

ORIGINAL RESEARCH

Functional outcome of intraarticular calcaneal fracture managed by open reduction and internal fixation

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ABSTRACT

Background: The biggest tarsal bone is the calcaneus. The calcaneus is the tarsal bone that breaks most frequently. One of the most difficult injuries for an orthopaedic surgeon to treat is a fracture of the calcaneus. 90% of calcaneal fractures in males between the ages of 21 and 45 have a significant socioeconomic impact since patients with this injury frequently take extended amounts of time off from job and regular activity. Calcaneal fractures may occur intra-articularly (involving subtalar joint) or extra-articularly, (sparing the subtalar joint). About 75% of calcaneal fractures are intra-articular fractures, which have been linked to poor functional outcomes. The best course of action for treating displaced intra-articular calcaneal fractures is still up for debate. According to the research, surgical intervention is preferable to non-operative therapy in patients with displaced intra-articular calcaneal fractures, patients with decreased Böhler's angle, and youthful, active, cooperative patients who are light to moderate workers. In this study, we are evaluating the results of surgical treatment of calcaneal fracture with open reduction and internal fixation.

Materials and Method: This study was carried out at the Department of Orthopaedics, Navodaya Medical College, Raichur over a period of 2 years. In this study, 21 patients ranging in age from 22 to 54 years with calcaneal fracture were admitted and were treated by open reduction and internal fixation through lateral extensile approach or any other approach as required. Functional outcome was assessed by AOFAS, MFS scoring system.

Results: A total of Twenty one patients were evaluated in our study of which all were males. According to AOFAS score, 23.8% patients had excellent results, 61.9% had good results and 14.2% had fair results and according to MFS score 9.5% had excellent results, 71.4% had good results and 19.1% had fair results at the end of nine months.

Conclusion: The intra articular calcaneal fractures are potentially debilitating and open reduction and internal fixation gives better functional outcomes as compared with other modalities of treatment.

Key words: AOFAS score, MFS score, intraarticular fractures

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INTRODUCTION

The biggest tarsal bone is the calcaneus. The calcaneus is the tarsal bone that breaks most frequently. One of the most difficult injuries for an orthopaedic surgeon to treat is a fracture of the calcaneus. 90% of calcaneal fractures in males between the ages of 21 and 45 have a significant socioeconomic impact since patients with this injury frequently take extended amounts of time off from job

and regular activity. Calcaneal fractures may occur intra-articularly (involving subtalar joint) or extra-articularly, (sparing the subtalar joint). About 75% of calcaneal fractures are intra-articular fractures, which have been linked to poor functional outcomes. These fractures can be linked to other axial load injuries such as lumbar, pelvic, and tibial plateau fractures and result from axial stress mechanisms like falls or vehicular accidents.

The best course of action for treating displaced intra-articular calcaneal fractures is still up for debate. According to the research, surgical intervention is preferable to non-operative therapy in patients with displaced intra-articular calcaneal fractures, patients with decreased Böhler's angle, and youthful, active, cooperative patients who are light to moderate workers. Non-operative therapy should be utilised to prevent complications and poor outcomes in senior patients as well as in patients with poor soft tissue, diabetes, vasculopathy, and smokers, as well as in situations of slightly displaced fractures, a slight reduction of Böhler's angle, and no foot deformity. The restoration of calcaneal anatomy, including the subtalar and calcaneocuboid joint surfaces, normal heel width for proper shoe usage, height for ankle function, and length for foot alignment, should be the aim of surgical therapy. Anatomic reduction and stable fixation have the potential to decrease soft tissue problems, according to a recent comprehensive analysis, which found that open reduction and internal fixation is the preferred method of treatment for the majority of displaced intra-articular calcaneal fractures.

Materials and Method

This study of 21 patients with intraarticular calcaneal fractures was conducted during the period between December 2020 to October 2022 in the Department of Orthopaedics, Navodaya Medical College Hospital and Research Centre, Raichur and were treated with open reduction and internal fixation. Inclusion criteria were patients above 18 years of age with calcaneum fractures, fresh fractures and fractures upto 4 weeks old, patients should be walking prior to fractures. Fractures in elderly (>70 years), children, associated with other injuries in ipsilateral extremities were excluded from the study. A detailed history taken and systematic examination of the patient was conducted according to Proforma. The swelling of the heel and

status of the skin was noted. X- ray of the calcaneum was taken on admission which included lateral and axial views. CT scans were taken to further evaluate the fracture pattern. The patient was temporarily put on a below knee slab with adequate limb elevation.

The fractures was classified based on the Essex-Lopresti and Sanders classification.

The patient was then posted for open reduction and internal fixation through lateral extensile approach or any other approach as required. All patients were taken for elective surgery as soon as possible after necessary investigations. The patients were followed up clinically and radiologically at 6 weeks, 3 months and 6 months. At every follow up clinical examination was done to assess status of the surgical wound, pain, tenderness, range of motion of subtalar joint, any complications of the wound and fracture, and clinical union. X ray of calcaneum in Lateral and axial views were taken, with respect to height of calcaneum, width of the calcaneum, Gissane's angle and Bohler's angle to look for signs of radiological union.

The functional outcome was measured by the "American Orthopaedic Foot and Ankle Society (AOFAS) Ankle Hindfoot scoring system" and Maryland foot score (MFS), at three months and six months. The AOFAS scoring system is a very useful tool to measure function of the foot developed by the American Academy of Orthopaedic Surgeons (AAOS) and has been validated by various studies. The AOFAS score is 0-100 point scoring system mainly assessing the pain, function and alignment of the foot. The functional outcome decreases as the score decreases. The result was then graded as Excellent, Good, Fair and poor as follows

Excellent – 89 to 100 Points, Good – 79 to 89 points, Fair – 69 to 79 points, Poor – <60 points. According to Maryland food score(MFS) the functional outcomes are graded as Excellent to failure as follows: Excellent - 90-100 points, Good - 75-89 points, Fair - 50-74 points, Failure -50 points.



Fig 1: Skin incision site



Fig 2: Exposure of fracture and k-wire fixation



Fig 3: Fixation with plate



Fig 4: Assessment of Functional outcome

Results

The data contains measurement on 21 subjects whose age ranges from 22 to 54 years with mean age 37.90 ± 9.20 years, having intra articular calcaneal fractures who are admitted in Navodaya Medical College Hospital and Research Centre. Out of 21 patients, 8 (38.1%) patients were between the age of 40-49, 7 (33.33%) between 30-39, 3 (14.29%) between 20-29 and 3 (14.29%) between 50-59. All 21 (100%) were males. Comorbidities were not observed in 16 (76.19%) patients. Mode of injury was fall from height for 16 (76.19%) patients and RTA for 5

(23.81%). Left side was injured for 11 (52.38%) patients and right side was injured in 10 (47.62%) patients. distribution of subjects according to Essex Loprsseti in our present study 90.48% of the participants showed Joint depression Essex loprsseti and similarly 9.52% of them showed Tongue type Essex loprsseti. distribution of subjects according to Sanders's classification 38.10% of the participants showed sander's classification type-2 followed by 61.90% of them showed sander's classification type-3.

Table 1: Distribution of subjects according to functional outcome

Variables	Sub Category	Number of Subjects (%)
AOFAS Grade	Fair	2 (9.52%)
	Good	13 (61.9%)
	Excellent	6 (28.57%)

AOFAS Score	Mean \pm SD	85.05 \pm 6.27
	Median (Min, Max)	86 (71, 95)
MFS Grade	Fair	4 (19.05%)
	Good	15 (71.43%)
	Excellent	2 (9.52%)
MFS Score	Mean \pm SD	79.81 \pm 6.55
	Median (Min, Max)	79 (66, 90)

Table 2: Comparison of radiological outcomes over time

Radiological outcome	Time points		p-value
	Pre-Op Xray	Post Op Xray	
Bohler's angle	16.81 \pm 8.47 15 (0, 35)	27.52 \pm 5.55 28 (20, 38)	< 0.001 ^{W*}
Gissane angle	123.14 \pm 6.04 124 (112, 133)	114.38 \pm 5.46 115 (105, 125)	< 0.001 ^{W*}

As shown in table comparison of radiological outcomes over time From Wilcoxon test, it is observed that, there is significant difference in the distribution of Bohler's angle and Gissane's angle over time. Further, it can be observed that, the Bohler's angle of the operated patients has increased and the Gissane's angle of operated patients has decreased. The Bohler's angle pre-op Xray was found to be 16.81 \pm 8.47 and Post Op Xray was found to be 27.52 \pm 5.55 and its p-value was found to be <0.0001^{W*}. The Gissane angle pre-op Xray was found to be 123.14 \pm 6.04 and Post Op Xray was found to be 114.38 \pm 5.46 and its p-value was found to be <0.0001^{W*}.

Discussion

The aim of surgical treatment in calcaneal fracture is, Restoring the posterior facet of the subtalar joint's congruency, Restoring the height of the calcaneus (Bohler's angle); Reducing the width of the calcaneus; Decompressing the space beneath the fibula that the fibular tendons can use; Realigning the tuberosity into a valgus position; and Anatomically reducing the fractured calcaneus.

Wu *et al.*, 2012, from January 2004 to December 2009, 329 patients (383 feet) who were found in our hospital's trauma inpatient database as having DIACFs were retrospectively examined. From January 2004 to December 2006, 148 patients (170 feet) underwent open reduction and internal fixation (OR group).

Krishnaraj *et al.*, 2014, concluded that, open Reduction was used to treat 72 patients who had been hospitalised with displaced intra-articular calcaneal fractures

Conclusion

In conclusion, calcaneal fractures are frequently complex injuries. They are crucial due to the numerous problems and poor outcomes that result in considerable long-term disability in life. There have been significant breakthroughs in the knowledge and therapy of displaced intra-articular calcaneal fractures. Computed tomographic scanning has been a game

changer in understanding the pathological anatomy of these fractures, and two dimensional computed tomographic scans in both the coronal and transverse planes are advised. Sanders categorization, for example, is predictive of outcome based on computed tomographic scanning. Not all calcaneal fractures are treated the same way. Open reduction and internal fixation are used to treat displaced intra-articular fractures.

After sufficient preoperative planning, displaced intra-articular calcaneum osteosynthesis by open reduction and internal fixation with locking plate employing extensile lateral approach resulted in early functional recovery with acceptable results. The surgical procedure must be considered.

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