

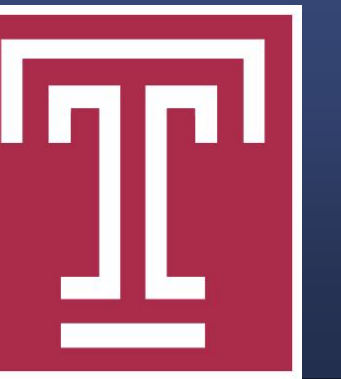
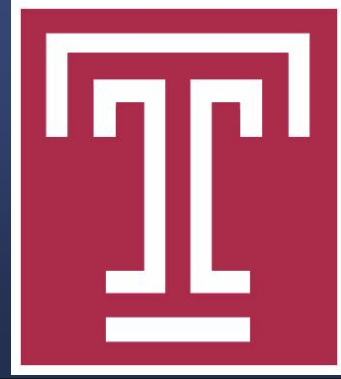
Treatment of Joint Depression Calcaneal Fractures Utilizing Combination Mini External Fixator and Percutaneous Screw Fixation

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Purpose

Joint depression fractures of the calcaneus remain complex and challenging for foot and ankle surgeons. The goals of calcaneal fracture operative reduction include restoring the height to correct the shortened and widened heel, correcting varus mal-alignment of the tuberosity, and reducing blow out of the lateral calcaneal wall. Additionally, preservation of the soft tissue envelope by managing fracture blisters, superficial and deep abrasions and edema remains paramount. The objective of this preliminary investigation is to describe a method of reducing joint depression fractures of the calcaneus utilizing a combination of mini external fixation with percutaneous screw fixation and to compare pre and post-operative radiographic outcomes with this technique.

Methodology

In this retrospective observational study, a total of 5 patients with 5 joint depression calcaneal fractures were included. A limited sinus tarsi incisional approach was used to visualize the posterior facet. Next, a mini external fixator was applied by first inserting a 4mm pin through the neck of the talus followed by another 4mm pin through the plantar posterior calcaneal tubercle. The preconfigured frames were then applied medially and laterally over the aforementioned pins in preparation for joint distraction and reduction manipulation. A third 4mm pin was inserted through a central hole in the lateral frame into the distal aspect of the calcaneus, just inferior to the anterior process, for added stability in anticipation of the distraction process. Figures 1, 2.

Once distraction was complete and reduction confirmed with intraoperative C-arm, percutaneous screws were then inserted. 6.5mm cannulated screws were inserted posterior to anterior, followed by 4.5mm cannulated screws from lateral to medial just inferior to the sustentaculum tali.

The following variables were assessed: preoperative and postoperative Böhler's angle, critical angle of Gissanes, calcaneal length, and width. Mean duration of follow up was 3 months (range 0.25 – 15.5).

Results

Results are displayed in the following charts and tables:

Patient demographics: The mean age was 46.6 years with a range of 32-63 years. One-hundred percent (100%; 5/5) of patients were male. Time from fracture to surgery was 8.8 days with a range of 0-16 days. Time from surgery to external fixator removal was 37.4 days with a range of 28-55 days.

Fractured feet characteristics: Sixty percent (60%; 3/5) of patients sustained left extremity injuries. Additionally, biomaterial was utilized in sixty percent (60%; 3/2) of patients. Complications are as follows; sixty percent (60%; 3/5) presented with superficial pin tract infections, twenty percent (20%; 1/5) presented with deep infection requiring surgical debridement, and forty percent (40%; 2/5) of patients encountered delayed union.

Radiographic data: Average pre-operative and post-operative Böhler's angle was 24.2° and 39.4°, respectively. Average pre-operative and post-operative angle of Gissanes was 121.8 and 113.0°, respectively. Average pre-operative and post-operative calcaneal length was 81.8mm and 87.0 mm, respectively. Average pre-operative and post-operative calcaneal width was 46.3mm and 43.9mm, respectively.

Table 2. Radiographic Data

		Patient #1	Patient #2	Patient #3	Patient #4	Patient #5	Average
Böhler's Angle (deg)	Pre-op	22.0	22.0	24.0	27.0	26.0	24.2
	Post-op	46.0	26.0	44.0	44.0	37.0	39.4
	% Change	109.1%	18.2%	83.3%	63.0%	42.3%	62.8%
Angle of Gissane (deg)	Pre-op	129.0	97.0	138.0	110.0	135.0	121.8
	Post-op	36.0	141.0	136.0	120.0	132.0	113.0
	% Change	-72.1%	45.4%	-1.4%	9.1%	-2.2%	-7.2%
Length (mm)	Pre-op	86.0	83.0	76.0	83.0	81.2	81.8
	Post-op	90.0	86.0	85.0	86.0	88.0	87.0
	% Change	4.7%	3.6%	11.8%	3.6%	8.4%	6.3%
Width (mm)	Pre-op	47.0	42.0	41.0	46.0	55.4	46.3
	Post-op	42.0	40.0	40.0	45.0	52.3	43.9
	% Change	-10.6%	-4.8%	-2.4%	-2.2%	-5.6%	-5.2%

Figure 1



Figure 2

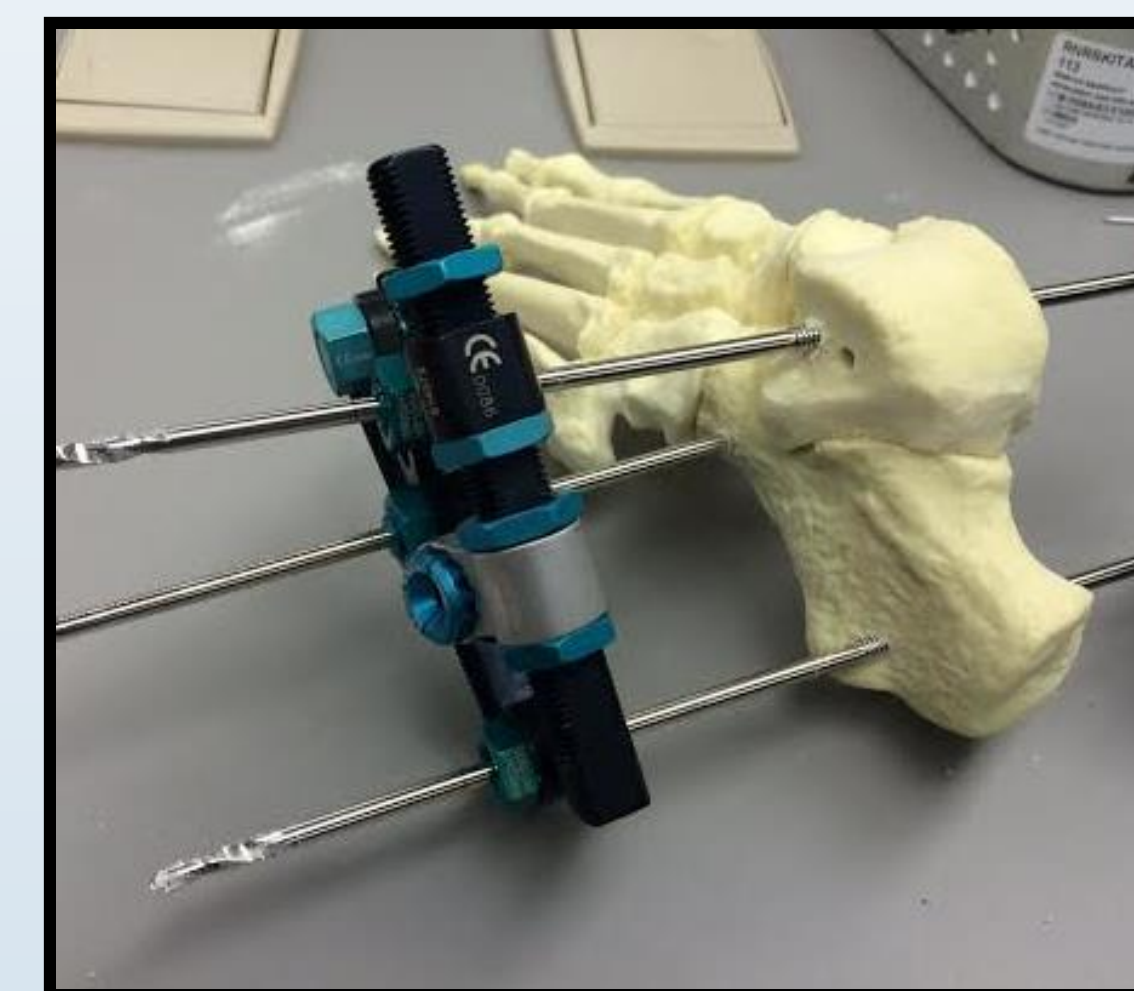


Table 1. Summary of Patient Demographics and Characteristics of Fractured Feet

Variable	
<i>Patient demographics</i> (N = 5)	
Age, y	46.6 (range 32-63)
Sex, n (%)	
Men	5 (100)
Women	0 (0)
Time from fracture to surgery, d	8.8 (range 0-16)
Time from surgery to EF removal, d	43.6 (range 28-65)
<i>Characteristics of fractured feet</i>	
Fracture, n (%)	
Right side	2 (40)
Left side	3 (60)
Biomaterial, n (%)	
PRO-STIM®	3 (60)
None	2 (40)
Postoperative complications, n (%)	
Superficial pin tract infection	3 (60)
Deep infection	1(20)
Delayed union	2(40)

Conclusion

Our findings suggest that this method of utilizing a combination of mini external fixation with percutaneous screw fixation is an effective option for treating joint depression calcaneal fractures. Still, comparative studies with more patients and longer outcomes are needed.

References

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