

Original Research Article

Short term outcome of open reduction and internal fixation with plating in displaced intra articular calcaneal fractures

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ABSTRACT

Background: Calcaneum fractures constitute the majority of the tarsal bone fractures worldwide. There is no gold standard consensus as of now for the management of the displaced intra articular calcaneal fractures. Open reduction and internal fixation with plating is one of the management options available.

Methods: Authors studied the results of open reduction and internal fixation with plating in 22 calcaneal fractures in a study with a minimum follow up of 6 months. Outcome was studied using Maryland foot score.

Results: Authors observed excellent results in 5 patients (22.72%), good results in 12 patients (54.54%), fair results in 4 patients (18.18%) and poor result in 1 patient (4.54%). Authors encountered wound infection in 1 patient (4.54%), heel varus in 1 patient (4.54%), heel broadening in 1 patient (4.54%), reduced range of motion at ankle in 2 patients (9.9%) and persistent heel pain in 1 patient (4.54%).

Conclusions: Open Reduction and Internal Fixation (ORIF) with calcaneum plating, through an extensive lateral approach, for displaced intra articular fractures of the calcaneum is an effective treatment modality with very good results in experienced hands.

Keywords: Calcaneal fracture, Internal fixation, Plating, Sanders's classification

INTRODUCTION

Calcaneum fractures constitute the majority of the tarsal bone fractures worldwide.¹ Although, these fractures account for only around 2% of all the fractures but the controversies that surround the management of these fractures are immense. Most of the calcaneum fractures are displaced intra-articular ones. Cotton and Henderson once quoted, "... the man who breaks his heel bone is done".² A hundred years ago, conservative treatment was accepted as the gold standard and any surgical intervention was unacceptable in view of the soft tissue complications associated. However, the results of the conservative management were far from good in most of the cases.³ This led to thorough research into the three-

dimensional anatomy of calcaneus and various classification schemes were propounded. Bohler and Essex-Lopresti were instrumental in explaining the anatomical and surgical prospects in the calcaneum fractures. With the fascinating advances in diagnostics like computer tomography, these fractures can now be analyzed and classified in a much better way. A computer tomography-based classification propounded by Sanders is commonly used nowadays. Due to refining of the meticulous surgical techniques, the surgical methods are now being routinely adopted for the management of these fractures. However, it is well accepted that there is a long learning curve.⁴ Currently, open reduction and internal fixation is the preferred method of treatment in displaced intra-articular fractures of calcaneus.⁵⁻⁷ However, no

gold standard consensus has been adopted as of now. Authors conducted an observational study among the patients having displaced intra-articular calcaneum fractures, managed with open reduction and internal fixation with plating to study the functional outcome.

METHODS

Authors conducted a prospective observational study in institution from June 2017 to December 2019 in which authors included displaced intra-articular calcaneum fractures, all of which were managed with open reduction and internal fixation with plating. 36 patients with calcaneum fractures attended the emergency and outpatient's department of orthopedics, out of which 28 fractures were included in this study. Six patients were lost to follow-up and were excluded from this study. Hence, the final number of patients included in the study was 22 (n = 22).

Inclusion criteria

- Age >18 years
- Sanders type II, III, IV fractures
- Non-diabetic
- No peripheral vascular disease
- Non-smoker

Exclusion criteria

- Extra-articular fractures of calcaneus
- Sanders type I fractures
- Diabetic
- Associated peripheral vascular disease
- Smoker

All the patients were thoroughly examined, and limb elevation was advised with complete non-weight bearing. The patients were admitted, and the soft tissue was inspected on rounds. The patients were operated only when the "wrinkle sign" was present (Figure 1).



Figure 1: Appearance of "wrinkle sign".

Radiographs of the involved foot (Anterio-posterior, lateral and axial views) along with the computer tomography of every patient was done prior to surgery to understand the fracture anatomy (Figure 2). In addition, all the relevant blood investigations, electrocardiography and chest radiographs were also performed to check for the fitness for anaesthesia. The fractures were classified according to computer tomography-based Sanders classification system.



Figure 2: Lateral view radiograph of left foot showing calcaneum fracture.

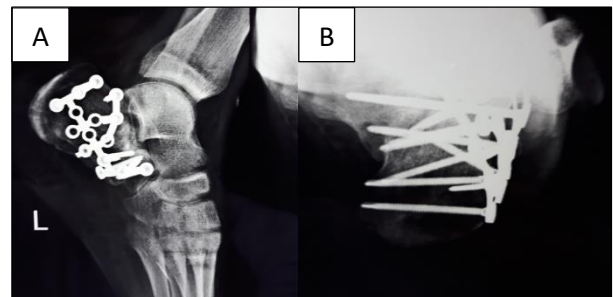


Figure 3: Post-operative radiograph A) Lateral view. B) Axial view.

Surgery was performed under spinal or general anaesthesia and a tourniquet was used in all the cases. An extended lateral approach was used. Open reduction and internal fixation using plate was done in all cases. A suction drain was placed in every patient.

Post-operatively the limb was elevated, and adequate analgesia was given. The drain was removed at 48 hours post-operatively. Post-operative radiograph was taken to confirm reduction and adequate fixation. (Figure 3A and 3B) Antiseptic dressings were done at 2nd and 7th day post-operative days. At, 2 weeks sutures were removed,

and gradual ankle movements started. Weight bearing was started after 10-12 weeks post-operatively.

The patients were followed at 4 weeks, 8 weeks, 12 weeks, 6 months and 1 year post-operatively in outpatient department. The outcome assessment was done using Maryland foot scoring.

RESULTS

This prospective, observational study was conducted in the department of Orthopedics Government Medical College, Jammu and included 22 patients. The mean age of the patients included in this study was 26.95 years. The study participants were predominantly males with a male

to female ratio of 4.5:1. Right sided calcaneum was fractured in 13 patients (59.09%) while as left one was fractured in 9 patients (40.9%). The most common mechanism of injury was fall from height. In 17 patients (77.27%), fall from height was the cause of injury while as the rest of 5 patients (22.72%) had suffered a Road Traffic Accident (RTA). Table 1 depicts the detailed characteristics of the patients included in the study.

Authors used CT based, Sander’s system to classify the calcaneum fractures. Sander’s type IIB fracture of the calcaneum was the commonest one observed. 14 patients (63.63%) had Sander’s type II fractures and 8 patients (36.36%) had Sander’s type III fractures. No patient with Sander’s type IV were seen (Figure 4).

Table 1: Characteristics of patients included in the study.

Characteristics	Male	Female	Overall
Age in years (mean±sd)	26.27±3.65	30.0±10.8	26.95±5.44
Sex	18/22 (81.81%)	04/22 (18.18%)	22 (100%)
Side	Right	3/4 (75%)	13/22 (59.09%)
	Left	1/4 (25%)	09/22 (40.90%)
Mode of injury	Fall	3/4 (75%)	17/22 (77.27%)
	RTA	1/4 (25%)	5/22 (22.72%)
Mean interval between injury and surgery±sd (days)			7.35±2.42
Average time to union±sd (weeks)			10.43±1.26
Mean operative time±sd (minutes)			82.32±9.42
Average maryland foot score±sd achieved post-operatively			79.48±9.56

In this study, 2 patients (09.09%) had suffered a spine injury, 1 patient (04.54%) had a pelvic injury, 2 patients (09.09%) had ipsilateral lower limb injuries, 1 patient (04.54%) each had contralateral lower limb injury and upper limb injury (Figure 5).

minutes. The average time to union was 10.43 weeks. The overall mean Maryland foot score observed was 79.48. Average Maryland foot score observed among Sander’s type II and type III was 80.58 and 78.28, respectively.

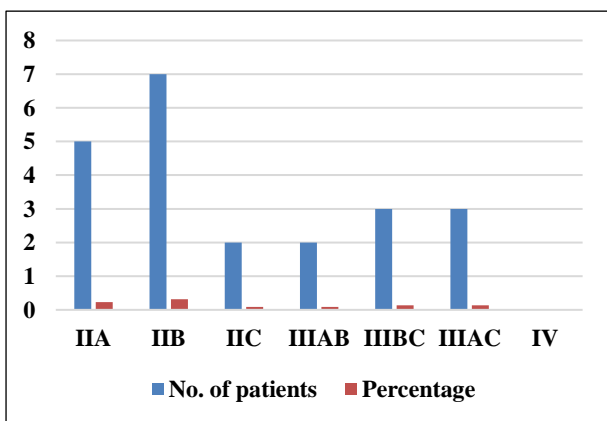


Figure 4: Distribution of fractures according to Sander’s classification system.

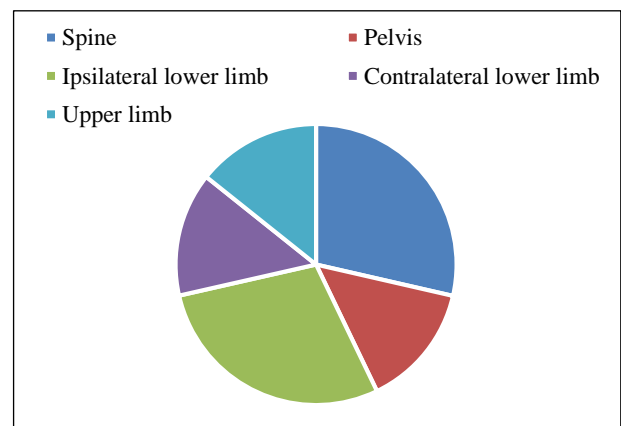


Figure 5: Associated injuries.

The average interval between injury and surgery was 7.35 days. The mean operative time in this study was 82.32

In this study, authors observed excellent results in 5 patients (22.72%), good results in 12 patients (54.54%), fair results in 4 patients (18.18%) and poor result in 1

patient (04.54%) (Table 2). Authors encountered wound infection in 1 patient (4.54%), heel varus in 1 patient (4.54%), heel broadening in 1 patient (4.54%), reduced range of motion at ankle in 2 patients (9.9%) and persistent heel pain in 1 patient (4.54%) (Table 3).

Table 2: Outcome observed.

Result	No. of patients	Percentage (%)
Excellent	05	22.72
Good	12	54.54
Fair	04	18.18
Poor	01	04.54
Total	22	100

Table 3: Complications encountered.

Complication	No. of patients	Percentage (%)
Wound infection	01	04.54
Heel varus	01	04.54
Heel broadening	01	04.54
Ankle range of motion	02	09.09
Persistent heel pain	02	09.09

DISCUSSION

Management of calcaneum fractures has been a dilemma for the foot and ankle surgeons for a long time. Various modalities of treatment are available but there is still an ongoing quest for an ideal treatment option. In this study, authors included 22 patients with unilateral calcaneum fractures who consented to take part in this study.

Majority of the patients included in this study were young adults, with an average age of 26.95 years, ranging from 19 years to 42 years. Most of the patients were in their twenties and thirties. There was a male predominance with a male to female ratio of 4.5:1. These observations is in agreement with previous studies, conducted by O’Farrell DA et al, and Joshi J et al.^{8,9}

Fall from a height was the commonest mode of injury followed by road traffic accidents. Spine injury was the commonest associated injury which was observed in 9.09% of the patients.

Sander’s classification system was used to study fracture patterns. Sander’s type IIB was the most common fracture pattern. Sander’s type II fractures included 63.63% of the patients while as 36.36% of the fractures were Sander’s type III. All the patients were managed with open reduction and internal fixation using calcaneum plating through an extensile lateral approach.

The patients were operated once the wrinkle sign appeared. The average waiting time for surgery, from the time of injury to surgery, was 7.35 days. The average operative time was 82.32 minutes. The mean fracture

union time was 10.43 weeks. The overall mean Maryland foot score observed was 79.48. Average Maryland foot score observed among Sander’s type II and type III was 80.58 and 78.28, respectively.

Authors observed excellent to good results in 77.26% of the patients, fair results in 18.18% of the patients, while as only 4.54% had poor results. Joshi J et al, achieve 88% excellent to good results in their series.⁹ Gulabi et al, achieved excellent to good results in 77.5% of their patients.¹⁰ Hence, these results are in agreement with the existing literature.

Complications encountered included wound infection in 1 patient (4.54%), heel varus in 1 patient (4.54%), heel broadening in 1 patient (4.54%), reduced range of motion at ankle in 2 patients (9.9%) and persistent heel pain in 1 patient (4.54%). The wound infection was managed by regular antiseptic dressings.

CONCLUSION

Open Reduction and Internal Fixation (ORIF) with calcaneum plating, through an extensile lateral approach, for displaced intra articular fractures of the calcaneum is an effective treatment modality with very good results in experienced hands.

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Ethical approval: Not required

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