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ORIGINAL ARTICLE

Outcomes of open Tibia Fracture using Ilizarov Ring Fixator

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ABSTRACT

Background: Currently, there has been a rise in severe trauma that occurs as a consequence of road accidents. Different treatment modalities are used for open tibia fracture but currently ilizarov ring fixator is used with better outcomes.

Objective: To assess the outcomes of open tibia fracture using ilizarov ring fixator

Methodology: This prospective study was carried out at the Orthopedic Department of Mercy Teaching Hospital Peshawar for duration of two years from November 2019 to November 2021. The Ilizarov ring fixator was scheduled for all of the participants in our research. Proper radiographs of the affected leg were acquired, comprising antero-posterior and lateral views. Postoperative radiographs were also collected. All the data was analyzed statistically by using SPSS version 24.

Results: In this study, totally 40 patients were included. Based on radio-graphical results, 10 (25%), 18 (45%) and 12 (30%) and 00 (00%) patients have excellent, good and fair and poor results respectively while on the basis of functional outcomes, 12 (30%), 22 (55%), 2 (5%) and 4 (10%) patients have excellent, good and fair and poor results respectively. Complications like pin tract infection, superficial skin infection and chronic osteomyelitis were observed in 10 (25%), 6 (15%) and 2 (5%) patients respectively.

Conclusion: Our study concludes that ilizarov external fixator can be effectively used for the management of open tibial fractures.

Keywords: Open tibia fracture; Ilizarov ring fixator; Radiographs; Complication

INTRODUCTION

Currently, there has been a rise in severe trauma that occurs as a consequence of road accidents. This has resulted to an increase in the complexity of open injuries to bones, particularly in tibia (1). Open fractures have three main categories, Type I, Type II and Type III based on GUSTILO ANDERSON Classification of Open fracture and the soft tissue damage assessment (2). Different treatment modalities are used for open tibia fracture. These include POP cast immobilization, open reduction and plating, locked intramedullary nailing and external fixation. Different complications like deep infection, chronic ostiomyelitis, problems of fixation, alignment loss in cast, non-union, mal-union and delayed union are associated with these treatment modalities (3). Ilizarov ring fixation method was devised by a Russian physician, Gavril A Ilizarov to treat open tibial fractures (4). The Ilizarov ring can hold K-wires or haft pins that can be attached to the 360-degree ring at any of the numerous holes on the ring. The frame of the equipment is made up of two or more linked rings. For flexible bone therapy, the rings have an extra part of the frame (5). There are several benefits of using the Ilizarov ring faxator (6). These external fixators are elastic and it let axial micromotion which is conductive to fracture healing and regeneration. In circular fixator, forces are acting in a plane. A more uniform distribution of stress is achieved using Ilozarov's circumferential rings, compared to other methods. Thus, there is possibility of correction inthree dimension (7). Illizarov device creates an optimum environment for fracture healing by controlling shearing at the site of the injury while also enabling axial and bending dynamization. The addition of wire stoppers increases the system's shear rigidity. For people with osteoporosis, circular fixators are preferable than wire fixators. Pain, cumbersome equipment, complexity in assembly, poor patient acceptability, and labor-orientedness of the whole process to both physicians and patients are some of the drawbacks of employing the Ilizarov ring fioxator (8). According to the literature very limited data is available about the use of this method in Pakistan. Therefore this study was done to determine the outcomes of open tibia fracture using ilizarov ring fixator.

MATERIALS AND METHODS

This prospective study was piloted at the Orthopedic Department of Mercy Teaching Hospital Peshawar, Khyber Pakhtunkhwa. The duration of study was two years from December 2019 to December 2021. The study approval was taken from the hospital research and ethical committee. The inclusion criteria for our study were patients of both the gender having age ranged from 18-60 years with open fracture of tibia diaphysis – Gustilo type I, II and IIIa while the exclusion criteria were patients with polytrauma, patients with neurovascular injury and intra articular fracture. A total of 40 patients were included in our study. An informed consent in written was taken from all the participants. The Ilizarov ring fixator was scheduled for all of the participants in our research. Proper radiographs of the affected leg were acquired, comprising antero-posterior and lateral views. The Ilizarov ring fixator and its operating concept were explained to participants and staff in an appropriate way. Treatment of Ilizarov necessitates close collaboration between patient and medical professional, which was achieved by this mean. The frame was designed

in compliance with the GUSTILO ANDERSON Classification of Open fracture and the soft tissue damage assessment (2). Antibiotics, analgesics, and edema-controlling treatments were administered to the patient throughout the postoperative period. Postoperative radiographs were also collected. For 3–4 days, the leg was raised. On the 2nd or 3rd post-operative day, Ilizarov frame modifications were made if necessary. From the 2nd post-operative day, the patient was able to bear some weight. The patient's pain tolerance and fracture type dictated the degree of weight bearing. A good pin care dressing was taught to the patient. Based on the wound status, the patients were released with instructions on how to care for the pin tract, mobilization exercises, and follow up. All the data was analyzed statistically by using SPSS version 24. For qualitative data mean (SD) were calculated while for quantitative data, frequency (percentages) were calculated.

RESULTS

In this study, totally 40 patients were included. There were 30 (75%) male and 10 (25%) female in our study. (Figure 1) The mean (SD) age was 27 (2.5) years ranging from 20-47 years. Right limb fracture was observed in 25 (62.5%) patients while left limb fracture was observed in 15 (37.5%). (Figure 2) Based on mode of injury, road accident was observed in 30 (75%) patients, 5 (12.5%) patients have assault and 5 (12.5%) patients have fall of heavy objects as mode of injury. (Figure 3) Based on Gustilo's Anderson Classification, 10 (25%), 20 (50%) and 10 (25%) patients have Grade I, Grade II and Grade III injury respectively. (Figure 4) Based on radio-graphical results, 10 (25%), 18 (45%) and 12 (30%) and 00 (00%) patients have excellent, good and fair and poor results respectively while on the basis of functional outcomes, 12 (30%), 22 (55%), 2 (5%) and 4 (10%) patients have excellent, good and fair and poor results respectively. Complications like pin tract infection, superficial skin infection and chronic osteomyelitis were observed in 10 (25%), 6 (15%) and 2 (5%) patients respectively. (Table 1) The duration for radiological union is given in figure 5.

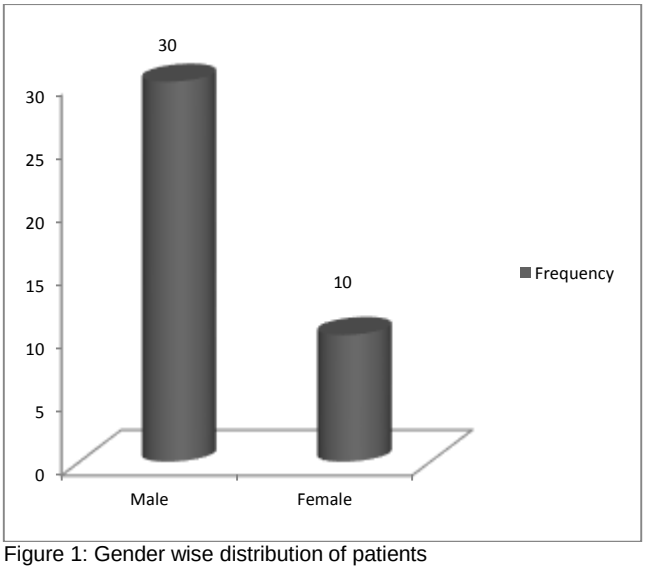

Figure 1: Gender wise distribution of patients

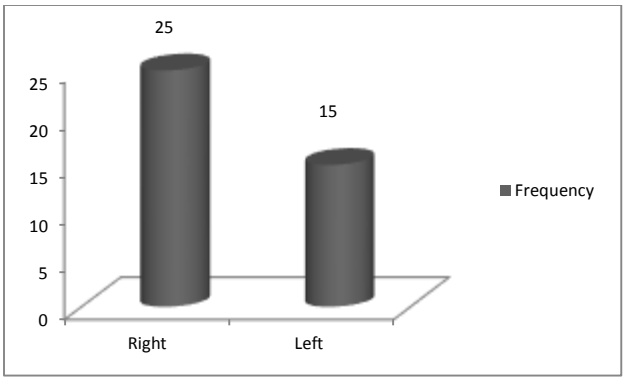

Figure 2: Distribution of patients based on limb involved

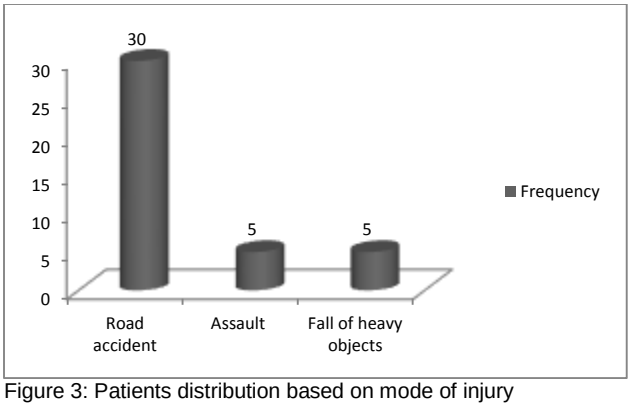

Figure 3: Patients distribution based on mode of injury

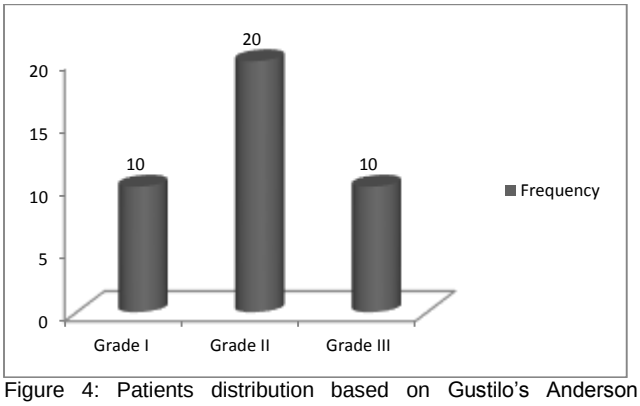

Figure 4: Patients distribution based on Gustilo's Anderson Classification.

Table 1: Radio-graphical results, functional outcomes and complications of patients post-operatively

Parameter	Sub category	Frequency (%)
Radio-graphical outcomes	Excellent	10 (25%)
	Good	18 (45%)
	poor	12 (30%)
	Fair	00 (00%)
Functional outcomes	Excellent	12 (30%)
	Good	22 (55%)
	poor	2 (5%)
	Fair	4 (10%)
Complications	Pin tract infection	10 (25%)
	Superficial skin infection	6 (15%)
	Chronic osteomyelitis	2 (5%)

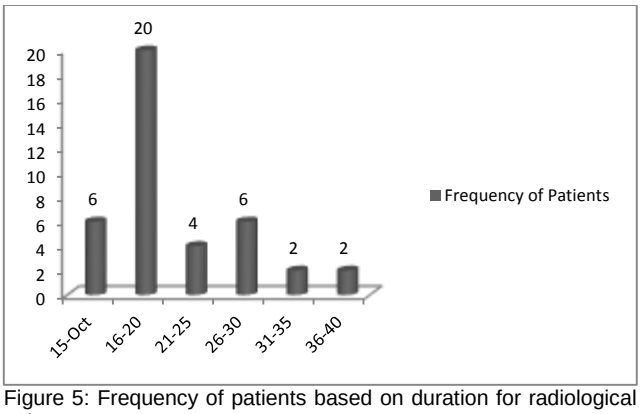

Figure 5: Frequency of patients based on duration for radiological union

DISCUSSION

The traditional focus of orthopedic practice and education has been on the treatment of bone and joint problems. The soft tissue has come to the notice of orthopedic traumatologists as the open technique of fracture repair has evolved and the prevalence of high energy trauma has increased. Reduction and stability are the primary goals of therapy for tibial comminutted fractures, however soft tissue attachments and vascularity must not be compromised. The illizarov approach may be used to accomplish this (9). Currently external fixators are used in the management of open fractures particularly Gustilo-Anderson type IIIB and IIIC (10). Very limited data is available about the comparison of Open reduction internal fixation and Ilizarov treatment method. A previous study conducted by Canadian Orthopaedic Trauma Society compared plate fixation and circular external fixation. They reported that both the methods have satisfactory fracture reduction but more and severe complications were observed in Open reduction internal fixation (11). A study done by Tucker et al. observed 100% union of tibial fracture treated by ilizarov external fixator with mean radiological union time of 25.6 weeks (12). This mean radiological union time was comparable to radiological union time of our study which was 23.61 weeks. A previous study done by Foster et al. reported mean union time of 187 days (13). A study done by Dagher et al. reported that Ilizarov method is useful in the treatment of fractures with loss of bone. He also reported that this technique is useful for treatment of infected non-union fractures (14). A study done by Thirumal et al. reported that Compound Grade IIIb fracture was treated effectively with this technique (15). The treatment of tibial bone loss and soft tissue defect, according to Bundgaard et al., was accomplished by stepwise anterior angulation, compression, and subsequently straightening (16). When extensive dissection and internal fixation are contraindicated for a fracture owing to damage to soft tissue, a lack of bone stock, or a comminuted fracture, Satish Nesari and colleagues came to the conclusion that Ilizarov circular fixation is the best alternative (17). A study done by Endrezt et al. reported that Ilizarov method is the effective method for the treatment of complicated tibial fracture (18) . In our study, based on radio-graphical results, 10 (25%), 18 (45%) and 12 (30%) and 00 (00%) patients have excellent, good and fair and poor results respectively while on the basis of functional outcomes, 12 (30%), 22 (55%), 2 (5%) and 4 (10%) patients have excellent, good and fair and poor results respectively. Complications like pin tract infection, superficial skin infection and chronic osteomyelitis were observed in 10 (25%), 6 (15%) and 2 (5%) patients respectively. In accordance with our study, another study reported comparable results (19). Another study also reported comparable results to our study (18). The major limitation of our study was small sample size. Another study should be conducted with large sample to get better results.

CONCLUSION

Our study concludes that ilizarov external fixator can be effectively used for the management of open tibial fractures. The major complication associated with this method is follow-up which is less complicated in other routine methods like pin external fixator but the major advantage of this technique is better results together with early return to work.

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