



Orthopaedics

CLINICAL STUDY OF MANAGEMENT OF INTRA-ARTICULAR CALCANEUM FRACTURE BY ESSEX LOPRESTI / WETHEUS REDUCTION TECHNIQUE AND IT'S OUTCOME.

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ABSTRACT

Background: Calcaneal fractures remain one of the most challenging problems for orthopedic surgeons. Calcaneal fractures accounts for 2% of all fractures. They account for 60% of tarsal injuries. Open reduction and internal fixation with k-wires, lag screws and plates is treatment of choice for intra articular calcaneal fractures. However, plate fixation requires a relatively large incision and extensive soft tissue dissection, which increase the risk of postoperative complications such as wound edge necrosis and infections. We were interested in determining whether reduction, bone grafting and plate fixation by a small incision can reduce soft tissue complications. We hypothesize minimally invasive treatment of calcaneal fractures would increase patient satisfaction and lower the incidence of complications. Therefore, we are trying to perform a prospective study to measure the outcomes of one of the minimally invasive techniques known as Essex Lopresti technique by using Steinman pins. **Methods:** From January 2023 to December 2023, 20 patients (three women, 17 men) with comminuted calcaneus fractures (Sander's classification type III and Essex-Lopresti classification joint- depression type fracture) were included. Plain films were obtained preoperatively in all patients. The operation was performed within three days post-injury, and patients were not allowed to bearweight until three months postoperatively. During this period, the patients were educated on how to perform bed exercises for joints above the surgical site, including muscle strengthening and body conditioning. Early active range of motion exercises for the ankle and forefoot began 3 to 6 weeks postoperatively. All patients were followed up regularly. The results were assessed using the American Orthopaedic Foot and Ankle Society (AOFAS) ankle score and Böhler's angle of the calcaneus. **Results:** After an average follow-up of two years, none of the patients required further surgery or experienced soft tissue complications. The clinical results were rated good to excellent on the AOFAS scale in 80% of the cases (16 of 20 patients), and most patients had pain relief and returned to their former daily activities at the same level as before the injury. **Conclusion:** A modified Essex-Lopresti procedure with percutaneous calcaneoplasty appears to be a safe and effective procedure to treat comminuted calcaneal fractures with acceptable functional results. Long-term outcomes and additional cases using this technique are required to support our conclusion.

KEYWORDS : Modified Essex-Lopresti, minimally invasive, Calcaneoplasty, AOFAS ankle score, Calcaneal fractures**INTRODUCTION:**

Calcaneal fractures remain one of the most challenging problems for orthopedic surgeons. Calcaneal fractures account for about 2% of all fractures, and 60% to 75% are displaced intra-articular fractures.^{1,2} Reliable reduction is difficult to achieve with nonoperative treatment of a displaced intra-articular calcaneal fracture, and malunion of the fracture and subtalar arthritis readily occur.³ In contrast, open reduction and internal fixation of displaced intra-articular calcaneal fractures can effectively restore the anatomical morphology of the subtalar articular surface and calcaneum.⁵ Kirschner wires (K-wires), lag screws, and steel plates can be selected as internal fixation materials based on the characteristics of the fracture. A plate can support a comminuted fracture and bone defect. Moreover, the use of a thin locking plate not only ensures the strength of fixation but also reduces the extent of soft tissue interference. Therefore, open reduction and internal fixation with a plate is widely used for treatment of intra-articular calcaneal fractures in clinical practice. However, plate fixation requires a relatively large incision and extensive soft tissue dissection, which increase the risk of postoperative complications such as wound edge necrosis and infection.⁶⁻⁸

We were interested in determining whether reduction, bone grafting, and plate fixation by a small incision can reduce soft tissue complications. We hypothesize minimally invasive treatment of calcaneal fractures would increase patient satisfaction and lower the incidence of complications. Therefore, we are trying to perform a prospective study to measure the outcomes of one of the minimally invasive technique known as Essex Lopresti technique. Cotton in 1908 said "Ordinarily speaking, the man who breaks his heel is 'done'". Historically most fractures were treated non-operatively because open reduction and internal fixation was associated with high complication rates and did not result in significantly improved outcomes with better understanding of fracture patterns and improved surgical and fixation techniques, there appears to be a renewed interest in the surgical treatment of displaced intra-articular fractures of the calcaneus.⁸

Calcaneal fractures make up about 2 percent of all fractures. They

account for 60 percent of major tarsal injuries. The economic importance of these fractures is apparent in that although they represent only 2 percent of all fractures, 90 percent occurs in males between 30 and 45 years of age.

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.⁹⁻¹⁰

Over the years, various techniques have been developed to accomplish this goal. All these techniques have certain steps in common including disimpaction of the fragments, reduction of the displaced fragments either manually or percutaneously and protection of reduction with pins and plasters, external fixation and open reduction and internal fixation.

Aims And Objectives-**Aim:**

The aim of the study is to analyze prospectively the results of Essex Lopresti technique in the management of intra articular calcaneum fracture.

Objective:

- To assess the stability of fixation and early mobilization of patients.
- To analyze the benefits of Essex Laprosti technique for management of intra-articular calcaneus fracture.
- To study postoperative complications.

MATERIALANDMETHODS:

This study was conducted at ACPM medical college, Dhule. This is a Retrospective observational study. All male and female patient having intra-articular calcaneum fractures above 18 years of age. This retrospective study will be carried out at our tertiary care hospital on cases with inclusion and exclusion criteria between January 2023 to December 2023.

Following inclusion and exclusion criteria will be used.

Inclusion Criteria:

- Patient who has been diagnosed as having intra- articular calcaneum fracture.
- Patients with more than 18 years of age.
- Patient who are fit for surgery.

Exclusion Criteria:

- Patients with pathological fractures.
- Patients with less than 18 years of age
- Polytrauma Patients

Operative Technique:

Patients were treated with minimally invasive manipulative reduction using large-diameter (3.2–4.0 mm) Steinmann pin fixation. The procedures were performed with patients in the lateral decubitus position under spinal anesthesia. First, the heel was squeezed to reduce the calcaneal morphology, and the manipulation was performed continually during the operation.

Guided by fluoroscopy, the first Steinmann pin was inserted from the superior external side of the calcaneal tuberosity and advanced to the forefoot without crossing the fracture line. With the forefoot plantarflexed, the Steinmann pin was pulled and poked toward the plantar foot, and reduction was performed to allow for calcaneal inversion and eversion as well as flexion and extension of the ankle. We utilized an iso-centric image intensifier intraoperatively to check lateral, Broden's and Harris axial views of the heel and thus confirmed that Böhler's angle was restored within the range of 20°–40°. The length and height of the calcaneus were restored as much as possible. The Steinmann pin was inserted into the tarsal bones after restoring the subtalar joint surface. A second Steinmann pin was inserted inferior to the first Steinmann pin and in the direction parallel to the inferior calcaneus for fracture fragment stabilization as well as fixation and support between the tarsal bones and the calcaneus. If necessary, a third Steinmann pin was inserted from the posterior of the calcaneus, traversing the fractured fragments of the subtalar joint and reaching the tarsal bones. Below knee posterior slab was applied post operatively. The pins were draped with antibiotic coated dressings and were removed after 6 weeks.

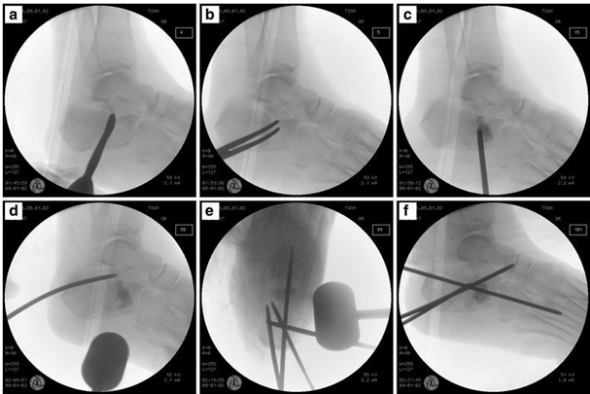


Image: Intraoperative images from an iso-centric image intensifier demonstrating reduction techniques and calcaneoplasty procedures.

- A. a dull elevator was inserted through a small incision to elevate the articular surface;
B. a Kelly clamp was used to spread the fracture site;
C. a 3.2-mm Steinmann was applied as a joystick to perform the Essex-Lopresti Manoeuvre;

D & E. Harris axial view demonstrating manipulation with a hammer and correction of the calcaneal axis using the distraction technique with Steinmann pins; **F.** Fixation with Steinmann pins across joints to maintain the reduction.

RESULTS:

We retrospectively reviewed 20 patients (three women and 17 men) with a mean age of 50 years (range, 31 to 66 years) who sustained comminuted intra-articular calcaneal fractures and were treated with closed reduction and percutaneous pinning with Steinmann pin at our institution between January 2023 and December 2023. The injury mechanism was a fall from a height on hard ground in 13 cases and

motor vehicle accidents in the remaining cases. Preoperatively, conventional X-rays were obtained in all cases. Surgery was scheduled within three days because the success of manipulative reduction is correlated with early surgery and minimal soft tissue violation from the surgical technique. All cases progressed to bony union within 3 months.

According to the AOFAS score, clinical results were excellent in 6 cases, good in 10 cases, and fair in 4 cases. The mean preoperative Böhler's angle was -1.8° (-16.1° – -16.6°), while the mean postoperative value was 25.9° (20.8° – 33.3°) (normal Böhler's angle is between 20° and 40° ; Table 1). After an average follow-up of 2 years, the mean Böhler's angle of the injured calcaneus was 21.7° (17.4° – 28.8°). Most patients returned to normal activities of daily living after 12 weeks or later. No wound complications or adverse reactions were observed.

Patient Data (table 1)

Patient	Sex	Preo p. BA	Posto p. BA	Follow-up BA	Follow-up (months)	AOFA S score	Etiology
1	M	-16.1	20.8	19.9	31	80	MVA
2	M	-11.8	22.3	18.7	33	81	Tumble
3	M	1.3	33.3	19.0	17	80	Tumble
4	F	-10	21.7	20.4	18	75	MVA
5	M	-2.5	26.6	21.4	31	87	MVA
6	M	0	22.5	21.2	26	90	Tumble
7	M	16.6	24.6	21.5	22	97	Tumble
8	M	-7.2	24.1	19.5	24	82	Tumble
9	M	13.8	25.8	21.9	15	93	Tumble
10	M	10.9	22.8	18.1	28	91	Tumble
11	F	9.0	31.1	24.5	16	78	MVA
12	M	-14.3	21.0	17.4	26	70	MVA
13	M	-15.9	30.1	24.0	22	86	Tumble
14	M	1.2	32.7	28.8	27	88	Tumble
15	M	3.2	28.9	26.4	21	86	Tumble
Patient	Sex	Preo p. BA	Posto p. BA	Follow-up BA	Follow-up (months)	AOFA S score	
16	M	-7.8	24.8	22.8	30	92	Tumble
17	M	-11.6	23.2	19.6	23	76	Tumble
18	M	-3.9	25.9	22.4	19	84	Tumble
19	F	1.7	24.8	18.2	26	82	MVA
20	M	7.5	30.6	28.5	22	94	MVA
Average		-1.8°	25.9°	21.7°	23.9	84.6	



Fig 3. Calcaneal fracture in a 61-year-old man (continued).
A. a postoperative plain film demonstrating restoration of Böhler's angle.
B. a postoperative plain film two months postoperatively.
C. a reduction of Böhler's angle was noted 12 months later.

Clinical Pictures Post Operatively:



CONCLUSION:

To our knowledge, a minimally invasive technique of modified Essex-Lopresti maneuver with a Steinmann pin has not been previously described in the literature. This technique can be performed in the presence of soft tissue swelling immediately following trauma, with a low incidence of wound infection/dehiscence. Although anatomic reduction of the articular surface cannot be achieved, this technique restores the calcaneal morphology by improving Böhler's angle and results in acceptable functional outcomes without major complications

in patients with Sander's type III joint depression type calcaneal fractures. Further study of long-term outcomes and additional cases using this technique is required to support our conclusion.

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