Original Article

Journal of Orthopedic Education
Volume 5 Number 1, January - April 2019
DOI: http://dx.doi.org/10.21088/joe.2454.7956.5119.1

Ilizarov Technique for Managing Fractures with Infection: An Institutional Based Study

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Received: 07.12.2018 **Accepted on:** 15.12.2018

Abstract

Background: Multiple treatment modalities have been reported for managing such cases like bone grafting, tissue transfers, antibiotic cement and Ilizarov technique. Bone grafting itself poses limitations of size and morbidity of the donor site. The aim of the present study was to determine the accuracy of Ilizarov technique in managing non-united infected tibial fractures. *Materials and Methods:* The present prospective study was conducted in the Department of Orthopaedics, Mata Gujri Memorial Medical College, Kishanganj, Bihar (India) for duration of 2 years. All the subjects were followed up for a period of 10 months. Under complete aseptic conditions, all the subjects were taken up for surgery. Debridement of the area was done, and the material was sent for sensitivity tests. Bone nibbling was performed until fresh bleeding was encountered. At regular intervals, X-rays were taken to determine the radiological extent of bone healing. Assessment was done based on Fernandez Esteve grading. In case of any discharge from the tract, infected pin was removed and exchanged in the same sitting. Once healing was satisfactory, ring and fixator were removed, and cast was applied. *Results:* The mean age of the subjects was 38.87±3.22 years. There were 13 males (59.1%) and 9 females (40.9%) in the study. There were 3 males and 2 females with bone shortening of 1-3 cm. The union time amongst them was 6 weeks and the consolidation time was 9-10 months. Conclusion: Treatment using Ilizarov method with infected tibial fractures provides promising results. Optimal fixation was seen amongst subjects in the present study.

Keywords: Consolidation; Fractures; Ilizarov; Infected.

Introduction

Nonunion of infection tibial fractures is common in orthopedic practice [1] and along with this there occur bone and soft tissue defects with inequalities in limb and multiple bacterial infections [2]. Managing such infected tibial fractures poses a great challenge to the clinicians [3]. Multiple treatment modalities have been reported for managing such cases like bone grafting, tissue transfers, antibiotic cement and Ilizarov technique. Bone grafting itself poses limitations of size and morbidity of the donor site. The defects in Tibia and fibula are very different from each other. The bony break generally results from traumatic bone loss at the location of the injury [4]. Due to high energy trauma there is gradually advancing area of cell death and this gap increases with subsequent debridements [5]. Repeated and consistent infection removes away at the end of bone due to various attempts at union. A multidisciplinary approach is required for the management of such cases. The operating team requires skills of limb lengthening, correction of deformity, and bone transport methodology [6-11]. For infected fractures of tibia with small defects antibiotic cement is suitable and bone grafting is

usually not possible for such cases. Other than these techniques may not be suitable of managing infected and bony non-united fractures simultaneously. This is only possible with the use of Ilizarov technique, and infection recurrence was rarely seen [12-14]. Bone transport is a form of Ilizarov technique, and it is apt for managing of infected non-united fractures with bone defects of any length. Hence, bone transport technique has proved to be of great advantage in managing infected tibial nonunion. The aim of the present study was to determine the accuracy of Ilizarov technique in managing non-united infected tibial fractures.

Materials and Methods

The present prospective study was conducted in the Department of Orthopaedics, Mata Gujri Memorial Medical College, Kishanganj, Bihar (India) for duration of 2 years. All the subjects were followed up for a period of 10 months. All the subjects were informed about the study and a written consent was obtained from all in their vernacular language. The study included both males and females between the age group of 30 to 50 years with the bone loss of upto 7.5 cm. Subjects failing to give the consent and reporting for follow up were excluded from the study. Subjects with tuberculosis or blood thinning agents were also excluded from the study. Smokers were also not included in the study. Subjects with discharge from the infected site were managed daily with dressing of silver stream solution and it was only when the discharge was minimal that the subjects were taken for surgery. Under complete aseptic conditions, all the subjects were taken up for surgery. Debridement of the area was done, and the material was sent for sensitivity tests. Bone nibbling was performed until fresh bleeding was encountered. The numbers of rings of the Instrument werepre-decided based on the site of fracture and corticotomy. Keeping the anatomical positions in mind and based on the position of fracture full rings were placed between the proximal and distal anatomical cuts. Tensioning was performed for allthe wires. Schanz pin were fixed with the posts attached to the ring if required. After complete fixing of the Ilizarov apparatus, the fracture location was compressed. Sterile pin dressing was done with povidone iodine. Limb vascularity was checked in all the cases. Postoperatively, injectable cefotaxime plus sulbactam antibiotics were given for 5 days. Analgesia was provided using injectable NSAIDS as and when required. Mobilization of knee and ankle were initiated at day 1. By day 5 to Day 14 weight bearing was initiated. In subjects with corticotomy, distraction was initiated by day 3 to day 5. Distraction was performed by 90 degrees every 4 hoursin 4 installments, in a way that by the end of a day, distraction of 1 mm was performed linearly at the corticotomy site. On day 14, suture removal was done. Dressings were performed regularly. Subjects were tutored about the distraction themselves. Distraction was stopped when desired bone length was achieved. At regular intervals, X-rays were taken to determine the radiological extent of bone healing. Assessment was done based on Fernandez Esteve grading. In case of any discharge from the tract, infected pin was removed and exchanged in the same sitting. Once healing was satisfactory, ring and fixator were removed, and cast was applied. All the data was arranged in a tabulated form and analysed statistically.

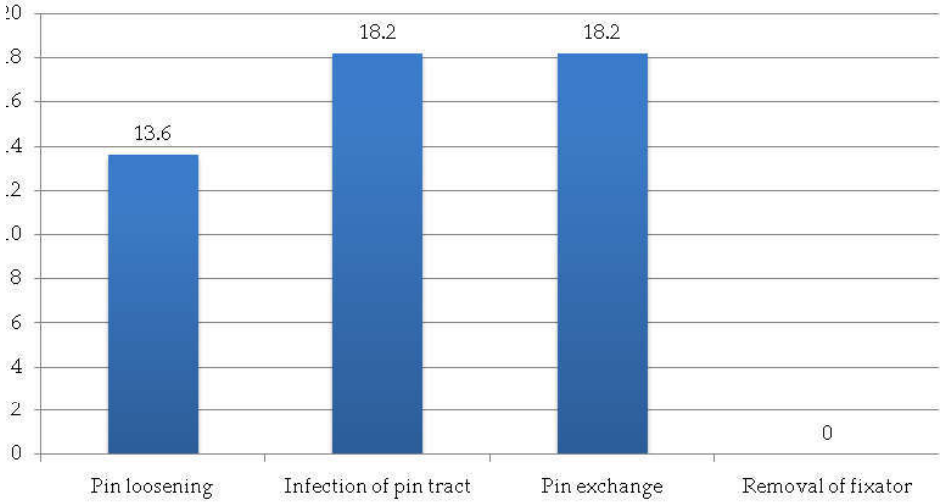
Results

Table 1 shows the demographic distribution of the subjects. The mean age of the subjects was 38.87±3.22 years. There were 13 males (59.1%) and 9 females (40.9%) in the study. Maximum number (31.8%) subjects were between 35-39 years of age. There were 22.7% (n=5) subjects between 30-34 years of age. There were 27.2% subjects between 40-44 years of age and 18.2% subjects between 45-49 years of age.

Table 2 shows the outcome of the treatment. There were 3 males and 2 females with bone shortening of 1-3 cm. The union time amongst them was 6 weeks and the consolidation time was 9-10 months. There were 5 males with shortening of 5 cm and the union time amongst them was 6.5 weeks with consolidation time of 10 months. There were 2 males with shortening of more than 5 cm and the mean consolidation time was 11.5 months amongst them. Amongst females, 4 females showed shortening of more than 5 cm with union time of 9 weeks and consolidation duration of 12 months.

Table 1: Demographic distribution of the subjects

Variable	Frequency	Percentage
Gender		
Male	13	59.1
Female	9	40.9
Age group		
30-34	5	22.7
35-39	7	31.8
40-44	6	27.2
45-49	4	18.2



Graph 1: Complications encountered during the study

Fig. 1: 45 years old male patient with infected nonunion tibia. Nail removed. Ilizorov frame applied. Infection controlled. Bony union in progress.

Fig. 2: 52 Years diabetic male patient with infected nonunion Tibia. Debridement, Masquelet technique, Ilizarov fixatar applied. Sound bony union. Wound healthy

Table 2: Outcome of the treatment

Gender	Bone shortening	Frequency	Union time	Duration of consolidation
Male	1-3	3	6	9
	3-5	5	6.5	10
	5-7.5	7	8.5	11.5
Female	1-3	2	6	10
	3-5	3	7	11
	5-7.5	4	9	12

Table 3: Complications encountered during the study

Complication	Frequency	Percentage
Pin loosening	3	13.6
Infection of pin tract	4	18.2
Pin exchange	4	18.2
Removal of fixator	0	0

Discussion

Due to road traffic accidents, open tibial fractures are becoming more common and also there are increased in facilities and rapid transfer to the trauma centers. Most of these fractures are operated during the golden window period and open reduction and internal fixation is done for type I and type II open fractures [15]. The incidence of infected non-unions range between 16-22% [16]. With the advent and use of Ilizarov internal fixators patient can be ambulated quickly and ambulation can be maintained throughout the treatment period. Also, the chances of fixation are increased with decreased incidence of infection [17]. In our study, the mean age of the subjects was 38.87±3.22 years. There were 13 males (59.1%) and 9 females (40.9%) in the study. Maximum number (31.8%) subjects were between 35-39 years of age. There were 22.7% (n=5) subjects between 30-34 years of age. There were 27.2% subjects between 40-44 years of age and 18.2% subjects between 45-49 years of age. As per Dervin et al. [18] and Keeling et al. [19] external fixations is the skeletal stabilization of optimal choice with lowest incidence of deep sepsis. Ilizarov method is a complex methodology that requires a lot of resources and time and it also exhibits various complications [20]. This theory hasmostly changed with the use of better operation theatres and use of high amount of antibiotics. This is comparable to the study by Laishram Singh et al., and Shtarker H et al. [21]. In our study, there were 3 males and 2 females with bone shortening of 1-3 cm. The union time amongst them was 6 weeks and the consolidation time was 9-10 months. There were 5 males with shortening of 5 cm and the union time amongst them was 6.5 weeks with consolidation time of 10 months. There were 2 males with shortening of more than 5 cm and the mean consolidation time was 11.5 months amongst them. Amongst females, 4 females showed shortening of more than 5 cm with union time of 9 weeks and consolidation duration of 12 months. All the subjects were ambulated within 2 weeks with full weight bearing. This is consistent with the study by Dagherand Ronkoz., [22] whose subjects were also initiated with partial weight bearing at 2 weeks. The use of Ilizarov technique of bone transport including distraction osteogenesis proposes a sound substitute towards managing infective non-union fractureof tibia. Ilizarov frame for osteogenesislets resection of the infected bony region, repair of the bony defect and stabilization for bony consolidation and maintains the bony length. Joint function is favorably encouraged with the use of bone transport technique.

Conclusion

Treatment using Ilizarov method with infected tibial fractures provides promising results. Optimal fixation was seen amongst subjects in the present study. With appropriate surgical skills, patient cooperation and patience desired results can be achieved.

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