



## A PROSPECTIVE OBSERVATIONAL STUDY OF THE FUNCTIONAL OUTCOME OF SURGICAL MANAGEMENT OF INTRA-ARTICULAR CALCANEUM FRACTURE BY CLOSED REDUCTION WITH PERCUTANEOUS PINNINGS

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### ABSTRACT

The calcaneum is the greatest bone of the foot and is the major weight-bearing structure of the foot and the most common tarsal bone to fracture. Many treatment techniques are described in the literature but indications for specific techniques are undefined. This study analyzes the outcome of the treatment of intra-articular tongue-type calcaneum fractures treated by Essex-leproesti technique. **Methods-** This prospective observational study aimed to evaluate the functional outcome of tongue-type intra-articular fracture by closed reduction with a percutaneous Steinmann pin. 16 patients with intra-articular tongue-type fracture were treated in Indra Gandhi government medical college and hospital, Nagpur from December 2020 to December 2022 with a minimum follow-up of 6 months. the functional outcome was assessed by the AOFAS Score. Most common cause for injury is fall from height. All patients were managed surgically and out of 16 patients, 4 cases(25%) had excellent, 9 cases (56%) had good and 5 cases (19%) had fair results. None of the patients in this series had poor results. As per our experience, the time for surgery is short and it can easily be performed even in the presence of swelling in the period immediately after injury also the risk of infection is very low.

**KEYWORDS :** Tongue-type Calcaneum Fractures, Minimally Invasive, Steinmann Pin

### INTRODUCTION

The calcaneum is the greatest bone of the foot and is the major weight-bearing structure of the foot(1). It is one of the components of the tritarsal articulation and has major role in normal ambulation.

The subtalar joint is the interface between the calcaneus and talus and is a primary load bearing joint of the foot. In some cases, additional joint surfaces may be affected (the calcaneal cuboid joint) but are not that important due to their limited weight bearing roles (2).

The economic impact becomes even more apparent when one considers that 20 percent of patients may be incapacitated for up to 3 years following the fracture and many are still partially incapacitated as long as 5 years after the fracture(3)

Patients mostly complain of a painful, swollen and bruised heel and arch of the foot. Significant swelling may lead to blistering of the skin. Approximately 15% of all calcaneal fractures have an associated open wound and 5% to 10% involve both the heels(4).

Historically a burst fracture of the calcaneus was coined a "Lovers Fracture" as the injury would occur as a suitor would jump off a lover's balcony to avoid detection (5,6,7).

One of the morphological variants of calcaneal fractures is the tongue-type fracture, which represents a unique pattern of injury to the bone and soft tissues.

Tongue-type fractures make up 25–35% of intra articular calcaneal fractures [6,9]. The management of this fracture is distinctly different from other calcaneal fractures, a urgent surgery may be required [10].

### MATERIALS AND METHODS

This was a prospective observational study at the Department of Orthopaedics; Indra Gandhi government medical college and Hospital Nagpur, from December 2020 to December 2022. Records of 16 patients diagnosed with tongue-type intra-articular calcaneum fractures between the age group of 11 to

55 yrs were included in this study. 16 cases of either sex were taken up for the study. Patients were well informed about the study in all respects and informed written consent was obtained. The period of follow up minimum 6 months.

All patients coming to the trauma center initially given first aid in the form of splinting (below knee slab), supportive care analgesics, iv fluids, limb elevation, ice application, and routine investigation were carried out.

Radiological analysis was done by anterior-posterior, lateral, and Harris axial view of the calcaneum, and also computed tomography scan was done. All fractures were classified using Essex lopresti classification based on preoperative radiographs and CT scans. pre-operative before the operative procedure and after the operative procedure Bholers angle measures.

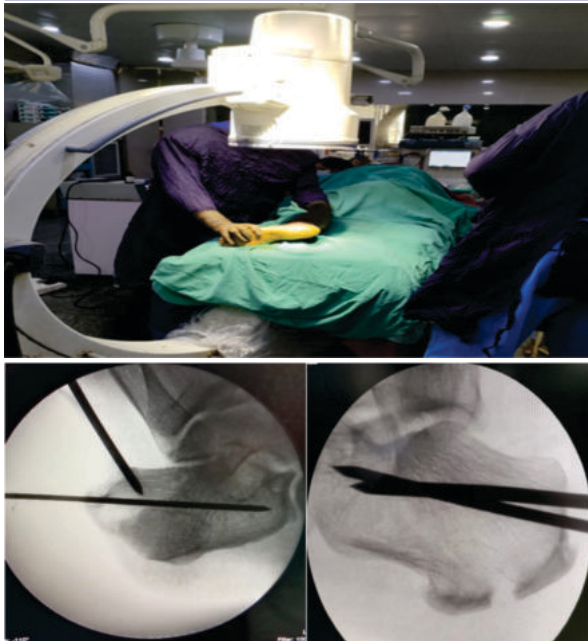
**Surgical procedure:** Surgery was performed in prone or lateral position, a small incision is made over the displaced tuberosity of the calcaneus just lateral to the attachment to the Achilles tendon.

A heavy Steinmann pin is introduced into the tongue fragment in the longitudinal direction, angling slightly to the lateral side. Image intensifier is used during the insertion of the pin and manipulation of the fracture.

With forefoot plantar flexed, the Steinman pin was pulled up and poked towards plantar foot. The spreading of the calcaneus is reduced by applying pressure on each side of the bone with the heels of the clasped hands.

It is important to clear the inferior aspect of the lateral malleolus from contact with any building bone fragments that may encroach on the peroneal tendons and produce chronic tenosynovitis.

The calcaneum is gently rocked at this stage to settle the smaller fragments into position. Final radiographs are made to confirm the position. The pin is advanced across the fracture into the anterior fragment of the calcaneus.



**C Arm Position And Reduction Technique**

**Postoperative care:**

Postoperatively intravenous antibiotics were given for 3 days followed by 7 days of oral antibiotics. Analgesics were given according to the need of patients. Check dressing was done on the third post-operative day. The foot is carefully padded, and a splint is applied, incorporating the protruding portion of the pin. The initial slab and pin usually are removed after 4-6 weeks and a slab is applied from the tibial tuberosity to the toes.

If the radiographs confirm union and reconstitution of the depressed cancellous bone beneath the elevated articular surface, weight bearing can be started 8-10 weeks after reduction.

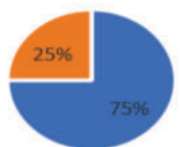
Patients were followed up every week for the first month, then every 2 weeks for 3 months, 6 months, and 1 year.

**RESULTS:**

The incidence of fracture maximum in age group 31-40 (60%) with a mean age of 35.2 years. Second commonest was the 41- 50 (25%) years. The youngest patient in this study was 15 years old and the oldest was 53 years old.

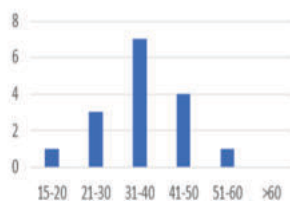
In this study there were 16 patients in total of which 12(75%) are males and 4(25%) are females.

**Sex Distribution**



■ Male ■ Female

**Age Distribution**



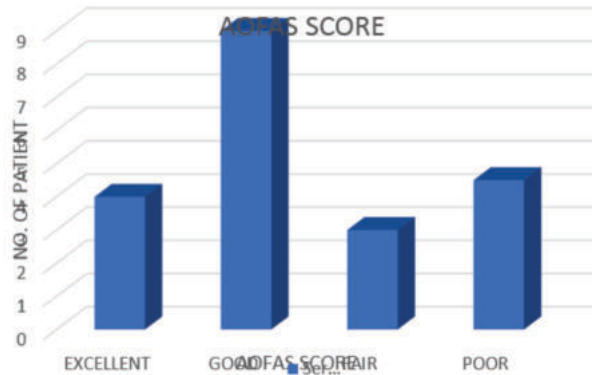
■ Age Distribution

In this study, there were 16 patients in total of which 7(44%) were affected on the right side, 7(44%) were affected on the left side and 2(12%) were affected bilaterally.

The predominant mechanism of injury was falling from height and landing on the heel, 7 cases (44%), second most common is road traffic accidents 6 cases (37%).

The results were graded as per the criteria of the AOFAS SCORE assessment sheet for the fracture of the calcaneum.

Of the 16 cases, 4 cases(25%) had excellent, 9 cases (56%) had good and 5 cases (19%) had fair results. None of the patients in this series had poor results.



**COMPLICATION:**

A total of 8 patients (51%) had surgery-related complications. There were 5 cases (32%) of heel widening all of which were managed conservatively with soft-soled shoes. At the end of 6 months, all 5 of these cases had good functional recovery. 2 cases of subtalar arthritis were observed both were managed conservatively with rest analgesics and ankle support orthosis, both of these cases had good functional outcomes at the end of 6 months. One case of superficial surgical site infection was observed which was managed conservatively with intravenous antibiotics and daily cleaning and dressing. The infection was controlled and the surgical site was healthy on 1-month follow-up. This patient also had a good functional outcome on 6 month follow-up.

**DISCUSSION:**

The present study was a prospective interventional study undertaken to evaluate the functional outcome of "Tongue type" fractures of calcaneum treated by Essex-Lopresti method of closed reduction with percutaneous pinning.

The study was conducted during the period of DECEMBER 2020 to DECEMBER 2022 at a tertiary care center. All the patients presenting to the OPD and Emergency department with a history of trauma and diagnosis of Tongue-type intra-articular calcaneal fractures were included as the study population.

A total sample size of 16 patients, who suffered such a fracture and were treated by Essex-Lopresti method of closed reduction with percutaneous pinning.

All the subjects included in the study volunteered after proper consent and reported for follow-up at the right time. The study was conducted after obtaining clearance from the ethical committee of the institute.

The data collection was done by using the AOFAS Ankle Hindfoot questionnaire. The questionnaire consisted of two parts. The first part included pain characteristics and the second studied the functional outcome of the patients.

In the present study, it was observed that most patients were from the age group 31-40 years (44%). The mean age among patients was 41.4 ± 11.25 years.

The maximum age incidence in our study has been 31-40 years (44%), mean age being 35.2 years and range between 24-48 years old. Nambiar (15) noted that 56% of his patients were in the 3<sup>rd</sup> to 4<sup>th</sup> decade of life, Parmar noticed an age

range between 16-64 with a mean age of 50.9 years and Buckley (16) noted that in his study the maximum age incidence was between 30-39 years (60%) with age range between 15-68 years. Chirag Arora (13) noted a mean age range between 17-46 yr with a mean age of 29.5yrs, Rajendra Prasad Ramesh Butala (12) noticed all the patients were aged between 20 to 50 yrs with a mean age of 35yrs, Padmanabh (11) noticed maximum age between 30-39yrs with mean age 35.2

16 patients in total of which 7(44%) were affected on the right side, 7(44%) were affected on the left side and 2(12%) were affected bilaterally. Nambiar (15) noted 44% involvement in the right foot, 31% involvement in left foot, and 25% bilateral involvement.

There was 1 case (6%) of associated thoracolumbar spine injury and 1(6%) case of Malleolar fracture, Metatarsal fracture, and 2 (13%) cases of Colles fracture. Hildebrand reported associated spine fractures in 10%, Buckley (16) reported 15% and Nambiar(15) reported 21% associated spine injuries.

In the evaluation of the results in the present study, 4 patients (25%) had excellent results, 9 patients (56%) had good results and patients (19%) had fair results. None of the patients had poor results.

In our study we have compared Bohler's angle in normal foot and operated foot of the patient and have statistically analyzed the outcome with the Bohler's angle ratio. We have noted that Bohler's angle ratio of the side of the fracture to the normal side was significantly lower in patients who had unsatisfactory results, compared with those who had satisfactory results, indicating that this ratio is a negative prognostic factor. We have compared our analysis with Paley (14) who did a similar analysis and has similar conclusions.

## CONCLUSION

Essex-Lopresti's method of closed reduction and percutaneous pin fixation can be the ideal treatment for tongue-type fractures of the calcaneum.

Bohler's angle ratio can be used as a prognostic indicator.

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