Study of Functional Outcome of Calcaneal Fractures with Percutaneous Cancellous Screws Fixation in Central Rural India

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Abstract

Background: Calcaneum fractures are nearly 2% of all adult fractures. Calcaneum is the main weight bearing bone in the foot. Mostly these fractures are caused by high energy trauma/fall from height leading to various patterns of fractures. There are various method of treating such fractures but due to high rate of complications by open reduction and internal fixation hence middle path regime shall be discovered for treating most important weight bearing bone. Inevitable malunion and arthritis due to conservative management can be avoided by percutaneous fixation.

Material and Method: A prospective retrospective review of 12 patients with 16 calcaneal fractures who had percutaneous reduction and screw fixation between January 2019 to April 2020 was done at at Shalinitai Meghe Hospital and Research center Nagpur. These cases were managed with 3-4 percutaneous cancellous screws.

Results: The results were assessed with Calcaneal fracture scoring system and Maryland foot scoring system and showed good to excellent functional results of complex intra-articular calcaneal fractures.

Conclusion: Percutaneous method of fixation with Cancellous screws is a far superior modality of treatment of calcaneal fractures in order to get better functional outcome with minimal complications.

Keywords: *CALCANEAL FRACTURES, traumatology, joystick.*

Introduction

Calcaneum is the main weight bearing bone in the foot. It bears and transmits 90% of the weight of body in different phases of gait cycle of human being. So, it plays very important part of lower limb function. So the fractures of calcaneum are most important when it comes to its functional results. The 3rd and 4th decade males (younger age group) are more affected due to their job profile[1] of all tarsal fractures 60% fractures are calcaneum. Calcaneum fractures are nearly 2% of all adult fractures[2]. Among fractures, 75% are intra-articular, and most proposed mechanism of injury is axial loading while fall from a height or a road traffic accident. . The important association of these calcaneal fractures is peculiarly with spinal fractures of thoraco-lumbar region

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which accounts for approximately 10%[3]. The bilateral calcaneum fracture injuries are 10% and open injuries are less than 5%.. The disability with calcaneal fractures leads to severe physical as well as financial burden. So these fractures are considered as most problematic since many decades [4]. Historically, treatment of displaced calcaneal fractures has varied from nonoperative management with or without closed reduction, to open reduction with internal fixation by various surgical approaches, to primary arthrodesis[5-10] Historically, most fractures were treated non-operatively because open reduction and internal fixation were associated with high complication rates and did not result in significantly improved outcomes. It's been reported that the infection rate is very high when open reduction and internal fixation is indicated leading to chronic osteomyelitis and permanent disability[11]. However, Conservatively treated patients have difficulty in maintaining fracture reduction leading to local complications like restricted movements, broadening of heel, moderate to severe pain, peroneal impingement and subtalar arthritis causing permanent disability and impaired gait[12-20]. Therefore, joystick reduction percutaneously by k wires and followed by percutaneous fixation could be the ideal option for displaced calcaneal fracture addressing both the above issues. Thus, we present a study to evaluate the results of percutaneous reduction and fixation with cancellous screws of displaced fracture calcaneum.

Materials and Method

A prospective retrospective review of 12 patients with 16 calcaneal fractures who had percutaneous reduction and screw fixation between January 2019 to April 2020 was in Dept. of Orthopedics at Jawaharlal Nehru Medical College, Datta Meghe Institute of Medical Sciences, Sawangi, Wardha in collaboration with Datta Meghe Institute of Medical Sciences, Shalinitai Meghe Hospital and Research center Nagpur. The patients were assessed with plain radiography. In developing countries like India, cost of medical treatment is often a concern, so computed tomography scan was not done as most of the patients were poor and did not afford the treatment. Standard calcaneal views were performed along with other views of the ankle and foot to find out other concominant fractures. Closed displaced calcaneal fracture were included in the study. All open calcaneal fracture and concomitant fractures were excluded from this study. The fractures were classified according to Essex-Lopresti classification system

- Essex-Lopresti 1952 (X-ray-based classification-lateral view foot)
- Extra-articular
- Intra-articular – Tongue type/Articular depression type.

As per our protocol, we operated all patients specifically in between 7–14 days, this golden period is due to subsidence of oedema around calcaneum till the wrinkle sign appeared. We have given RICE treatment for our patients. All Surgeries were performed without tourniquet under spinal anaesthesia, all patients were given injection ceftriaxone with sulbactam for antibiotic prophylaxis 20 min before starting surgery. Unilateral cases were done in lateral position and bilateral cases were done in supine position with 'figure of 4' leg. Using the image intensifier, percutaneous reduction of fracture fragments was done using 4mm k-wires, and fixation was done with 6.5 mm cancellous cannulated screws.

Post-operatively, a posterior splint given in neutral position of foot. Patients were kept non weight-bearing for minimum of 6 weeks and later ankle physiotherapy started after removal of splint. Follow up of patients were done on regular basis The patients were followed up at 6 weeks, 12 weeks and 24 weeks in the OPD. We allowed partial weight-bearing stand/walk at 6 weeks time and full weight-bearing at 12 weeks when radiological union is noticed. Functional assessment was done by calcaneal fracture scoring system by Kerr *et al*.[21] and functional outcome noted with Maryland foot scoring system[22] on questionnaire basis by questioning patients level of activity and pain control. All patients were listed in various subordinates on scoring basis of 90–100 (excellent), 80–89 (good), 65–79 (fair), and below 64 (poor).

Patient 1-28 years male
Pre op xray (lateral views) showing calcaneal fracture.

Right side-Intra-articular

Left side-Extra-articular + Intra-articular extension

Post op xray (axial views) showing Percutaneous fixation with Cancellous screws.

Right side

Left side

Results

Our study consists of patients aged between 21-65 years with mean age group of 43 years. Out of 12, 10 patients were male and 2 were female. The right calcaneum involved in 8 patients and 4 were left calcaneum with bilaterally involved in 2 patients. The mode of injury were due to fall from height. Among 12 patients,4 patients had associated spinal injuries in which 3 patients had wedge compression fracture of dorso-lumbar junction which were managed with rest, medications and LS brace and 1 patient underwent spinal fixation. All calcaneal fractures cases were listed on fracture pattern which was classified on the basis of Essex-Lopresti classification. 10 fractures were Tongue type and remaining 6 were Joint depression type. The average time of surgery was 7 days (ranges from 4–14 days). Mean follow-up was 24 weeks (range 12–36 weeks). No major complication were noted in our study. 2 patients developed superficial wound infection which was managed with regular wound care and antibiotic medications. Time to union was judged both radiologically and clinically, at an average of 12 weeks (range 10–14 weeks). The outcome assessed on 'Calcaneal fracture scoring system' is ranging from 62 to 92 with mean score of 77. The mean calcaneal fracture score was 87 (72–91) for all tongue- type fracture group and 73 (52–83) for all joint depression type group (P = 0.0034). The mean score is 73 on 'Maryland foot scoring system', with 86% of patients have achieved fair to excellent results. The mean functional score was 83 (42–91) for the tongue-type group and 61 (52–73) for the joint depression type group (P = 0.002). A significantly better functional outcome is noted in group with tongue-type fracture fixation when compared to joint depression type fracture fixation.

Discussion

In our study, 86% patients were between 21 and 65 years of age. Four patients had associated spine fracture which accounts for around 33%, which is higher when compared to other studies, but this can be explained by mode of injury being fall from height in all the 12 patients. As fall from height is also the commonest cause of wedge compression fracture in dorso-lumbar spine. Essex-Lopresti classified displaced intra-articular calcaneal fractures as either tongue type or joint depression type, based on secondary fracture line pattern passing through the posterior facet. He suggested that nondisplaced fractures be treated nonsurgically. Displaced tongue fractures are best treated by percutaneous pin fixation, using a large posterior reduction tool for closed reduction. Joint depression fractures require surgical reduction because of fracture impaction. Essex-Lopresti classification is X-ray-based classification system for calcaneal fractures, and we assess the fractures only on X-rays due to economic constraints. Furthermore, we compared the outcome of both tongue-type and articular depression-type fracture managed with percutaneous reduction and fixation. Kitaoka *et al,*[23] in his study treated conservatively 16 of 27 patients with plaster, most of these patients showed difference in gait pattern which was observed while walking specially on uneven ground. So this study states the conservative management of calcaneal fractures gives fair to poor results in most of their patients. O'Farrell *et al*[24] compared equal number of surgical and conservatively managed patients which suggested superior results in surgically treated patients. Similar study with long follow up of 3 years done by Si Leung *et al*. [25] showed superior results with surgical outcome then patients who are managed with conservative method.

The most authors suggest that the surgery is advisable after occurence of wrinkling which usally expected between 7- 10 days post injury when oedema subsidence occurs. According to study conducted by Sander[26] the results were fair to poor if surgery is executed after 2 weeks post injury and optimal outcome seen in cases which were operated in between 7 and 10 days injury26 The study by Weber *et al*[27] in which 50 cases of displaced intra-articular calcaneal fractures manged with different modalities of treatment, which showed complications like deep soft tissue infection and wound dehiscence due to loss of vascularity. Damian Griffin *et al*[28] in his study of 151 cases with calcaneal fractures showed the ate of complications and re-surgeries and wound complications were much higher after treatment of displaced intra-articular calcaneal fractures with open reduction. Similar results were also seen by authors like Essex-Lopresti and Tim Schepers *et al*. [29] who concluded that percutaneous cancellous screws fixation after joystick reduction is a good modality. Though the results were not similar in tongue-type and articular depression-type of calcaneal fractures, the percutaneous fixation shows optimal results in displaced intra-articular fractures of calcaneum. The tongue-type fractures showed much better results than articular type calcaneal fractures with Maryland foot score as well as calcaneal fracture scoring system . The joint depression

type fracture group depicted mean calcaneal fracture score of 73, whereas the mean score was 86 for the tongue-shaped type fracture group (P = 0.0034). The mean functional score was 83 for the tongue-shaped type fracture group and 61 for the joint depression type fracture group (P = 0.002).

CONCLUSION

Percutaneous cancellous screw fixation after joystick method of reduction under image intensifier in displaced closed calcaneal fractures both intra articular as well as extra articular gives good to excellent results. This method proves to be beneficial in terms of soft tissue management and functional outcome as compared to open reduction and internal fixation which showed wound dehiscence in many cases and conservative method which also showed poor functional outcome because of inevitable malunion.

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Conflict of Interest: Nil.

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