

Operative and non-operative treatment of intraarticular displaced calcaneal fractures: a comparative study

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Abstract

The treatment of intra-articular displaced calcaneal fracture is debatable. We conducted comparative study to operative and non-operative treatment for intra-articular displaced calcaneal fractures. Patients were assigned to two groups based on the treatment given (operative and non-operative) and were regularly followed for a period of 12 months. The outcome measures were assessed by Modified Rowe's Score (MRS), Visual Analogue e Scale (VAS) and The American Orthopaedic Foot and Ankle Society (AOFAS) scale. The outcome related to patient's job was noted after one year and compared with pre-injury status. 46 calcaneal fractures were studied. 22 of them were operated and 24 were treated conservatively. Out of 22 operated cases, Bohler's angle was restored in 18 cases and these had good results with all three outcome scores at 1 year follow up and remaining 4 cases showed fair results. 24 cases treated with cast also showed fair results. The overall outcome of operated cases were better than non-operated cases Operative treatment of displaced intra-articular calcaneal fractures gave good results at one year follow up, provided Bohler's angle was restored to normal range. Non operative treatment gave fair results. Complications were seen both with operative and non-operative treatment.

Keywords: Operative and non-operative treatment, intra-articular, calcaneal fractures

Introduction

Calcaneal fractures are the most common tarsal bone fracture and approximately 75% of these fractures are intra-articular ^[1, 2]. The results of treatment of displaced intra-articular calcaneal fractures are usually not satisfactory. According to published data, there is no consensus on whether surgical treatment is superior to conservative treatment in displaced intraarticular calcaneal fractures ^[3, 4]. Some retrospective studies suggest surgical treatment for DIACF. It is known that patients who underwent surgical treatment had better functional outcome scores and experienced less pain than conservatively treated patients ^[5-9]. However, many orthopedic surgeons have expressed concern that the benefits derived from surgery will be compensated by wound complications ^[10]. Several randomized controlled trials comparing conservative treatment with surgical treatment for DIACF are available in the literature. However, these randomized trials have yielded inconsistent results. Most of these studies are limited to a small sample size. There is also little statistical power to detect the difference between the groups compared. Some clinicians have concluded that current evidence is insufficient for proving that surgical treatment for DIACF is superior to non-surgical

treatment, while other clinicians have reported that patients who are surgically treated tend to have better results^[3]. Although the development of modern surgical techniques has improved clinical outcomes in many patients, a complete consensus has not been achieved in the classification, treatment, surgical technique and postoperative care^[10]. Therefore, the surgical method of choice for DIACF remains unclear. The aim of this study is to make an updated analysis on the surgical and conservative treatment of displaced intra-articular calcaneal fractures in adults.

Our study aimed to compare the functional outcome, quality of life and residual pain following displaced intra-articular calcaneal fractures treated operatively and conservatively.

Methodology

An observational study was conducted on forty six patients with closed displaced intra-articular calcaneal fractures, aged between 20 and 60 years. The study included patients treated in the Department of orthopaedics in MGG General Hospital and GMERS Medical College, Navsari from November 2020 to November 2022. Patients with undisplaced fracture (Sanders type 1), extra-articular fractures, comorbidity like diabetes, associated spine fractures with neurological deficits, open fractures were excluded. Informed and written consent was taken from all patients. The study was cleared by the Institutional Ethics Committee and all the regulations and guidelines have been followed.

Forty six calcaneal fractures were studied. Patients were assigned to two groups (operative and conservative). Randomization was done based on alternate allocation. X-ray and CT scan was done for all patients. Using a CT scan, fractures were classified as per Sanders classification^[11] type II, III, IV.

Pre and postoperative Bohler's angle^[12] was calculated using MB ruler in the Computerized Radiographic system of our hospital. To avoid inter-observer bias, the values were checked by two medical assistants and a mean value was taken. Twenty two calcaneal fractures were treated operatively and Twenty four conservative. Non-operative treatment was done with below-knee cast and non-weight bearing crutch walking for six weeks. After six weeks, the cast was removed and radiographs were done. Based on X-ray features, patients were gradually mobilized with partial weight-bearing as per their pain tolerance and full weight-bearing was started after four months.

Operative treatment was done with one of these methods

- i) Percutaneous reduction and fixation with Cannulated Cancellous screws.
- ii) Open reduction and internal fixation with Plates/Cannulated Cancellous screws.

Patients treated by operative method were put on splints with non-weight bearing mobilization for up to 4 weeks. From 4 to 8 weeks, active mobilization of toes and ankles were started. Gradual partial weight bearing was allowed from 8 weeks onwards with strengthening exercises and full weight bearing was allowed after 12 weeks.

Patients were followed up for a minimum period of one year. The outcome measures were Modified Rowe's Score (MRS) 13, Visual Analogue Scale (VAS) 14 and The American Orthopaedic Foot and Ankle Society (AOFAS) 15 scale. The results of operative and conservative groups were compared. Outcome related to the patient's job at one year follow up was determined. Complications of treated calcaneal fractures were noted. Statistical analysis was done.

Results

In our study, age of the patients ranged from 20 to 60 years with a mean age in the non-operative group was 37 and the operative group was 35.1 years. Twenty patients had a fracture on the right side, twenty-six on the left side. The majority of the calcaneal fractures were caused by fall from height (40 cases), three cases were due to slip and fall from stairs, two due to falling of a heavy object over the foot and 1 road traffic accident. Two patients had poly trauma injury. Thirty six patients were manual labourers, four were drivers, four were tree climbers and two were college students. Twenty two fractures were treated

operatively and 24 were treated conservatively.

Out of twenty two treated operatively, eleven fractures underwent percutaneous fixation of CC screw, six fractures underwent open reduction and internal fixation (ORIF) using CC screw and five underwent ORIF with plating. Twenty four fractures were treated with cast immobilization.

Out of twenty two Operated cases, Bohler's angle was restored in 18 cases and showed good results with MRS at one year. The remaining four cases showed fair results. Twenty four cases treated conservatively showed fair results when compared at one year, operated cases showed better functional outcomes with MRS, VAS, and AOFAS (Table 1). The outcome related to the job of the patient at a year follow up showed better results in the operative group (Table 2).

Table 1: Comparison between operated group and the non-operated group at 1 year of follow up

Score	Treatment	N	Mean	SD	T test
MRS 1 year	Operated	22	73.621	11.219	5.765 $P < 0.001$
	Non operated	24	58.294	7.426	
AOFAS 1 year	Operated	22	77.883	9.577	2.624 $P = 0.007$
	Non operated	24	71.365	8.364	
VAS 1 year	Operated	22	3.348	1.322	4.422 $P < 0.001$
	Non operated	24	4.882	0.798	

Table 2: Outcome related to the job of patients at 1 year follow up

Outcome related to patient's job	Operative group	Non operative group
No restrictions	18	19
Change of job/substantial restrictions	2	3
Unable to work	2	2

Discussion

The treatment of calcaneal fractures is controversial. Many studies have been reported but there is a lack of consensus. There are studies that have shown better outcomes with non-operative management^[9]. Some authors have investigated operative management and got good results^[16, 17, 18].

Algren *et al.*^[19] in 2013 compared operative and conservative management and results obtained at one year were not significantly different statistically. However Agren *et al.*^[20], in a post-hoc analysis of their results found significantly better results in the subgroup of patients with anatomic reduction. Conservative management showed fair results in our study. This may be due to a lack of compliance with rehabilitation protocol or due to improper selection of patients for conservative management. The outcome of surgically managed cases in our study is comparable to the results in the study by Algren *et al.*^[19]. In the present study, the outcome of surgically treated cases was better when the Bohler's angle was restored to normal range (more than 18°). Buckley *et al.*^[21] also found that the results were equivalent between operative and non-operative groups and except in some operated cases, results were uniformly good. However patients undergoing non-operative treatment were 6 times more likely to require secondary subtalar fusion than patients treated operatively.

In our study, two cases with type 4 fracture showed good results as the Bohler's angle was restored whereas the other one case with Bohler's angle not restored gave optimal outcome. Two cases of type 4 fracture treated by ORIF with plating, one case each of type 2C and type 3BC treated with percutaneous CC screw and one case of type 2B treated by open reduction and CC screw fixation showed fair results. The common factor in all these cases was that Bohler's angle was not restored above 18°.

The complications were noted with both the treatment options. The commonest complications in both groups were stiffness, heel pain, and gait abnormalities. The other complications like plaster sores and wound infection were specific to the conservative and operative group

respectively. A study by Li *et al.* [22] looked for the complication rate in the operated cases. In that study pain and necrosis were the commonest complications with the figures of 7.9% and 6.8% respectively. Infection, malunion and loss of fixation were other complications encountered. The complication rate was 26.2% in the operated group and 13.7% in the non-operated group as per the study by Wei *et al.* [23].



X-ray 1: Fracture treated conservatively



X-ray 2: Fracture treated operatively

The present study also recorded the outcome related to the job of the patient at one year and compared with the pre-injury job status. While two patients in operated group and two in the conservative group were unable to work after one year, two patients in operated and 3 patients in the non-operative group had to change their job. Eighteen patients in operated and 19 in the conservative group had no or minimal restrictions. Wei *et al.* [23] found that the complication rate was higher with the operated group and also there was a significant number of patients who were unable to work at the final follow up.

The limitations of this study were sample size and lack of long term follow up. The results of our study need to be substantiated by a multicenter study with long term outcome assessments.

Conclusion

Operative treatment of displaced intra-articular calcaneal fractures showed good results at one year when Bohler's angle was restored to normal range. Conservative treatment gave fair

results. Complications were seen both with operative and non-operative treatment.

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