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Original Article

Evaluation of the Results of Fixation of Femoral Shaft Non-union with Implant failure by Ilizarov External Fixator Method

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Abstract

Background: The Ilizarov operation is a type of external fixation procedure used in orthopedic surgery to lengthen or reshape limb bones as a limb-sparing technique to treat complex and/or open bone fracture, and in cases of infected non-union bones that are not amendable with other techniques. It is named after the orthopedic surgeon Gavriil Abramovich Ilizarov from the Soviet Union, who pioneered the technique.

Objective: To find out the effectiveness of Illizarov external fixator for implant failure and non-union of femoral shaft fracture with implant failure.

Method: This prospective study of Evaluation of the result of fixation of femoral shaft non-union with implant failure by Ilizarov External fixator was carried out during the period of January 2019 to December 2021 at Department of Orthopedic Surgery in Dhaka National Medical College and Hospital, Dhaka. In total 10 patients with femoral shaft fracture non-union were selected as the study population. Mean age of the patients was 40 years. Majority of the patients were male. Among 10 cases 8 were found injury was high energy trauma due to motor vehicle accident and there was a preponderance of fracture on the right side. Removal of previous implant refer shinning of fracture ends, reduction and fixation under C-Arm.

Result: In our study total 10 participants 8 male (80%) and 2 female (20%). So, male dominance was observed in this study. We found the highest 5 participants had injury from road accidents, 3 Sports injuries and rest only 2 from general falls. There is no intra-operative complication. As for the post-operative complications local pain with motion and local edema were seen in 4 cases, and painful tenting of skin in 6 cases. Delayed complications included Pin tract infection in 3 patients, restricted knee motion and shortening of limb 2 patients, Superficial wound infection 2 cases. Deep wound infection and Delayed union 1 patients. In this study results, 7 patients (70%) were excellent, 2 patients (20%) were good' 1 patient was fair.

Conclusion: The present study we found some good features of using Ilizarov induced method in the treatment of femoral shaft non-union facture with implant failure.

Keywords: Femoral shaft, Non-union, Ilizarov External Fixator.

Introduction

The femur in the largest and heaviest bone in the body.[1] It transmits a person's body weight to tibia while standing has an anterior bow. Shaft of femur is mostly smoothly rounded except posteriorly broad rough line, linea aspera exists providing aponeurotic attachment to adductors on thigh. Especially prominent at the it has medial and lateral lips.[2] Femoral shaft fracture is defined as a fracture of the diaphysis occurring between 5cm distal to the lesser trochanter and 5 cm proximal to the adductor tubercle. High energy injury frequently associated with life threatening conditions. The femoral shaft is circumferentially padded with. large muscle Despite advances in surgical technique

. Fracture fixation alternatives and adjusts to healings femoral non-union continue to be significant clinical problem, femoral fractures may fail to unite because of the injury, damage to the surrounding soft tissue inadequate initial fixation and demographic characteristics of the patients. The management of femoral shaft fracture non-union was revolutionized by Ilizarov external fixator techniques by orthopedic surgeon Gavriil Abramovich Ilizarov from the Soviet Union, who pioneered the technique. The excellent clinical result in wide dissemination of the technique.[3] The study was done to determine the union status, time of union of Ilizarov external fixator with implant failure and non-union of femoral shaft, to find out difficulties and complication during operation, to find out complication after operation, to find out functional outcome including range of motion of both hip and knee Joint.

Materials and Methods

This prospective study was under taken to evaluate the result of fixation of femoral shaft non-union with implant failure by Ilizarov external fixator. The study was carried in the Dhaka National Medical College and Hospital, Dhaka from January 2019 to December 2021.

Sampling method

Purposive sampling method was followed of as per inclusion and exclusion criteria. Selection was done on the basic of history, Clinical examination and radiological evaluation at the out patients department (OPD) of Dhaka National Medical College and Hospital.

Inclusion criteria: Age about (>20 years), Implant failure, Non-union of femoral shaft.

Exclusion criteria: Recent facture, Infected non-union, Open fracture, Non-union of femoral neck and trochanter fracture, Non-union of T-Y intercondylar fracture, Pathological fracture, Children's fracture.

Clinical procedure

1. Clinical Assessment

A completes history of the selected cases was taken with particular emphasis to the time and mechanism of injury, past treatment, and was assessed to rule out any co-existing disease (Diabetes Mellitus, Hypertension, collagen tissue disorder). This was followed by a through general and physical examination to exclude any associated injuries. A detailed local examination was the carried out with particular attention to, Attitude of limbs and deformity, Limbs length discrepancies, Mobility of the fracture fragments, Signs of active infection, Discharging sinus, Joint Status to hip and knee, Neurovascular status, Any associated injuries.[4]

2. Radiological Assessment

A good quality antero-posterior and lateral view of the involved femur including hip and knee joint was taken fracture configuration, status of the previous implant, status of union was assessed.

3. Laboratory Investigation

Complete Blood count, Blood grouping, Urine for R/E and M/E, Random blood sugar, Blood urea**,** CRP, X-ray chest P/A view**,** ECG.[5]

4. Pre-operative preparation

Pre-anesthetic checkup, 6 hours NPO before operation[5], Selection of appropriate size of Ilizarov ring, rods, bar.[6]

Ring size Measurement and apply procedure

Pre-operative measurements of patient's thigh, diameter and length was done to estimate of Ring and length of Rods (Bar) of Ilizarov frame.[6] In all cases 3rd generation cephalosporins were started 1 hours before surgery. All the 10 patients were operated under spinal anesthesia. All operation patients were placed in the supine position over fracture table with traction of both lower limb. Assembly of the frame was done during surgery. Distance between the rings was adjusted according to the fracture anatomy.[7] Fracture with minimal comminution and length loss less than l CM was usually managed with a four ring frame, more complex fracture needed more number of rings. Wires were fixed to the rings with ring fixator bolt after tensioning up to 90-110 kg using a dynamometer. The rings were kept 2 finger breadths from skin all around. Reduction was checked with C-arm image intensifier on the table and adjustments done according at the same setting. The pin tract wounds were dressed by povidone iodine solution (10%) and covered with pad. Pin site was cleaned everyday with spirit or povidone iodine (10% solution). When clot and crust was present, weak solution of hydrogen peroxide (H_20_2) was applied to remove it. When pin tract wound was inflamed or discharge was present, oral antibiotics were given. Partial weight bearing with axillary crutch was allowed as soon as the patient could tolerate the pain. The frame and wire was checked whenever the patients complained of pain, stability. Tension of the wire was checked and retensioning was done as per need. Check X-ray was taken on first or second postoperative day and reduction was checked). Knee and hip stiffness was prevented by active and passive movement. The patients was followed up an interval of 2 weeks for a minimum period of 8 weeks, there after every months for 3 months and subsequently 3 monthly till a period of 1 years. Cheek radio graphs were taken on the next day and then at 6^{th} week, 12^{th} week and 36^{th} week

. The patients were assessed clinically for the range of movement of the knee and hip respectively, pain at the fracture site, anterior knee pain, infection, muscular atrophy, clinical union, difficulty in walking and performing daily routine.[8] Frames were removed after clinico-radiological union. The fracture was regarded to be united (1) if the patient could walk without support after loosening the frame crossing the fracture site and not tender at fracture site (2) if there was no mobility at fracture site after loosening the frame and (3) radiologically, if there was enough callus across the fracture site and obliteration of the fracture line. The frame was removed at the outpatient's department or in the operation theatre once the fracture was united. At the end of follow-up period, the results were grouped into excellent (7), good (2), fair (1) and poor (0).

Fig-I: Pre-operative x-ray of thigh (B/V)	Fig-II: Post-operative X-ray of thigh showing Ilizarov external fixator	Fig-III: post operative picture of lower limb showing Ilizarov external fixator

Result

In our study among total 10 participants 8 male (80%) and 2 female (20%). So, male dominance was observed in this study. Mean age of the patients was 40 yours.

Fig-IV: Gender distribution of participants (n=10)

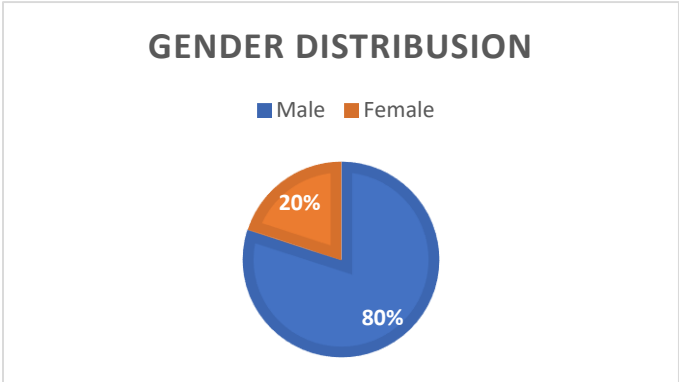

Table-I: Distribution in mode of injury (n=10)

Mode of Injury	Frequency	Percentage
Road Accident	5	50%
Sports injury	3	30%
General Fall	2	20%
Total	10	100%

In analyzing mode of injuries, we found the highest 5 participants had injury from road accidents, 3 Sports injuries and rest only 2 from general falls. The duration or treatment will the fixation was 12-23 week (average 16 weeks). From patients wore long legs back slab for an additional period of 4 week. The operation time ranged from 90 minutes to 120 minutes (Mean 102±4 minutes). The Ilizarov external fixator was withdrawn when there was clinic-radiological union. The duration of treatment with the fixation ranged from 12 to 23 week (Mean 16 ± 3 weeks). The time to union varied from 12 to 28 weeks (average 24.5 weeks).

The complication in fracture shaft of femur non-union with Ilizarov ring fixator were broadly divided into intra-operative, post-operative and delayed complications. There is no intra-operative complication. As for the post-operative complications local pain with motion and local edema were seen in 4 cases, and painful tenting of skin in 6 cases. Delayed complications included Pin tract infection in 3 patients, restricted knee motion and shortening of limb 2 patients, Superficial wound infection 2 cases. Deep wound infection and Delayed union 1 patients.

Table-II: Results of the Patients series (n=10)

Grading	Number of patients	Percentage
Excellent	7	70%
Good	2	20%
Fair	1	10%
Poor	0	0%
Total	10	100%

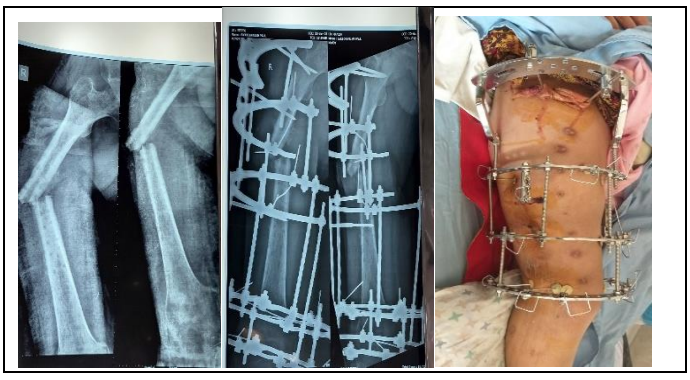

Fig-V: Pre-operative x-ray of thigh (B/V)	Fig-VI: Post-operative X-ray of thighshowing Ilizarov external fixator	Fig-VII: Post operative picture of lower limb showing Ilizarov external fixator

Discussion:

There are many methods for stabilizing of femoral shaft non-union with implant failure. The problems are attributable mainly to the injury of skin, soft tissue and severity of bone damage. In this study, the age of the patients ranged from 20 years to > 65 years with mean as of 40 years. In our study, there were 80% male 20% female. The sex incidence of male was 8 (80%) and that of females were 2 (20%). Period between admission and Ilizarov ring fixation varied from 2 to 12 days with the average of 7 days in generally. It is generally agreed that Ilizarov ring should be applied as soon as the general physical condition allowed. In our study we found, heights 5 participants had injury from road accidents, 3 sports injury and rest only 2 from general falls. The average operating time varied from 90 minutes to 120 minutes. The partial weight bearing on crutches was started on the very next day or on the third day and full weight bearing after 2-3 weeks. In our study, the patients were discharged from the hospital on an average on the 5^{th} post-operative day. The average duration of hospital stay in this intervention was 12 days. In this study, the duration of treatment will the fixation was 12-23 weeks (average 16 weeks, patients were long leg back slab for and additional period of 4 weeks. In this study, the Ilizarov external fixator was removed after on average 16±3 (ranging from 12-22 weeks). In our series, the average time of Clinico-Radiological union was 24 weeks (ranging from 21-28 weeks). Weight bearing to some degree, stimulates bone healing. The current concept of fracture healing was based on two variables namely blood supply and stability. In the present study, there were 3 cases of pin tract infection, manifested by pain, erythema and small purulent discharge around the pin sites which was controlled by oral antibiotic within 10 days. In this study, restricted knee motion and shortening of limb 2 patients, deep wound infection and delayed union 1 patient. The aim of this study was to evaluate the Ilizarov Technique in the treatment of non-union femoral shaft fracture with implant failure. We found some positive features of Iliazrov in treating non-union femoral shaft fracture with implant failure through this study.

Conclusion:

To treat the cases of femoral shaft non-union facture with implant failure is a difficult task for the physicians. In our study we found some good features of using Ilizarov induced method in the treatment of femoral shaft non-union facture.
with implant failure. But to bring out more potential findings we would like to recommend for conducting more studies in several place in similar arena of the treatment procedure

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