

Original article

A study on the functional outcome of tension band wiring in various fractures

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Abstract

Introduction: Tension band is not a particular implant, it is a principle. This technique converts a tensile force into a compressive force. Tension bands can enable immediate motion at the involved joints, which allows for an improved functional outcome.

Materials and methods: A prospective study was taken up among 20 patients undergoing tension band wiring satisfying the inclusion criteria, in the department of orthopedics, SVS Medical College, Yenugonda, Mahabubnagar from Sept 2017 to Aug 2019.

Results: Excellent outcome was seen in 55% and 45% had shown good outcome. Complications were not reported.

Conclusion; Tension band wiring is a simple, inexpensive technique and effective means of fixing fracture based on biomechanical principles with minimum complications.

Keywords: Tension Band wiring, Paletella, Olecranon, Medial Malleolus.

INTRODUCTION

A complete or incomplete break in bone by application of excessive force is called a fracture.[1] There is an increased note of fracture of Patella, Olecranon. Patella is the largest sesamoid bone and it is embedded in the tendon of quadriceps femoris anterior to distal femoral condyles. Olecranon is the proximal extremity of the ulna. It articulates with the distal humerus and forms part of the elbow joint. Medial malleolus is the slightly expanded medial portion of the distal end of the tibia. It projects inferomedially as the medial malleolus.[2]

Fractures of the eccentrically loaded bones like patella, olecranon, and medial malleolus are one of the most common fractures encountered by an orthopedic surgeon. Tension band is not a particular implant, it is a principle. This technique converts a tensile force into a compressive force. As stability is improved when tensile force is reduced at the fracture site, it improved fracture healing. For the application of an implant with a tension band technique, a device is fixed eccentrically to the convex side of the

fractured bone. A curved structure has a compression side and a tension side when an axial load is applied. The device on tension side neutralizes the forces under an axial load. A tension band can produce compression statically or dynamically. Tension bands can enable immediate motion at the involved joints, which allows for an improved functional outcome.[3]

OBJECTIVES

To assess the functional outcome of tension band wiring in various fractures.

MATERIALS AND METHODS

A prospective study was taken up among 20 patients undergoing tension band wiring satisfying the inclusion criteria, in the department of orthopedics, SVS Medical College, Yenugonda, Mahabubnagar from Sept 2017 to Aug 2019.

Inclusion criteria:

- Isolated fractures of patella or olecranon or medial malleolus.
- Displaced fractures of patella or olecranon or medial malleolus.

- Age more than 17 years.
- Sex both male and female.

Exclusion criteria:

- Patients with age group less than 17 years.
- Patients with open fractures.
- Patients with pathological fractures.
- Patients with comorbidities which make them unfit for surgery.

A detailed history was taken and pre operative assessment was done. After the procedure (tension band wiring), patients were discharged on day 12. Follow up was done on OPD basis at 12th week. Postoperatively with clinical and radiological evaluation & results were assessed based on:

- Pain
- Swelling
- Tenderness at fracture site
- Movements of related joint
- Radiological union

The following scale was used to assess the functional outcome:

Good fellow grading of Range of Motion

Excellent	Painless full movement and able to squat.
Good	Full flexion and extension but painful squat.
Fair	Painless movement with 10-20° limitation of flexion.
Satisfactory	Painless movement with limitation of 20-40 of flexion.
Poor	Limitation of >40 degrees flexion.

American Orthopaedic Foot & Ankle Society - Ankle – Hindfoot Scale[4]

S. No.	PAIN (40 POINTS)	
1	None	40
2	Mild, occasional	30
3	Moderate, daily	20
4	Severe, almost always present	0
FUNCTION (50 POINTS)		
1	Activity limitations, support requirement	
	- No limitations, no support	10
	- no limitations of daily activities, limitations of recreations activities, no support	7
	- limited daily and recreational activities, cane	4 0
	- severe limitations of daily and recreational activities, walker, crutches, wheelchair, brace	
2	Maximum walking distance, blocks	5
	- greater than 6	4

	- 4-6	2
	- 1-3	0
	- Less than 1	
3	Walking surfaces	
	- No difficulty on any surface	5
	- Some difficulty on uneven terrain, stairs, inclines, ladders	3
	- Severe difficulty on uneven terrain, stairs, inclines, ladders	
4	Gait abnormality	
	- None, slight	8
	- Obvious	4
	- Marked	0
5	Sagittal motion (flexion and extension)	
	- normal or mild restriction (30 or more)	8
	- moderate restriction (15-29)	4
	- severe restriction (less than 15)	0
6	Hindfoot motion (inversion plus eversion)	
	- normal or mild restriction (75- 100%)	
	- moderate restriction (25- 74%)	6
	- severe restriction (less than 25%)	3 0
7	Ankle – hindfoot stability	
	- Stable	8
	- Definitely unstable	0
ALIGNMENT (10 POINTS)		
1	Good, plantigrade foot, midfoot well aligned	15
2	Fair, plantigrade foot, some degree of midfoot malalignment observed, no symptoms	8
3	Poor, nonplantigrade foot, severe mal-alignment, symptoms	0

Interpretation:

Excellent - 90 to 100
 Good - 80 to 89
 Fair - 70 to 79
 Poor - <70

MAYO ELBOW PERFORMANCE SCORE[5] for Olecranon

SL.NO	VARIABLE	POINTS
1.	PAIN INTENSITY	
	- Non	45
	- Mild	30
	- Moderate	15
	- Severe	0
2	RANGE OF MOTION	20
	- arc of motion greater than 100 degree	15
	- arc of motion between 50 – 100 degree	5
	- arc of motion less than 50 degree	5
3	STABILITY	
	- stable	10
	- moderate instability	5
	- grossly unstable	0
4	FUNCTIONAL EVALUATION	
	- can comb hair	5
	- can eat	5
	- can perform hygiene	5
	- can don shirt	5
	- can don shoe	5

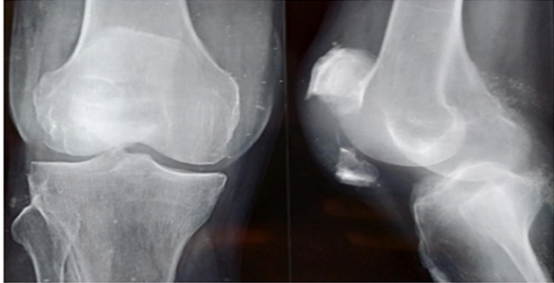
Interpretation:

Excellent - > 90
 Good - 75- 89
 Fair - 60 -7
 Poor - <60

Data was collected using anonymous pretested structured questionnaire. The data was entered in Microsoft Excel 2010 version. Data was analyzed using Microsoft Excel 2010 and Epi Info 7.2.0. Descriptive and inferential statistical analysis were

used in the present study. Results on continuous measurements were presented on Mean±SD (Min-Max) and results on categorical measurements were presented in Number (%). Significance was assessed at 5% level of significance.

Case 1-PATELLA
Preoperative X-ray



Intraoperative pictures



Incision



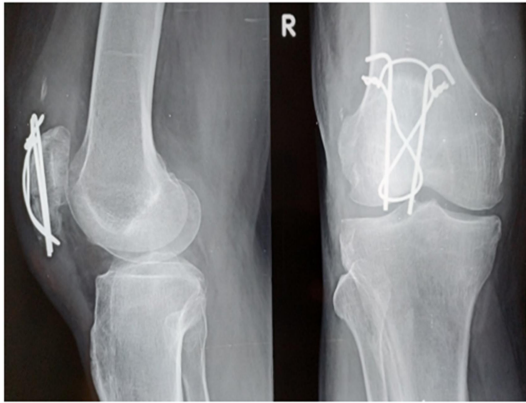
Fracture Reduction



TBW application



Postoperative X-ray



Postoperative Clinical pictures



Clinical pictures



Case 2-MEDIAL MALLEOLUS
Preoperative X-ray



Incision



Exposure



Fracture Reduction



TBW application

PostoperativeX-ray



Results

A longitudinal cohort study was conducted on 20 patients who are diagnosed as fractures of Olecranon or Patella or Medial malleolus in the department of orthopaedics at SVS Medical College and Hospital, among the total of 20 patients enrolled in this study, there were no deponents or loss to follow-ups.

The outcomes of the patients were evaluated clinically and radiologically on periodic basis. The Clinical evaluation was done using Good fellow grading of range of motion for patella, American Orthopaedic Foot and Ankle Society - ankle – Hindfoot Scale for medial malleolus and Mayo Elbow Performance Score for olecranon.

Table showing the age and gender:

Parameter	Frequency	Percentage (%)
Age in years		
20-30	9	45
31-40	2	10
41-50	5	25
51-60	4	20
Gender		
Male	13	65
Female	7	35

Table showing injury related characteristic features

Parameter	Frequency	Percentage (%)
Bone involved		
Patella	12	60
Olecranon	3	15
Medial Malleolus	5	25
Side involved		
Left	9	45

Right	11	55
Mechanism of injury		
Direct	15	75
Indirect	5	25
Mode of injury		
RTA	9	45
ASF	11	55

Table showing the functional assessment at the end of 12th week:

Parameter	Frequency	Percentage (%)
Pain		
Yes	0	0
No	20	100
Swelling		
Yes	0	0
No	20	100
Tenderness		
Yes	0	0
No	20	100
Radiological union		
Yes	0	0
No	20	100
Functional outcome for range of movements		
Excellent	9	45
Good	11	55

DISCUSSION

Tension band wiring technique is a type of open reduction and internal fixation. The principle of the tension band wiring is to convert the tensile forces at the fracture site into compressive forces. Tension bands are used to stabilize the avulsion fractures due to muscle pull or ligamentous pull.

In intraarticular fractures of Patella, Olecranon and Medial Malleolus it is important to maintain anatomical reduction of fragments to obtain

articular congruity. Tension Band wiring can facilitate early mobilization of joints and prevents joint stiffness. Thus, the resultant functional outcome for this technique is more successful than most of the other alternatives.

Hence, the treatment of choice for these fractures is tension band wiring. Tension band wiring was used in 20 cases in the present study which gave favorable results.

Comparison of outcome of Patellar tension band wiring with various studies:

Outcome	Present study	Dudani[6]	Maini PS [7]	Levack B[8]	Bansilal K [9]
Excellent	41.6%	93.3%	36.6%	--	50%
Good	58.3%	6.66%	38.4%	50%	40%
Fair	--	--	15%	35.7%	10%
Poor	--	--	10%	14.3%	--

Comparison of outcome of Olecranon tension band wiring with various studies:

Outcome	Present study	Maini PS [7]	Pandit [10]	Wolfgang [11]	Mathewson MH[12]	Bansilal K [9]
Excellent	66.6%	46.6%	75%	73%	90.48%	60%
Good	33.3%	46.2%	25%	15%	9.52%	20%
Fair	--	7.6%	--	12%	--	13.3%
Poor	--	--	-	--	--	6.66%

Comparison of outcome of medial malleolus tension band wiring with various studies:

Outcome	Present study	Rao TK [13]
Excellent	66.6%	46.6%
Good	33.3%	46.2%
Fair	--	7.6%
Poor	--	--

CONCLUSION

Tension Band Wiring enables early active movement of joints during fracture healing, thereby prevents joint stiffness. The long-term complications of prolonged immobilization like joint stiffness, muscle

wasting, pressure sores, and osteoporosis are avoided. Hence, it is concluded that tension band wiring is a simple, inexpensive technique and effective means of fixing fracture based on biomechanical principles with minimum complications.

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