

Outcome of Open Diaphyseal Tibial Fracture Managed with Unreamed Intra Medullary Inter Locking Nail

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ABSTRACT

Objective: To determine the outcome of unreamed intra medullary inter locking nail in management of open tibial diaphyseal fracture in terms of union.

Methods: This descriptive case series study was conducted from July 2011 to June 2012. Adult patients of either sex with tibial diaphyseal open fracture Gustilo-Anderson type I-III A treated by unreamed intramedullary static inter locking nail were selected, while patients with co-morbidities, associated intra articular fractures, infection and Gustilo-Anderson type III B-C were excluded. Patients were operated with intramedullary interlocking and along with wound management. Some required reconstruction with flaps and dynamization of nail. Patients were clinically and radiographically followed up for union of fracture on monthly interval for 9 months and documented on proforma. SPSS 20 was used for statistical analysis.

Results: 70 patients were selected. Males were 60 (85.71%) and females were 10 (14.29%). Mean age was 35.3 ± 12.8 . 32 (45.7%) patients had Gustilo-Anderson type I fracture, 24 (35.2%) had type II fracture and type III-A in 14 (20%) patients. 61(87.14%) patients had duration of fracture 3 or less days and 9 (12.86%) had duration of more than 3 days at presentation. Union occurred in 60 patients (85.71 %), Non-union in 10(14.29%) patients. Mean duration of union of fracture was 16.24 ± 4.19 weeks. 20(28.57%) patients required dynamization of nail. 9(12.85%) patients developed delayed wound and bone infection requiring management..

Conclusion: Intramedullary static unreamed Interlocking Nail is a suitable treatment, and could be preferred treatment in tibial diaphyseal open Gustilo-Anderson Type I-III A fractures, due to achieving timely union and low infection rate.

Key words: Tibia, static interlocking nail, diaphyseal open fracture, non-union

INTRODUCTION

Tibial shaft fracture is the most common diaphyseal fracture in adults [1]. Some of these fractures are open fractures because tibia is a subcutaneous bone. Management of unstable fractures of the tibia shaft remains controversial [2] despite significant advances in fracture care. Severe soft tissue injuries have association with open fractures, causing complications, such as malunion, non-union, and infection [3]. Surgical techniques, which are being used for managing open tibial fractures are intramedullary nailing [4] with or without reaming or external fixation [5]. Preservation of the endosteal blood supply is the advantage of

unreamed intramedullary nailing and therefore improves fracture healing and decreases the risk of infection [6]. Unreamed intramedullary tibial nailing is a "biological" method of osteosynthesis [7]. This study will help us in understanding the effectiveness of our surgical technique and give us an opportunity to improve it, so that we can better treat our patients and can prevent long-term disability.

METHODS

Adult patients with Gustilo-Anderson classification Type I-III A [8] tibial diaphyseal open traumatic fracture of every age and either sex were included. Patients younger than 18 years, Gustilo and Anderson B and C fractures, patients with co morbidities, associated injuries including articular fractures and infection were excluded. Patients were informed about the procedure, its pros and cons were discussed. Informed consent was taken. Majority of patients were operated within 6 hours of injury for soft tissue management and others

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within 6 – 12 hours of injury. Wound swabs for culture and sensitivity for antibiotics were taken. Wounds were debrided, washed and loosely closed. Intra medullary interlocking nail in a static mode was used to stabilize fractures on next elective operation list along with appropriate per operative wound management. First author along with other investigators performed surgery and follow up. Post admission and preoperative antibiotic prophylaxis was administered to every patient. Operations were done using standard protocol of static tibial inter locking nailing [9] under spinal or general anesthesia using image intensifier. After para patellar tendon incision, midline entry in proximal tibia made. Guide wire was inserted closely after reducing the fragments under image intensifier. Open reduction was required in few fractures through the open wound. Nail diameter was calculated pre operatively according to width of tibia medullary canal on radiographs. Suitable length diameter fluted nails 1mm smaller than the diameter of medullary canal measured pre operatively on radiographs was inserted. Nail was inserted and locked proximally and distally under image intensifier without difficulty. Overlying wound was regularly managed as required. Post operatively I/V antibiotics were given till hospital stay, and converted later to oral at the time of discharge according to C/S report. Oral antibiotics continued for 5 days.

Physiotherapy was carried out with the help of trained physiotherapist. Patient was allowed to sit on bedside next morning and active and passive range of motion exercises started. Fracture wounds were inspected every 24-48 hours. Healthy wounds were dressed. Infected unhealthy wounds were debrided regularly and closed secondarily when got clean and healthy. Some extensively debrided wounds required bone coverage with local flaps. Patient was discharged as soon the wound was found to be clean and healthy, with the advice of non-weight bearing ambulation with crutches for 2 weeks. Sutures were removed on 14th day of their application for each individual patient. Gradual increasing weight bearing was allowed using a walker or two crutches three weeks after fracture stabilization and progress monitored with signs of union and appearance of callus on radiographs. Patients were clinically and radiographically followed up at monthly intervals up to 9 months for union and recorded in Performa. Union was evaluated clinically by pain and tenderness at fracture site, and signs of callous formation on X-rays.

Patients, who showed delayed union after 3 months of fracture stabilization, were dynamized under local anaesthesia by removing farther interlocking screws in relation to the fracture site. 9 patients who developed delayed infection required management with prolonged oral antibiotics administration and removal of implant with external fixation

The data was analyzed by using statistical software SPSS, version 20. Descriptive statistics were calculated for age, duration of fracture, and duration of union of fracture and presented as mean standard deviation. Qualitative variables like gender and outcome i.e. union, delayed union, mal-union and non-union were presented as percentage and frequency. Stratification was used to control effect of age, gender and duration of fracture on final outcome.

RESULTS

70 adult patients with classification type Gustilo-Anderson I-IIIa tibial diaphyseal open fracture were selected. 60 (85.71%) patients were male and 10 (14.29%) were females. Mean age was 35.3 ± 12.8 years ranging from 20 to 65 years. 33 (44.28%) patients were in age group of 21–30 years, 14(20%) in 31–40 years age group, 14 (20%) in 41 – 50 years age group, 7 (10%) in 51 – 60 years age group and 2 (2.85%) patients were in the age group of more than 60 years. 61(87.14%) patients had duration of fracture less than 3 days and 9(12.86%) patients had duration more than 3 days of duration. Union occurred in 60 patients (85.71 %) and non-union in 10 (14.29 %) patients. Mean duration of union of fracture was 16.24 ± 4.19 weeks with a minimum 11 and a maximum 24 weeks. 54(90%) male patients had union and 6(10%) non union. 8 females (80 %) had successful union and 2(20%) non union. 32 (45.7 %) patients had Gustillo and Anderson type I fracture, 24 (34.2 %) type II, 14 (20 %) type IIIa. Among type I fracture, union occurred in 38 (54.28%), non-union in 2 (2.85%). In type II, union occurred in 22 (31.4%) patients,. In type IIIa, 10 (14.28%) patients got union. The mean duration of union in Gustilo type I was found to be 14.3 ± 2.26 weeks with a range of 11 – 19 weeks, in type II 16 ± 2 weeks with range of 13 – 20 weeks and mean duration of union in type IIIa was 17 ± 1.9 weeks with a range of 15 – 21 weeks. In age group of 21–30 years all 33 (47.14%) got successful union, in 31 – 40 years patients 13 (18.57%) got union, in 41 – 50 years group 8 (11.42 %) got union, in 51 – 60 years group 5 (7.14 %) got union, and in patients of more than 60 years 1 (1.42 %)

achieved union. The mean duration of fracture was 1.9 ± 1.3 days with a minimum of one and maximum of 6 days. In group of fracture duration less than or equal to 3 days, 59 (84.28 %) patients achieved union and in group more than 3 days of duration, 5 (7.14 %) patients achieved union. 20 patients developed delayed union in which dynamization of nail was done. 9 patients developed delayed wound and bone infection requiring antibiotics, removal of implant and external fixation

DISCUSSION

Open tibial diaphyseal fractures occur mostly in road traffic accidents and falls [10]. These fractures have significant association with soft tissue trauma and complications [11]. Treatment options are based on management of fracture and soft tissue injuries simultaneously. Different treatment options have been tried and are available in managing open tibial fractures [10]. Most common method of treatment in the past and currently employed for poly trauma patient is external fixation, which can be applied after any duration of injury and any type of open fracture [12]. Fracture stability is achieved along with regular management for soft tissue injury. Now interest has shifted on stabilization of tibial diaphyseal open fractures from external fixation to intra medullary interlocking nail [13]. There is much debate and controversy between reamed or unreamed interlocking nail in stabilization of open fracture of tibia [14]. Because of soft tissue injury in open fracture, union is significantly affected as tibia is subcutaneous bone and has less soft tissue coverage overall. Hence focus of some researchers is mainly on use of unreamed interlocking nail, to preserve endosteal blood supply and prevent compromising soft tissue injury further and hence achieve early union [15]. This improves rate of union [16], early recovery and rehabilitation of patient. But its use is limited to Gustilo and Anderson type 1-111A [8] open fractures within 6-12 hours of injury. Use after 12 hours lapse increases chance of infection. Our study focused on used of unreamed intramedullary interlocking nail in open tibial fractures, so we could show rate of union by this technique. Different studies have been carried out locally and abroad and have shown different results. Agrawal and colleagues [17] showed increased soft tissue and bony healing with average union time of 20.7 weeks with unreamed interlocking tibial nailing. Our time of union was 16.2 weeks, which was better than their study. We had satisfactory results in 91.3 % patients. Joshi and

colleagues [18] showed 83 % satisfactory results, Lin J and coinvestigators [19] showed 92 % union and satisfactory result. Runkel M [20] showed 83 % satisfactory results, Angliss RD [21] showed 86.2 %, and Harrington P [22] showed 100% satisfactory results. Our and results of these investigators showed superior union rates and satisfactory outcomes with little variation, but all are almost comparable. Shannon FJ and colleagues [23] showed better results with unreamed interlocking nail, Kaftandziev. I [24] found less time of union, a lower percentage of non union and an improved functional outcome and Alberts KA [25] showed superior union rates in less time. These above three studies are in comparison with our study because we also showed satisfactory results and union, 14.29 % non union rate and satisfactory functional outcome. Tu YK and colleagues [26] suggested unreamed tibial interlocking nail to be good choice for management of open tibial fractures. Results of our study also showed that it is a reasonable choice in management of open fractures compared to other surgical options. Mayr E and colleagues [27] showed unreamed interlocking nail to have an advantage in fracture healing as shown by results in our study.

Our study and all other studies done to find out the role of unreamed tibial interlocking nail in treatment of open tibial fractures have shown that it offers a better union rate and decreased complications, hence excellent and satisfactory functional outcome. This makes unreamed interlocking nail a better choice than reamed interlocking nail and external fixators, and offers an advantage over other surgical modalities in terms of better results.

CONCLUSION

Unreamed Intramedullary Interlocking Nail is a suitable treatment, in fact could be preferred treatment in diaphyseal open tibia fractures because it provides better fracture stability, timely union and low infection rate. This results in early ambulation of the patient, decreased hospitalization, early recovery and rehabilitation, because of early union and lesser complications.

Authors Contribution

KMK. Conceived and designed data collection and manuscript writing

HA. Data collection and did statistical analysis

MSM. Editing of manuscript

AB. Did review and final approval of manuscript.

KMK. Takes the responsibility and is accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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