



Functional outcome of internal fixation of distal third shaft of fibula by TENs nailing in addition to tibia in both bone leg fractures

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Abstract

Background: The distal tibia and fibula fracture are common orthopaedic injuries resulting from high-energy trauma such as falls, sports-related incidents, and motor vehicle accidents. The optimal fixation strategy for these fractures remains a subject of debate. Traditional methods, such as plating and screw fixation, provide stability but may be associated with complications, including soft tissue compromise and delayed healing. In recent years, elastic nailing has emerged as a minimally invasive surgery alternative for fibular fixation, particularly when performed in conjunction with distal tibial fractures.

Objective: The study was done to evaluate the functional outcomes of fibular fracture fixation using elastic nails in combination with distal tibial fractures. Key outcome measures include pain levels, range of motion, return to daily activities, and complication rates.

Methods: A prospective cohort of 20 patients with distal tibia-fibula fractures underwent surgical fixation with elastic nails was assessed. Clinical and functional outcomes was evaluated using standardized scoring systems, radiographic assessments, and patient-reported measures at regular follow-up intervals.

Results: Preliminary findings suggest that elastic nailing provides adequate stabilization while minimizing soft tissue disruption. Patients demonstrated satisfactory functional recovery with acceptable pain levels and early mobilization. Complication rates, including non-union and implant-related issues, were comparable to or lower than those associated with conventional fixation methods.

Conclusion: Elastic nailing for fibular fractures, when used in conjunction with distal tibial fracture fixation, appears to be a viable and effective treatment option for bone healing

Keywords: Distal third tibia fracture, Fibula shaft fracture, Both bone leg fractures, TENS nailing, Fibular intramedullary nailing, Internal fixation, Functional outcome, Titanium Elastic Nailing System (TENS)

Introduction

Diaphyseal fractures of the tibial fibula are among the most common long bone fractures [1, 2]. Around the distal third area of tibia fibula, It contributes about 20–30% of total fracture [1, 2, 3]. There is a risk of malunions, ankle stiffness from extended immobilization, delayed union, and tibial malalignment in either valgus or varus when the leg is treated non operative. Elastic nails provide a less invasive alternative to screws and plates for managing distal fibula fractures. Fibular fractures in 77.7% of the cases are common with tibial fractures. Fibula fixation as an additive method was proposed by Morrison *et al.*, to manage the fractures of the tibia and fibula. In both clinical and laboratory settings the role of fibular fracture fixation in cases of distal tibia fibula fractures has been examined, and particularly in the setting of distal tibia fractures, has been shown to help maintaining the tibia fracture reduction. Previously, studies have reported that effective plating of the fibula fracture improves alignment and the ability of the tibial fracture fixation to resist motion across the defect and prevents loss of reduction [4].

Schoot *et al* [5]. (1996) followed 88 patients with distal third leg fractures to evaluate angular deformity, osteoarthritis of the knee and ankle, and other residual symptoms. They found a positive association between tibial malalignment and degenerative changes in the knee and ankle joints.

Based on these findings, they emphasized that distal third tibial fractures should be managed carefully to minimize angular deformity and reduce the risk of late arthritis.

Intramedullary interlocking nailing is considered a best treatment option because it is associated with lower rates wound complications, fewer malunion, and immediate early weight-bearing and mobilization. Malalignment of the tibia can cause irregular distribution of articular pressures in the knee and ankle, which may predispose to early osteoarthritis.

Therefore, this study was undertaken to evaluate the clinical relevance and benefits of fibular fixation using closed TENS nailing in addition to tibial fixation in distal third fractures of both bones of the leg.

Aim of the Study

The aim of this study is to analyze and evaluate the functional outcome of internal fixation of the distal third shaft of the fibula using TENS (Titanium Elastic Nailing System) in addition to tibial fixation in fractures involving both bones of the leg.

Objectives

To assess tibial malalignment in patients with distal third fractures of both bones of the leg treated with closed TENS nailing of the fibula along with tibial fixation.

To evaluate the range of motion of the ankle joint following fracture fixation.

To determine the overall functional outcome after surgical management of these fractures.

Discussion

Although fibular fixation is commonly performed, its exact role in distal third fractures involving both bones of the leg has not been clearly established. Therefore, this study was conducted on 20 patients to evaluate the outcomes of fibular fixation in fractures of the distal third of the tibia and fibula. In all cases, the tibia fracture was managed with interlocking intramedullary nailing, while the fibula was fixed as part of the treatment protocol. On radiological assessment, 13 patients showed no angular deformity, 5 patients demonstrated varus angulation with a mean deformity of 2°, and 1 patient had valgus angulation measuring 4°.

Following are the Literature support;

In Journal of OrthopaedicTrauma: ^[7] February 2006 - Volume 20 - Issue 2 - pp94-103

It was proposed that, the proportion of fractures that lost alignment was very minimal among those receiving stabilization for fibula fracture in conjunction with IM nailing in comparison with those candidates receiving IM nailing alone. The authors insisted on fibular fixation whenever IM nailing is contemplated in the unstable distal tibia fibular fracture.

In Journal of OrthopaedicTrauma: ^[8] January 2009; Vol. 1, no. 1, 33 40(2009)

Concluded that fibula fixation and intramedullary nailing of distal Tibial Fibular fractures is a valid technique which prevents malalignment and respects soft tissue envelope.

Journal of Orthopaedics&Traumatology ^[9]: Surgery and Research (2010) 96, 674-682

In laboratory simulation, fibular fixation initially increased stability by decreasing initial rotational displacement in nailed distal third tibial fractures. These data support our clinical observations 76 that fibular fixation may decrease

late valgus malalignment in distal third comminuted tibia fractures with a fibular fracture at the same level.

A study published in the Journal of Bone and Joint Surgery ^[10] (American), April 2003; 85-A (4): 604–608, reported that plate fixation of the fibula improved the initial rotational stability in distal tibial fractures compared with tibial intramedullary nailing alone. However, as the applied rotational torque increased, no significant difference in overall rotational structural stiffness was observed between specimens treated with fibular plate fixation and those without it.

When these findings are considered alongside other studies, it suggests that fixing the fibula before intramedullary nailing of the tibia can aid in proper alignment of the proximal and distal tibial fragments. Additionally, fibular fixation helps maintain the length of the lateral column of the leg, thereby reducing the likelihood of varus or valgus malalignment at the fracture site.

Merchant and Deitz ^[11] (1989) conducted a long-term clinical study involving 3717 patients, with a 29-year follow-up, and reported a mean ankle evaluation score of 88.4 points in patients with fractures of the distal third of the tibial shaft. In their series, all patients were treated non-operatively using cast immobilization.

In comparison, the mean ankle evaluation score in our study was 91.92 points. The slightly higher score may be attributed to the shorter duration of follow-up in our study, where the maximum follow-up period was 1 year and 6 months with a mean duration of 11.3 months.

Among the 20 patients treated with fibular fixation, one patient developed a superficial wound infection at the fibular incision site, which was successfully managed with appropriate dressings and antibiotic therapy.

The average time to fracture union was 5 months, ranging from 4 to 6 months, and no cases of non-union were observed. When compared with the study conducted by Jeffrey *et al* ^[12]. (2004), the time to union was not significantly affected by fibular fixation, and all fractures in our study healed within the expected period.

According to the Johner and Wruh's criteria, the final outcome was excellent in 13 patients (65%) and good in 7 patients (35%).

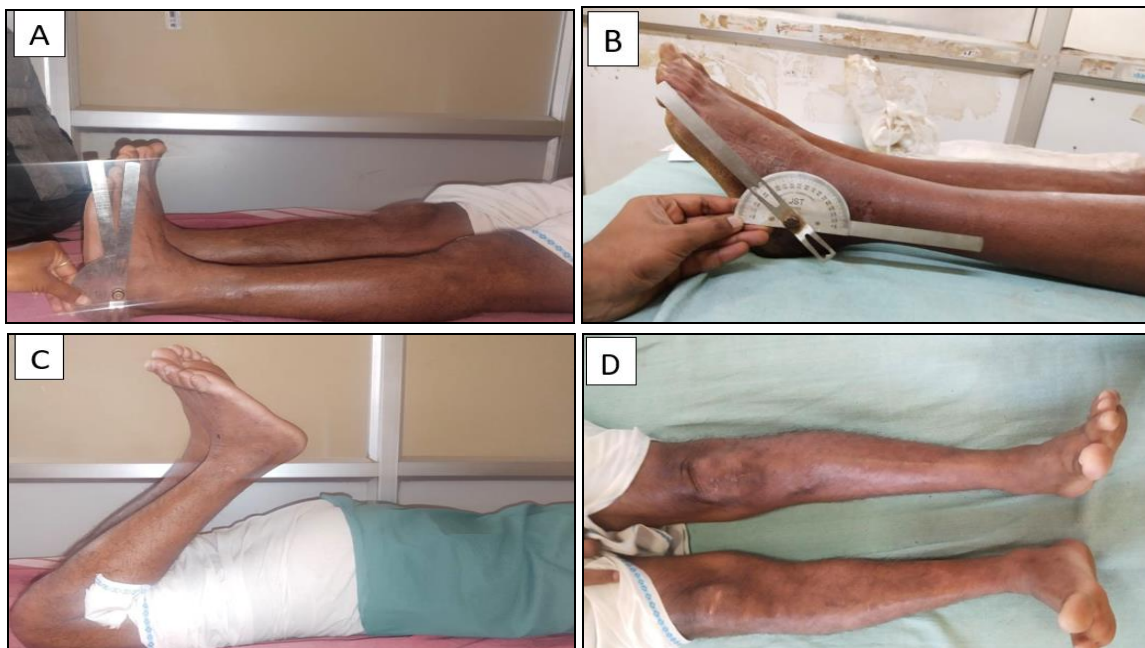


Fig 2: 1 Year Clinical Image Describing Range of Motion. A, Plantar Flexion. B, Dorsiflexion. C, Knee Extension. D, Knee Flexion



Figure Legends

Figure 1: Ankle evaluation rating system

Figure 2: 1 Year Clinical Image Describing Range of Motion. A, plantar flexion. B, dorsiflexion. C, knee extension. D, knee flexion

Figure 3: 1 Year Post X-Ray Leg with Ankle AP (A) and Lateral View (B)

Conclusion

Fixation of the fibula in distal third fractures of both bones of the leg, when performed along with tibial intramedullary nailing, is associated with lower rates of tibial malalignment and better maintenance of limb length, helps restore the height of the lateral column, facilitating anatomical reduction of the tibia and thereby reducing the incidence of varus and valgus malalignment. It promotes better healing of the soft tissues and syndesmotic structures, resulting in improved functional outcome while also reducing surgical soft-tissue trauma.

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