OUTCOME OF UNREAMED INTERLOCKING NAIL IN OPEN FRACTURES OF TIBIA

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ABSTRACT
This study was undertaken to investigate the outcome of unreamed interlocking nail in open fractures of tibia in our setup. sixty cases of open tibial diaphyseal fractures were treated with unreamed intramedullary interlocking nail. The cases were followed up for a period of nine months and data regarding, infection, union, delayed union and nonunion was recorded. In our study union occurred in 50 (83.3%) patients within 5 months, delayed union in 9 (15 %) patients and nonunion in 1 (1.7%) patient after course of follow-up. Infection was observed in 8 (13.3%) cases while 52 (86.7%) cases did not show any sign of infection. Because of the high union rate and low infection rate, we consider unreamed interlocking nailing of tibial fractures as the best mode of treatment for open diaphyseal tibial fractures.

Keywords: open tibial fracture, unreamed interlocking nailing, union, non-union, infection

INTRODUCTION
Tibia is one of the most common bone to sustain open injury because of its superficial nature.[1] over speeding with motor vehicles, motorcycles and increase in popularity of extreme sports contributing to the occurrence of tibial shaft fracture in modern society.[2]Open fractures of the tibia shaft are both limb threatening and potentially life threatening emergencies. Optimal treatment involves appropriate initial evaluation and administration of antibiotics, urgent debridement and skeletal stabilization. Repeated soft tissue debridement may be required followed by soft tissue coverage. [3] Treatment of open fracture of the tibial shaft remains controversial (whether by External fixator, Dynamic compression plate or by interlocking nail). Because of precarious blood supply and the lack of soft tissue cover of the shaft of tibia make these fractures vulnerable to nonunion and infections.[4] Open tibial shaft fractures have traditionally been treated with external fixation and repeated wound debridement.[5] But with external fixation there are some drawbacks i.e. it is associated with pin track infection, delayed union, nonunion, malunion, and ankle joint stiffness.[6] In the presence of external fixator if we have to perform soft tissues procedure its pins may act as an obstacle. External fixator is either Uniplanar AO/ASIF type fixator or multiplanar Ilizarov ring fixator. Uniplanar fixator offers less stability and patient is unable to bear weight. While ring Fixator give good stability but multiple pins are problematic (pin tract infection) and hinders soft tissue care and procedures.[7]

Early debridement and unreamed interlocking nail has emerged as better modality in the treatment of open fractures of tibia.[8] It has got better result as compared to other conventional techniques in the management of open fractures of tibia, as unreamed nailing preserves the endosteal blood supply and therefore improves fracture healing and decreases risk of infection. In the presence of interlocking nail soft tissue procedure can be easily performed.[9]

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METHODS AND MATERIALS
This descriptive case series study was conducted at the Department of orthopedics, Lahore General Hospital/PGMI Lahore for the period of 6 months. Through non-probability purposive sampling, 60 cases of open fracture of tibia were included. Demographic information of patients was obtained, Patients were explained about the risks and informed and written consent was taken. Procedures were performed by single surgeon. After thorough debridement under anesthesia, an unreamed interlocking nail was inserted in all the sixty patients and each nail was statically locked with one screw proximally and one screw distally. After operation 3rd generation cephalosporin was given to each patient for 1 week. wound were managed by change of dressing/ debridement and closure/coverage according to individual needs. Patients were followed regularly i.e on 1st then 10th , 20th , 30th

post operative day then monthly for 9 months in OPD and data for union, Delayed union , nonunion and infection was recorded as per operational definitions. This data was collected in a specially designed Performa. Data was analyzed by SPSS version 11.

OBSERVATIONS AND RESULTS

The mean age of all patients was 32.82±8.87years. There were 49 (81.7%) male and 11 (18.3%) female patients involved in this study. There were 27 (45%) patients who presented with Gustilo Anderson type I fracture, 23 (38.3%) had Gustilo Anderson type II and 10 (16.7%) had Gustilo Anderson type IIIA.

We observed that there were 17 (28.3%) patients who had transverse fracture, 22 (36.7%) had oblique fracture, 8(13.3%) had spiral fracture and 13 (21.7%) had comminuted fracture. Union occurred within 5 months in 50 (83.3%) patients, 9 (15 %) showed delayed union while 1 (1.7%) patient had non-union after course of follow-up. Infection was also observed in some cases during follow-up of patients in OPD. It was observed in 8 (13.3%) cases while 52 (86.7%) cases did not show any sign of infection.

Among patients of age range 18-25 years, union occurred in 11 (84.6%) cases while 2 (15.4%) showed delayed union. Among cases of age range 26-35 years, union occurred in 22 (88%) cases while 3 (12%) showed delayed union. Among patients of age range 36-45 years, union occurred in 12 (85.7%) cases while 2 (14.3%) showed delayed union. Among patients of age range 46-55 years, union occurred in 5 (62.5%) cases while 2 (25%) showed delayed union and 1 (12.5%) had non-union. The highest rate of union was observed in patients 26-35 years of age.

Among patients of age range 18-25 years, infection occurred only in 1 (7.7%) case, among cases of age range 26-35 years, infection occurs in 2 (7.7%) cases among patients of age range 36-45 years, infection occurs in 2 (14.3%) cases and among patients of age range 46-55 years, infection occurs in 3 (42.9%) cases.

Among cases of type I fracture, union occurred in 24 (88.9%) cases, delayed union occurred in 3 (11.1%) cases .Among cases of type II fracture, union occurred in 20 (87 %) cases and delayed union occurred in 3 (13%) cases. While among cases of type III fracture, union occurred in 6 (60%) cases and delayed union occurred in 3 (30%) cases and non-union occurred in 1 (10%) cases.

Among cases of type I fracture, infection occurred in 2 (7.4%) cases, among cases of type II fracture, infection occurred in 3 (13.0%) cases and among cases of type III fracture, infection occurred in 3(30%) cases.

Among cases of transverse fracture, union occurred in 14 (82.4%) cases and delayed union occurred in 3 (17.6%) cases. Among cases of oblique fracture, union occurred in 20 (91%) cases and delayed union occurred in 2 (9%) cases. Among cases of spiral fracture, union occurred in 8 (100%) cases. Among cases of comminuted fracture, union occurred in 8 (61.5%) cases and delayed union occurred in 4 (30.8%) cases and 1 (7.7%) case showed non-union.

Among cases of transverse fracture, infection occurred in 2 (11.8%) cases, among cases of oblique fracture, infection occurred in 2 (9.1%) cases, among cases of spiral fracture, infection occurred in 1 (12.5%) cases and among cases of comminuted fracture, infection occurred in 3 (23.1%)cases.

DISCUSSION

Fractures of the tibial shaft have a recorded incidence of 17–21 per 100,000 population, represent 2% of all fractures, and 36.7% of all long-bone fractures in adults. Due to the specific anatomical features of the tibia (limited soft tissue coverage), more than 15% of it's fractures are classified as open, representing the most common (44.4%) open long-bone injuries. Open tibial fractures are mostly the result of high-energy trauma. [10]

Due to the precarious blood supply of the tibial bone, the initial and secondary contamination, and the often sub-optimal conditions of their treatment present as an urgent surgical priority, they are associated with high rates of complications, such as nonunion, malunion, infection and compartment syndrome.[11]

The use of unreamed interlocking tibial nails in the management of open fractures of the tibial shaft has gained wide acceptance. This technique has been reported to have reproducible good results with a low incidence of complications in Type I, Type II, and Type IIIA open tibial shaft fractures. The use of unreamed nails in Type IIIB fractures continues to be a source of controversy.[12]

In this study, we included 60 patients of open tibial fracture. The mean age of all patients was 32.82±8.87years. In one study by, Clatworthy MG et al the mean age of patients presented with open tibial fracture was 29.25±13.36years.[13]

In our study, there were 49 (81.7%) male and 11 (18.3%) female patients involved. The male-to-female ration was 4.5:1. Results of one study coincide with distribution of gender in our study. Researchers found male to female ratio as 2.5:1.[14]The prevalence of open tibial fracture in male was 13% and in female the prevalence of open tibial fracture was 15%.[15]

According to our study, mostly patients presented with Gustilo Anderson type I [27 (45%)] and II fracture

[23 (38.3%)] while only 10 (16.7%) had Gustilo Anderson type IIIA. But one study (By Ibeanusi SEB), showed that Gustilo and Anderson type III open injuries were the most frequent followed by the type II injuries.[14]

On clinical examination of patients we observed that mostly cases presented with oblique fracture [22(36.7%)], 17 (28.3%) cases presented with transverse fracture, 13 (21.7%) had comminuted fracture and 8 (13.3%) had spiral fracture. While in a study by Joshi et al., the most common presentation of patients with open tibial fracture was transverse (62.5%), Comminuted (17.9%) and Oblique (10.7%) while spiral were present in least patients (8.9%).[16]

After the analysis of the data, it was noted that union occur with 5 months in 50 (83.3%) patients, 9 (15%) showed delayed union while 1 (1.7%) patient had non-union after course of follow-up. In study by Joshi et al., union was observed 73.3% cases, delayed union in 10.7% cases, non-union was also observed in 10.7% cases which underwent unreamed interlocking nailing.[11] Bonatus et al., study showed 68% united by 6 months, all fractures had united by 12 months and concluded that the use of unreamed locking intramedullary nailing in Types I, II, IIIA, and IIIB open fractures of the tibial shaft is supported.[13]

Despite thorough debridement and adequate soft tissue coverage, there was an overall infection in 8 (13.3%) cases. Joshi et al., study showed infection only in 10.7% cases.[16] various series reported 2% to 16% incidence of deep infection.[17]

Gaebler et al., conducted a metaanalysis on unreamed interlocking nailing. Analysis showed 1.1% deep infections,9.2% delayed unions and 2.6% nonunions and he concluded that fracture distraction of more than three millimeters should not be tolerated when stabilizing tibial fractures with unreamed, small-diameter nails as this increases the odds of having a delayed union by twelve times ($p < 0.001$) and a nonunion by four times ($p = 0.057$).[18]

Inan et al., concluded that the unreamed interlocking nailing technique had the disadvantage of a posttraumatic osteomyelitis and delayed union that require additional surgery[19]

In our study, when data was stratified for different age groups, Gustilo Anderson type and geometry of fracture. Highest rate of union and lowest rate of infection was observed in younger patients, whereas highest rate of delayed union, nonunion and infection was seen in elderly patients. There was also observed that among Gustilo Anderson type III open fracture nonunion and infection rate was higher as compared with type I and type II. As for as fracture geometry is concerned highest union rates were observed in spiral followed by oblique, transverse and comminuted fracture respectively. Delayed union and nonunion rate was higher in comminuted fractures

CONCLUSION

Results of this study showed that unreamed interlocking nailing is quite enough to manage the patients presenting with open tibial fracture as results of our study showed that there is higher union rate with low infection and non-union rate. The key procedures to minimize deep infection are adequate debridement, early soft-tissue coverage, and adequate fixation. Now we can recommend this technique to manage patients of open tibial fracture. By recommending this technique we can minimize morbidity and burden of repeated surgeries on patients as required with other traditional techniques (i.e. external fixation) in the management of open fractures being used in our setup and also in this way we can also reduce economic burden on poor patients.

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