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Comparative Study between Fixation of Small Size Posterior Malleolus and Conservative Treatment

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Abstract

Ankle fractures are among the most common lower extremity injuries. Displaced fractures typically are treated operatively to restore anatomic alignment of joint surfaces, reduce tibiotalar contact stresses, and minimize posttraumatic arthritis. Treatment of these fractures must include intraoperative examination of the syndesmosis to ensure its integrity. determine result of fixation of small fragement posterior malleolus versus conservative treatment on syndesmotic stability. This study was conducted on twenty patients who were candidate for operative treatment of pott's fracture with posterior malleolus fracture at Benha university hospitals. Patients were divided into two groups; Group I: Underwent posterior malleolus fixation with or without syndesmotic screw. Group II: Underwent conservative treatment with Syndesmotic screw**.** Mean age of the study population was 39 years, The most frequent side was right side (60.0%) while left side was 40.0%. The most frequent mechanism of injury was SER (60.0%) followed by PER (40.0%). As regard skin condition, 70.0% of patients showed skin edema. As regard integrity of skin, 90.0% of patients showed closed fracture, 10.0% showed open fracture grade I. There was no significant difference between both groups as regard AOFAS. P value was 0.517. There was no significant difference between both groups as regard ROM. P value was 0.517. There was no significant difference between both groups as regard union time. P value was 0.853.

Great benfit of fixation of posterior malleolus on sydesmotic stability as syndesmotic stability restore without need supplemental fixation of syndesmosis provided that AITFL and PITFL are intact. If AITFL, PITFL torn fixation of posterior malleolus alone not suffient supplemental fixation of syndesmosis is required in addition to reduction and fixation of posterior malleolus.

Keywords: Fixation, Posterior malleolus, Conservative treatment.

1. Introduction

Ankle fractures are common injuries treated by orthopedic surgeons. These injuries are increasing in number due to more active, aging population [1].

Ankle fractures where the ankle mortise is stable and there is adequate alignment are usually treated nonoperatively [2].

Stability and reduction quality can be determined simply in the coronal plane, but syndesmotic instability and posterior malleolar stability are not as easily established and have been the subject of much research and debate [3].

Previously, syndesmotic instability has been thought to be predicted based on Lauge-Hansen classification and fibular fracture height [4].

More recent studies have shown that syndesmotic disruption can happen with almost any fracture Pattern [5].

The intraoperative stress examination of the syndesmosis currently the gold standard for determining the need for stabilization, although a preoperative assessment with computed tomography (CT) and magnetic resonance imaging (MRI) may be useful in predicting syndesmotic disruption [6].

Biomechanical studies suggest that fixation of the posterior malleolus will restore the posterior aspect of the tibiofibular ligament, obviating the need for syndesmotic stabilization. These data have yet to be shown in a large clinical series [7].

Posterior fragment instability is likewise difficult to predict. There is evidence for fixation of fractures that are greater than 25% of the articular surface based on concern for articular incongruity and instability [8].

However, there are limited data to suggest a fragment size that will predict posterior instability,extremely large malunited fragments have a role in posterior instability.When looking at studies over nearly 40 years period the dearth of literature and disparity in practice patterns has been well documented and source of current debate [9].

When posterior malleolus is fractured in trimalloelar pott's failure through bone suggests the integrity of posterior interosseous tibiofibular ligament [PITF] may be preserved. The PITFL complex is though to contribute to most stability of ankle syndesmosis [10].

Evidence suggest syndesmotic screws don't stabilize the syndesmotic adequately with early weight bearing [11].

Rigid fixation of fibula followed by reduction and fixation of post malleolus may restore ligamentous tenison on PITFL adequately and stabilize syndesmosis without syndesmotic fixation [2].

The aim of study was to determine result of fixation of small fragement posterior malleolus versus conservative treatment on syndesmotic stability.

2. Patients and methods

This prospective study was conducted on twenty patients,who were candidate for operative treatment of pott's fracture with posterior malleolus fracture at Benha university hospitals. Patients were divided into two groups.

- Group I: Underwent posterior malleolus fixation with or without syndesmotic screw.

- Group II: Underwent conservative treatment with Syndesmotic screw.

Inclusion criteria

- Patient with posterior malleolus fracture small size <25% of articular surface.
- Skeletally mature patients.
- No sex limitation .

Exclusion criteria

- Inflmmatory arthritis.
- Active infection .
- Sever vascular or neurological deficit affecting lower limbs .
- Charcot joint .
- Pilon fracture .
- Trimalleolar fracture with chaput fragments.
- Large size fragment.

Preoperative evaluation

Full history taking, complete clinical examination and Radiological evaluation; All patient will be examined radiologically by Anteropostetior, Lateral radiograhs and following date to be include Weber classification presence of medial clear space, size of post fragment immediate post operative ,2w ,6w; and CTscan.

Operative intervention

1) The procdure was done under general or regional anesthesia.
2) The used approachs were posterolateral,posteromedial approach
3) ORIF was done by cannulated screw partially threaded.
4) Intraoperative assesment of syndesmotic stability.
5) Back slab**.**

Post operative evaluation

All patient will be followed up for at least 6 mo

1. AOFAS score comprises 3 areas pain function and alignment This is clinical administrated questionnaire scored out of 100.
2. E F A S score Euorpean foot and ankle society score.
3. X-ray at each followup, patients were assessed with AP, lateral, and mortise radiographs to evaluate for syndesmotic reduction, loss of fixation, and hardware failure.

Assessment of complications

Intraoperative, early post-operative and complaction during the period of follow up recorded.

2.1 Statistical methods

Data management and statistical analysis were done using SPSS vs.25. (IBM, Armonk, New York, United states). Numerical data was summarized as means and standard deviations. Categorical data was summarized as numbers and percentages. Comparisons between both groups were done using Mann Whitney U test for numerical data. Categorical data was compared using Fisher's exact test. All P values were two sided. P values less than 0.05 were considered significant.

3. Results

Mean age of the study population was 39 years with standard deviation of 9 years. 60.0% of the study population were males while only 40.0% were females. Smoking, diabetes and hypertension represented 20.0%, 10.0% and 10.0% respectively. The most frequent side was right side (60.0%) while left side was 40.0% Table (1).

Table (1) General characteristics in both groups.

			Group I (n = 10)	**Group II (n = 10)**	**P value**
Age (years)	Mean ±SD	T=39±9	39 ±8	38 ±9	0.739
Gender	Males	n (%)	6 (60.0)	5 (50.0)	1.0
	Females	n (%)	4 (40.0)	5 (50.0)	
Smoking	Yes	n (%)	2 (20.0)	2 (20.0)	1.0
Co-morbidity	DM	n (%)	1 (10.0)	1 (10.0)	1.0
	HTN	n (%)	1 (10.0)	1 (10.0)	
	No	n (%)	8 (80.0)	8 (80.0)	
Side	Lt	n (%)	3 (30.0)	5 (50.0)	0.65
	Rt	n (%)	7 (70.0)	5 (50.0)	

The most frequent mechanism of injury was SER (60.0%) followed by PER (40.0%), The most frequent type was Type 2 posterolateral fragment (80.0%) followed by Type 3 two-part fragment with involvement of medial malleoluS 20%.As regard skin condition, 70.0% of patients showed skin edema. As regard integrity of skin, 90.0% of patients showed closed fracture, 10.0% showed open fracture grade I . There was no significant difference between both groups as regard trauma mechanism. P value was 0.65.There was no significant difference between both groups as regard fracture type. P value was 1.0.There was no significant difference between both groups as regard skin condition. P value was 1.0.There was no

significant difference between both groups as regard skin integrity. P value was 1.0. Table (2).

Table (2) Comparison between both groups regarding trauma mechanism, fracture type, skin condition, integrity and operative timing.

			Group I (n = 10)	Group II (n = 10)	P value
Trauma mechanism	Per	n (%)	3 (30.0)	5 (50.0)	0.65
	Ser	n (%)	7 (70.0)	5 (50.0)	
Fracture type	Type2	n (%)	8 (80.0)	8 (80.0)	1.0
	Type3	n (%)	2 (20.0)	2 (20.0)	
Skin condition	Edema	n (%)	7 (70.0)	7 (70.0)	1.0
	Good	n (%)	3 (30.0)	3 (30.0)	
Skin integrity	Closed	n (%)	9 (90.0)	9 (90.0)	1.0
	Open g1	n (%)	1 (10.0)	1 (10.0)	
Operation timing (w)		Mean ±SD	2 ±0.5	2 ±0.5	1.0

There was no significant difference between both groups as regard AOFAS. P value was 0.517 Fig (1).

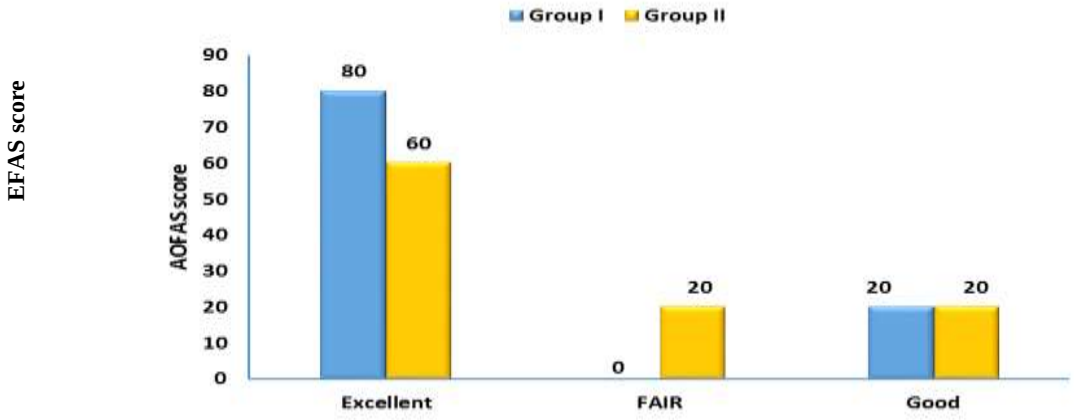

Fig (1) AOFAS, EFAS score in both groups.

There was no significant difference between both groups as regard ROM. P value was 0.517 Fig (2).

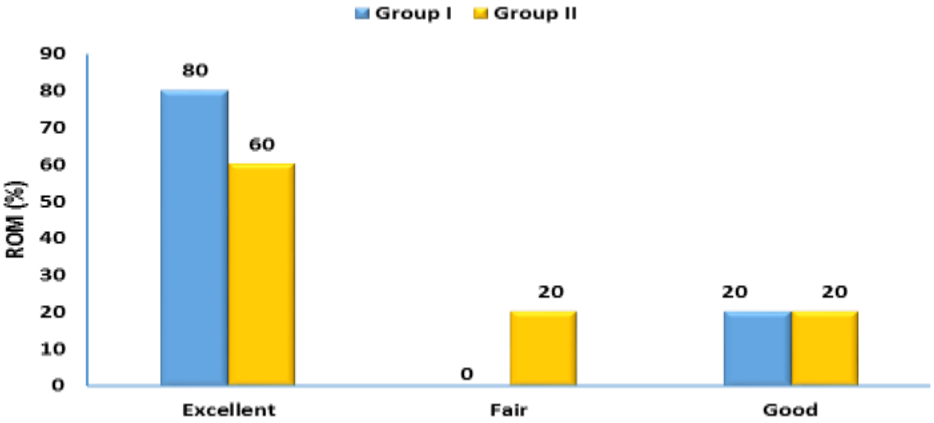

Fig (2) ROM in both groups

There was no significant difference between both groups as regard union time. P value was 0.853 Fig (3).

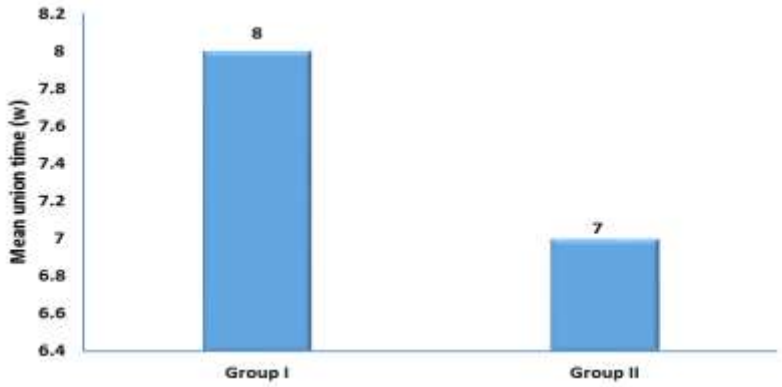

Fig (3) Union time score in both groups.

There was no significant difference between both groups as regard complications. P value was 1.0, Table (3).

Table (3) Complications in both groups.

			Group I (n = 10)	Group II (n = 10)	P value
Complication	Healed infection	n (%)	0 (0.0)	1 (10.0)	1.0
	United	n (%)	10 (100.0)	9 (90.0)	

4. Discussion

We believe direct reduction of posterior malleolar fractures, independent of fragment size, stabilizes the syndesmosis through the intact PITFL, resulting in more anatomic reduction of the distal tibiofibular articulation. This theory was first put forth by Mast et al., in 1980, but previously has not been proven in a methodical fashion [12].

Several studies have suggested syndesmotic reduction is the most important factor contributing to functional outcome.

An anatomic reconstruction of the posterior malleolus and PITFL complex for syndesmosis injury is more accurate than syndesmotic screw fixation and indirect reduction.

Without recreation of the posterior incisura as a posterior buttress, the fibula may rotate out the back of the articulation, which can be difficult to appreciate on plain radiographs. Reduction through the posterior malleolus and PITFL complex is as stable radiographically at followup as syndesmotic screw stabilization.

In comparing our thesis of anatomic posterior malleolar incisura recreation with a group treated through the syndesmotic screw fixation, we have seen that the patients are not considerably different functionally or radiographically. In addition to the lack of true anatomic reduction when using syndesmotic screws, there are many problems associated with the screws, including the fact that they sometimes are removed at a later date. This entails a second procedure for the patient [12].

Anatomic fixation of the posterior malleolus, stabilizing the syndesmosis through the PITFL, was biomechanically superior to syndesmotic screw fixation in a cadaver study, Our data suggest patients treated in this manner retain fixation and alignment at followup. Meticulous reduction of the posterior malleolus and PITFL complex to recreate the tibial incisura led short-term results equivalent to syndesmotic screws radiographically and functionally [13].

Also because, in some institutions, syndesmotic screws are removed routinely through a separate operative procedure, posterior malleolar fixation saves patients the morbidity of another trip to the operating room. When a posterior malleolar fracture is present, we recommend anatomic reconstruction, regardless of the size of the fracture fragment, to recreate the incisura; this obviates the need for syndesmotic screws [13].

5. Conclusion

Great attention has been placed on role of posterior malleolus when treate ankle fracture. More than 2ml displacement of articular surface is carry worse functional outcome 1year after injury regard less size of posterior malleolar fragments. Stabilization of posterior malleolus restore stability of syndesmosis. Indication of ORIF controversial because historical criteria based on size may not be sufficient. Displacement more than 2ml or size more than 25% ideal treated with ORIF. Great benfit of fixation of posterior malleolus on sydesmotic stability as syndesmotic stability restore without need supplemental fixation of syndesmosis provided that AITFL and PITFL are intact. If AITFL, PITFL torn fixation of posterior malleolus alone not suffient supplemental fixation of syndesmosis is required in addition to reduction and fixation of posterior malleolus. Integrity of AITFL assessed preoperative by Axial CT scan cut,Stability of syndesmosis assed intraoperative by gravity stress test.

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