

Evaluation of Radiological and Functional Outcome of Calcaneum Fractures using Essex-Lopresti Technique of Reduction

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Learning Points for this Article

This article states about various treatment modalities about management of the calcaneum fractures, it shows that non-displaced fractures can be treated conservatively and also Bohler's and Gissane's angles should be maintained post-operatively to have a good functional outcome.

Abstract

Background: Calcaneum fractures account for approximately 2% of all fractures, with displaced intra-articular fractures comprising 60-75% of these injuries of which 10% have associated spine fractures and 26% are associated with other extremity injuries. Several authors have reported that patients may be totally incapacitated for up to 3 years and partially impaired for up to 5 years post injury, Although modern surgical techniques have improved the outcome, controversy still exists regarding classification, treatment, operative technique, and post-operative management.

Materials and Methods: 28 out of 31 cases were analyzed prospectively and retrospectively from July 2011 to August 2013 after local ethical and scientific clearance. Three patients had lost to follow-up. All patients with calcaneum fractures above age of 18 with either simple or open injuries were included in the study, excluding pediatric and complex injuries. All patients were clinically evaluated and Bohler's, Gissane's angles were calculated preoperatively. All patients were treated with one of the modalities, which include conservative, Steinmann pinning, and Calcaneum plate fixation. All patients were followed up in outpatient basis fortnightly for 3 months and on 6th month and 1 year respectively, to check signs of union of fracture, subtalar movements, and complications if any. After radiological evaluation, functional outcome assessment was done using American Orthopaedic Foot and Ankle Society

Results: Mean age was 35.1 with range 20-52 years, male to female ratio of 9:1. 85% were due to high-velocity trauma. The most common type of injury was tongue type. Preoperative mean Bohler's and Gissane's angles which were about 14.87 and 121.5 degrees respectively, the improved angles postoperatively were 25.68 and 104.37 degrees. One patient had heel pain, one patient had residual edema, one patient developed subtalar and ankle stiffness, there was one case of tendocalcaneus weakness, one with broadening of heel, and one case of wound infection.

Conclusion: Undisplaced or minimally displaced calcaneum fractures are best-treated conservatively with cast immobilization for 6 weeks. Essex-Lopresti technique of reduction was superior technique for displaced fractures and achievement of Bohler's and Gissane's angle to the after reduction was judgemental for optimal functional outcome.

Keywords: Calcaneum, Essex-Lopresti, functional outcome.

Introduction

Fractures of the calcaneum are among the most challenging fractures for the orthopedic surgeon. Calcaneum fractures account for approximately 2% of all fractures, with displaced intra-articular

fractures comprising 60-75% of these injuries [1, 2]. Of patients with calcaneum fractures, 10% have associated spine fractures, 26% are associated with other extremity injuries. 90% occurs in males between 21 and 45 years of age, with the majority being in industrial workers:

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Thus, the economic implications of this injury are substantial [2]. Several authors have reported that patients may be totally impaired for up to 3 years and partially impaired for up to 5 years post injury. Although modern surgical techniques have improved the outcome in many patients, controversy still exists regarding classification, treatment, operative technique, and postoperative management [3]. The controversy between conservative and operative management remains because of improper and inadequate knowledge of fracture anatomy due to improper imaging, variation in the treatment with respect to mobilization, weight-bearing considering cancellous nature of the bone [4]. In this study, an attempt has been made to put forward comparative evaluation of management of fracture calcaneum with respect to conservative, and operative management for decision-making and selection of cases for conservative and operative management.

Materials and Methods

The study was conducted at a Medical College, Hospital and Research Centre, which was a tertiary referral center, between July 2011 and August 2013. 31 cases were studied both prospectively and retrospectively after taking the local Ethical Committee clearance. 3 patients had lost to follow-up, remaining 28 were included in the study. All patients with calcaneum fractures within age groups from 18 years and above, which included both the sexes, irrespective of whether simple or open injuries were included in the study. Pediatric injuries and grossly comminuted fractures were excluded from the study. All the cases on admission were subjected to detail history, radiological, and clinical examination. Orthogonal views of the foot and axial view of the calcaneum were taken, Bohler's and Gissane's angles were measured preoperatively and below knee plaster slab was given. After pre-operative evaluation patients were treated according to the fracture classification. Bohler's and Gissane's angles were maintained intraoperatively and stabilized with the cast. Operative management was done using closed reduction + Steinmann pin/ Cannulated cancellous (CC) screw fixation with casting. All the patients were followed up in outpatient department every 15 days for a period of 3 months then followed up at 6 months and at 1 year postoperatively. Early mobilization of the patients was started from day 4 with partial weight bearing with bilateral axillary crutches or walker. Patients treated conservatively were immobilized in a below-knee plaster cast for 6 weeks, after removal the patients were clinically judged for signs of union, movements of ankle and subtalar joint and complications. Radiological assessment was done to confirm the process of union and then partial weight bearing was allowed along with physiotherapy. At follow-up visits at 3 months, 6 months and 1-year assessment was done for ankle and subtalar movements and broadening. Radiologically assessed for Bohler's and Gissane's angle.

Patients who were treated operatively with Steinman's pin, nonweight-bearing walking allowed after 4 days post-operatively, Steinmann pin was removed and cast was reinforced at 1 month with complete immobilization of ankle joint for 6 weeks. Clinical and radiological assessment was done at each follow up. Functional outcome of all the patients irrespective of mode of treatment was checked with American Orthopaedic Foot and Ankle Society (AOFAS) score by Kitaoka and graded accordingly..

Results

Out of 31 patients in the study, three patients had lost follow-up, remaining 28 patients were included in the study. In our study, the mean age of the patients was 35.1 years with range (20-52) with peak incidence in the age group of 21-30 years (32.5%) with a male: Female ratio of 9:1. We recorded 85% patients with history of fall from height followed by 7.5% due to vehicular accidents. Out of 28 patients in our study, 14 were of tongue type and 14 were of joint depression type, treated with both conservative and operative methods. Accordingly our study included 50% of patients of each type. The mean Bohler's and Gissane's angles were about 14.87 degrees and 121.5 degrees, respectively, those were improved postoperatively as 25.68° and 104.37° respectively. Out of 28 cases, 1 patient had heel pain, 1 had residual edema after 6 weeks of treatment, one had subtalar and ankle stiffness, 1 out of 28 had tendocalcaneus weakness, 1 had broadening of heel, and lastly one (4%) had wound infection with no evidence of subtalar arthritis. According to AOFAS scoring system by Kitaoka, out of 28 patients in our series, 66% patients had excellent result, 22% patients had good results and 8% patients had fair results whereas 4% patients showed poor results as functional outcome comparatively much higher than literature. In our study, radiological evaluation was done after measuring pre-operative and post-operative Bohler's angle and crucial angle of Gissane's. Restoration of both these angles fully was observed in 75% cases.

Discussion

Mean age of the patients was 35.1 years, which ranged between 20-52 years, peak incidence was between 21 and 30 years. Majority of the fractures occurred in the age group of 21-50 years, this can be attributed to the active lifestyle of the patients in this age group. Pillai *et al.* [5] reported a mean age of 39.1 years (19-63), Silva *et al.* [6] reported mean age of 41.41 years with range 20-60. Majority of our patients were male (25) with a male-to-female ratio of 9:1 comparable to 4:1 of Pillai *et al.* [5] and 8:1 by Silva *et al.* [6]. This can be attributed to our typical Indian setup where the male population largely works outdoors making them more prone to fall from heights or vehicular accidents or bump from below or assault. Calcaneum fracture was a result of high-velocity trauma. The most common mode of injury was fall from height. It was found that the increased modernization, mechanization and industrial development made more accidents. Increase in the population was also reason for the same. In our study, we recorded 85% patients with history of fall from height followed by 7.5% due to vehicular accidents, 5% due to bump from below and 2.5% due to assault comparable to 80% due to fall from height by Pillai *et al.* [5], 98.59% by Silva *et al.* [6], whereas Meraj *et al.* [7] reported 85% due to fall from height and 15% due to vehicular accidents. In our study, 14 each fracture type were of tongue type and joint depression type respectively, treated with both conservative and operative methods. Silva *et al.* [6] reported 22.54% patients were of tongue type and 77.46% were of joint depression type. The mean Bohler's and Gissane's angles were 14.870° degrees and 121.50° degrees respectively, and the improved angles postoperatively calculated as 25.68° and 104.37° simultaneously comparable to the study done by Meraj *et al.* [7] who reported 5.130° and 113.570° respectively preoperatively which improved postoperatively to 20.27° and 104.9°. Restoration of Bohler's as well as Gissane's angle fully was observed in 75% cases. Yip-Kan and

Yuen-Fong [8] described showed restoration of Bohler's angle in 52% of cases and crucial angle of Gissane's in 68% of the cases. We observed 1 out of 28 patients had heel pain, 1 had residual edema after 6 weeks of treatment, 1 had subtalar and ankle stiffness, 1 had tendocalcaneus weakness, 1 had broadening of heel. Pin tract infection was seen in one patient accounting to 4% of the total. Meraj et al. had an incidence of wound infection in 14% cases [7]. Pillai et al. reported only 1.5% of the wound infection [5]. Stulik et al. [9] reported 8.3% wound infection rate. El-Khalifa et al. [10] reported 5% of wound infection. Subtalar and ankle stiffness were one of the common complications after the surgery for calcaneum fractures. Physical therapy should be initiated to obtain full range of movements as much as possible. In our study, we reported 4% patients having subtalar and ankle stiffness after the surgery. Stulik et al. [9] reported pain and stiffness of subtalar and ankle in 12.9% of patients. Functional scoring done by AOFAS scoring system by Kitaoka, 64% patients had excellent result, 22% patients had good results, 8% patients had fair results whereas 4% patients showed poor results. Silva et al. [6] in their study, according to AOFAS scoring system reported, 18.32% of patients had excellent results, 40.84% patients had good results, 14.08% came with fair results and 26.76% showed poor result. In a study by El-Khalifa et al., [10] the results

were excellent in 27% of patients, good in 52% of patients, fair in 15%, and poor in 6% of patients of the calcaneum fractures.

Conclusion

We conclude that undisplaced or minimally displaced calcaneum fractures are best-treated conservatively with cast immobilization for 6 weeks. Essex-Lopresti technique of reduction is best technique for displaced fractures and achievement of Bohler's and Gissane's angle after reduction is important for optimal functional outcome.

Clinical Relevance

Fractures undisplaced or minimally displaced are best treated by below knee plaster of Paris cast for 6 weeks followed by physiotherapy. Commonly seen complications of fracture of calcaneum are broadening, residual edema after daily long work and wound infections but these were least common by this procedure. Fractures with tongue type or joint depression type can best be treated by modified Essex-Lopresti technique of reduction with Steinman pin and cannulated screw incorporated in below knee plaster cast after achieving normal Bohler's and Gissane's angle with early nonweight-bearing mobilization for 6 weeks.

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Conflict of Interest: NIL
Source of Support: NIL

How to Cite this Article

Kharat AA, Biraris SR, Chikhalikar PP, Ali S, Goud GKN. Evaluation of Radiological and Functional Outcome of Calcaneum Fractures using Essex-Lopresti Technique of Reduction. *Trauma International* Sep-Dec 2017;3(2):28-30.