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Original Research Paper

Orthopaedics

A STUDY OF FUNCTIONAL OUTCOME OF EXTRA-ARTICULAR DISTAL TIBIA FRACTURES TREATED BY INTRAMEDULLARY NAILING

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KEYWORDS :

INTRODUCTION

- High energy Road traffic accidents often result in tibia fractures, particularly distal tibia fractures, due to its subcutaneous location and poor blood supply.
- In 1969, Reudi and Allgower revolutionized treatment with internal fixation.
- However, complications like non-unions and infections were common.
- This led to newer techniques like Intramedullary nailing and Minimally invasive osteosynthesis for better outcomes.

Aim Of The Study

To assess the functional outcome of extra-articular distal Tibia fractures treated by intramedullary nailing

MATERIALS AND METHODS

- **Study Centre :** Narayana medical college and hospital
- **Duration of Study :** December 2023 and November 2024
- **Study Design :** Prospective study
- **Sample Size :** 25

- **Inclusion Criteria**

Patients who sustained extra-articular distal tibia fractures from 4cms – 11cms above the tibial plafond and were treated by intramedullary interlocking nailing were included in the study. Both open and closed fractures were included.

- **Exclusion Criteria**

Patients with pathological fractures, stress fractures, paediatric patients (< 14 yrs of age), metabolic bone diseases, distal tibia fractures with intra-articular involvement and patients with extraarticular fractures involved in other interventional studies were all excluded

Outcome Measures

American Orthopaedic Foot and Ankle Society Score :

- The American orthopaedic Foot and Ankle Society Score has nine questions divided into three components.

1. Pain
2. Function
3. Alignment

- Total score possible for a patient was 100 points.
- Alignment of the foot and range of motion of the ankle (measured by orthopaedic goniometer) was completed by the examiner on clinical assessment and assessing the radiographs.
- The individual scores were then added 38 together to obtain an overall functional score, which was then expressed as a percentage of the normal (100 points).

Olerud and Molander Score:

The Olerud and Molander score is a self-administered patient questionnaire.

The least possible score was 0 (totally impaired) to a maximum possible score of 100 (completely normal). It is based on nine different aspects

1. Pain
2. Stiffness
3. Swelling
4. Stair climbing
5. Running
6. Jumping
7. Squatting 8. Supports
9. Work.

AOFAS SCORING SYSTEM

Parameter		Scores
1.Pain (score: 40)		
	None	40
	Mild, occasional	30
	Moderate, daily	20
	Strong, almost always present	0
2. Function (score: 50)		
2.1 Activities restraint and need of support		
	No restraints or supports	10
	No daily activities restraint, recreational restraint, no supports	7
	Daily and recreational activities restraint, cane	4
	Major daily activities restraint, crutches, walker, wheelchair	0
2.2 Maximum gait distance (blocks)		
	More than 6	5
	From 4 to 6	4
	From 1 to 3	2
	Less than 1	0
2.3 Gait surface		
	Easy in any surface	5
	Some difficult in irregular grounds, stairs or slopes	3
	Strong difficult in irregular grounds, stairs or slopes	0
2.4 Gait abnormality		
	None or mild	8
	Evident	4
	Marked	0
2.5 Saggital mobility (flexion + extension)		
	Normal or minimal restraint (30º or more)	8
	Moderate restraint (15º to 29º)	4
	Strong restraint (less than 15º)	0
2.6 Hindfoot mobility(inversion and eversion)		
	Normal or minimal restraint (75 to 100%)	6
	Moderate restraint (25 to 74%)	3
	Strong restraint (less than 25%)	0
2.7 Ankle and hindfoot stability (anteroposterior + varus-valgus)		
	Stable	8
	Unstable	0
3. Alignment (score:10)		
	Good – plantigrade foot, with aligned ankle and hindfoot	10
	Fair - plantigrade foot, some degree of non-alignment, no pain	5
	Bad – non-plantigrade foot, major and symptomatic non-alignment	0

Chart 1 - AOFAS (American Orthopaedic Foot and Ankle Society) scale for clinical evaluation of the ankle and hindfoot

METHODOLOGY

- Preoperatively, every patient's standard anteroposterior and lateral radiographs of lower tibia and ankle were taken .
- Appropriate guide wires, intra-medullary nails and screws were taken.
- The methodology ensures a structured approach to fracture reduction, fixation, and stabilization.

Operative Procedure

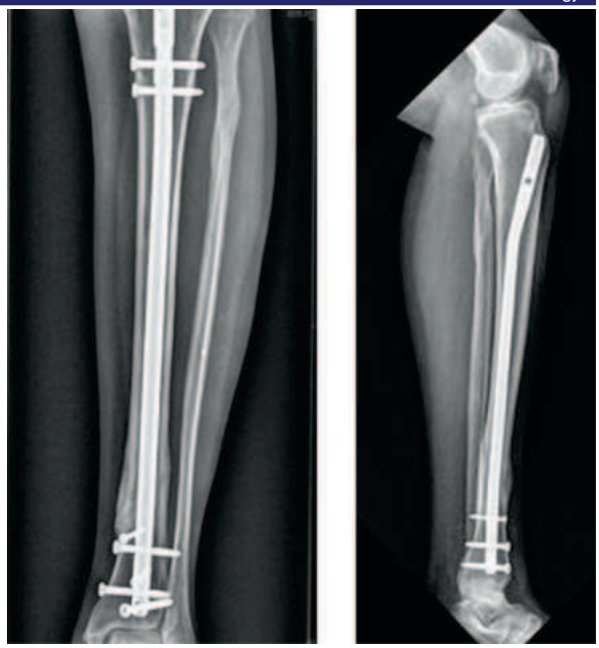
- Surgery was done in the supine position, with the injured limb painted and draped to allow it to hang freely from the side of the operating table.
- Care was taken to ensure adequate knee flexion to place the guide wire centrally without hitting the posterior cortex.
- A 5 cm skin incision was made starting from the tip of the

tibial tuberosity extending proximally to the lower pole of the patella.
- The patellar tendon-splitting approach was used for all cases.
- The entry point for tibial nailing was made just below the articular margin of the tibial plateau in the lateral view and medial to the lateral tibial spine in the anteroposterior view.
- Rotational alignment was confirmed using an image intensifier.
- A guide wire was inserted, and manual reduction of the fracture was performed.
- Appropriate size nail is passed. Central location of nail facilitated by Poller screws.
- Then inter-locking nails were used to fix the nail.

Follow-up:-
- Patients were followed up every 3 weeks till fracture united and there after at 3 months, 5 months and 1 year.
- The results were analysed with standard anteroposterior and lateral radiographs.
- Clinical and radiological signs of union were checked at each follow up.

RESULTS
- 25 Patients who were followed up were included in the study for assessment of functional outcome of intramedullary nailing for their distal tibia extra-articular fractures.
- Out of the 25 patients there were 19 males and 6 female patients.
- The mean age of the patients at the time of injury is
- 41.29 yrs (range of 19 to 71 yrs).
- The minimum follow up period was 12 months and maximum of up to 40 months.
- One patient had infection during the course of follow up and hence underwent an implant removal followed by ex-fix fixation.
- Hence a total of 24 patients were included for final analysis.
- Mechanism of injury was of high energy in 21 patients (84%) and low energy in 4 (16%).
- Out of 25 patients, 15 (60%) had sustained closed fractures and 10 (40%) patients have sustained open fractures.
- Open fractures were further classified by Gustilo and Anderson's method.
- Distal tibia fracture sustained was classified by AO/OTA classification.
- Higher percentage of patients had sustained A2 (metaphyseal wedge) type of fracture.
- Two patients were polytrauma patients sustaining injury to more than 2 organ systems. 22 patients had sustained isolated limb injury
- The average time taken to partial weight bearing was 11 weeks (range of 2 weeks to 20 weeks).
- The average time taken to full weight bearing was 18.92 weeks (range of 2 weeks to 40 weeks).
- The average time taken to return to work was 29.68 weeks (range of 12 weeks to 54 weeks). Two patients did not return to their work.
- Out of the 24 patients, 9 patients have changed their job or have not returned to their job since they were not able to continue in their previous jobs due to their injury.
- 15 patients were able to return to their previous jobs without any difficulties.

Functional Scores Assessment:
- The mean AOFAS score was 88.33 (Range of 64 to 100). The mean Olerud and Molander score was 81.25 (Range of 20 to 100).



DISCUSSION
- This study examines the use of intramedullary nailing (IM nailing) for distal tibial fractures, comparing it to other fixation methods like plating and external fixation.
- It finds that IM nailing is associated with relatively short times to return to work (29.68 weeks) and good radiological union (19.88 weeks).
- However, malalignment, particularly valgus malalignment, was observed in 36% of cases and was linked to delayed union and poorer functional outcomes.
- The study highlights that perfect alignment during surgery is crucial for achieving better results, with the use of Poller screws being a useful technique to correct alignment without additional inventory or soft tissue compromise.
- Although the overall infection rate was low (4%), the study reports a non-union rate of 8%, slightly higher than the typical 5.5% for IM nailing.
- Implant-related pain occurred in 29.2% of patients, and 16.5% required implant removal, mostly due to anterior knee pain.
- The study found no significant correlation between fibula fixation and radiological union, and Poller screws did not significantly prevent malalignment.
- Functional outcomes were more influenced by fracture alignment rather than patient age or associated injuries.
- The results support IM nailing as a viable option but suggest that further research is needed to optimize fixation techniques and improve alignment accuracy.
- Overall, the study indicates the importance of careful surgical technique to minimize mal-alignment and enhance functional recovery.

CONCLUSION
- The hypothesis of our study is that intramedullary nailing in distal tibia fractures achieve consistent union and earlier return to work.
- This objective has been achieved. However there is a high rate of complication in terms of malalignment.
- This indicated the need for more prospective trials before considering intramedullary nailing as the treatment of choice for extra-articular distal tibia fractures.

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