Management of calcaneum fracture in adults treated with plating

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Abstract

Introduction: Intraarticular fractures of Calcaneum are not uncommon. Among the tarsal bones calcaneus is most frequently fractured. Calcaneal fractures account for 60% of tarsal bone injuries and 2% of all fractures. Axial loading is most common mode of injury, fall from height causing bilateral calcaneal fractures. Other fractures associated with fall from height have to be excluded such as pelvic and spinal fractures.

Material and Methods: This is a prospective study of 20 patients with displaced intraarticular fractures (Type–II Sanders and above) of calcaneum, which were admitted to the hospital and operated with plating and bonegrafting through extensile lateral approach, between September 2013 and February 2016.

Result: A total of 20 calcaneal fractures in 24 patients were randomly selected treated by plating for example locking calcaneal plate. Among the 20, there was predominance of right sided fractures.

Discussion: Open reduction and internal fixation of displaced intra-articular calcaneal fractures by locking calcaneal plate maintains the joint congruity and decrease the incidence of subtalar arthritis. Although, conservative treatment was considered gold standard previously, there is increase tendency towards internal fixation with excellent results. Surgery for calcaneus fractures should be delayed, ideally for 10-14 days, in the presence of significant edema or fracture blister formation.

Conclusion: Based on our small study and results, we conclude that open reduction and internal fixation with locking calcaneal plate is excellent treatment option with good post operative outcome for displaced fracture of calcaneum, as serious complications are not significant.

Keywords: Calcaneum, Locking Plate, Internal Fixation.

Introduction

Intraarticular fractures of Calcaneum are not uncommon. Among the tarsal bones calcaneus is most frequently fractured. Calcaneal fractures account for 60% of tarsal bone injuries and 2% of all fractures. Most calcaneal fractures occur in male industrial workers, making the economic importance of this injury substantial.

Axial loading is most common mode of injury, fall from height causing bilateral calcaneal fractures. Other fractures associated with fall from height have to be excluded such as pelvic and spinal fractures. Others like break pedal injuries and highvelocity trauma leading to open fractures are also common.[1-3] Talus is driven down into calcaneum by axial load which results in primary fracture line which runs across the posterior facet forming anteromedial and posterolateral fragments. Sustantacular fragment stays associated with the talus due to strong ligaments. Posterior fragment is important as it contains posterior facet. Essex Lopresti described secondary fracture lines, which can produce tongue type and joint depression type calcaneal fractures. Secondary fracture line extending through tuberosity of the calcaneum produces tongue type fracture and if it extends through dorsal aspect of calcaneum joint, depression type fracture results.[4,5] For these fractures Open method might be done applying various approaches, according to the degree of injury and the position of the fragments.[6-8] If operative procedure is chosen, the various methods range from lateral plating from the extended lateral L-shaped method[9-16] to percutaneous reduction and internal fixation with pins or screws, or external fixation.[4,5,17-22] Out of these tedious methods of the extended lateral method have been reported.[1,23,24]

The point of this paper was to calculate the effective outcome after open reduction and internal fixation of displaced intra-articular injuries of the calcaneum by locking calcaneum plate.

Material and Methods

This is a prospective study of 20 patients with displaced intraarticular injuries (Type–II Sanders and above) of calcaneum, which were inpatients in orthopedic ward and fixed with plating and grafting through extended lateral method, between autumn 2013 and spring 2016.

The age of the patients ranged from 19 years to 53 years. 28 were males and 2 were females. Fractures were classified as per Sanders classification based on, coronal images of posterior facet. Patients with type–I Sanders fractures were subjected to conservative line of management, as is the standard protocol according to the prevailing literature.[5,7] Sanders type–I fractures were not included in the present study.

- Sanders type– II-IV underwent surgical procedure and were considered in this study.

- Surgical approach used was Lateral plating via the L-approach. The patient is placed in the lateral position with a thigh tourniquet.
- Follow-up was done at 3,6,12 and 24 months.
- Serial x rays were taken (Table/Fig. 1, 2).
- Gissane's angle was calculated.
- Bohler's angle were calculated.
- The final outcome based on the above observations was done as per American Orthopaedic Foot and Ankle Society Score (AOFAS), Ankle–Hindfoot Scale.
- The clinical results were graded as 90 excellent, 80 good, 70 fair and ≤70 as poor.[34,12]

Fig. 1

Fig. 2

Results

A total of 20 calcaneal fractures in 24 patients were randomly selected treated by plating for example locking calcaneal plate. Among the 20, there was predominance of right sided fractures. No patients were lost to follow-up

Table 1: Age Distribution

Age in yrs.	Cases	Percentage
<20	1	5.0%
21-30	5	25%
31-40	10	50%
40 & above	4	20%

Majority of patients were adults belonging to age group 31-40 years. The youngest patient was of 19 years old and oldest was 53 years.

Table 2: Sex distribution

Sex	Cases	Percentage
Male	19	95%
Female	1	5%

Thus majority of patients involved were young adult males sustaining fall from height.

Table 3: Mechanism of injury

Mechanism	Cases	Percentage
Fall	19	95%
RTA	1	5%

Thus majority of the injury was due to fall from height, while working as in construction work. There was a small minority of fractures due to road traffic accidents involving four wheelers.

Table 4: Side of calcaneus

Side of calcaneus	Cases	Percentage
Right	11	55%
Left	9	45%

There was a slight preponderance of right side fracture in this study. Bilateral fractures and compound fractures were not included in this study.

Fig. 3

Table 4: Type of fracture (Sanders Type)

Type of fracture	Cases	Percentage
Type 2	14	70%
Type 3	4	20%
Type 4	2	10%

Table 5: Pre-operative Bohler's angle

Pre-op angle	Cases	Percentage
<20	20	66.67%
21-25	5	16.67%
26-30	4	13.33%
31-35	-	-
Above 36	1	3.33%

Table 6: Post-operative Bohler's angle

Post-op angle	Cases	Percentage
<20	5	16.67%
21-25	2	6.67%
26-30	15	50%
31-35	6	20%
Above 36	2	6.67%

Discussion

Open reduction and internal fixation of displaced intra-articular calcaneal fractures by locking calcaneal plate maintains the joint congruity and decrease the incidence of subtalar arthritis. Although, conservative treatment was considered gold standard previously, there is increase tendency towards internal fixation with excellent results. Surgery for calcaneus fractures should be delayed, ideally for 10-14 days, in the presence of significant edema or fracture blister formation.[22] Exceptions to this rule include open fractures and the presence of a compartment syndrome in the foot, which should prompt immediate surgery for appropriate intervention.[25] In their report of a prospective, randomized study, Buckley et al suggested that the functional results after operative fixation of displaced intra-articular calcaneus fractures were better than those undergoing non-operative treatment, in selected groups.[40] Further prospective studies are required to validate these results.[26]

Zhang et al performed a meta-analysis of seven randomized controlled trials (N=908) comparing operative treatment of displaced intra-articular calcaneal fractures with non-operative treatment.[27]

Historically, most calcaneus fractures have been treated closed because open reduction and internal fixation (ORIF) did not result in improved outcomes and had high complication rates.[28] The open reduction of intraarticular fractures of calcaneus has gained a strong impulse after the publication of studies by Palmer performing a open reduction through lateral approach , fragments reduction, repair of the subtalar joint surface depression, bone gap filling with bone graft and immobilization with cast.[17] Open techniques may be performed by using medial, lateral, or combined approaches, depending on the extent of injury and the location of the fracture fragments.[6-8] A majority of authors have preferred the extended lateral L-type approach with lateral plate fixation. Good to excellent results have been obtained in 60% to 85%.[29-32] Extended 'L' lateral approach had given a good exposure in our cases. But the point to be kept in mind is and the point of contention is that the extensive nature of this approach bears the risks of problems with skin healing. It worsens the trau-matic devascularisation of the central and anterior part of the lateral wall, as 45% of the calcaneal vascularity is derived from vessels entering at this site.[33,34] The frequency of the general complications ranges from nil up to 33% with wound problems,[40-46] 32% with infection[28] and 10% with sural nerve injury and a CRPS.[45] Thus this study proves that are the risks of plating worth it.

Weber et al., in their study assessed 139 cases, in our study we assessed 20 fractures (66.6%) were on right side and ten fractures (33.3%) on left side. At final, follow-up assessment of AOFAS score was calculated, the mean AOFAS score was 79.9 (Range 49-96). Excellent results were achieved in 13 (45%) cases, good results in 10 (35%), fair result in three (10%) cases and poor result in four cases (10%). These results were comparable to other study conducted by other autors.

		Present Study	**Weber M et al.,[12]**
Excellent	9	45%	38%
Good	7	35%	46%
Fair	2	10%	12%
Poor	2	10%	4%

Conclusion

Based on our small study and results, we conclude that open reduction and internal fixation with locking calcaneal plate is excellent treatment option with good post operative outcome for displaced fracture of calcaneum, as serious complications are not significant.

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