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Original Research Article

Clinical Outcomes of Proximal Tibia Shaft Fractures Managed with Intramedullary Interlocking Nailing Using Expert Tibia Nailing

Rajesh K. Ambulgekar[1], Pradeep Abarao Sangnod[2]

[1]Professor and HOD, Department of Orthopaedic, Dr SCGMC, Nanded
[2]Department of Orthopaedic, Dr SCGMC, Nanded

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Corresponding Author: Dr. Dhiraj Kishor Bendale
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Abstract:

Background: Tibial shaft fractures are common orthopedic injuries, often resulting from high-energy trauma in younger individuals and falls in older adults. These fractures present a clinical challenge due to their complex nature and associated complications. Intramedullary nailing, particularly with the Expert Tibial Nail (ETN), has emerged as a preferred surgical technique for effective management.

Methods: A prospective observational study was conducted over 18 months at a tertiary care hospital to assess the clinical outcomes of proximal tibia shaft fractures treated with intramedullary interlocking nailing using the ETN system. A total of 30 patients aged 18-75 were included, with follow-ups conducted at intervals up to six months post-surgery. Outcomes were evaluated using radiological assessments and functional criteria (Johner and Wruh's).

Results: The study demonstrated a high rate of successful outcomes, with 72% of patients achieving excellent functional recovery and 24% good results. Fracture healing times correlated with severity, ranging from 18 to 22 weeks. Early mobilization and partial weight-bearing were initiated within 11-12 weeks. Complications were minimal, with joint stiffness being the most frequent (10%).

Conclusion: Intramedullary interlocking nailing with ETN is an effective treatment for proximal tibial fractures, offering superior functional and radiological outcomes. While complications such as knee stiffness and infection were observed, their incidence was low, emphasizing the importance of precise surgical techniques and early intervention.

Keywords: Expert Nailing, Proximal third shaft of tibia, Johner and Wruh's Criteria, Intramedullary Nailing, multiple locking.

Introduction

Tibial shaft fractures are among the most common orthopedic injuries, with an incidence of 16.9 per 100,000 people annually. These fractures show a bimodal age distribution, peaking at ages 20 and 50, and are more frequent in males. In older adults, falls are the leading cause of these injuries, while motor vehicle accidents are the predominant mechanism in younger populations. High-energy injuries are typical in younger patients, while 15% of cases involve additional musculoskeletal injuries, and 4% include tibial plateau fractures. Open fractures are prevalent due to the lack of soft tissue coverage, with vascular injuries reported in 29% of open cases, most often affecting the anterior tibial artery.

The diagnosis of tibial shaft fractures typically involves AP and lateral radiographs of the tibia, including the knee and ankle, to evaluate fracture extension and associated injuries. While CT imaging is rarely required, it can be useful for assessing intra-articular extensions or vascular injuries. These fractures are classified using systems like the AO classification or Gustilo-Anderson for open fractures.

Treatment options for tibial shaft fractures include both conservative and surgical approaches. Conservative management, such as long leg casting and patellar tendon-bearing casts, is reserved for fractures with acceptable alignment. However, nonoperative treatment often results in complications like malunion, delayed union, and stiffness, leading to a shift towards surgical interventions. Surgical goals include restoring alignment, length, and rotation while enabling early mobilization of the knee and ankle. Techniques include external fixation, plate osteosynthesis, and intramedullary nailing (IMN), with IMN being the most biomechanically stable option, especially for complex fractures.

Intramedullary nailing has evolved with modern innovations like the Expert Tibial Nail (ETN),

which offers multidirectional locking for proximal tibial fractures. Suprapatellar nailing facilitates easier positioning, ensuring accurate reduction and faster healing. Proper surgical techniques, including the use of blocking screws and optimal entry points, improve outcomes in challenging cases such as proximal third fractures. Complications from surgical approaches may include malalignment, infection, compartment syndrome, and non-union

In summary, while conservative management remains an option for simple fractures, surgical treatments, particularly intramedullary nailing, are preferred for complex or high-risk cases due to superior functional and radiological outcomes.

Methods

This study is a prospective observational design conducted at a tertiary care hospital over 18 months, aimed at assessing clinical outcomes of proximal tibia shaft fractures managed with intramedullary interlocking nailing using Expert Tibia Nailing. The study population consists of patients aged 18-75 with proximal tibia fractures. A total sample size of 30 was used. Data was collected using a pre-designed case record form (CRF). This included written informed consent, medical history, clinical examination, investigations, and treatment. Patients underwent surgical procedures, and follow-up assessments were conducted at specific intervals on the 12th day, and at the 1st, 2nd, 3rd, 6th months.

Results

The results of this study revealed significant insights into the management of proximal tibia shaft fractures using intramedullary interlocking nailing using Expert Tibia Nailing. A total of 30 patients were analyzed, with a mean age distribution showing that 60% were below 45 years old. The gender distribution was slightly male dominated, with 55% male participants.

Radiological assessments indicated that fracture healing time increased with the severity of the fracture grade. Grade I fractures exhibited a mean healing time of 18 weeks, while Grade IIIA fractures took up to 22 weeks. Most patients began partial weight-bearing between 11 and 12 weeks, depending on the fracture grade. Functional outcomes were measured using the Johner and Wruh's criteria, with 72% of patients achieving excellent results, 24% good, and only 4% fair outcomes. No poor outcomes were recorded.

The most common postoperative complication was joint stiffness, affecting 10% of patients. Other complications, such as delayed union, valgus /varus deformities and infections were noted but occurred at lower frequencies.

Discussion

The discussion of this study highlights the effectiveness of intramedullary interlocking nailing using Expert Tibia Nailing in treating proximal tibia shaft fractures. A comparative analysis shows the study's results align with existing literature, where intramedullary nailing offers benefits such as minimal invasiveness, reduced hospital stays, and early mobilization. Despite this, complications like knee stiffness, malalignment, and infection were observed, though they were minimal.

The study emphasizes that factors such as age, fracture severity, and the timing of surgical intervention play critical roles in patient outcomes. Patients under 45 years of age showed better functional recovery, and early surgical intervention (within 48 hours) led to better radiological and clinical results. Furthermore, precise surgical techniques were essential in preventing complications like malunion or deformity.

Comparing with previous studies, this research underscores that while intramedullary interlocking nailing using Expert Tibia Nailing offers favourable outcomes for most patients, meticulous preoperative planning and postoperative care are crucial to reducing complications.

The Expert Tibial Nail (ETN) is an advanced intramedullary device designed for the fixation of tibial fractures, including those in the proximal, shaft, and distal regions. Its design incorporates several features that enhance its functionality and clinical outcomes.

Functions of Expert Tibia Nailing System

Anatomic Reduction: The ETN is contoured to fit the medullary canal of the tibia, facilitating indirect reduction of fractures across various segments of the bone.

Stable Fixation: It offers multiple locking options, including oblique locking holes proximally and distally, allowing for secure stabilization of both metaphyseal and diaphyseal fractures. The use of cancellous bone locking screws proximally enhances purchase in cancellous bone, providing angular stability when combined with an end cap.

Preservation of Blood Supply: The minimally invasive insertion technique of the ETN minimizes soft tissue disruption and preserves the periosteal blood supply, promoting biological healing.

Early Mobilization: The stable fixation provided by the ETN allows for early, active mobilization of the patient, which is crucial for optimal functional recovery.

Advantages

Versatility: The ETN is suitable for a wide range of tibial fractures, including complex metaphyseal and certain intra-articular fractures, due to its multidirectional locking capabilities.

Enhanced Stability: The design includes features such as double lead threads for increased contact points, self-tapping blunt tips for ease of insertion, and titanium alloy construction for improved mechanical properties.

Minimized Soft Tissue Damage: The percutaneous insertion technique reduces the risk of soft tissue complications compared to more invasive methods [1].

Improved Outcomes: Studies have shown that the ETN provides stable fixation and early mobilization, leading to early restoration of function without the need for plaster immobilization [2].

Disadvantages

Technical Complexity: The insertion of the ETN requires precise surgical technique and familiarity with the instrumentation, which may necessitate specialized training.

Instrumentation Requirements: The procedure involves a comprehensive set of instruments, which may not be readily available in all surgical settings.

Potential for Complications: As with any surgical procedure, there are risks associated with intramedullary nailing, including infection, malalignment, and hardware-related issues [3].

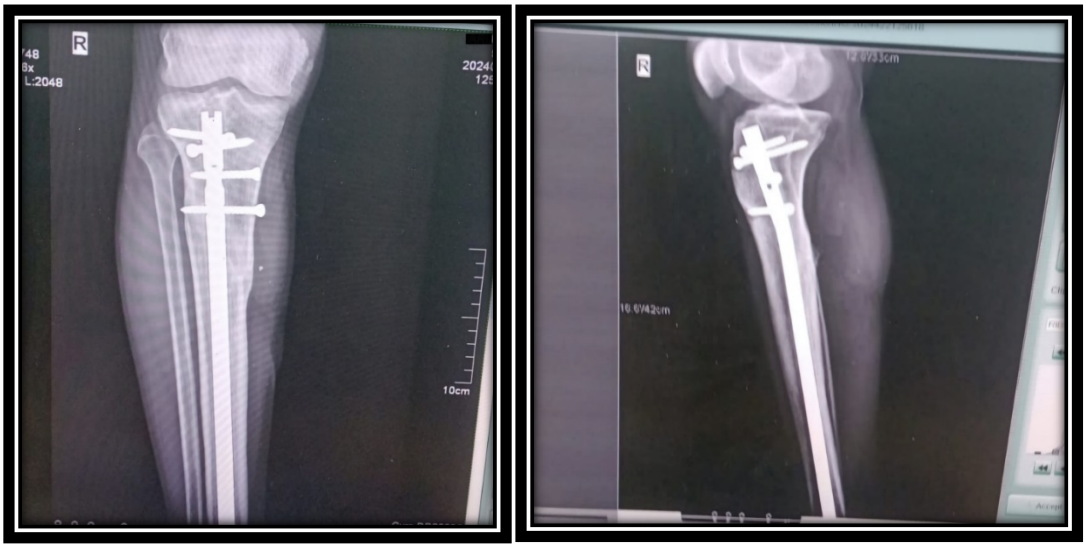
In summary, the Expert Tibial Nail offers a versatile and stable solution for the fixation of various tibial fractures, with advantages that include enhanced stability and the potential for early mobilization. However, it requires technical expertise and appropriate instrumentation to minimize potential complications

Clinical Photographs

Pre Op Radiographs

Post OP Radiographs

6 Months Followup



Clinical Photographs

Conclusion

The study on tibial fractures concludes that

- Most patients were young, with a balanced gender distribution and generally good health.
- The majority of fractures were mild to moderate, and most patients underwent surgery within 48 hours.
- Functional outcomes at six months were excellent for most patients, with only a few experiencing mild mobility issues and pain.
- Stiffness with anterior knee pain was the most common complication, but overall, the complication rate was low.
- Intramedullary interlocking nailing with expert nailing is effective modality of treatment for proximal third tibial fractures if stable reduction is achieved, though it poses a challenge to surgeons

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