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Original Research Article

Early Rehabilitation with Minimal Invasive Surgery using Expert Tibia Nail (ETN) in Extraarticular Proximal Tibia Metaphyseal Fractures

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Abstract

Introduction: Extraarticular proximal tibia metaphyseal fractures are very common fractures along with soft tissue injuries. Aim of this study is to evaluate effectiveness of Expert Tibia Nail (ETN) for these fractures in view of early rehabilitation, soft tissue complications, radiological union and malalignment.

Materials and Methods: A prospective study of 60 patients treated with ETN for extraarticular proximal tibia metaphyseal fractures from July 2013 to July 2016 at a tertiary care centre. The commonest deformity of apex anterior and valgus angulation was addressed with modification in surgical technique.

Results: The commonest mode of injury in the study was RTA (60%). Johnerand wruh's criteria was used to assess the functional outcome of patient, according to which out of 60 patients outcome were excellent in 41(68.33%), good in 10(16.67%), fair in 4(6.67%) and poor in 5(8.33%). . Mean union time was 20.5 weeks. Nonunion and malalignment was seen in cases 5 each.

Conclusion: With experience and good technique, the overall complication rates are quite low along with early weight bearing and union. It can be considered as an effective alternative technique for extraarticular proximal tibia metaphyseal fractures.

Keywords: Proximal Tibia Metaphysial Fractures, Expert Tibia Nail (ETN).

1. Introduction

Tibial fractures are one of the most common fractures in clinical practice. These fractures present a big challenge for orthopaedic surgeons. High velocity injuries following road traffic accidents are quite common in young patients which are associated with soft tissue injuries. Considering the soft tissue injury, now the trend is shifting towards management of these fractures with intramedullary nailing and minimal invasive plate osteosynthesis[1,2].

Intramedullary fixation is desirable as it is less invasive, load sharing, spares extraosseous blood supply and fracture hematoma [3-5,14]. Patient can be mobilized early with faster rehabilitation. Earlier the use of IMN for these fractures was not suggested by many series due to high incidence of malalignment. Freedman and Johnson, Land and colleagues demonstrated the results of malalignment with IMN in these fractures.

The common deformity seen in proximal tibia metaphyseal fractures is an apex anterior and valgus deformity due to pull of extensor mechanism in flexed position and forces of pull by hamstrings and iliotibial band along with spacious canal at this level respectively[8]. To overcome these deformities, with course of time various techniques have been used with IMN like proximal and lateral entry point[8,9], use of the semiextended position[7], poller screws[10,11], temporary unicortical plates[12], clamps and provisional Kwire reduction and use of newer implant designs[13]. The aim of this study is to evaluate the effectiveness of expert tibia nail in proximal tibia metaphyseal fractures in view of faster rehabilitation, soft tissue complications and malalignment.

2. Material and Methods

A prospective study of 60 patients with closed extrarticular proximal tibia metaphyseal fractures underwent fixation using Expert Tibia Nail at a tertiary centre from July 2016 to July 2016. Approval was given by the institutional ethics committee, with written informed consent from all patients. Inclusion criteria were closed extrarticular proximal tibia metaphyseal fracture and exclusion criteria were compound fractures, intraarticular fractures, pediatric and pathological fractures.

All patients were initially evaluated with radiographs of affected leg with knee and ankle joint in both planes. After giving initial treatment in the form of closed reduction and splint, patients were admitted, investigated and posted for surgery after taking written informed consent. Routine antibiotic prophylaxis was used during preoperative and postoperative period for 24 hours. All patients were operated using 316L stainless steel expert tibia nail with five interlocking screws proximally which includes two from medial to lateral and two placed obliquely to get hold in tibial condyles for better rotational stability and the last one in anterior to posterior plane. A lateral parapatellar tendon approach with patient supine on radiolucent table was used. From the various techniques described in literature we have used extended position of knee, AO reduction clamps and K-wires for provisional fixation from medial side of proximal fragment into the medial side of distal fragment directing anteriorly to posteriorly (Figure 1, 2 & 3).

A proximal and lateral entry point is chosen to gain maximum length of nail in proximal fragment and prevent valgus deformity. After achieving reduction and confirming it in image intensifier we do the rest of the procedure in routine manner with distal locking done using free hand technique under image intensifier. The proximal end of nail is kept flush with the bone to gain maximum length of oblique screws in proximal fragment.

Postoperatively radiographic evaluation was done with radiographs of affected leg along with knee and ankle joint. An angular malreduction was defined as being 5 degrees or greater in any plane. Passive range of motion exercises along with static quadriceps strengthening exercises was started from immediate postoperative period. Wound check was done on third postoperative day and patients were discharged and called for suture removal on 12th postoperative day. Active ROM exercises were started on suture removal and patients were advised to follow-up on completion of 4 weeks. Toe touch weight bearing started after 4 weeks and radiographs were done and assessed for alignment and union. Partial weight bearing started from 6th week and shifted to full weight bearing after 8 weeks. All patients were followed up on monthly basis for radiographic and clinical evaluation. Fracture union was defined radiographically as bridging cortical contact of three out of four cortices combined with ability to bear full weight on extremities.

Figure 1: IITV Image showing provisional reduction with K wire in AP plane

Figure 2: IITV Image showing provisional reduction with K wire in Lateral plane

Figure 3: Intraoperative image showing reduction of fracture in extension using AO reduction clamp

3. Results

Road traffic Accident (60%) was most common mode of injury. The age distribution range from 22to 63

(mean age 48.7). Among 60 patients 44(73.33%) were male and 16(26.67) were females. Time of fixation ranged between 3 days to 10 days (mean 7 days) depending upon soft tissue status. Out of 60 patients, 56(93.33) united with mean union time of 20.5 weeks and range from 14 to 30 weeks and remaining 4 patients had to be intervened by bone grafting. Johnerand wruh's criteria was used to assess the functional outcome of patient, according to which out of 60 patients outcome were excellent in 41(68.33%), good in 10(16.67%), fair in 4(6.67%) and poor in 5(8.33%). Acceptable alignment was seen in 55 patients (criteria for acceptability was considered with average coronal and sagittal plane deformity less than 5 degree). 5 patients had coronal plane deformity (3 varus and 2 valgus) of more than 5 degree but did not had any effect clinically. Complications include surgical site infection with 1 deep infection and 3 superficial infections, patient with deep infection was managed with nail removal and debridement and patients with superficial site infection were treated with wound care and antibiotic treatment. No case of compartment syndrome, neurovascular complication was reported post operatively.

Figure 4: Preop radiograph showing fracture proximal tibia

Figure 5: Postop Radiograph showing adequate reduction and alignment with Expert Tibia Nail

4. Discussion

Extraarticular Proximal tibial metaphyseal fractures are still a treatment challenge for orthopedic surgeons. Soft tissue concerns due to injury and with open plating techniques resulted in the increased use of either percutaneous plating methods (MIPO) or intramedullary nailing fixation (IMN), which has an added benefit of being load sharing device to allow early weight bearing. Malalignment was very common with early nailing techniques and implant designs as shown by results of series published during 1990s [3,8]. In a radiographic analysis of 133 tibia fracture streated with IMN fixation, Freedman and Johnson [8] reported that 7(58%) of the 12 proximal tibia fracture were malaligned, compared with an overall rate of 12% in the whole cohort. This experience was shared by Lang *et al*. too. Although the analysis of three prospective and 14 retrospective case series yielded rather weak evidence, higher rates of malunion were noted for intramedullary nails, while infection rates were significantly lower. The malunion rates in our series are much lower compared to the above mentioned series because of modification in technique and new implant design providing multiple locking options for better stability. Extraarticular proximal tibia fractures which were treated with plate osteosynthesis especially after high energy injuries had encountered higher complication rates, because of which many surgeons preferred intramedullary interlocking nailing technique to minimize surgical insult to the fracture and adjacent soft tissue. Clinical benefits of ILN influenced surgeons to device better strategies by implant design modifications and newer surgical techniques. Blocking or poller screw [9-11] are used to minimize canal diameter in metaphyseal wide region i.e. decrease effective size of canal when needed. They are believed to provide added stability to the construct. They are preferred and retained in cases of osteoporosis orcomminution. They are always placed in the concave side of deformity; so lateral or posterior to nail usually, ideally before reaming. No poller screws were used in any of our cases. Since all the cases were closed fractures, plate assisted reduction [12] was not performed. They are indicated ideally asa temporary measure in open fracture or maybe used in closedwhen other reduction maneuvers fail.

5. Conclusion

The good results shown in the study proves that expert tibia nailing should be considered as an equally good option in extraarticular proximal tibiametaphyseal fractures and those patients with poor status of soft tissue. From our study it is clear that adequacy of reduction and alignment at union solely depends on the precise operative technique. Early rehabilitation in terms of movements and

weight bearing is an additional advantage being a load sharing device. Given that there is no clear consensus on acceptable alignment in these fractures, the minor malalignments in the majority study cases may very well not be clinically significant and would be considered by some to be acceptable; especially when the patients are functionally not impaired. There were no serious complications like neurovascular deficit noted in the study groups except for delayed union in 5 cases which were managed with bone grafting.

Compartment syndrome and other soft tissue complications like blisters is not been seen in any of the postoperative patient. Dynamization was not considered since it was believed to increase the instability at the fracture site. The major limitation of the study is the smaller number of cases and the limited period of follow up.

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