



Original article

Patient satisfaction after open reduction and internal fixation through lateral extensile approach in displaced intraarticular calcaneal fractures (Sander's type II and III)



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ABSTRACT

Aim: To determine patient satisfaction in the patients of displaced intraarticular calcaneal fractures treated with standard lateral approach.

Method: The patients of displaced calcaneal fractures (Sander's type II and III) treated between March 2009 and March 2012 were included in the retrospective review and functional outcome was evaluated using American Orthopaedic Foot and Ankle Society (AOFAS) hind foot score, Creighton Nebraska Health Foundation Assessment (CNHFA) scale and foot function index (FFI).

Result: The cohort included 26 patients (19 males: seven were females) with a mean age of 38.16 ± 13.53 years (range 18–64 years). The mean period of follow-up was 24.42 ± 6.68 months. The patients achieved good functional scores after anatomical reduction of the fracture. The complication rate was low following strict inclusion criteria.

Conclusion: Careful patient selection in displaced intraarticular calcaneal fractures treated through lateral extensile approach achieves good patient satisfaction.

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1. Introduction

Calcaneal fractures constitute the majority of the tarsal bone fractures.¹ The intraarticular involvement is present in 3/4th of the cases² and usually there is associated heel widening with varus deformity, decrease in calcaneal height and incongruity of subtalar joint.³

Surgical management of these fractures with open reduction and internal fixation can restore the anatomical parameters of the calcaneum with normal subtalar joint motion.^{4,5} It is also associated with lower incidence of subtalar arthrodesis and shorter time off from the workplace.⁶ On the other hand, non-operative treatment of intraarticular fractures with loss of Bohler's angle consistently results in poor functional outcome.⁷

However, open reduction is not advised univocally in displaced intraarticular fractures of calcaneum as in other parts of the body and there is ambiguity in management of these cases.^{8,9} In addition to articular damage and foot widening, there is damage to medial and lateral soft tissue envelope.¹⁰ Sander's et al.¹¹ in their case series of 120 patients had reported wound dehiscence in eight patients and required flaps to cover wound in five patients. Three patients had to undergo below knee amputation in the same series. The incidence of wound complications can be reduced with the appropriate selection of patients.¹²

Displaced intraarticular calcaneal fractures (DIACFs) are associated with substantial morbidity across all age groups. The perception of health care provider and patient can be different regarding the final outcome. Patient satisfaction is increasingly being given importance with achievement of radiological parameters. During the past few decades, there has been shift of focus from surgeon satisfaction to patient satisfaction.

The purpose of the current study was to evaluate the functional outcome, patient satisfaction and complications after open reduction and internal fixation through lateral extensile approach in Sander's type II and III displaced intraarticular calcaneal fractures (DIACFs).

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2. Patient and methods

The study was conducted at level 1 trauma centre with the approval of ethics committee of the institution. The study was performed in accordance with the ethical standards of the 1964 declaration of Helsinki as revised in the year 2000. The DIACF was defined as those with more than two millimetres of displacement of subtalar joint, decreased Bohler's angle or increased Gissane's angle, valgus deviation of greater than 10°, varus deviation of greater than 5° and widened heel. Sander's classification system was used to categorise the calcaneal fractures.¹¹

Patients excluded from the study were the following:

- (1) Patients treated non-operatively.
- (2) Open calcaneal fractures.
- (3) Bilateral calcaneal fractures.
- (4) Prior involvement of ipsilateral foot and or ankle due to surgery or arthritis.
- (5) Undisplaced intraarticular, Sander's type IV and extraarticular calcaneal fractures.
- (6) Patients with peripheral vascular diseases, skin infection and compartment syndrome.
- (7) Those who had sustained neurologic deficit with head or spinal injury and associated lower limb fractures.
- (8) Patients with diabetes mellitus and known smokers.

The inpatient record of patients with DIACF treated with open reduction and internal fixation between March 2009 and March 2012 was searched from the medical record section of the institution. The hospital record included clinical history sheet and operative notes. They were studied for demographic data, mode of injury, delay in surgery, treatment given, complications of either the fracture or treatment and revision surgery if any required. The data regarding comorbid conditions, associated limb injuries and side of injury were also collected. The patients were contacted by telephone provided in the medical record section of the institution and also by letter. They were asked to come up to the hospital for one additional visit. All patients were provided with informed consent for participation in the study.

A total of 36 patients of DIACFs fulfilled the inclusion criteria. One patient had died due to associated cardiac problem; six patients could not be located and three patients were not willing to participate in the study. So, twenty-six patients were included in the study.

Among the 26 patients included in this study, 19 were males and seven were females. Their average age was 38.16 ± 13.53 years (range 18–64 years). The mean period of follow-up was 24.42 ± 6.68 months. The right side was involved in ten cases and the left side was involved in sixteen cases. The mechanism of injury was motor vehicle accident (MVA) in seventeen patients and a fall from height in nine patients. Nine patients had associated upper limb and axial skeletal injuries. Delay in surgery was defined as time interval between injury and surgery. Delay in surgery was influenced by late referral from the primary or secondary care centres and wait period until subsidence of swelling.

All the selected cases were taken up for surgery after the subsidence of soft tissue oedema and appearance of wrinkle sign in the hind foot (range 6–29 days, mean 13.5 ± 5.06 days). The operative procedures were performed under general or spinal anaesthesia, with the patient placed in lateral decubitus position. The lateral extensile approach and locking plates were used to treat the fracture. The bone graft or bone graft substitutes were used by the operating surgeon as per his discretion. The artificial bone graft in the form of calcium hydroxyapatite (G-bone, Surgiwear Pvt. Ltd. Shahjahanpur, India) was used in the five cases and autologous bone graft was not used in any case. Postoperatively, the limb was elevated

and actively assisted along with active movements at subtalar joint that were started under the supervision of a physiotherapist as per the comfort of the patient. Strengthening exercises for the muscles of foot and ankle were started at one month postoperatively. Gait training was started at 10 weeks and full weight bearing was allowed at three months.

The follow-up radiographs were taken immediately in the postoperative period, at six weeks, twelve weeks and at one-year follow-up (Fig. 1). The radiographs included lateral, Broden and Harris axial view. Bohler's angle was measured by a manual standard goniometer by placing it over the lateral radiograph of the hind foot and comparing it with the angle measured in uninjured foot. This method of angle measurement is reliable and validated.¹³ The criteria described by Sander's et al.¹¹ was used to assess subtalar joint reduction. However, for the purpose of grouping, the results were tabulated as anatomic, near anatomic and non-anatomic (includes approximate and failure of reduction) as per Sander's criteria. The hind foot alignment was calculated as varus, valgus or neutral with respect to long axis of calcaneum relative to long axis of leg (Fig. 2).

The functional outcome was evaluated using American Orthopaedic Foot and Ankle Society (AOFAS) hind foot score,¹⁴ Creighton Nebraska Health Foundation Assessment (CNHFA) scale¹⁵ and foot function index (FFI).¹⁶ The AOFAS ankle hind foot score consists of two sections: objective section to be completed by surgeon and subjective section completed by the patient. The maximum attainable score is 100. The functional outcome was defined as excellent with score between 90 and 100, good between 75 and 89, fair ranging within 50 and 74 and poor as less than 50 points.

Creighton Nebraska Health Foundation assessment (CNHFA) scale is specific for assessment of calcaneal fractures. It is a 100-point questionnaire about pain during activity and rest, subtalar range of motion, change in shoe size, hind foot swelling and patient's ability to return to work. The maximum possible score is 100 points. A score between 90 and 100 points is considered excellent, 80 and 89 is considered good, between 65 and 79 indicates fair result and less than 64 points is indicative of poor outcome.

Foot function index was designed to measure the effect of pathology on the function of foot with respect to pain, disability and activity restriction. It consists of 23 items divided into three subscales. The pain and disability subscale consists of nine items each, while activity limitation subscale has five items in the questionnaire. For each question, a score is assigned on a scale of zero indicating no difficulty or pain and ten denoting worst imaginable pain or difficulty and requiring help. The total of three subclasses lies between zero and 100. The lower scores denote good functional outcome while higher scores represent poor outcome. All the three outcome measurement scales (AOFAS, CNHFA scale and FFI) are reliable and validated.¹⁷

2.1. Statistical analysis

The end point of study was the findings noted at the time of last follow-up. Data were analysed by using Student's *t* test and correlations were analysed using the Pearson correlation coefficient. The statistical significance was determined at *p* value less than 0.05. With a sample size of 26, a beta of 0.2 and an alpha of 0.05, there was sufficient power to detect a difference of more than 10 points in CNHFA, AOFAS and FFI scales.

3. Results

Twenty-six patients participated in the retrospective cohort study, and among them, eleven patients had sustained Sanders type II fracture (group A) and fifteen patients had Sanders Type III

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