Assessment of Functional and Clinical Outcome of Intra-Medullary Locking Nail in Open Fracture Shaft of Tibia

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Abstract

Objective: To evaluate the clinical as well as functional outcomes after the open fracture shaft’s intra-medullary locking nail fixation of tibia.

Methodology: A sum of 25 patients got recruitment having the age from 18 to 65 years appearing with the open fracture shaft tibia depending upon the admissions in emergency and outpatient departments of DHQ Faisalabad. The classification of the fractures was carried out according to the criteria of Gustilo Anderson categorization. All the patients underwent operations with intra-medullary interlocking nail with antibiotic coating. The assessment of the outcomes was carried out according to the Alho and Ekeland standard. We observed the complications with a follow up period of 6 months clinically as well as through radiological imaging.

Result: In this research work, 25 patients having age from 18 to 65 years got treatment with the antibiotic coated intra-medullary interlocking nail. 80% patients were male and 20% patients were from female gender. Average duration of union was 16.50 weeks. There was no implant associated infection but there was superficial infection available in only two patients.

Conclusion: There was much good radiological and clinical outcomes of utilization of antibiotic coated nail after 6 months. These preliminary findings help the utilization of the implants with antibiotic coating as new potential option of treatment to prevent the rate of infections in the patients of trauma.

Keywords: Preliminary; Intra-Medullary; Categorization; Infection; Antibiotic; Union

Introduction

Open tibia fracture is very frequent type of injuries seen in the practice of orthopedic field. Proper treatment for the open fractures of tibia is serious issue in the developed traumatology era. There are increase chances of infections as well as non-union for this bone of tibia [1]. For the selection of the optimal treatment mode, one has to consider the significance of the related injuries to soft tissue along with the management of fractures. There are various types of modalities which are in practice for the management of such fractures as immobilization and stabilization through surgeries. Locking of intra-medullary nails reduced the incidence of mal union in fractures of comminuted types. Most of the inter-locking intra-medullary nails convoluted reaming which destroys the blood supply of endostea [2] and it leads to the thermal tibia’s necrosis. There is high rate of infection after the management of open fractures of tibia with the help of intra-medullary nailing.

In one research work on eight patients suffering from open fracture of tibia got treatment through UTN PRO tect intra-medullary nails, it was stated that there was existence of no infection in complete one year and there was healing of all fractures in just 6 months [3]. The main aim of the locally provided antibiotics was to restrict the bacterial colonization on implant surface, thereby decreasing the risk of the infections associated with implant. One other advantage of the local delivery systems is that there is achievement of high antibiotic concentrations in the required region with no high doses and related side effects [4].

**Methodology**

The collection of the information for this research work was carried out from the DHQ Faisalabad from March 2019 to January 2020. All these patients will get treatment surgically with the utilization of the antibiotic interlocking nail because they were suffering from the open fracture of the tibia. The design of this research work was prospective. All the patients in the study period were administered surgically by antibiotic coated Intra-medullary nailing for the open fractures of tibia shaft at our institute. All these patients got treatment with the help of antibiotic coated tibia nail. We called all the patients and informed them about the purpose of this research work, we took the written consent from the patients before assessment.

A sum of 25 patients present with open fracture of tibia shaft got inclusion in this research work who underwent treatment surgically with the help of antibiotic coated nail. The inclusion criteria of the patients were having greater than eighteen years of age and open fractures gustillo Anderson Type-1, Type-2 fractures. All the patients with related injury to head, delayed union, patients unwell or not fit surgical intervention, patients who lost their follow-up and patients present with the neurovascular injuries got exclusion from this research work.

**Surgical technique**

We placed the patients on the operation in supine limb hanging position. After the application of anesthesia, debridement of the wound was performed. Approximately, three to six liters saline will be utilized in each patient.

![Figure 1: Intraoperative position of nailing.](image-url)
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Figure 2: Incision at entry point of nailing.

Figure 3: Bony entry with awl.

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Surgeries were carried out under the image intensifier. We took all the aseptic precautions. We applied the five centimeters long incision in midline from lower patella pole to tuberosity patellar tendon of tibia in line with the incision to skin. We used curved awl for entry. We initially inserted the awl at right-angle to bone. We used a small hand reamer to ream cancellous bone of entry portal for the accommodation to the proximal nail end. We tightened the proper nail size to insert and jig. We used the tissue protector to avoid the skin injury and knee’s tissues. We drove the nail with the help of manual pressure and then checked its progress with the help of image intensifiers. There was insertion of eight mm protection trocar and sleeve through proper hole present in insertion handle until the cortex contact. The removal of the trocar was carried out and insertion of the four mm drill sleeve was carried out. We measured the bolt length to be inserted. We inserted two bolts. In only some patients, only single locking was carried out normally distal one. Then we performed the closure and applied the POP slab, we noted down the mean duration of surgery for nailing. We encouraged the movement of active toe. We watched the patients for excessive pain, swelling and distal circulation. We provided the physiotherapy to the patients after surgery by proper gait training. We allowed the weight bearing to the patients who were present with less than 50.0% comminution. We called all the patients after 6th, 12th, 18th, 6th month and thereafter each three months interval till the occurrence of union. We also measured the movement at ankle and knee joints.

Results

52% patients of this research work were having age of 18 to 34 years and 48.0% patients of were having age from 35 to 65 years. There was predominance of the male gender. There were 80% male and 20% female patients. Road traffic accidents was the most common injury cause and it was present in 80% patients. Most of the fractures were Type-1 (52.0%). 64% fractures were available to be in middle 1/3rd, 12% fractures in upper 1/3rd and 24.0% fractures were in the lower 1/3rd of the tibia shaft. 91% patients underwent surgery

within 24 hours of surgery. We did close nailing in all the patients. There was early union of the non-comminuted fractures in 15.50 weeks in comparison with the comminuted fractures (16.20 weeks). 8% patients of this research work got infection in this research work. The control of the infection was carried out with proper antibiotics, debridement and drainage. There was no removal of any nail for the infection control. There was no requirement of the bone grafting after initial surgical intervention.

Figure 5: Radiological outcome.

Average duration of the stay in hospital was 10 days from 5 to 19 days. Most of the patients got discharge after seven days of surgery. There was delayed discharge for those patients who developed some complications. In the patients of this research work, there was start of partial weight bearing after a mean duration of 25.14 days. There was start of full weight bearing after a mean duration of 8.94 weeks. The mean duration of union was 15.80 weeks. There was no limb shortening case in this research work. There was 070 Valgus and 100 varus deformity in two patients. There was delayed union in 2 patients and the union of these fractures carried out after the dynamization. The outcome was from excellent too good in 85.0% patients of this research work.

Discussion

The most common injuries of the long bone are tibia shaft’s injuries. There should be individual assessment of every open fracture of shaft of tibia and it can be harmful to establish the fixed treatment routines [5,6]. Some of the difficulties which have association with the fractures of tibia shaft are given below; there is high prevalence of the infected and open fractures because tibia is present beneath the skin, there is re-displacements of different fragments under the swollen subside areas and there is functional disability sometimes due to the imperfect placement of the fragments [7-10]. There is delayed union as an outcome of the fracture severity. These difficulties are the main reason of great concern for surgeons to select the best method for the management of the fractures of tibia shaft [11,12]. There is existence of many methods with excellent outcomes. In this research work, we assessed our findings and compared these results with findings of many other research works. Analysis of this research work is as follows [13-15].

This current research work showed that average age for such fractures was 33.40 years. This finding is much similar with the results of other research studies [16]. These types of injuries are much common in the males of young age of less than thirty-five year of age. In current research work, 52% patients of this research work were between 18 to 34 years of age. 80% patients of this research work were males. This factor was because of the more outdoor activities of males as compared to females [17-19].

The most common tibia fracture cause was road traffic accident in this research work (80.0%). There is difference in rate of incidence of injuries due to road traffic accidents in the research works of Ellis D Seddin and David TZienter (60.0%) and 57.0% in the study of C.M. Court Brown [20]. These rates of incidence were much less as compared to the rate of incidence present in this current research work. The mean duration for the union of fracture in various research works was about 9 to 24 weeks [21]. In this current research work, mean duration for the union of fracture was about 15.80 weeks. The results of this current research work are much comparable with the findings of another research works of particular field.

**Conclusion**

Infections associated with implants pose a much significant challenge in surgical management of the fracture of tibia. Local management through antibiotics can reduce the risk of associated infections. In this current research work, we stated that utilization of the antibiotic coated nail for the treatment of open tibia fracture was present with association to the absence of infections of wound as well as good healing of fractures. These positive outcomes were also under observation in the patients with serious traumas of tibia.

**Bibliography**

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