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Original Research Article

Functional Outcome of Metadiaphyseal Tibial Fractures Treated with Intramedullary Nailing Through the Suprapatellar Approach.

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Conflict of interest: Nil

Abstract:

To determine the functional outcome of intramedullary nailing through suprapatellar approach for metadiaphyseal tibial fractures.

Materials and Methods: A prospective observational study was conducted on 34 patients Patients were selected for study based on inclusion criteria. Consent was taken who underwent intramedullary fixation using suprapatellar approach for metadiaphysial tibia fracture patients were assessed sequentially from 2nd postoperative week (visit 1), at 6 weeks (visit 2), at 12 weeks (visit 3) and at 6 months (visit 4) from the date of surgery. At each visit the presenting complaints were noted, general physical examination and local examination of the affected limb was done, standard radiographs of the limb were taken.

Results: On the basis of the assessment the lower extremity functional score of 24(70.59%) were poor and 10(29.41%) were fair after 2 weeks of postoperative period. On second visit after 6 weeks of postoperative period lower extremity functional score of 12(35.29%) were poor and 22(64.71%) were fair. On third visit after 3 months of postoperative period lower extremity functional score of 22(64.7%) were good and 12(35.3%) were excellent. On final visit after 6 months of postoperative period lower extremity functional score of 19(55.88%) were good and15(44.12%) were excellent.

Conclusion: The functions of patient's leg during post operative period were assessed by lower extremity functional score. The lower extremity function became good and excellent (61-80) after 3 months of postoperative period (3rd visit).

Keywords: Metadiaphysial Tibia Fracture; Suprapatellar Approoach; Expert Tibia Nail; Intramedullary Inter-Locking Nail; Lower Extremity Functional Score.

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Introduction

Fractures of tibia and fibula shaft are the most common long bone fractures. In an average population more than 45 both bone leg fractures per one lakh population per year. Tibial fractures are associated with wide range of injury mechanism and severity.

The highest incidence of adult both bone leg fractures seen in young males is between 19 and 39 years of age. Compared to fractures elsewhere in the body, tibial fracture has relatively high incidence of nonunion and malunion. Tibial diaphysis is the most common site of fracture in the tibia and about 80% of these injuries are associated with fibular fractures.

Various treatment options are available for tibial shaft fractures depending upon the associated soft tissue injury. Severe open fractures of tibia are associated with high complication rates and poor long term outcomes. It is typically encountered in young patients and are a result of high energy trauma. In surgical treatment intramedullary nail fixation remains the treatment of choice for displaced and displaced tibial shaft fractures in adult population

Recent advance in nail design and reduction techniques have expanded the indications for intramedullary nail fixation to more proximal as well as more distal tibia fractures involving metaphyseal area. Establishing an anatomic starting point appears to be crucial in these fracture patterns. Suprapatellar nailing in the semi extended position has recently been suggested as a safe and effective surgical technique. This technique allows establishment of an appropriate starting point and semi extended position facilitates the fracture

reduction of apex anterior deformity[1-3].

Methodology

Source of data: Patients undergoing supra-patellar intra-medullary approach for tibial shaft fractures in department of orthopaedics.

Study design: Prospective Observational study.

Study Sample size: In this study sample size is 34.

Inclusion Criteria:

1. Age greater than or equal to 18 years
2. Closed fractures of both bone leg
3. Segmental fractures of tibia
4. Proximal one third of tibia fracture
5. All diaphyseal fracture of tibia
6. Ipsilateral femoral fractures associated with metadiaphyseal tibial fractures

Patient who have given written informed consent for the study.

Exclusion Criteria:

1. Pediatric fractures of tibia
2. Age more than 70 years
3. Associated comorbidities
4. Intra articular extension fracture

Results

Data collected from patients undergoing supra-patellar intra-medullary approach for tibial shaft fractures at department of orthopaedics are collected, analyzed and the results are interpretated.

Demographic details:

Age

Table 1: Age

Age	Frequency	Percentage
<30years	8	23.53
30-39years	6	17.65
40-49years	4	11.76
50-59years	12	35.29
>60years	4	11.76

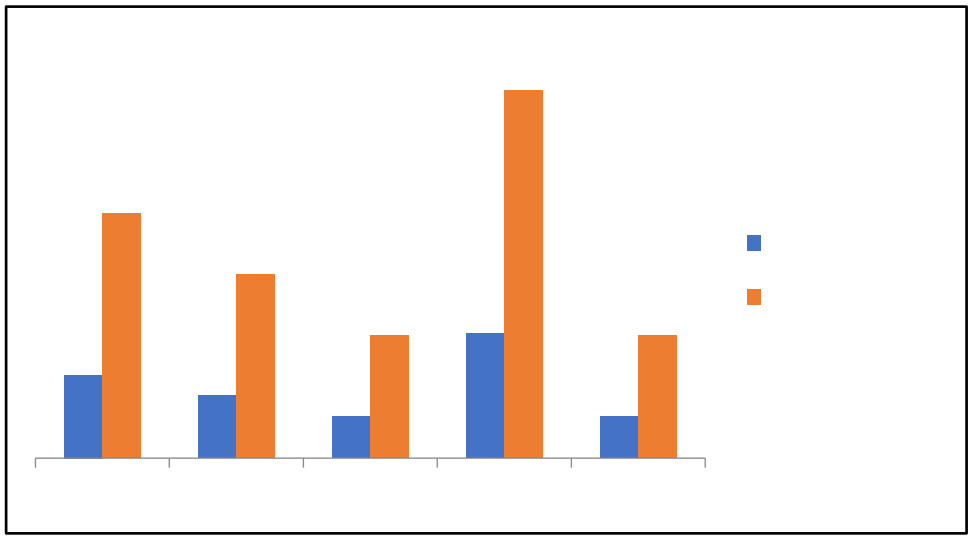


Fig 1: Age

Most participants admitted in hospital for supra-patellar intra-medullary approach for tibial shaft fractures are between the age group of 50 - 59 years (35.29%). 12(35.29%) patients are between the age group of 50-59 years, 8(23.53) were below the age of 306(17.65%) were between the age group of 30-39years, 4(11.76%) were between the age group of 40-49 years and 4(11.76%) were above the age of 60.

Sex

Table 2: Sex

Sex	Frequency	Percentage
Female	7	20.59
Male	27	79.41
Total	34	100

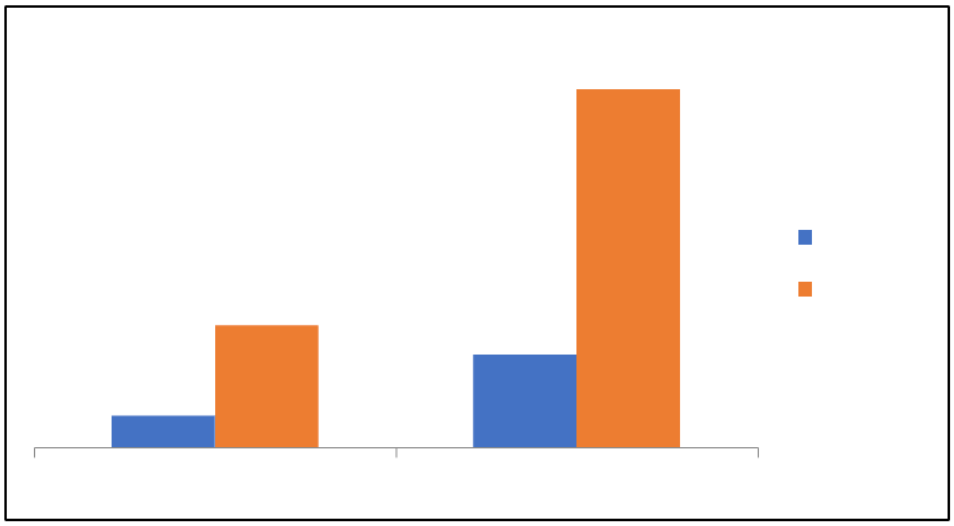


Fig 2: Sex

79.41% patients admitted for supra-patellar intra-medullary approach for tibial shaft fractures were male. 27 (79.41%) were male and 7(20.59%) were female

Fracture Type

Table 3: Types of Fracture

Fracture Type	Frequency	Percentage
Closed	27	79.41
Open	7	20.59

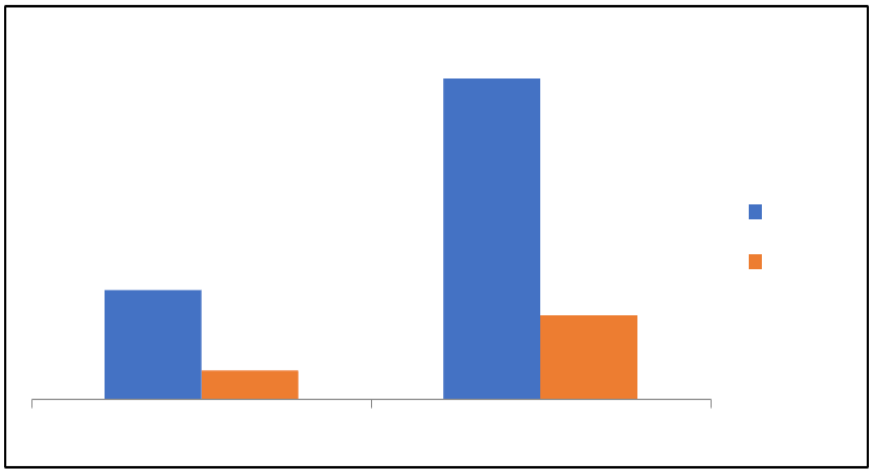


Fig 3: Types of Fracture

In our observational study 27(79.41%) were admitted due to closed fracture and 7(20.59%) were admitted due to closed fracture.

Comorbidities:

Table 4: Co Morbidities

Comorbidities	Frequency	Percentage
DM	5	14.71
DM,HTN	1	2.94
HTN	5	14.71
Hypothyroid	1	2.94
No	22	64.71
Total	34	100

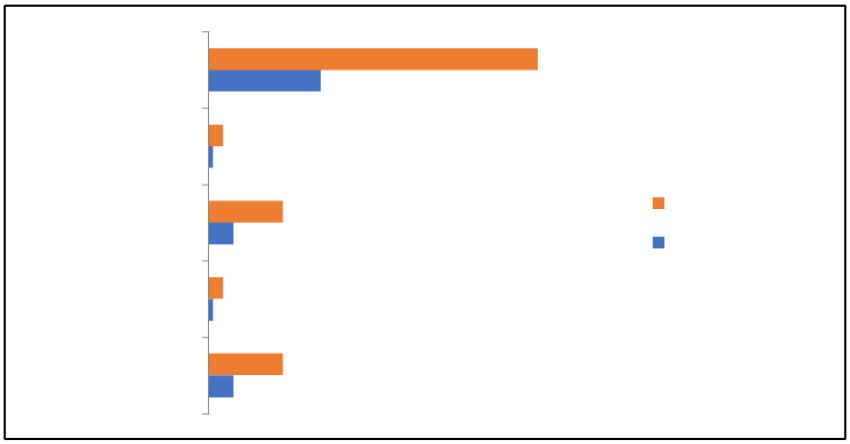


Fig 4: Co Morbidities

22(64.71%) patients admitted with supra-patellar intra-medullary approach for tibial shaft fracture have no co morbidities. 5(14.71%) have Diabetes mellitus, 5(14.71%) have Hypertension, 1(2.94) have both Diabetes mellitus and hypertension and 1(2.94) have hyperthyroidism.

Smoking:

Table 5: Smoking

Smoking	Frequency	Percentage
No	21	61.76
Yes	13	38.24
Total	34	100

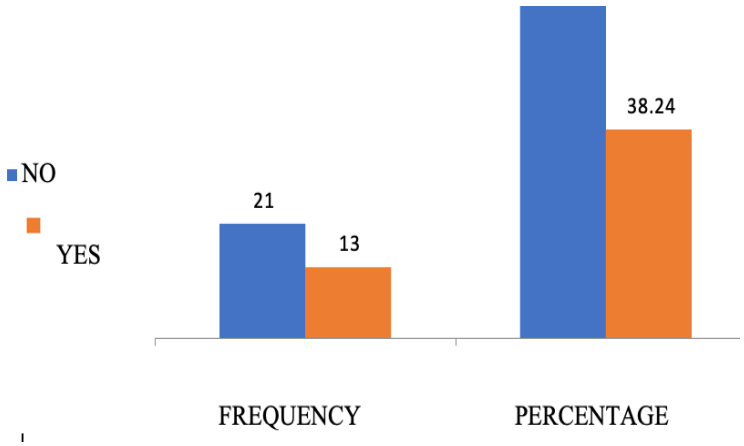


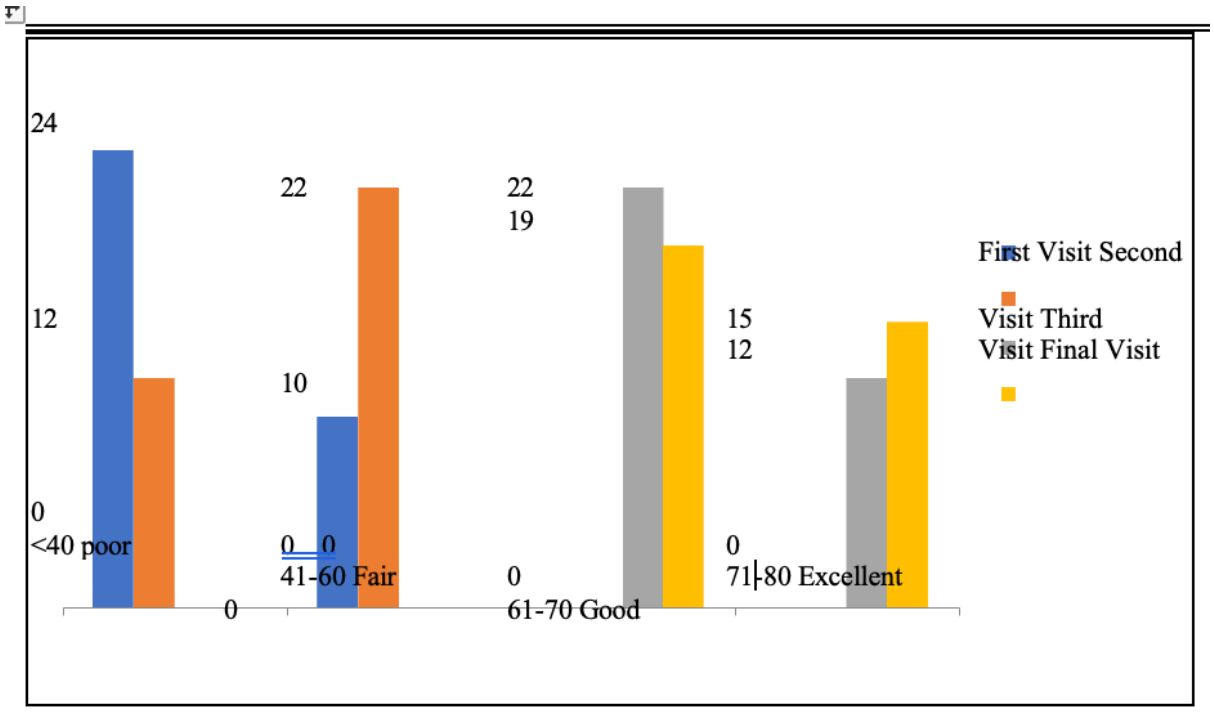
Fig 5: Smoking

21(61.76%) patients admitted with supra-patellar intra-medullary approaches for tibial shaft fracture were non smokers and 13(38.24%) were smokers.

LOWER EXTREMITY FUNCTIONAL SCORE:

Table 6: Lower Extremity Functional Score

Lower Extremity Functional Score	First Visit 2 weeks	Second Visit 6 weeks	Third Visit 3 months	Final Visit 6 months
<40 poor	24(70.59%)	12(35.29%)	0(0%)	0(0%)
41-60 Fair	10(29.41%)	22(64.71%)	0(0%)	0(0%)
61-70 Good	0(0%)	0(0%)	22(64.7%)	19(55.88%)
71-80 Excellent	0(0%)	0(0%)	12(35.3%)	15(44.12%)



The functions of patient's leg during post operative period were assessed by lower extremity functional score. The lower extremity function became good and excellent after 3 months of postoperative period (3rd visit).

On the basis of the assessment the lower extremity functional score of 24(70.59%) were poor and 10(29.41%) were fair after 2 weeks of postoperative period. On second visit after 6 weeks of postoperative period lower extremity functional score of 12(35.29%) were poor and 22(64.71%) were fair. On third visit after 3 months of postoperative period lower extremity functional score of 22(64.7%) were good and 12(35.3%) were excellent. On final visit after 6 months of postoperative period lower extremity functional score of 19(55.88%) were good and 15(44.12%) were excellent.

Based on healing of fracture site the lower extremity functional score of the patients get increasing. 12(35.3%) patients healed within 3 months of postoperative period.

Discussion

Data collected from patients undergoing supra-patellar intra-medullary approach for tibial shaft fractures department of orthopaedics are collected, analyzed and the results are interpreted.

Most participants admitted in hospital for supra-patellar intra-medullary approach for tibial shaft fractures are between the age group of 50 - 59 years (35.29%). 79.41% patients admitted for supra-patellar intra-medullary approach for tibial shaft fractures were male. 27 (79.41%) were male and 7(20.59%) were female.

In our observational study 27(79.41%) were admitted due to closed fracture and 7(20.59%) were admitted due to closed fracture. Prather, John C et al; 2021 says, Ballistic tibia fractures require more surgeries and have higher rates of soft tissue reconstruction than blunt, closed fractures and seem to have outcomes similar to lower severity open fractures.

Out of the 34 individuals, 1 (2.94) has hypertension and diabetes mellitus, 5 (14.71%) have hypertension, and 1 (2.94%) has hyperthyroidism.13 (38.24%) were smokers.

Most patient's undergone supra-patellar intra-medullary approach for tibial shaft fracture were free from complications. Similar results were seen in the study conducted by Nevish H. Patel et al; 2022 says patients treated with suprapatellar approach reports excellent results with good range of movements with excellent lower extremity functional scale score.

During post operative period the patients suffer from various complications such as discharge from the surgical site, sepsis, delayed union, nonunion, malunion, limb deformity and shortening of limb. Mitchell et al 2017 says, one concern with use of instrumentation through the knee joint is development of postoperative knee sepsis, particularly in cases of open tibial shaft fractures. Maslow JI et al; 2020 says, despite overall excellent results of the approach, well-documented complications include chronic anterior knee pain (47%), malalignment (58–85%), and malunion (30%). On final visit most patients with complications have a significant decrease in the

lower extremity functional score. Results of Inga Kröger et al;2022 says, patients with tibia fractures demonstrated functional improvements over the early course of healing, some residual deficits in lower extremity movement biomechanics were identified at six months post-surgery.

The patients with sepsis have to undergo antibiotic therapy, patients with delayed union and nonunion have to undergo dynamization procedure, patients with malunion have to undergo intra-articular osteotomy and patients with shoterning of limb and limb deformity have to undergo ilizarov procedure. Irene K. Sigmund et al; 2020 says, acute shortening and relengthening by ilizarov procedure deliver good functional outcome after completion of treatment. Results of Cesar Angel Pesciallo et al; 2022 says, in cases of delayed union of tibial fractures, dynamization offered a high union rate.

Patients with Diabetes Mellitus and hypothyroidism have a delay in healing when compared to patients with hypertension and patients without any co morbidity. Florence Figeac al; 2022 T2D exerts negative effects on bone healing through inhibition of osteoblast differentiation of skeletal stem cells. Findings of M. S. H. Simawy et al; 2024 bone fracture healing was shown to be considerably impacted, with instances of delayed healing and non-healing.

The healing time of patients with complications such as sepsis, nonunion and delayed union have a longer healing time when compared to others. Similar results seen in study of Yohan Jang et al; 2020 Tibial non-union leads to prolonged recovery. Austin

M. Looney, MD et al; 2020 concludes solid IM screw fixation of Jones fractures appear to be safe and do not delay fracture healing or increase the risk of delayed union.[4-17]

Conclusion

The functions of patient's leg during post operative period were assessed by lower extremity functional score. The lower extremity function became good and excellent (61-80) after 3 months of postoperative period (3rd visit). During post operative period the patients suffer from various complications such as discharge from the surgical site, sepsis, delayed union, nonunion, malunion, limb deformity and shortening of limb. These complications after supra-patellar intra-medullary approach have a decreased lower extremity functional Score when compared to patients without complications. Healing time in our study was assessed by the time required for the union of bones. The healing times of patients enrolled in our study were between 4 to 6 months .Based on our study results we conclude that comorbidities such as Diabetes Mellites and hypothyroidism affects healing of patients and complications such as delayed union, nonunion delays healing in patients.

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