

MODIFIED TENSION BAND WIRING TECHNIQUE FOR FRACTURES OF PATELLA, OLECRANON AND MEDIAL MALLEOLUS

R. G. Madhu¹, K. Madhavi²

¹Assistant Professor, Department of Orthopaedics, Rangaraya Medical College, Kakinada.

²Assistant Professor, Department of General Medicine, Rangaraya Medical College, Kakinada.

ABSTRACT: A study of fractures of patella, olecranon and medial malleolus requiring surgical treatment at the Orthopedics Department of Rangaraya medical college Kakinada from January 2014 to July 2014. Twenty five cases were operated by modified tension band wiring technique and results were analyzed. All the cases were followed up for a mean period of 16 months post operatively.

KEYWORDS: Fracture Fixation Internal E04.555.300.300 Medial Malleolus Fractures C26.404.014.

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INTRODUCTION: Tension band wiring principle was used in engineering from a long time but it was introduced to Orthopedics only in 20th century. Pauwels (1935) first defined and applied tension band principle in the fixation of fracture and non-union.^[1] CURTIS devised PYRFORD TECHNIQUE using a cerclage wire and 2nd tension band wire through tendon affords improve fixation.^[2] Screw fixation has been recommended by DE PALMA, MULLER, and SMILLE.^[3] The cerclage wiring technique universally accepted is the one advised by A.O. GROUP of Switzerland. The prerequisites for tension band fixation are 1. A plate or wire able to withstand the tensile forces. 2. Bone which is able to withstand compression. 3. An intact buttress of the opposite cortex. If the medial buttress (the opposite cortex) is deficient under load, the plate will be subjected to repetitive bending, will suffer fatigue and break.

AIM AND OBJECTIVES:

1. To evaluate the principle of tension band wiring in treatment of fractures of patella, olecranon and medial malleolus.
2. To evaluate the functional advantage of early mobilization with tension band wiring.

MATERIAL AND METHOD: All the patients who required surgical treatment for fracture patella, olecranon and medial malleolus amongst the admissions at our institute of Rangaraya medical college Kakinada in the department of orthopaedics were taken up for the study.

Inclusion Criteria:

1. All transverse fractures of patella, olecranon and medial malleolus.
2. Only closed fractures were included.

Exclusion Criteria:

1. All comminuted fractures of patella, olecranon and medial malleolus.
2. Ipsilateral fractures patella, olecranon and medial malleolus excluded.
3. Open fractures were excluded criteria taken in to consideration for categorization.

Excellent: No subjective complaints fully mobile knee/elbow/ Ankle with stability quadriceps/triceps/ leg muscles power grade 5.

Good: Few subjective complaints no extensors lag. Restriction of terminal flexion. Last 20 deg at knee/elbow 10 deg at ankle. Good stability Quadriceps/triceps/leg muscles power grade 5.

Satisfactory: A subject complains painful flexion beyond 90 at Elbow/Knee and passive-flexion beyond 20 in ankle. No extensor lag Quadriceps/Triceps/Leg muscles power grade 5.

Poor: Many subjective complaints Flexion short of 90 degree in Knee/Elbow Passive-flexion short of 20 degree in Ankle. Extensor lag Quadriceps/Triceps/Leg muscle power Grade less than 5.

RESULTS & OBSERVATIONS: In the present series of twenty five cases (Sixteen patella, FIVE olecranon and FOUR medial malleolus) Patella has the highest no of cases followed by olecranon and medial malleolus (Table 1). Following ORIF and tension band wiring, 19cases had excellent results and 5 cases had good results. One case had satisfactory results and poor results were seen in one case (Table 4). Most of the patients in the present series regained good functional range of movements between 5-9 months after surgery theoretically the following complications have been described; Early: 1. Post-operative wound infection. 2. Asymptomatic metal prominence. Late: 1. Painful retained hardware. 2. Fracture of Cerclage wire (breakage of wire), 3. Re fracture. 4. Patello-Femoral arthritis. 5. Avascular necrosis. 6. Non-Union. None of the above-described complications were observed except post-operative wound infection and asymptomatic metal prominence. One case got grossly infected for which wire was removed after eight months. Delayed union and non-

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Corresponding Author:

Dr. Madhu R. G, Assistant Professor of Orthopaedics,
Department of Orthopaedics,

Rangaraya Medical College, Kakinada-533001.

E-mail: madhu.revulagadda2@gmail.com

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union have not been observed. Asymptomatic metal prominence was seen in four cases for which wire removal was done after twelve months. In the present series 19 cases had good functional range of movement with good muscle power. The period of follow up in the present study was 16 months. In the respect of age distribution 65% people belong to age between 20-40 years. This corresponds to the young and middle age group who are more involved in field work and traveling. In the present study the incidence of fractures were more common in males when compared to females (Table 2).

The reason for male predominance lies with the fact that the males are involved in more vigorous physical activities than females like motor vehicle accident, sports, risk of accidents at the work spot. The incident in females is probably due to slippery ground in the kitchen, bathroom, washing places and the shopping markets. Regarding the nature of violence, indirect violence was responsible for most of the fractures of patella and olecranon. In case of fracture medial malleolus all the fractures were due to indirect forces only. In this series there is slight right sided predominance of the fractures. Injury is more on right side compared to left. This reflects the involvement of the dominant side in protection reflexively (Table 3).

All the cases under study were treated by open reduction and internal fixation, tension band wiring. In the series, post-operative wound infection was observed in 1 case. Asymptomatic Metal prominence was observed in 2 cases. Fracture of cerclage wire, refracture of patella, olecranon or medial malleolus, patella femoral arthritis, avascular necrosis have not been observed. The result was poor in one case. Wound was grossly infected, for which 8 months later: the wire was removed. Patient ended up with 40 degrees of flexion at knee. Patient followed physiotherapy properly. In our study out of 25 cases 22 cases showed complete healing and 2 cases showed metal prominence and 1 case showed post-operative infection with a success rate of 88% which was corresponding to the study done in Chang gung memorial hospital, Taiwan which showed union rate of 100 %, skin irritation was noted in 2 patients (3%). With net success rate of 97% (Table no 5).^[4]

The percentage of results varied here perhaps due to delayed early post-operative physiotherapy. We usually start after suture removal at the end of 2 weeks but they have started from day one.

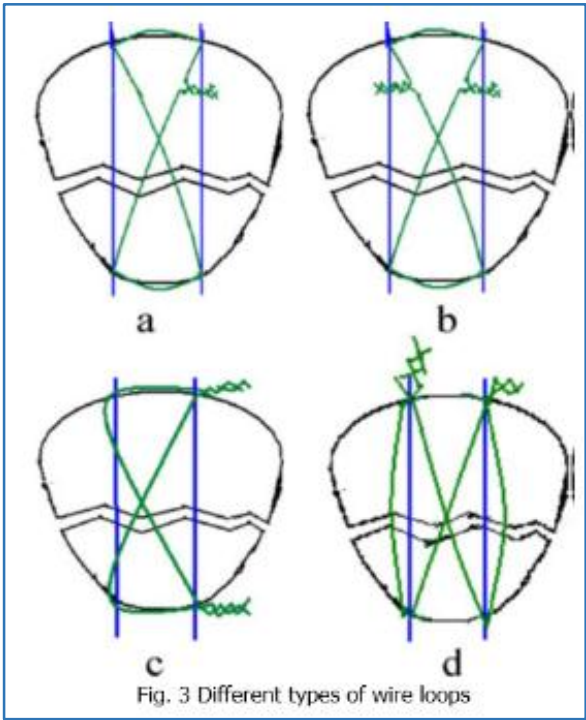
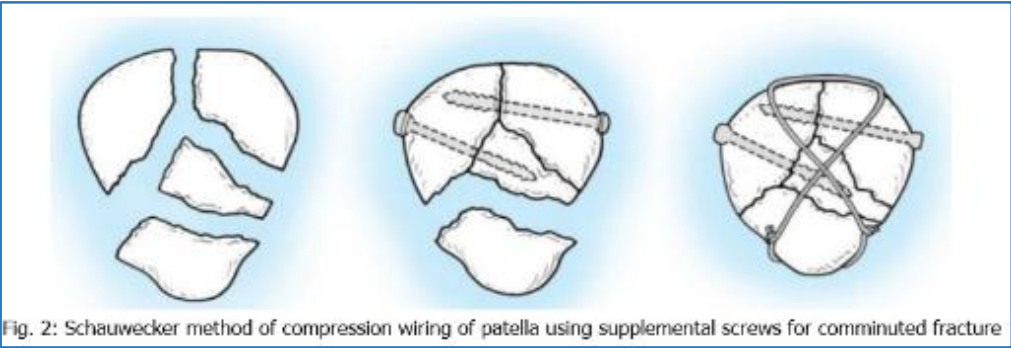
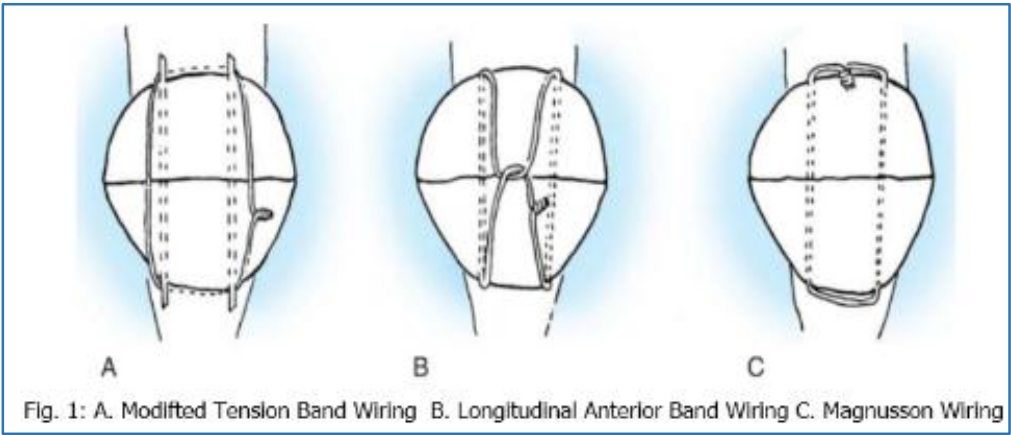
DISCUSSION: Many different wiring techniques have been described, including cerclage wiring, alone or in combination; tension band wiring, alone or modified with longitudinal Kirschner wires or screws; Magnusson wiring; and Lotke longitudinal anterior band wiring (fig. 1). Schauwecker described a similar technique in which the wire is crossed in a figure-of-eight over the anterior surface of the patella (fig. 2). Modified tension band technique is applicable in both transverse and comminuted fractures of patella. This modified technique differs from usual

encerclage wiring in that the fracture fragments are brought together with a wire passed through the insertion of quadriceps tendon and patellar ligament and secured on to the anterior aspect of patella.^[5] Varied wiring configurations are also in vogue (fig. 3). Two K wires or 4 mm. cancellous lag screw are used both to provide rotation control of fragment and to facilitate anchorage of encerclage compression. Anterior tension band wiring intentionally creates a small separation of posterior articular surface, with knee extension. Pauwel's used an anterior wire suture for a fractured patella, thus successfully applying the principle of tension band fixation.^[1] On analysis of the AO tension band technique John & W. W. Wagner & J. H. Kuiper in their wooden model study hypothesized that placing the two twists of wire at adjacent corners would decrease the effect of friction generated by the stainless steel wire having to slip around the ends of the K wires and would increase the inter fragmentary compression developed at the fracture site.^[6] Carpenter et al. studied transverse fractures fixed with screws alone, modified tension band with Kirschner wires, and tension band wire placed through cannulated screws and found that specimens fixed with the tension band through cannulated screws failed at the highest load.^[7]

CONCLUSION: Ever since the introduction of the technique this technique has been used extensively tension band plating and wiring are the most common. It has been most useful in three situations of fractures namely fractures of the patella, olecranon and medial malleolus than any other fracture fixations. A normal range of knee, elbow and ankle joint movement can be retained after tension band wiring with proper postoperative care and physiotherapy.

REFERENCES:

1. Pauwels, F. (1935) Der Schenkelhalsbruch. Ein mechanisches problem: grundlagen des heilungsvorganges prognose und kausale therapie. Stuttgart: Ferdinand Enke Verlag; 1935.
2. Curtis MJ., Internal fixation for fractures of the patella. A comparison of two methods. Journal Bone & Joint Surgery Br. 1990; 72: 280-2.
3. Depalma A F (1954) Diseases of the knee. J. B. Lippincott. 3rd edn. Philadelphia. pp: 218.
4. C. C. Wu, C. L. tai, W. J. Chen, chang gung memorial hospital, taiwan. vol 121. 12-162004.
5. Rockwood and green: 5th edn.vol2 .fractures in adults. fractures of patella.1775-1790.
6. J. John &W. W. Wagner & J. H. Kuiper journal of International Orthopaedics (SICOT) (2007) 31: 703–707.
7. Cambells: Operative orthopaedics, 12th edition, vol 3 fractures and dislocations. p; 2681-86.



SITE	No of Cases
Patella	16
Olecranon	5
Medial Malleolus	4
Table No. 1: Total Number of Cases 25	

	Male	Female
Patella	10	6
Olecranon	3	2
Medial Malleolus	4	0
Table No. : 2 Gender Distribution		

	Right	Left
Patella	9	7
Olecranon	3	2
Medial Malleolus	2	2
Table No. 3: Side Distribution		

Total no of cases	Excellent result	Good result	Satisfactory result	Poor result
25	19	5	1	1
Table No. 4				

	Present study	Taiwan study
Success rate	88 %	97 %
Table No. 5		