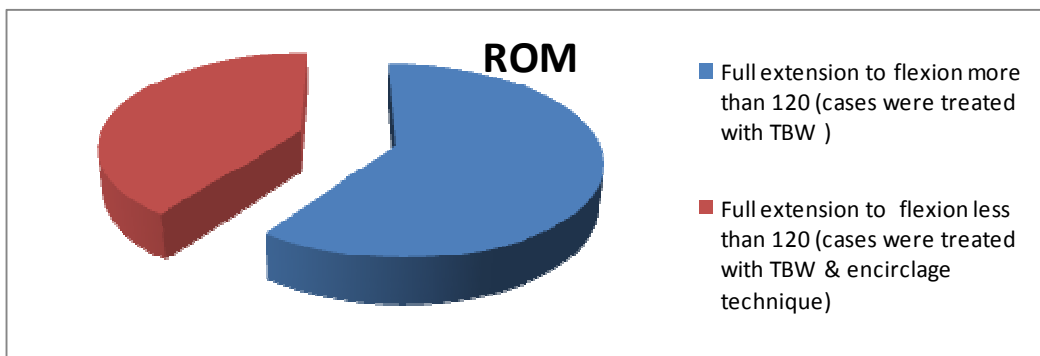
9.	Partial weight bearing	After 6 weeks	After 6 weeks
10.	Full weight bearing	After 10-12 weeks	After 10-12 weeks
11.	X- ray evaluation		
	After 6 weeks		
	After 3 months		
	After 6 months		
12.	Wire back out	None	1
13.	SS wire cut out	None	None
14.	Post operative infection	None	None
15.	Full weight bearing without support		
16.	ROM of knee joint		
	Full range	3	3
	More than 120	15	8
	Less than 120	4	5
17.	Squatting.	6	2
18.	Extension lag	1	3
19.	Quadriceps wasting	6	7
20.	Quadriceps power.		
	Gr.V	7	4
	Gr. IV	15	12
	Less than Gr IV	None	None

The evaluation of the results can also be done as per Modified scale of Bostman et al (1981), wherein the observations are recorded on various parameters like ROM, Pain, Work, Atrophy of

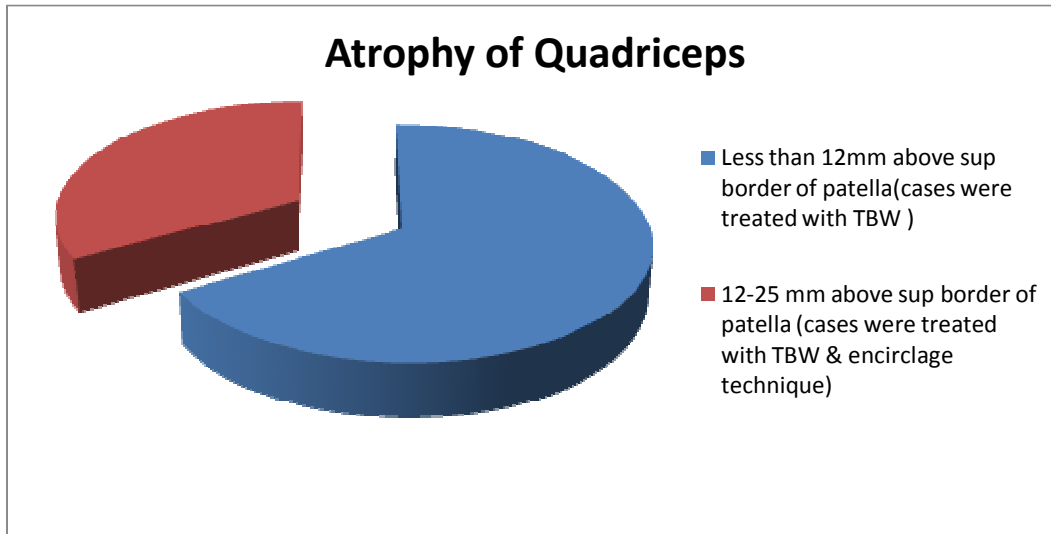
quadriceps, Walking aids, Effusion, Give way sensation, staircase climbing & squatting. Points are assigned for each parameter & thus total score is counted.

A	ROM	
	Full extension to flexion more than 120	6 points
	Full extension to flexion less than 120	4
	Loss of free extension	0
B	Pain	
	None / Minimal	6
	Moderate	3
	During daily activities	0
C	Work	
	Original work	4
	Diff job after surgery	2
	Cannot work	0

D	Atrophy of quadriceps	
	Less than 12mm above sup border of patella	4
	12-25 mm above sup border of patella	2
	More than 25 mm	0
E	Walking aid	
	None	4
	Part time	2
	Full time	0
F	Effusion	
	None	2
	Minimal	1
	Obvious	0
G	Give way	
	None	2
	Sometimes	1
	All the time	0
H	Staircase climbing	
	Normal	2
	Difficult	1
	Disabling	0
I	Squatting	
	Comfortable	2
	Difficult	1
	Not able to squat	0



Graph 1: Range of movements of the patients after 1 ½ years



Graph 2: Quadriceps muscle atrophy of the patients after 1 ½ years

29 -32 points-----Excellent results

23 -28 points-----Good

Below 23pnts-----Poor results



X- ray 2: shows fracture patella transverse in lateral view



X-ray 4: shows post operatively fracture patella fixed with TBW in Lateral view



X- ray 3: shows post operatively fracture patella fixed with TBW in AP view



X ray 1: shows fracture patella transverse in lateral view

The inference that was drawn from the above table is as under -

1. There is no significant difference in outcome of treatment in 1st or 2nd group.
2. The only advantage what we found was fixation was easily possible with TBW & encirclage, in comminuted fractures of Patella with relatively less bone purchase.
3. The av. time of fracture healing was more or less same in both the groups.
4. Abstinence from weight bearing was also same in both groups.
5. Full weight bearing without support started in both the groups after 10 - 12 weeks.
6. The radiological union of fracture was seen in both groups after 6 months.
7. Wasting of the Quadriceps was common sequelae in both series. The reasons what we noticed were
 - a) Poor compliance of patient in toning of quadriceps.
 - b) Change in gait pattern after fracture patella.
8. ROM was found to be lesser in second group.

9. Incidence of extension lag was more in second group.
10. Quadriceps weakness was more in second group.

Discussion:

In this study, it was found that just encirclage of the patella is not sufficient for union of fracture fragments. For achieving union of fracture fragments of patella, the compression has to be done by figure of eight wire loop. The various methods of loops have been mentioned earlier. So far as the results of two groups are concerned, it was found that in both the groups time of i) healing of fracture, ii) clinical union & iii) the radiological union was almost same.

In both groups, it was found that abstinence of weight bearing was around 10-12 weeks (3 months).

Although there was wasting of quadriceps in both the groups, the incidence was more in the second grouping i.e. TBW with encirclage. The weakness of quadriceps was quite common feature in both the groups. Another point noted in this study was that incidence of joint stiffness was more found in

second group, i.e. TBW with encirclage. Also it was noted that incidence of extension lag was more in second group.^[14] In comminuted fracture of patella where the bone purchase is relatively less in comminution, it becomes easy to restore the articular surface of patella with TBW with encirclage. Hence the second group i.e. TBW with encirclage has added advantage in comminuted fracture of patella.

Conclusion:

TBW is the treatment of choice in fractures of Patella. Just circlage of the fracture fragments is not sufficient to hold fracture fragments in rigid manner. TBW with encirclage has an advantage when the fracture of Patella is comminuted & there is relatively less bone purchase for the implant. Restoration of articular surface & tracking of patella is better with TBW & Encirclage, especially in comminuted fractures of patella. All though the fracture healed well in all the cases, the incidence of quadriceps wasting was seen in both the groups, more so in the second group. Vigorous physiotherapy & toning exercises of quadriceps are absolutely essential to minimise discrepancy in band wiring and encirclage wiring

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