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Functional Outcome of Expert Tibial Intramedulary Nailing for Metaphyseal Distal One Third Fractures of Tibia

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Introduction: In Orthopaedics fractures of tibia remains the commonest and most challenging fractures to be treated. Various modes of treatment are described for the fixation of fractures of lower third shaft tibia. When the aim is stable fixation with early restoration of function without use of plaster, intramedullary nailing offers an attractive treatment option. Newer expeet tibia nail design have been developed for the osteosynthesis of fractures of lower third tibia. The main purpose of the study was to study functional outcomes of expert interlocking nai for management of lower third tibia shaft fractures.

Materials and Methods: This study was conducted on 20 skeletally mature patients with metaphyseal distal one third fractures of the tibia treated with Expert Tibial Nail which is having advanced proximal and distal locking options.

Results: All the patients on follow up were evaluated on the basis of Johner R, Wruhs SD criteria and were graded as excellent, good, fair and poor as per the score obtained based on deformity and moment at ankle joint. Out of 20 patients 15 (75%) patients had excellent results as they had full function as pretrauma without any residual symptoms. 3 patients (15%) had good results, 1 (5%) patients had fair results and 1 (5%) patient had poor results.

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Conclusion: On the basis of the above obtained observations it seems that expert interlocking tibia nail appears to be a ideal implant for the management of lower third shaft tibia fractures.

Keywords: Tibia fracture; tibial intramedulary nailing; fractures; tibia.

1. INTRODUCTION

Distal tibia fracture is commonest fracture presented to the emergency department with significant soft tissue injury and comminution. The goal of the treatment is to provide stable fixation with minimal soft tissue injury. These fractures can be treated using variety of methods like cast, intra medullary nails, plates and external fixator one method of treatment of these fractures is open reduction and internal fixation using plates but this requires extensive soft tissue dissection. Minimally invasive plate technique may have a complication of hardware problem [1]. External fixator used for fixation of distal tibia fractures is associated with ankle stiffness [2]. Intramedullary nailing is one of the popular method of treatment of distal one third tibia fractures. Expert intramedullary interlocking nail has emerged as one of the most suitable management option for treatment of lower third shaft tibia fractures by providing the principal of biomechanical compression. Interlocking nail has widened the range of indications for medullary osteosynthesis of tibial shaft fractures to include almost every type of fracture [3].

The Expert Tbial Nail System (ETNS) an intramedullary nailing system is indicated not only for distal third tibia fractures but also for proximal third fractures of tibia and fractures of shaft of tibia. Apart from the two routine locking options expert intramedullary interlocking options has multiple locking options in proximal and distal part that gives additional stability to the fracture. End cap block the most proximal screw creating an angular stable construct. ETNS is having an option for compression at the fracture site (up to 7 mm) by inserting one distal locking screw and one proximal dynamic locking screw with a compression screw.

2. MATERIALS AND METHODOLOGY

Present study was carried out in a total of 20 patients with metaphyseal distal one third fractures of the tibia presented to us between September 2018–dec 2019, treated with Expert Tibial Intramedullary Nailing. Ethical committee approval was obtained, and patients were recruited once written informed consent had been provided. Inclusion criteria were skeletally mature patients with (1) Distal third fractures of tibia (2) Extraarticular metaphyseal fractures of distal tibia (simple, wedge or complex) (3) segmental fractures of tibia or combination of these. Exclusion criteria were skeletally immature patients, comminuted intraarticular fractures, grade IIIC open fractures. The implant used was Expert Tibial Intramedullary Nail having advanced nail design and 5 proximal locking options(three unique oblique and two medio-lateral locking options) and 4 distal locking options(Two medio-lateral ,one antero-posterior and one additional oblique locking option, placed very distally). Patient was positioned supine on the radiolucent table ensuring that the knee of the injured leg can be flexed until at least 90-110 degree and tourniquet was applied. Close reduction was performed manually by axial traction under image intensifier. An incision was given proximally at the distal third of the patella along the patellar ligament down to the tibial tuberosity. The entry site of the nail was prepared on the ventral edge of the tibial plateau. The entry point was in line with the axis of the intramedullary canal and with the lateral tubercle of the intercondylar eminence in AP view, and was at the ventral edge of the tibial plateau in Lateral view. A guide wire was secured on universal chunk and inserted at an angle of 10 degree to the shaft axis in lateral view. The cannulated awl was placed over the guide wire and the medullary canal was opened using a twisting motion to advance the awl to a depth of approx. 8–10 cm taking care not to open posterior cortex. Decision for reaming were taken per-operatively, and medullary canal was reamed by increasing the reamer size by 0.5 mm. The proximal and distal nail position was checked under image intensifier. Third generation cephalosporins antibiotics were administered in suitable doses. The limb was elevated on Braun Bohler splint to control postoperative swelling. From first postoperative day the patient was encouraged to do active and assisted hip, knee, ankle and toe movements. The skin sutures were removed after 10-12 days after operation. Non-weight bearing crutch walking was started as early as possible. Protected full weight bearing

with or without PTB/PVC brace was started depending upon the pattern of fracture and stability of fixation achieved. The patients were followed in OPD every 4 weeks for first three visits and thereafter every three months for one year. At each follow up visit patient was assessed both clinically and radiologically. X-ray was taken to note the progress of the union. Clinical examination was done to note the active range of movements at the knee, ankle and foot, time taken for fracture union, residual shortening, deformity and any other complaints. Results were evaluated as Excellent, Good, Fair, and Poor on the basis of Johner R, Wruhs SD criteria [4]. Johner, Wruhs criteria scoring is done based on deformity and moment of joint.

3. OBSERVATIONS

There were 14 males and 6 females in our study with an average age of 39 years (Range 18 to 72 yrs). Majority of patients sustained fracture both bone leg due to road side accidents (80%), followed by history of fall. In 19 (95%) cases both tibia and fibula were fractured and in 1 (5%) cases only tibia was fractured. 15 patients (85%) were having closed fracture while 5 (25%)patients were having open fracture.

Reduction was achieved by closed method in 15 (75%) cases and polar screws were used for reduction in 5(25%) cases. Additional procedure (bone grafting) was done in one case. Out of 20 cases, dynamization was performed in 3 (15%) cases. One patient with postoperative infection lead to delayed union and fracture united at 26 weeks. Average interval of protected full weight bearing was 4 weeks, while average interval of unprotected full weight bearing was 9 weeks. Average time taken for clinical union was 13.4 weeks while average duration of radiological union was 16.8 weeks.

Complications observed in the series were restricted ankle movements in 3 patients, valgus at ankle seen in 2 patients, anterior knee pain in 2 patients, delayed union seen in 2 patients and non-union in one patient for which bone grafting was performed.

Table 1. Sample collection criteria

Wruhs SD criteria	Out of 20 patients
Excellent	15
Good	03
Fair	01
Poor	01

Results were evaluated as Excellent, Good, Fair and Poor on the basis of Johner R, Wruhs SD criteria: Out of 20 patients 15 (75%) patients had excellent results as they had full function as pretrauma without any residual symptoms, 3 patients (15%) had good results, 1 (5%) patients had fair results and 1 (5%) patient had poor results.

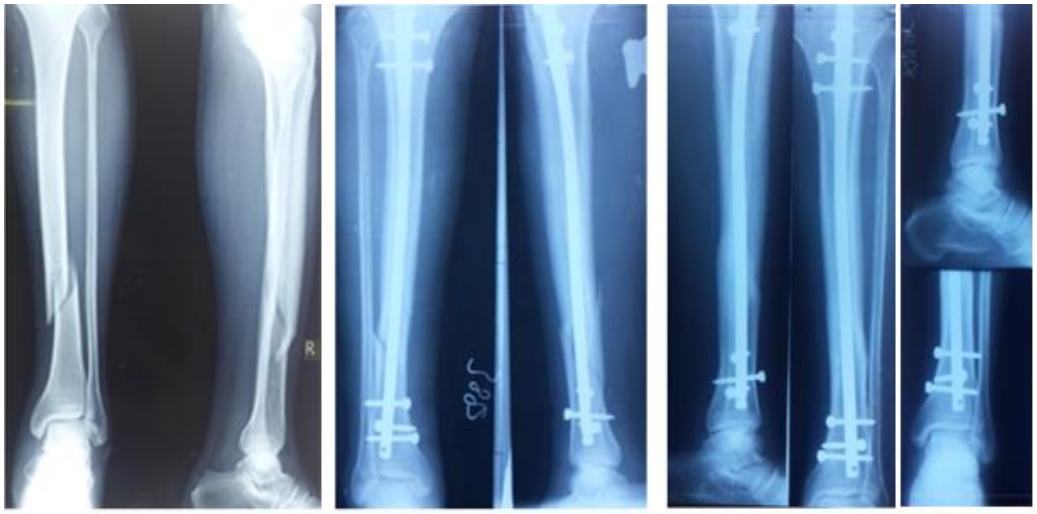

Fig. 1. X-Ray image of pre- post and 6 months of operation

4. DISCUSSION

Distal tibia fractures pose impeding dilemma to orthopaedic surgeons owing to the multiple modalities of treatmet options available for them. Every fracture of tibia must be assessed individually and it can be difficult to establish fixed routine of treatment for these fractures. Open reduction and internal fixation of such fractures lead to skin necrosis and ulceration, wound dehiscence, non union., osteomyelitis and refracture [5]. Conventional intramedulaary nails used for treatment of distal third tibia fractures have a drawback of innacurate stability provided by these nails. These disadvantage of conventional intramedullary interlocking nail in managing proximal and distal third fractures have been overcome by the introduction of Expert Tibial Interlocking Nail due to modifications in operative techniques, its design and advancement in locking screws [6].

Expert intramedullary nails proves to be a better option for treatment of distal third metaphyseal tibia fractures due to multiple locking options thus providing additional rotational stability. Multidirectional interlocking screws ensure that alignment can be well maintained and stability preserved despite a short proximal or distal fragments. Observations obtained in our study can be compared with international studies to validate and authenticate our conclusions. Studies conducted by Gregory and Sanders [7] (85.10%) and Krettek et al. [8] (71%) showed same observations as was obtained in our study. 9 (45%)cases out of 20 had fracture of tibia in its distal third followed by middle third in 6 (30%) and proximal third in 5 (25%) cases. In a study conducted by Duwelius et al. [9] 80% of the cases showed radiological and clinical union between 8-10 weeks following expert nail and remaining 20% of patients achieved union between 10-12 weeks. Blachut et al in their series of 64 fractures have reported the average time for radiological union to be 9 weeks [10]. Duwelius et al. nailed the closed fractures electively within 24 to 72 hours after trauma and obtained the score of excellent in 85% of patients and remaining 15% of pateints were good and fair as per Wruhs SD criteria. In study conducted by Gregory and Sanders following observations were obtained, Average duration of injury to surgery was 2 days. Average duration of protected and unprotected full weight bearing was 4.4 weeks and 7.5 weeks respectively in our series. In our study we allowed protected non weight bearing till 8 weeks and after that partial weight bearing over a walking cast and full weight bearing only after clinical and radiological signs of union are established. Union obtained in 90% of patients treated with expert interlocking intra medullary nails is comparable with observatios obtained from international studies (In the series of Gregory and Sanders [7] and Duwelius et al. [9] union rate was 92% and 97% respectively).

5. CONCLUSION

Observations obtained in our study using expert interlocking intramedullary nails for distal third tibia fractures are intresting Multiple three dimensional locking options allows it to be used in proximal and distal third fractures where conventional nails cannot be used. Also unique nail design and three dimensional locking option allows it to produce rotational stability and promotes union and improved functional outcomes. Thus Expert interlocking intramedullary nail is a ideal implant for the treatment of distal third metaphyseal tibia fractures.

CONSENT AND ETHICAL APPROVAL

As per international standard guideline participant consent and ethical approval has been collected and preserved by the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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