



Sinus tarsi approach for displaced, Intra-articular Calcaneal Fractures

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Introduction

The Calcaneus is the largest bone of the foot and is the major weight bearing osseous structure of the foot¹. Calcaneal fracture fixation is regarded as one of the serious orthopaedic problems fraught with many complications ranging from osseous, soft tissue related and morbidity sometimes very high^{1,2,3}.

Calcaneal fractures make up to 2 percent of all fractures, with a displacing intra articular fractures comprising 60 percent to 75 percent of these injuries^{2,4}. There is a substantial economic implications associated with these fractures with as many 20 percent of people remain functionally incapacitated for up to three years after injury⁵.

With introduction of calcaneal plates in 1980, open reduction and internal fixation became standard^{5,6}. But these were associated with high complication rates ranging from wound dehiscence, osteomyelitis, personal tendinitis, sural nerve injury, fibular abutment, calcaneocuboid arthritis, stiff foot and toes, weak gastrosoleus complex, fixed flat foot, chronic heel pain and complex regional pain syndrome^{3,7,8,9}.

Wound dehiscence and infection are particularly unique to this procedure^{2,6}.

Conservative management has its own problems like subtalar osteoarthritis, subfibular impingement, complex regional pain syndrome and it seems logical to restore calcaneus to its anatomical contours^{7,10,11}.

Minimally invasive osteosynthesis using sinus Tarsi approach can be a procedure between open reduction internal fixation using lateral extensive approach and conservative management^{1,3,4,12}. It's advantages are restoration of anatomical contours of calcaneum like calcaneal height, width, restoration of calcaneal length, visualisation of posterior facet and no need for extensive lateral approach and no guilt of not restoring anatomy as in conservative treatment^{13,14}.

Materials and Methods

The study was conducted at bone and joint hospital barzullah Srinagar from January 2015 to January 2017.

The inclusion criteria were as follows:

1. Age group 20 to 60

2. Duration of injury within 3 weeks of trauma
3. Sanders types II, III, IV
4. Closed calcaneal fractures

Exclusion criteria

1. Age less than 18 and greater than 60
2. Extra articular fractures
3. Sanders type I fractures
4. Associated major fractures which hampers postoperative rehabilitation
5. Patients with associated neurological disorders
6. Bilateral calcaneal fractures

After admission to hospital all necessary investigations were carried out, particularly CT SCAN with coronal and axial images were analysed to determine displacement of the articular surface of posterior facet and number and location of articular fracture fragments. Fractures were classified according to SANDERS CLASSIFICATION for calcaneal fractures.

Operative technique

All patients were operated under Spinal Anaesthesia and Tourniquet control. Patients were draped and operated in lateral decubitus position. Image intensifier was kept standby and operated by expert Radiographer who is proficient in taking all views of Calcaneus.

A 2 cm incision was given over sinus tarsi. The deep soft tissues were divided carefully to protect the Sural Nerve. Posterior facet was exposed and elevated under vision. Provisional fixation was done with K wires. Once articular surface was restored, a subchondral screw was passed from lateral to medial in posterior to anterior direction directed towards sustentaculum tali. Final screw position is confirmed by taking proper radiographic views.

Next Steinmann pin was passed from medial to lateral in calcaneal tuberosity with equal lengths of pin on either side of tuberosity. Traction was applied on pin and at same time valgus stress was applied to correct varus deformity. While

maintaining traction on pin and calcaneal height, length and heel position restored, provisional fixation done with K wires. And finally two parallel screws were passed from posterior to anterior part of calcaneum for fixation, and its position confirmed on image intensifier. Wound was closed and below knee cast applied for 3 months with absolute non weight bearing on the involved side.

Postoperative care Final assessment was done at nine months with following considerations
A. Clinical assessment was according to American Orthopaedic foot and Ankle society (AOFAS) hind foot score^{1,2,5,6,15,16,17}. This scoring was graded as follows:

Excellent: More than 90

Good: 80-90

Fair: 70-79

Poor: Less than 69

B. Radiographic outcome

Observations and Results

This study was conducted on 60 patients from January 2015 to January 2017 with minimum follow up of 9 months and maximum of 29 months with average follow up of 16 months. Age distribution Most patients were in age group of 30-39 years(50%), second commonest was age group 40-49 years. Youngest patient was 20 years and eldest was 60 years.

We operated on 60 percent of male patients and 40 percent of female patients. we operated on left side in 57 percent of patients and on right side in 43 percent of patients.

We had 17 percent Sanders type II, 47 percent were Sanders type III, and 36 percent were type IV. Injury to surgery interval ranged from 3 days to 12 days, average injury interval was 6.6 days. Surgery time was average of 45 minutes. About 90 percent of patients were discharged next day after operation. All patients were kept nonweight bearing for a period of 12 weeks.

Outcome scores

We used AOFAS scale for clinical evaluation of the ankle and hind foot. We achieved excellent

results in 30 percent and good in 57 percent and fair in 13 percent of cases.

Fair results in our study were in patients where complete anatomic fixation was not achieved (7%).

Complications

We had no case of wound infection or skin related problems, No case of non union.

We had complication in the form of not able to achieve anatomical contours which was most of times a surgeons inability to follow surgical steps. We had decreased heal height in 10 patients, heel broadening in 7 patients and subfibular impingement in 5 patients which was symptomatic in 1 patient only.

Discussion

Calcaneal fractures are devastating injuries with lot of morbidity associated both with conservative and operative treatment^{1,18}.

Restoration of calcaneus to its pre-fracture contours is the goal of operative treatment^{19,20}. Restoration of calcaneal height, length, articular facet congruence is important for optimal results but one cannot ignore soft tissue respect, and the punishment which patient and operating surgeon goes through, if soft tissue problems arise^{21,22}.

Lateral extensible approach is used for open reduction internal fixation of intra articular calcaneal fractures^{23,24}. But it has many tormenting complications especially of soft tissues and wound complications reported as high as 50% by some studies^{12,25,26}. Lateral extensible approach may cause lateral flap necrosis due to poor blood supply, may be associated with nerve injuries (sural nerve injuries) and infection^{27,38,29}. Conservative treatment has its indications but it appears logical to restore calcaneus to its pre injury parameters when they are disturbed by fracture. There are many theories to explain poor results of non operative management most important being non anatomical reduction^{18,30}. Minimally invasive method using sinus Tarsi approach is intermediate between conservative

and operative reduction with lateral extensive approach^{1,9,16}.

It's modus operandi of action is to restore calcaneal dimensions with focus on restoration of calcaneal height, length, heal position and operative reduction of posterior facet not by indirect method but under supervision of surgeons eye^{2,16,18}. These things cannot be achieved by conservative treatment and this is where it takes precedence compared to conservative treatment. We don't need extensive dissection to achieve reduction and avoid many complications of lateral extensive approach^{19,31}.

It takes less time for operating using this technique, less blood loss, no incidence of nonunion, low complication rate, bone graft was never used, And drastically reduced infection rate, no painful and ugly scars^{32,33}.

Summary and Conclusion

Minimally invasive calcaneal fracture management is excellent option for operative treatment of calcaneal fractures and is excellent option comparable to open reduction and internal fixation. It has fewer complications and is almost devoid of soft tissue problems.

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