

## Medial malleolus fracture management- A comparative study between tension band wiring and cancellous screw fixation.

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### Abstract

**Background:** Medial malleolus fracture is commonly seen nowadays in orthopaedic practice. There are different modalities of treatment based on fracture pattern, socio-economic status. Undisplaced fracture can be managed by cast application. Various surgical modalities of treatment are available in treating medial malleolus fracture like tension band wiring, cancellous screw or cortical screw fixation, plate fixation, k-wire, suture anchors. The purpose of our study was to evaluate and compare radiological outcome of medial malleolar fracture managed with tension band wiring and cancellous screw fixation.

**Materials and Methods:** Our study included 53 patients who met inclusion criteria and were divided into two groups. 25 patients with bimalleolar fractures cases were included in group 1 and treated with open reduction and tension band wiring (TBW) for medial malleolus fracture. Other 28 patients in group 2 were treated by open reduction/closed reduction with cannulated cancellous screw for medial malleolus fracture. In all the cases lateral malleolus was fixed and common factor in both the group. All post op patients were evaluated at 1st month, 2nd month, 3rd month, 6th month and 1 year. We evaluated patient clinically and radiological union of fractures.

**Results:** In our study out of 53 patients there was male preponderance and average age was 42.07 years. Right side fractures were more compared to left side fractures. Most common mode of injury was road traffic accident. Average union time in group 1 is 14.4 weeks and group 2 is 12.6 weeks. Fracture union was 100% in group 1 and in group 2 was 96.66%. All the data from the study was evaluated by Fischer exact test with P value calculated for union rates between two groups patient treated with Tension Band Wiring Vs Cannulated cancellous screw. P value <0.05 was considered statistically significant.

**Conclusion:** In our study average union time in patients treated with cancellous screw fixation was early compared to patients treated with tension band wiring group. In cancellous screw fixation group required additional stability in the form additional k-wire or second cancellous screw with ankle joint immobilization.

**Keywords:** Medial malleolus, Tension Band Wiring (TBW), Cancellous screw.

### Introduction:

Medial malleolus fracture are commonly seen nowadays in orthopaedic practice [1,2]. There are different modalities of treatment based on fracture pattern, socio-economic status. Undisplaced fracture and isolated medial malleolus fracture can be managed by cast

application[3,4]. Various surgical modalities of treatment are available in treating medial malleolus fracture like tension band wiring [5], cancellous screw or cortical screw fixation [6], plate fixation, k-wire, suture anchors [10].

Tension band wire fixation provides greatest resistance to pronation forces [5]. Tension band fixation of the medial malleolus is a biomechanically strong and clinically acceptable method of treatment for displaced comminuted medial malleolus fractures[5]. This technique is

also suitable if distal component of the fracture is of smaller size[5].

Conventional technique for medial malleolar fracture fixation is using partially threaded cancellous screws with or without washer[7]. Cancellous or cortical lag screws placed perpendicular to fracture surface showed good results for stabilization of vertical shear fractures of the medial malleolus[8].

Antiglide plate constructs provide more rigid initial fixation and withstand higher load to failure for vertical medial malleolus fracture compared to unicortical and bicortical screw fixation

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**Figure 1:** Post op x-ray - Medial malleolus fracture treated with Tension Band Wiring



**Figure 2:** Post op x-ray - Medial malleolus fracture treated with Cannulated Cancellous screw

[9]. More studies required to know results of plate fixation in medial malleolus fracture fixation.

Suture anchors have been used to manage small fracture fragment of the medial malleolus fracture without causing complication of fracture fragment or prominent hardware[10]. More studies are required to demonstrate use of suture anchors in medial malleolus fracture management. The purpose of the study was to evaluate and compare radiological outcome of medial malleolus fracture in bimalleolar fractures cases managed with tension band wiring and cancellous screw fixation.

### Materials & Methods

Study was conducted in tertiary referral hospital after obtaining ethical clearance from institution. This was retrospective study which included cases between June 2015 to June 2018. Total 53 patients who met inclusion criteria were included in the study and were divided into two groups. 25 patients with bimalleolar fractures cases were included in group 1 and treated with open reduction and tension band wiring

(TBW) for medial malleolus fracture. Other 28 patients in group 2 were treated by open reduction/closed reduction with cannulated cancellous screw for medial malleolus fracture. In all the cases lateral malleolus was fixed and common factor in both the group. Group 1 patients were operated by one surgeon and group 2 patients were operated by another surgeon, both of them were trained in respective two technique. All post op patients were evaluated at 1st month, 2nd month, 3rd month, 6th month, 1 year. Sutures were removed on post of day 14, and subsequent follow up patients were evaluated clinically and radiological union of fractures.

### Inclusion Criteria:

1. Patients of age group > 18 years.
2. All patients with bimalleolar fractures were included.
3. Open fractures Gustilo Anderson type I

### Exclusion Criteria:

1. Pathological fractures
2. Associated neurovascular injury
3. Crush injury

### Results:

Out of 53 patients 47 were males, 6 were females. There was male preponderance. Youngest age of patient was 20 years old and oldest age was 65 years old. And average age was 42.07 years. Mean age for group 1 is 39.28 years and group 2 is 44.57 years. Right side fractures 31(58%) was more compared to left side fractures 22(42%).

In our study most of patient met with road traffic accidents which included 37 patients (69.81%), other mechanism of injury were fall from height which included 7 patients (13.21%), and slip and fall down included 9 patients(16.98%).

In our study average union time in group 1 was 14.8 weeks and group 2 was 12.7 weeks. Early complication like superficial infection in group 1 was 1(04%) which was less compared to group 2, 02(07%), late complications like ankle stiffness in group 1 was 03 (12%) and in group 2 was 06(21%), delayed union in group 1 was 1 (4%) and in group 2 was 2(7%), non-union in group 1 was 0(nil) and in group 2 was 1 (3%).

### Statistical Analysis:

All the data from the study was evaluated

Table 1: Demographic details of patient

Variable	Group 1 (Tension Band Wiring)	Group 2 (Cannulated cancellous screw)
Number of patients	25	28
Age group	39.28 years	44.57 years
Sex (Male:Female)	24:01:00	23:05
Fracture side (Right:Left)	16:09	15:13

by Fischer exact test with P value calculated for union rates between two groups patient treated with Tension Band Wiring Vs Cannulated cancellous screw. P value <0.05 was considered statistically significant.

**Discussion:**

Medial malleolus fracture should be reduced anatomically to prevent ankle arthritis. It can be treated by various methods. Undisplaced fracture can be treated with conservative management. Conservative management fails in most of displaced fracture because of entrapment of periosteum between fracture fragments and there are more chances of non-union. Displaced fracture fragments require surgical management. In our study we evaluated radiological outcome of patients with medial malleolus fracture in bimalleolar fracture cases treated with Tension band wiring method (group 1) versus Cannulated cancellous screw fixation

(group 2). Lateral malleolus fracture was fixed in all cases. In our study radiological union was seen in 100% of medial malleolus fracture treated with tension band wiring and union of 96.42% treated with cannulated cancellous screw

fixation. We evaluated statistically union rates using Fischer exact test and p value was 0.8 which showed radiological union rates were not statistically significant difference between two groups. Average time for radiological union in group 1 (tension band wiring) was 14.8 weeks and in group 2 (Cannulated cancellous screw fixation) was 12.7 weeks compared to Nural SK and Shahidi P 11 study reported average time of 9 weeks for tension band wiring and 12 weeks for cancellous screw fixation group.

We had 3 cases of delayed union out of 53 cases medial malleolus fracture which took around 24 weeks to unite. Out of 3 cases, 1 from group 1 (tension band wiring) and 2 cases from group 2 (Cannulated cancellous screw fixation). In group 2 patients it was noted there was loss of reduction on subsequent follow up x-ray which resulted in delayed union. And one case of non-union is observed in cannulated cancellous screw

fixation group (group 2) this is because patient started early weight bearing in spite of advice non-weight bearing which resulted in loss of reduction on follow up x-ray. Our results compared to Nural SK and Shahidi P11 study, their study reported no cases of delayed union and non-union in both group.

Ostrum and Litski demonstrated biomechanics advantages of the tension-band wiring technique over other fixation techniques for medial malleolus fracture [5]. Tension band wiring reduces rotation movement at fracture site, thereby reduces chances of screw cut out, implant failure and non-union. Rovinsky [5] study showed that tension band wiring technique is useful in fixation of small fracture fragment compared to other fixation technique, because screw fixation might be difficult in holding small fracture fragment and chances of cut out or shattering fracture fragments are possible while fixing fracture fragment. Complications of tension band wiring like migration of k-wire [12], loosening of fracture fragment. In our study we did not find any migration of k-wire or loss of fracture reduction in patients treated with tension band wiring group.

Use of single Cannulated cancellous screw fixation for medial malleolus fracture reduces stability against torsion forces which was demonstrated by Kim et al [13,14]. This requires additional stability in form of k-wire or one more

Table 2: Mechanism of injury

Mechanism of injury	Group 1 (Tension Band Wiring)	Group 2 (Cannulated cancellous screw)
Road traffic accident	19	18
Fall from height	3	4
Slip and fall down	3	6

Table 3: Radiological union in two groups

Union	Tension Band Wiring (No of cases)	Percentages	Cannulated cancellous screw (No of cases)	Percentages	P value
United	24	96	25	89.28	0.08
Delayed union	1	4	2	7.14	
Non-union	0	0	1	3.58	
Avg time for union in weeks	14.8		13		

cancellous screw or immobilization of ankle joint with slab or cast. Jones PS [15] study showed that single screw fixation for medial malleolus fracture gave good results. In our study among group 2 patients 23 cases were treated with single cannulated cancellous screw and no additional stabilization required and in 5 cases of medial malleolus fracture fragment required additional

stability, we used additional k-wire or second cannulated cancellous screw with ankle joint immobilization with slab or cast application.

### Conclusion:

In our study average union time in patients treated with cancellous screw fixation was early compared to patients treated with tension band wiring group, but radiological union rates statistically

showed no significant difference between both groups. In cancellous screw fixation group required additional stability in the form additional k-wire or second cancellous screw with ankle joint immobilization.

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