

Displaced calcaneal fractures treated by open reduction and internal fixation - A functional outcome

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Abstract

About 75 % of all calcaneal fractures are intra articular and have high rates of complications and poor outcomes. Regardless of the treatment, calcaneal fractures are associated with numerous complications and poor outcomes with significant long-term quality of-life issues. **Objectives:** To evaluate functional outcome of displaced calcaneal fractures treated by open reduction and internal fixation with calcaneal plating. **Material and Methods:** Using Sander's classification twelve patients of displaced calcaneal fractures mostly in the age group of 30-40 years were treated by open reduction and internal fixation with calcaneal plate. 11 patients were males and 1 was female. Patients were followed up for a period of two years and were evaluated by AOFAS score. **Observation and Results:** Most common cause was road traffic accident (75%). In post-operative period, 1 patient developed wound edge necrosis and 1 patient developed deep infection. At final followup, the average AOFAS score was 6 excellent (50%), 4 good (33.3%), 1 fair (8.3%) and 1 poor (8.3%) results. **Conclusion:** Open reduction and internal fixation of joint depression type calcaneal fracture using calcaneal plate gives good to excellent functional outcome in majority of patients.

Key Words: Calcaneal Fracture, Bohler's angle, Gissane's angle, Internal Fixation and AOFAS score.

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Received Date: 12/03/2018 Revised Date: 27/04/2018 Accepted Date: 20/05/2018

DOI: <https://doi.org/10.26611/1020631>

Access this article online

Quick Response Code:



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Accessed Date:
10 June 2018

INTRODUCTION

Calcaneum is the most frequently injured tarsal bone and accounts for about 1-2% of all fractures in the human body. Approximately 75% of calcaneal fractures are intraarticular involving the subtalar joint and are mostly caused by a fall from a height with the heel directly hitting the ground^{1,2}. These cases are also associated with other bony injuries in 22 % of cases. The classification of displaced intra articular fractures was based previously on intraoperative findings but later has moved to more

definite classification by computer tomography based on number and location of articular fragment^{3,4}. In the radiological assessment of calcaneal fractures two crucial angles are seen on the lateral radiograph of the calcaneus, Bohler's angle and the angle of Gissane⁵. Mechanism of injury remains a crucial factor in the outcome of intra articular fractures of calcaneum⁶. The conservative treatment of intra articular fracture leads to increase in morbidity due to incongruence of the articular surface, widening of the heel, loss of talar dorsiflexion, loss of talocalcaneal lever arm and peroneal tendon impingement⁷. Open reduction and internal fixation with plates is a better option to restore good functional outcome. Open reduction and internal fixation is the ideal treatment for Sanders type 2,3,4 by using proper surgical timing and technique leading to excellent results in more than 90% of patients avoiding majority of the complications⁸. The operative treatment of intraarticular calcaneal fractures with bone grafts could restore the Bohler's angle better and the patients could return to full weight bearing earlier⁹. The technique of plate fixation with a lateral approach is appropriate for fracture union

and functional outcome and also aids in anatomical reduction by correcting Bohler's and Gissane angles¹⁰. Surgical treatment through lateral approach with large plates and locking screws gives better stability but has the disadvantage of devascularisation of lateral wall of calcaneum and fragment of posterolateral joint facet¹¹. The treatment of choice for displaced and intra-articular calcaneal fractures is open reduction with internal fixation. However, soft tissue complications, such as wound dehiscence and infection can occur in up to 30% of the patients¹². In our study we evaluated the functional outcome of displaced calcaneal fractures treated by open reduction and internal fixation with plating. Some of the other studies said that there was no difference in outcome between operatively and conservatively treated displaced fractures¹³. Few of them concluded that the operative treatment of displaced intra articular fractures of the calcaneum by open reduction through lateral approach stable internal fixation and bone grafting have better results than conservative management and allows early mobilization and weight bearing¹⁴. Some of the studies concluded that restoration of Bohler's angle is associated with better outcome and subtalar arthrodesis may be considered in some patients for better functional outcome¹⁵. Objectives of the study are to evaluate Functional outcome, to evaluate Radiological outcome and to assess the Complications

MATERIALS AND METHODS

The present study was a prospective study conducted in the Department of Orthopaedics, in this institute on the patients who have sustained calcaneal fractures and met the inclusion criteria between October 2014 to September 2016. 12 patients with fracture calcaneum were treated with open reduction and internal fixation. Inclusion criteria are age group 21 -60 years, unilateral and bilateral closed and displaced calcaneal fractures. Exclusion criteria are age above 60 years, undisplaced calcaneal fractures (Sander's type 1), all compound calcaneal fractures and pathological fractures of calcaneum. All patients were selected from the admissions in the Department of Orthopaedics and the patients were counselled and consent was taken for their participation in the study. They were informed of all the possible complications of the surgery: superficial and deep infection, wound dehiscence, flap necrosis, malunion, painful hardware leading to removal of implant and prolonged immobilisation that can occur during or as a result of the surgery prior to their giving unconditional consent. As soon as these patients were admitted to the hospital history was recorded and detailed clinical examination was done. Radiographs of the foot and ankle including Broden's view and Harris beath axial view

were taken. CT scan especially axial cuts and 3D reconstruction films were taken in every case to rule out any intraarticular extension and for fracture classification.

RESULTS

Most common cause of injury was road traffic accident (75%) and fall from height(25%).Mean duration between injury and surgery was 5 days. In post-operative period, 1 patient developed wound edge necrosis and 1 patient developed deep infection. Bohler's angle and Gissane's angle at final follow up were between 20-30 degree and less than 130 degree respectively. At final follow up, the average AOFAS score was 6 excellent (50%), 4 good (33.3%), 1 fair (8.3%) and 1 poor (8.3%) results.

Complications: In our series one patient had wound dehiscence (8.33%) and another had deep wound infection (8.33%). The Cause is attributed to elderly age with diabetes.



Figure 1: CT IMAGES

Figure 2: POST OP X RAY

Table 1: Functional status at the end of 6 months as per aofas score

Functional Status	No of Cases	Percentage %
Normal	6	50 %
Restricted	4	33.33 %
Compromised Activities	2	16.67%
Functionally disabled	0	0 %
Total	12	100 %

Table 2: Results based on AOFAS (American Orthopaedic Foot and Ankle Society) Score at 6 Months

Sr. No	Result	Number of Patients	Percentage %
1	Excellent	6	50 %
2	Good	4	33.34 %
3	Fair	1	8.33 %
4	Poor	1	8.33 %
Total		12	100 %

DISCUSSION

The present study evaluates the outcome of displaced calcaneal fractures treated with conventional lateral approach and internal fixation with locking plates.

Majority of all calcaneal fractures are intraarticular. The mechanism of injury is axial loading in a majority of patients. The functional sequelae are serious, and therapy is economically demanding. Conservative treatment of intraarticular fractures very often leads to increased morbidity due to incongruity of articular surface, widening of heel, loss of talar dorsiflexion, loss of talocalcaneal lever arm and peroneal tendon impingement. The maximum age incidence in our study has been in age group of 31 - 40 (58.3%), with a mean age of 34.41 yrs and range between 21- 48 yrs. The average incidence in our study is 34.42 yrs which is close to the study by Michael Q. Potter *et al*⁶ which is 42 yrs and Vaclav Rak *et al*¹⁶ study has an average age incidence of 44 yrs. Cheng Long *et al*¹⁷ has reported an average age incidence of 68.5 and this high age is attributed to the study criteria of fractures of calcaneum in elderly only. In our study it is observed that male are more affected than females. The male predilection in our study is comparable to that of Aniruddha Pendse *et al*¹⁸. In our study common mode of injury was road traffic accident i.e., 75% that may be attributed to the occupational status of the patients with driver being most common and fall from height being 25%. However Aniruddha Pendse *et al*¹⁸ has reported 86.67% of the cases were due to fall from height and only 10% of the cases are due to road traffic accident. In Cheng Long *et al*¹⁷ (2016) study 30% of the cases were fall from height and 69.6% were road traffic accidents which is comparable to our observation. Majority of fractures in the present study are of Type 2 or Type 3 and constitute 100% of cases which was also observed in the study done by Cheng Long *et al*¹⁷ (2016). The present study has a joint depression fracture incidence of 83.33% and tongue

type as 16.67%. Aniruddha Pendse *et al*¹⁸ (2006) has reported joint depression fracture as 70% and tongue type to be 30% which may be comparable to our study. Our study has observed the values of average preoperative Bohler's angle of 80° and average post operative Bohler's angle of 260°. Aniruddha Pendse *et al*¹⁸ has reported average preoperative Bohler's angle as 100° and average post operative Bohler's angle is 300°. Vaclav Rak *et al*¹⁶ (2009) had reported average preoperative Bohler's angle as 4.03° and post operative Bohler's angle of 22.5°. Cheng Long *et al*¹⁷ had post operative Bohler's angle as 25.31° which are comparable and on expected lines. The average pre operative angle of Gissane in our study was 149° and post operative Gissane angle to be 121°. Aniruddha Pendse *et al*¹⁸ reported average post operative angle as 100°. Cheng Long *et al*¹⁷ reported average Gissane angle to be 117.5°. Our study statistics corresponds to the study done by Vaclav Rak *et al*¹⁶ which is 122.5°. In our study of 12 patients of displaced calcaneal fractures that were managed by open reduction and internal fixation with plate, excellent results were present in 6(50%) cases and good in 4(33%) cases when assessed by AOFAS score. Our study has good to excellent results in 83.3% which is comparable to Vaclav Rak *et al*¹⁶ (2009) 85%, Cheng Long *et al*¹⁷ (2016) 82%. Wound dehiscence is one of the complications. Deep infection is other complication noted in the present study and are comparable to other studies. Both the complications were managed conservatively and no secondary surgical procedures were required. Though a total of 20 cases of fracture calcaneum were received in this hospital during the study period, we could get only twelve (n=12) cases which met the inclusion criteria. A large number of cases would obviously help to analyze the results more scientifically.

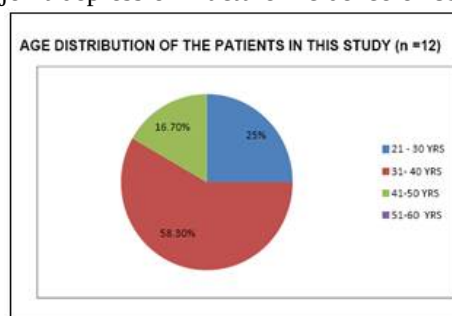


Figure 3

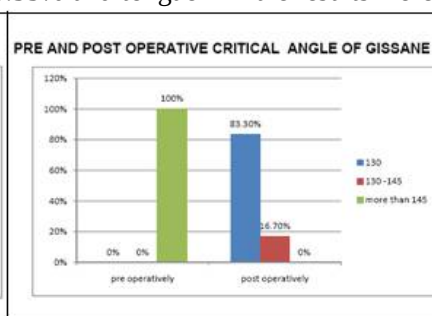


Figure 4

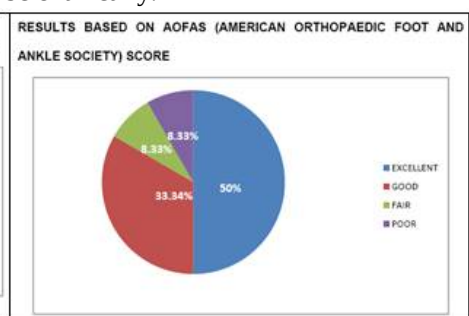


Figure 5

CONCLUSION

It is concluded that open reduction and internal fixation of Sander's type 2 and 3 fractures of calcaneum gives good results. It restores the anatomy of the calcaneum, and restores the patient's ankle and subtalar joint functions early. Hence from this study, it can be stated that surgical management is an excellent method for Sander's type 2

and 3 fractures of the calcaneum and gives good results in majority of patients. Careful soft tissue dissection is required because of possibility of infection. A large number of cases would obviously help to analyze the results more scientifically.

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