



Orthopaedics

CLINICAL AND FUNCTIONAL OUTCOME OF OPERATIVELY MANAGED PROXIMAL AND SEGMENTAL TIBIAL FRACTURES BY SUPRAPATELLAR INTRAMEDULLARY NAILING: A PROSPECTIVE STUDY OF 25 CASES WITH MINIMUM 6-MONTHS FOLLOW-UP

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ABSTRACT

Background: Proximal and segmental tibial fractures are technically challenging because of the wide proximal metaphysis and the tendency for malalignment with conventional tibial nailing. This study evaluated the clinical and functional outcome of closed reamed multi-locking intramedullary nailing through the suprapatellar approach. **Methods:** This prospective cohort study included 25 adult patients with extra-articular proximal or segmental tibial fractures, including open and closed injuries, treated at Shri M. P. Shah Government Medical College and G.G. Hospital, Jamnagar, with a minimum follow-up of 6 months. Clinical, radiological and functional outcomes were assessed, including union, complications, knee and ankle motion, weight bearing and Olerud-Molander score. **Results:** The mean age was 38 years and 84% were male. Proximal-third fractures accounted for 84% and segmental fractures for 16%. The union rate was 96%; one patient had non-union. Superficial infection and anterior knee pain occurred in 12% each. Delayed union and malunion occurred in 4% each. The mean Olerud-Molander score was 83, with 24% excellent and 76% good results. **Conclusion:** Suprapatellar reamed multi-locking intramedullary nailing provided satisfactory union and functional outcomes in proximal and segmental tibial fractures, with acceptable complication rates and early progression to weight bearing.

KEYWORDS : Proximal Tibial Fracture; Segmental Tibial Fracture; Intramedullary Nailing; Suprapatellar Approach; Multi-Locking Nail; Olerud-Molander Score

INTRODUCTION

The tibia is the most commonly fractured long bone in the human body. Reamed intramedullary nailing with interlocking screws is an established method for unstable tibial fractures, providing axial and rotational stability.

Proximal tibial fractures are particularly difficult to nail because the metaphysis is wide and the proximal fragment is short. With conventional intrapatellar nailing, the flexed knee and extensor mechanism may contribute to apex-anterior and coronal malalignment. The suprapatellar approach permits nail insertion with the knee in a semi-extended position, facilitating fracture reduction, fluoroscopic visualization and maintenance of alignment.

Modern multi-locking tibial nails provide multiple proximal locking options and improved control of short metaphyseal fragments. The present study evaluated the clinical, radiological and functional outcomes of reamed multi-locking intramedullary nailing through a suprapatellar approach in proximal and segmental tibial fractures.

Aim and Objectives

The study aimed to evaluate the clinical and functional outcome of suprapatellar intramedullary nailing in proximal and segmental tibial fractures.

To assess fracture union and time to weight bearing.

To assess knee and ankle range of motion and functional recovery.

To evaluate postoperative complications including infection, delayed union, non-union, malunion and anterior knee pain.

To assess functional outcome using the Olerud-Molander scoring system.

MATERIALS AND METHODS

Study Design and Setting: This was a prospective cohort study conducted in the Department of Orthopaedics, Shri M. P. Shah Government Medical College and G.G. Hospital, Jamnagar. Twenty-five adult patients with proximal or segmental tibial fractures were included and followed for a minimum of 6 months.

Participants: Adults with extra-articular proximal or segmental tibial fractures, including open and closed injuries, treated by closed reduction and reamed multi-locking intramedullary nailing through a suprapatellar approach were studied.

Operative Technique: Patients underwent suprapatellar entry with the knee in a semi-extended position. Closed reduction was achieved under fluoroscopic guidance. Reaming was performed followed by insertion of a multi-locking tibial nail and proximal and distal interlocking. Poller screw assistance was used when required for alignment.

Postoperative Assessment: Clinical and radiological follow-up assessed fracture union, alignment, knee and ankle motion, weight-bearing progression, pain and complications. Functional outcome was assessed using the Olerud-Molander scoring system.

RESULTS

Table 1. Demographic and Injury Characteristics.

Variable	No. (n=25)	Percentage
Male	21	84
Female	4	16
Right side	20	80
Left side	5	20
Closed fracture	11	44
Open fracture	14	56
Proximal-third fracture	21	84
Segmental fracture	4	16

Table 2. Mode of Injury.

Mode of injury	No. (n=25)	Percentage
Hit by animal	3	12
Road traffic accident	3	12
Fall from vehicle	9	36
Physical assault	9	36
Domestic fall	1	4

Table 3. Fracture Pattern and Associated Findings.

Finding	No. (n=25)	Percentage
Fibular fracture	9	36
AO type A	19	76
AO type B	1	4
AO type C	5	20
A1	6	24
A2	12	48
A3	1	4
B1	1	4
C2	2	8
C3	3	12

Table 4. Operative Characteristics.

Variable	No. (n=25)	Percentage
Surgery within 0–3 days	17	68
Surgery within 4–6 days	5	20
Surgery after >6 days	3	12
8-mm nail	1	4
9-mm nail	5	20
10-mm nail	14	56
11-mm nail	5	20
Poller screw used	2	8

Table 5. Fracture Healing and Complications.

Outcome / complication	No. (n=25)	Percentage
Union	24	96
Non-union	1	4
Delayed union	1	4
Malunion	1	4
Superficial infection	3	12
Anterior knee pain	3	12
Edema	1	4
Ankle pain	2	8
Fat embolism	0	0
Compartment syndrome	0	0
Neurovascular injury	0	0

Table 6. Functional Outcome.

Outcome	No. (n=25)	Percentage
Olerud–Molander: Excellent	6	24
Olerud–Molander: Good	19	76
Knee ROM >120°	3	12
Knee ROM 110–120°	19	76
Knee ROM <110°	3	12
No fixed flexion deformity	25	100
No ankle restriction	24	96
25–50% ankle restriction	1	4

Table 7. Weight Bearing and Activities.

Outcome	No. (n=25)	Percentage
Partial weight bearing 4–8 weeks	22	88
Partial weight bearing 9–13 weeks	3	12
Full weight bearing 9–13 weeks	16	64
Full weight bearing 14–18 weeks	2	8
Walking >2 km	14	56
Walking 1–2 km	9	36
Walking 500–1000 m	1	4
Walking <500 m	1	4
Cross-leg sitting possible	22	88
Squatting possible	22	88
Returned to pre-injury employment	25	100

DISCUSSION

The present prospective study included 25 patients with proximal or segmental tibial fractures treated by closed reamed multi-locking intramedullary nailing through a suprapatellar approach. The mean age was 38 years and there was a marked male predominance (84%). Fall from vehicle and physical assault were the commonest mechanisms, each accounting for 36% of cases.

Proximal-third fractures constituted 84% of the cohort. The suprapatellar semi-extended position facilitates reduction and fluoroscopic assessment in these fractures, where conventional infrapatellar nailing may be associated with procurvatum and coronal malalignment. Multidirectional proximal locking provides additional stability in the wide metaphyseal region.

Fracture union was achieved in 24 of 25 patients (96%). One patient developed non-union and one delayed union was managed with dynamization. Only one patient had malunion. These findings support the effectiveness of stable intramedullary fixation when satisfactory reduction and appropriate locking are achieved.

Superficial infection occurred in three patients (12%) and resolved with dressings and oral antibiotics. Anterior knee pain was reported in three patients (12%) and was tolerable. No fat embolism, compartment syndrome, neurological or vascular injury occurred.

Functional recovery was satisfactory. The mean Olerud–Molander score was 83, with 24% excellent and 76% good results. Most patients

achieved knee flexion of 110–120°, were able to squat and sit cross-legged, and returned to pre-injury employment. Partial weight bearing was started within 4–8 weeks in 88% of patients, while full weight bearing was achieved at approximately 10 weeks on average.

CONCLUSION

Suprapatellar reamed multi-locking intramedullary nailing is an effective treatment option for appropriately selected proximal and segmental tibial fractures. In this 25-patient prospective cohort, a 96% union rate, satisfactory functional recovery and acceptable complication profile were observed. The technique permits stable fixation of short proximal fragments, facilitates alignment in the semi-extended position and allows early progression of weight bearing. Careful fracture reduction, appropriate entry point, judicious use of poller screws and adequate proximal and distal locking are important for achieving good outcomes.

Limitations

Small sample size of 25 patients.

Single-centre prospective study without a comparative treatment group.

Follow-up was limited to a minimum of 6 months.

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