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Management of segmental fractures of tibia by Ilizarov technique

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Introduction

The Ilizarov technique pioneer by G. A. Ilizarov has evolved as the last 70 years in a technique using an innovative modular circular external fixator based on biologic principle of distraction neohistogenesis slow and steady traction on a living tissue creates a stress. Which is metabolically activated both in biosynthetic and proliferative pathways depending upon the vascularity and functional use. This principle is used to correct a wide variety of orthopaedic problems including, fractures, mal unions, non-union, congenital deformities, osteomyelitis limb length inequalities, joint contracture, arthritis soft tissue defects cosmetic bone abnormalities and occlusive vascular diseases.[1]

Segmental fracture is a high energy trauma which is associated with soft tissue injury in most cases. Transosseous osteosynthesis technique allows stabilization of segmental fractures with accurate reduction, while unminimizing operative trauma to soft tissues and preserving critical blood supply. Early weight bearing is permitted and encouraged. Tibia is subcutaneous bone with a high incidence of open fractures; the Ilizarov surgeon can simultaneously correct angulation, translation, rotation and longitudinal deformities and achieve union is difficult segmental fractures.[2]

Materials and methods

27 patients with segmental tibial fractures (22 males and females) were treated by applying the Ilizarov technique. 17 were open fractures with a mean age of 44 years. 6 patients were initially treated with interlocking nail: 10 were treated with plaster immobilization and 12 with uniaxial external fixator. The mean length of intermediate Segment was 5 cm (range 3 to 6 cm). Therefore intra-articular involvement in 8 patients, 6 cases required fasciotomies due to compartment syndrome; 7 cases were infected due to interlocking nailing which had to be removed followed by excision of intermediate segment for bone transport. Stabilization of segmental fractures with periarticular fragments is possible with Ilizarov fixator. Spanning the knee or ankle for 3 to 6 weeks is necessary in some cases. The unstable segmental fractures, soft tissue defect and bone loss are all managed successfully with one device and technique. The first step is the management of segmental fractures is to determine where the limb is salvageable.[3–6]

Post-operative care

Regarding treatment and tactics, the follow up post-operative period should be singled out.

a. Early post post-operative period (5 days)

b. Period of distraction

c. Period of fixation

d. Period of functional rehabilitation

The process of treating segmental fractures is rather difficult when accomplished by deformities. Treatment of the segmental fractures without complications and in short period is impossible without elementary understanding of kinematics of an “apparatus extremity” system.[1]

Results

The mean time for proximal segment union was 14 weeks and 18 weeks for distal segment. Reapplication of Ilizarov was required in 3 cases due to non-union where was caused by lack of follow up by the patient.

Discussions

Ilizarov compression-distraction device has proved valuable in treating segmental fractures of the tibia; it has been used more frequently for difficult fractures, especially metaphyseal fractures with significant soft extension. The Ilizarov fixator proved an effective and safe as more traditional methods for simpler configurations of diaphyseal fractures; This modular circumferential fixator is a unique tool for any kind of segmental fractures; preoperative planning, early mobilization of the patient, and intra meticulous follow up minimizes the complication of the wonderful technique.[7,8] In the case of tibial fracture that cannot be treated with a cast or internal fixation, we use circular Illizarov external fixation as a definitive mode of treatment. A definitive procedure must/should be performed in the next 24 to 48 hours. In all cases of tibial fractures, the use of a fracture table makes the procedure easier to perform. After insertion of temporary skeletal traction through the calcaneus, the limb is positioned on the fracture table. The skeletal traction clamp is fixed in the clamp adaptor of the fracture table and then an initial traction is applied. In this way, exposure is maximized for both surgery and C-arm imaging. When initial reduction is performed, it is very important to control the plane and the rotational alignment of the limb segment.

Case 1

i. 70 yrs. Old male with segmental fracture of Rt. Tibia
ii. Patient treated with Ilizarov
iii. Segmental fracture of tibia with Ilizarov *in situ* (1 month follow-up)
iv. Segmental fracture of tibia with Ilizarov *in situ* (2 month follow-up)
v. 7 months follow-up
vi. 11 months follow-up
vii. Final follow-up after 11 months

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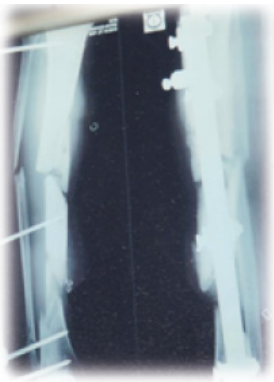

Case 2

i. 38 yrs. Old man with segmental fracture Rt. Tibia with uniaxial fixator *in situ*
ii. X-ray showing segmental fracture Rt. Tibia with uniaxial fixator *in situ*
iii. During treatment with Ilizarov technique
iv. X-ray showing reduction done with Ilizarov apparatus
v. Final x-ray after 7months
vi. Final follow-up after 7 months (front view)
vii. Final follow-up after 7 months (back view)

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Case 3

i. 75 yrs. old man with Segmental fracture Lt. tibia with uniaxial fixator *in situ*
ii. X-ray showing Segmental fracture Lt. tibia with uniaxial fixator *in situ*
iii. After removal of ex-fix
iv. During treatment, 2 months follow-up
v. Patient is mobile with Ilizarov *in situ*
vi. Final x-ray after 11 months
vii. 9 months follow-up

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None.

Conflicts of interest

None.

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