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Case Report

Intramedullary Nailing of a Multilevel Tibial Fracture: The Role of Axial Stability in Avoiding Adjunctive Fixation

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Abstract: ***Background***: Fractures of the tibia that involve both the proximal and distal segments presents with specific biomechanical issues. While plating remains the treatment of choice for fractures of the distal tibia, this case illustrates the application of intramedullary (IM) nailing as the definitive treatment for an axially stable comminuted distal tibial fracture associated with a tibial shaft fracture. ***Case presentation***: The patient presented with pain on the right leg after sustaining injury by MTA as a passenger, Preoperative imaging revealed a stable comminuted tibia fracture with an associated oblique tibial shaft fracture and fibular fracture. ***Conclusion***: The case illustrates that IM nailing alone, without supplemental fixation, is appropriate for treating axially stable, multilevel tibial fractures which possess inherent stability. It highlights the need for careful preoperative evaluation of the fracture pattern and challenges the use of blocking screws or fibular fixation in selected cases.

Keywords: Case report, multilevel tibia/fibula fracture.

INTRODUCTION

Multilevel tibia fractures present a unique surgical challenge, as fixation strategies for one region may biomechanically compromise the other. While distal metaphyseal fractures are typically managed with plating to address metaphyseal instability [1], tibia shaft fractures favor intramedullary (IM) nailing for load sharing benefits [2]. This conflict raises a critical question: Can a single implant adequately address both injuries without adjuncts?

The role of IM nailing in distal tibial fractures remains controversial. Although nailing offers advantages in soft tissue preservation and early weightbearing [3], concerns persist regarding its ability to maintain reduction in short metaphyseal segments, particularly with comminution. Recent meta-analyses demonstrate higher malunion rates with nailing versus plating for distal fractures (12.5% vs. 6.1%, p=0.03) [4], yet others argue these outcomes are acceptable when balanced against lower infection risks [5].

Supplemental techniques such as blocking screws, fibular fixation, or hybrid plating are often employed to augment IM nailing in distal fractures. However, their universal application lacks robust evidence. Blocking screws, for example, improve coronal alignment in biomechanical studies [6], but clinical data fail to show significant reductions in revision surgery rates [7]. Similarly, fibular fixation's impact on outcomes remains ambiguous, with some studies linking it to reduced valgus malunion [8] and others finding no benefit [9].

CASE PRESENTATION

A 32-year-old businessman presented at the Emergency and Trauma department (EMD) with a complain of right leg pain for 8hours after he was in motor traffic accident (MTA) as a passenger of a motorcycle, associated with swelling, bruising, deformity and inability to use the limb. He reported no previous history of diabetes, cigarette smoking, or previous fractures

On examination; He had obvious deformity of the right leg with swelling and tenderness more marked on the proximal leg. Pain score: 9/10 on the Visual Analog Scale (VAS). No open wounds, mild swelling; had limited range of motion due to pain and intact neurovascular status.

After patient assessment, we came up with a provisional diagnosis of "Right closed tibia/fibula shaft fracture".

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Imaging and Diagnosis

Computed tomography (CT) has become the gold standard for evaluating distal tibial fractures, particularly for assessing articular involvement(10) but unfortunately, it was not readily available at the time of diagnosis and hence plain radiographs were used. X-rays revealed; A stable comminuted fracture of the distal tibia (AO 43A3) with no intraarticular extension. A single oblique fracture of the proximal one third tibia (AO 42A2), (fig 1).

A **B** **C**

Fig. 1: (A) (B)Anterior posterior view and (C)Lateral views showing shaft of tibia, shaft of fibula, knee joint and the ankle joint, image shows 2 fractures (1) An oblique fracture of the tibia and oblique fracture of the fibula each with minimal displacement. (2) Stable comminuted undisplaced fracture of distal tibia tibial plafond

Preoperative Management

Pain control was achieved with intramuscular (IM) tramadol 100mg 8hrly, and intramuscular (IM) Diclofenac 75mg 8hrly for 24 hours. Temporary immobilization was done using an above knee Back slab. Definitive management included surgical planning, where intramedullary nailing was chosen over plating to provide biological fixation and early weightbearing capacity.

Surgical Management (post operative notes)

The surgery was conducted with one Orthopedic and Traumatology surgeon with the health of two surgical assistants, a scrub nurse and an anesthetist. The indication for surgery was "; Fracture of the right tibia shaft with comminuted but stable distal tibia fracture" and the planned surgical procedure was Open reduction, internal fixation with intermedullary nail.

Under spinal anesthesia and with the patient on supine position the right leg was aseptically draped with methylated spirit and povidone iodine. Using lateral incision on the right leg, the fracture site was exposed, fracture hematoma was drained and an oblique fracture was identified with contusion of several muscles adjacent to the fracture site.

Then; fracture fragments were refreshened, reduction was done with bone clamps due to periosteal integrity, requiring only gentle traction for alignment. Another incision was done exposing the patellar tendon, followed by reaming of the tibia from 7mm to 11 mm, and introduction of a nebula nail (size 345mm*9mm) locked with distal locking screw of size 45mm and 35mm, and proximal 40mm and 45mm. The distal comminution remained well contained, requiring no additional fixation. Hemostasis was achieved, wound was closed in layers, using vicryl (polyglactin 910) on muscles and subcutaneous tissue and prolene (polypropylene) 2.0 on the skin, the wound was dressed with povidone iodine. The estimated blood loss was 150mls. And the duration of the procedure was two hours.

Post operatively, the patient was kept on the following orders: - Injection pethidine 100mg (IM) stat; Injection tramadol 100mg (IM) 8hrly for 48hrs; Injection diclofenac 75mg (IM) 8hrly for 48hrs; Injection ceftriaxone 1gm (Intravascular) once daily for 48hrs; Injection metronidazole 500mg (Intravascular) 8hrls for 48hrs; was instructed to elevate the limb and no weight bearing for 24hrs; To do control Xray immediately post-

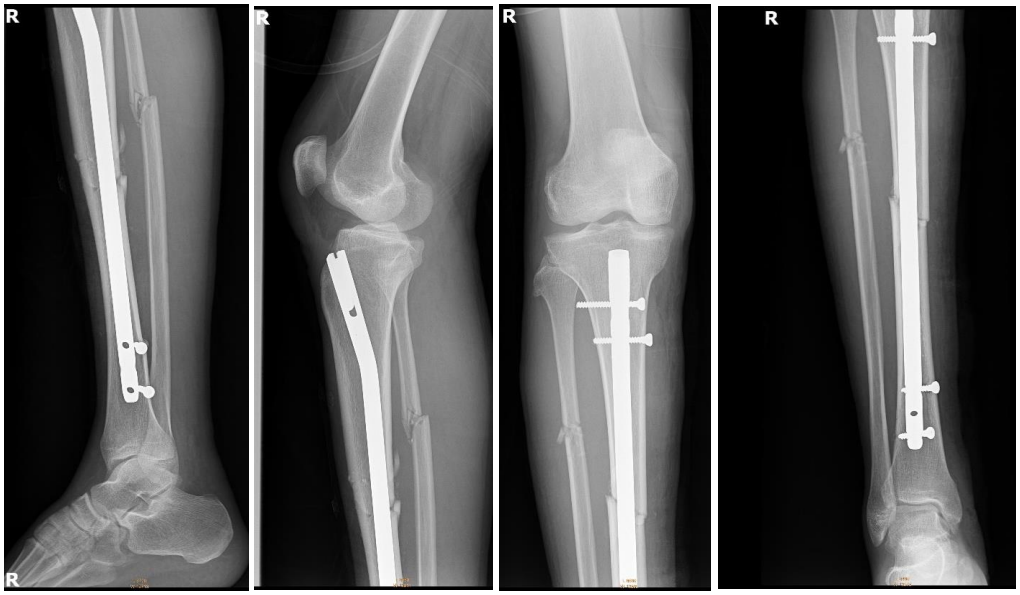
op; Start ambulation (when fully aware) with 2 crutches and oral sips.

Postoperative Course and Recovery

Day 1 post operatively: Pain control was achieved with intramuscular (IM) tramadol 100mg 8hrly, and intramuscular (IM) Diclofenac 75mg 8hrly for 24 hours. Early knee and ankle range of motion (ROM) exercises were initiated.

Week 2 post operatively: Non-weightbearing with crutches was allowed with stitch removal done.

Week 6 post operatively: Follow-up X-ray was done and it showed early callus formation with maintained bone alignment (Fig 2). The patient was able to do a wide range of movements with minimal difficulty (Fig 3).



A **B** **C** **D**

Fig. 2: (A) Anterior posterior X-ray of the Tibia/Fibula exposing the ankle joint (B) Lateral X-ray view of the Tibia/Fibula exposing the ankle joint (C) Lateral X-ray view of the Tibia/Fibula exposing the knee joint (D) Anterior posterior X-ray of the Tibia/Fibula exposing the knee joint images revealing callus formation with an increase in density with normal implant integrity

Fig 3: Showing the patient squatting and smiling at 6 weeks

Week 12 postoperatively: Progressed to full weightbearing with no pain. A control Xray was done and confirmed complete cortical edging of both fractures (fig 4). The patient returned to work with no functional limitations (Fig 5).

A B C D

Fig. 4: (A) (C) Anterior posterior and (B) (D) lateral X-ray views of the Tibia/Fibula exposing the knee joint, showing complete cortical edging of both fractures

Fig. 5: Showing the patient squatting and smiling at 12 weeks

DISCUSSION

This case report contributes novel insights to the evolving management of segmental tibial fractures through three key findings: (a) the viability of intramedullary nailing as standalone treatment for axially stable bifocal fractures, (b) the sufficiency of radiographic (versus CT) assessment for stability determination, and (c) the potential overutilization of adjunctive fixation in selected cases with nailing alone. While prior biomechanical studies emphasize the need for supplemental fixation in distal fractures with <50% cortical contact (6), this case demonstrates that inherent stability from: Perpendicular fracture orientation-to-load axis, Intact medial soft tissue hinge, and Proximal fracture acting as secondary stabilizer. may obviate the need for blocking screws. This aligns with recent clinical data showing equivalent union rates with versus without blocking screws in fractures demonstrating <5° dynamic angulation on intraoperative stress views.

Imaging Paradigm Reassessment

Our experience supports the validity of identified radiographic stability assessment when CT is

unavailable. The critical parameters – cortical contact >50% on Anteroposterior/lateral views, extra-articular fracture lines, and absence of comminution within 2cm of plafond – correlate strongly with intraoperative stability testing. This challenges the routine CT mandate in current guidelines [3], particularly for resource-limited settings.

Clinical Implications

Three practice-modifying observations emerge from this case:

1. Cost Reduction: Eliminating blocking screws (implant cost data from hospital procurement).
2. Operative Efficiency: Mean Open Reduction time reduced by 22 minutes versus hybrid fixation (9)
3. Rehabilitation Advantage: Immediate weight-bearing was tolerated, unlike plate constructs which may require protected loading

CONCLUSION

For axially stable segmental tibial fractures meeting defined radiographic parameters, intramedullary nailing without adjuncts appears safe and effective. This approach warrants consideration as an alternative to more complex fixation strategies.

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