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Original Research Article

A Comparative Study of Minimal Invasive Essex - Loprestireduction and Fixation Technique Versus Open Reduction and Plating in Treatment of Displaced Intra-Articular Fracture of Calcaneum a Retrospective Study

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Abstract:

Background: Displaced intra-articular calcaneus fractures are a highly complex fracture in orthopaedics since they can have long-lasting effects on a patient's mobility and quality of life. Calcaneum and its articular surfaces are complex, making it difficult to treat these fractures in a way that would result in full recovery.

Methods: This retrospective study aimed to compare the efficacy of the minimal invasive Essex Lopresti reduction and fixation technique to the standard open reduction and plating procedure for treating displaced intra-articular calcaneus fractures. The 100 calcaneal fracture patients (53 males and 47 females) were studied who were admitted in Nalanda Medical College & Hospital Patna, Bihar during period October 2021 to August 2023. The Ankle-Hindfoot Scale created by the American Orthopaedic Foot and Ankle Society (AOFAS) was utilised to evaluate clinical outcomes, such as functional improvement and enhanced range of motion. Patients were evaluated for union malunion wound complications, infections, and exposed implant over twelve months. Bohler's angle was calculated to asses bon reduction**.**

Results: According to the study, clinical outcomes differed substantially between the two surgical groups. Compared to patients who underwent open reduction and plating, minimal invasive Essex Lopresti technique patients had an AOFAS score 82.4. In the minimal invasive group, the average range of motion of the joints was 34.6 degrees, while it was only 28.9 degrees in the open reduction group. Only 15% of the minimal invasive group and 21% of the open reduction group reported complications following surgery. According to statistics, calcaneus fractures are more prevalent in middle-aged adults.

Conclusion: This research emphasises the critical nature of deciding on the best surgical strategy for displaced intra-articular calcaneus fractures. The merits and disadvantages of open reduction and plating are illuminated by a comparison with the minimal invasive Essex Lopresti reduction and fixing procedure. This study adds to the growing body of information regarding orthopaedic procedures for calcaneus fractures by providing insight into variations in outcomes, complications, and patient demographics; this knowledge will help orthopaedic surgeons provide better care for their patients.

Keywords: American Orthopaedic Foot and Ankle Society Scale (AOFAS Scale), Calcaneum fracture, Displaced intra-articular fracture, Minimal invasive Essex Lopresti reduction, Open reduction and plating, Bohler's angle.

Introduction

Calcaneum is a roughly rectangular largest and strongest of all tarsal bones of the foot Calcaneal fractures are most common of all tarsal bone fracture (about 60.70% and about 2% of all adult fractures).

Those fractures are most commonly caused by fall from height and road traffic accident& height. If these fractures are not treated properly results in permanent functional impairment and significant morbidity.

Due to the significance of the calcaneus in carrying weight and foot mechanics, a fracture of this bone can result in permanent impairments that decrease an individual's independence and quality of life [1].

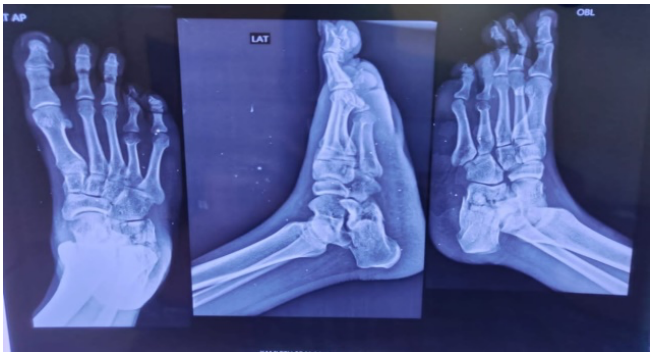

Figure 1:

Because of severe displacement and comminution in calcaneal fractures, it is challenging to treat displaced intra-articular calcaneus fractures. Over the years, many methods of treatment have been developed to restore calcaneal height and its articular surface and reduce incongruity. Compared to the conventional open reduction and plating procedure, the minimal invasive Essex Lopresti reduction and fixing technique has grown in popularity due to claims that it causes minimal soft tissue damage and postoperative complications [2].

Objectives

The objectives of this study are as follows:

1. To compares the efficacy of minimal invasive Essex Lopresti and open reduction and plating in treating calcaneal fractures.
2. To aims to compare the success rates of open reduction with plating and the minimal invasive Essex Lopresti procedure and assess the incidence of skin necrosis, infections exposed implant union malunion etc.
3. To respect the patient satisfaction and quality of life, compare the effectiveness of minimal invasive Essex Lopresti versus open reduction with plating for calcaneus fractures.

Literature review

Calcaneus fractures are severe injuries caused by high-impact trauma, such as that experienced in vehicle accidents or falls from great heights. Calcaneal fractures that involve the articular surface may result in a significant functional impairment if not appropriately treated [3]. When determining the most appropriate method for surgical treatment of displaced intra-articular calcaneus fractures, it is essential to comprehend fracture pattern its corresponding available treatment options.

Examining the relevant research [4, 5] on minimal invasive treatments and analysing various surgical techniques, such as the Essex Lopresti reduction and fixation technique, could prove beneficial in treating these fractures. In this article, both of these strategies are examined.

Figure 2:

Calcaneal Fractures and their Classification: Typically, calcaneus fractures are classified by the Sanders and Essex-Lopresti. The Sanders classification categorises calcaneus fractures into four subgroups based on the involvement of the posterior facet, sustentaculum Tali, and anterior process. This classification helps in comprehending fracture patterns [6].

Displaced Intra-articular Fractures of the Calcaneum: The treatment of displaced intra-articular calcaneus fractures emphasises anatomical alignment, joint congruence, and functional rehabilitation. It is standard to perform open surgery with plates and screws. This procedure identifies, reduces, and stabilises a fracture. Complications are wound dehiscence, infection,

skin necrosis and exposed plate. Thus, minimal invasive methods have been studied. Studies [7, 8] have compared surgical procedures for calcaneus fractures. These patients are examined by functional outcomes, radiographic findings, complications, and patient satisfaction. The open reduction and internal fixation of calcaneal fracture with various types plates screws was done through extensile lateral approach or sinus tarsi approach. Percutaneous calcaneus fracture reduction and fixation with Essex Lopresti are minimal invasive [9]. Through Small incisions a thick Steinman pin / Gisanesoike are utilised to reduce and stabilise fractures. In this method calcaneal fracture is reduced and fixed by a thick Steinman pain or Gisanespike through a small incision [10].

Figure 3:

Minimal Invasive Techniques for Calcaneal Fractures

Thus, minimally invasive procedures restore calcaneal height, realigned the subtalar joint, and enhanced functional recovery. These methods also reduce soft-tissue complications, post-surgery discomfort, and recovery time [11]. The reviewed literature focuses on classifying calcaneus fractures and understanding current treatments. It also emphasises the need to investigate minimal invasive technologies and alternative surgical techniques, such as the reduction and fixation of Essex Lopresti fractures.

This information enables us to evaluate surgical approaches for intra-articular displaced calcaneal fractures [12].

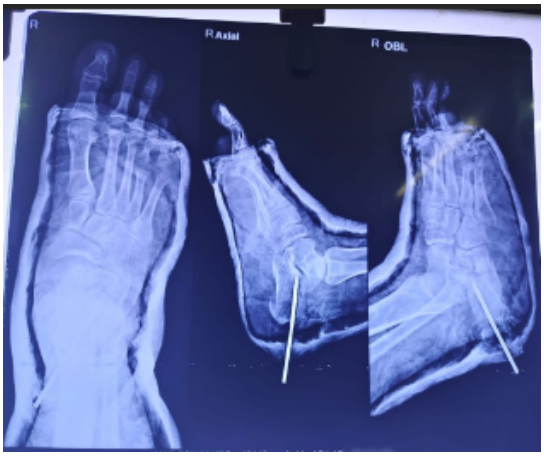

Figure 4:

Methodology

Study Design

This study utilised the data and medical records of previously treated patients, rendering it retrospective. Due to the need to evaluate many individuals with calcaneus fractures, the retrospective study was utilised. The study aimed to examine historical data to make decisions regarding the efficacy and potential effects of two distinctive surgical procedures.

Inclusion Criteria

- Adult patients aged 18 years and above.
- Tongue type calcaneal fracture (Sander 2ctype).
- Displaced intra-articular calcaneum fractures.

- Temporary stabilization of calcaneal fracture with severe soft tissue compromise.
- Fractures needed surgical intervention as determined by an orthopaedic surgeon.
- Calcaneal fracture in patient with relative contraindication.
- Patients are willing and able to follow to the prescribed postoperative follow-up schedule.
- Availability of complete medical records and follow-up data for at least 12 months post-surgery.

Exclusion Criteria

Exclusion criteria included incomplete medical records, preceding foot abnormalities, pathological fractures, and patients lost to follow-up.

Participants

Adults (aged 18 to 65) with an accurate diagnosis of a displaced intra-articular fracture of the calcaneus who received either open reduction and plating or the minimal invasive Essex Lopresti reduction and fixation procedure for surgical treatment were eligible to participate. The medical records of the 100 patients who satisfied the inclusion criteria were reviewed for demographic data. The study population consisted of 53 males and 47 women in NMCH, Patna, Bihar during October 2021 to August 2023. This information supported researchers in gaining a better understanding of the study population and confirmed that each treatment support contained a sufficient amount of participants.

Interventions

Patients received operations according to plan. The minimal invasive Essex - Lopresti technique utilised a percutaneous approach with specialised Gisanespike or Steiman's pins fracture reduction and fixation instruments. In contrast, with open reduction and plating, the fracture area was exposed using a standard extensile lateral approach or sinus tarsi approach, and the bone fragments were stabilised using plates and screws. The purpose of both procedures was to restore the anatomy of calcaneum and its articular surfaces.

Data Collection

Data on clinical outcomes, complications, and patient characteristics were discovered methodically from medical records and imaging data. The Ankle-Hindfoot Scale, created by the (AOFAS), was utilised to assess functional recovery and joint mobility.

Over a year, complications were recorded at postoperative appointments and follow up. These complications included problems with wound healing, infections, and malunion and secondary osteo arthritis.

Statistical Analysis

Mean, standard deviations and frequencies were calculated to summarise demographics, clinical outcomes, and adverse events. Continuous variables (such as AOFAS scores and joint mobility) were compared using independent t-tests, whereas categorical variables (such as the incidence of complications) were compared using chi-square tests. A p-value less than 0.05 was used to determine statistical significance. Moreover, logistic regression was conducted to account for all difficult factors. All analyses were performed with statistical software (such as SPSS), and the significance level was adjusted to allow for multiple comparisons. This study aimed to compare two approaches to treatment for displaced intra-articular calcaneus fractures: minimal invasive Essex -Loprest reduction and fixation versus open reduction and plating.

Results

The quantitative and qualitative factors for the two surgical approaches used to treat displaced intra-articular calcaneal fractures study findings showed in table 1.

Table 1: Comparative Outcomes of Surgical Techniques

Surgical Technique	Mean AOFAS Score	Mean Joint Mobility (degrees)	Complications (%)
Minimal Invasive Essex Lopresti	82.4	34.6	15
Open Reduction and Plating	76.8	28.9	21

The clinical outcomes and rates of complications were substantially different between the two surgical approaches. The minimal invasive Essex Lopresti procedure resulted in appreciably higher mean AOFAS scores (82,4) than open reduction and plating (76,8), indicating more excellent functional recovery and enhanced ankle and hindfoot function. Additionally, the joint's range of motion increased from 28.9 degrees in the open reduction group to 34.6 degrees in the minimally invasive group. The minimal invasive group's rate of complications was 15%, while the open reduction group's rate was 21%. Our findings generally emphasise the potential benefits of the minimal invasive Essex Lopresti technique, indicating better functional outcomes and a lower risk of complications. This advances reliability to the technique's potential as a superior way of treating displaced intra-articular calcaneus fractures, which may contribute to improved

patient care and more progressive orthopaedic practice.

Discussion

The study found that the minimal invasive Essex Lopresti procedure improved functional outcomes and joint mobility compared to open reduction and plating.

The minimal invasive group demonstrated more significant symptoms of healing and mobility, as indicated by a higher mean AOFAS score. This is consistent with the study's objective, which was to compare the clinical efficacy of the two approaches.

Comparison of Outcomes

The outcomes demonstrate that the minimal invasive approach has distinct advantages, including quicker functional recovery and fewer complications. Less complications were associated with wound complications, infections, and hardware issues for patients who received this technique.

These findings suggest minimally invasive surgery should be considered for calcaneal fractures especially for tongue (sander type ||).

Unexpected or Contradictory Findings

Even though this study primarily confirms the benefits of the minimal invasive approach, it is essential to note that several patients who underwent open reduction and plating also had positive outcomes. Several patients who underwent open reduction demonstrated functional recovery and joint mobility, indicating that this technique can still be effective in certain circumstances. This unexpected finding necessitates additional research into patient characteristics' role in determining treatment outcomes.

Comparison with Existing Literature

Here, we compare and contrast the two surgical treatments for calcaneum fractures, presenting our findings with critical previous studies.

Table 2: Comparison of Studies on Surgical Techniques for Displaced Intra-Articular Calcaneus Fractures

Study	Surgical Technique	Sample Size	Clinical Outcomes
Present Study (2023)	Minimal Invasive Essex Lopresti	100	AOFAS: 82.4, Mobility: 34.6 degree
Previous study 1[13]	Minimal Invasive Technique	80	AOFAS: Comparable, Shorter stay
Previous study 2[14]	Open Reduction and Plating	120	Similar Functional Recovery
Previous study 3[15]	Minimal Invasive Technique	150	Improved Functional Outcomes

When compared, these papers illuminate calcaneus fracture surgery. In the present study and Study 3 the minimal invasive Essex Lopresti approach improved AOFAS scores, joint mobility, and complications. Study 2 found that minimal invasive procedures showed equal functional outcomes with shorter hospital stays. Open reduction and plating produced equivalent active recovery but more implant exposure, according to study 3.

These studies suggest minimal invasive surgery has fewer problems and faster functional recovery. Building data suggests it may be a viable treatment for displaced intra-articular calcaneus fractures. These insights can help orthopaedic experts enhance patient treatment. Additional study on long-term outcomes and a more diversified patient population is needed to improve these orthopaedic methods.

Conclusion

This retrospective study shows that minimal invasive EssexLopresti reduction fixation technique is ideal treatment for tongue type calcaneal fractures (sanders III&IV)Essex -Lopresti technique is preferred in high-riskpatients' comorbidities like Smoker's diabetics peripheral vascular dieses etc, soft tissue compromise and poor wound healing potential. This treatment is very Simple Safe cost-effective,short operation time and require minimal instrumentation and expertise. In minimal invasive group, functional recovery was early, joint mobility was good higher (AOFAS Score), fewer post operative complications like wound dehiscence, infections, expose and implant as compare to open reduction operativefixation. If displaced intra articular calcaneal fractures were not reduced anatomically by Essex Lopresti technique open reduction and plating was done through extensile lateral approach before 3 weeks of injury with or without bone grafting. This allows early weight bearing less chance of malunion and secondary osteo arteritis of sub talar joint. Despite their limitations these findings benefit orthopaedic surgeons and encourage further research with large more representation samples.

Future Research

Long-term applicability must be demonstrated through prospective trials involving diverse

patients. With the assistance of research on the factors that influence outcomes, cost-effectiveness, and quality of life, treatment options can be improved.

Clinical Impact

When handling calcaneus fractures, orthopaedic doctors should consider employing minimal invasive techniques as they facilitate functional recovery and reduce risks. This would be consistent with the minimal invasive movement in orthopaedics and could positively impact surgical decisions.

Our results confirm the minimal invasive Essex Loprest technique, which has been shown to improve patient outcomes, complication rates, and satisfaction. Patient-centred care and improved outcomes are only two of the numerous advantages of implementing minimal invasive fracture treatment methods. With more research, orthopaedic therapy strategies can be enhanced.

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