Management of Infected Non-united Tibial Fractures by Ilizarov External Fixator with compression distraction technique

A Thesis Submitted for the Fulfillment of MD Degree in Orthopedic Surgery

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Abstract

This study included 30 patients with infected non united shaft tibia fractures with bone defect after debridement up to 6 cm. the study included 27 males and 3 females, mean age was 36 years old. The average time between fracture and inclusion in the study was 14 month. The average number of previous operations was 2 surgeries. Soft tissue compromise was present in 10 patients.Operative technique: adequate debridement of soft tissue and bone at the fracture site followed application of the preassembled frame. Acute compression at the fracture site with check of the distal circulation followed by corticotomy at the metaphysis far to the fracture.Ilizarov fixation with compression distraction technique is a safe and a reliable method for treatment of infected non united tibia. There is no definite safe limits for acute compression.

Keywords:

(ASAMI, Ilizarov external, Osteogenesis, *compression distraction technique)*

بِسْمِ اللَّهِ الرَّحْمَٰنِ الرَّحِيمِ

”إِنْ أُرِيدُ إِلاَّ الإِصْلاَحَ مَا اسْتَطَعْتُ وَمَا تَوْفِيقِي إِلاَّ بِاللَّهِ عَلَيْهِ تَوَكَّلْتُ وَإِلَيْهِ أُنِيبُ.“ (هود: ٨٨)

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Introduction

Introduction

Tibia is the most exposed bone in the body and vulnerable to trauma and therefore its fractures are common among the long bone fractures. Tibia is the common site of non-union in long bone fractures.[(1)]

Long standing infected non-union and gap non-union is difficult to treat and is a challenging problem for the orthopedic surgeon. It usually leads to residual deformity, persistent infection, contracture, and at worst - a useless limb.[(2)]

Many methods have been employed to treat this situation e.g. radical debridement, local flaps, muscle flaps, bone grafting, tibiofibular synostosis, cancellous allograft, fibrin mixed with antibiotics, antibiotic beads, microvascular flaps and vascularized bone transplants. All have improved results but none has been able to fully solve this clinical situation.[(3)]

Debridement and sequestrectomy result in large gaps which are difficult to treat with conventional methods. Internal fixation with dynamic compression plate (DCP) or interlocking nail (ILN) is impossible due to the gap at the non-union site, defective quality of bone, and above all the presence of infection. In these conditions external fixator is the treatment of choice, especially the ring fixator of Ilizarov.[(4)]

The Ilizarov ring fixator gives an option of compression, distraction and bone transport, and is effective in the treatment of infected non-union of tibia where other types of treatment have failed. Weight bearing and

The functioning of the joints while on the treatment is an advantage that cannot be matched by any other technique.[5]

The Ilizarov apparatus is axially elastic and as the weight bearing forces are directly applied to the bone ends, maintaining the weight bearing function of the extremity actually becomes one of the prerequisites for the success of the method. The cyclic axial telescoping mobility, not rigidity, at the non-union or fracture site is an important requirement for the formation of a reparative callus. Ilizarov experimentally showed that when gradual distraction tension stress is applied to the corticotomy site, the vascularity of the entire limb is increased, which in turn enhances the ability of the bone ends to unite.[6]

Recently, the introduction of the distraction osteogenesis and bone transport technique of Ilizarov has allowed problems of infection, shortening, deformity, soft-tissue loss, and joint contracture to be addressed. Based on the Ilizarov philosophy, tibial nonunion with bone loss can be managed by acute shortening after resection at the site of the nonunion combined with lengthening of the shortened bone at another level. [7]

Ilizarov introduced the concept of resection of the site of nonunion and acute shortening combined with bone lengthening by distraction osteogenesis using a circular external frame. This method can maintain or regain limb length and also successfully deal with deformity, infection, joint contracture and malalignment. [8]

Experiences with acute compression and simultaneous lengthening for infected nonunion of the tibia showed that the technique produces union and restores leg length. This technique addresses both alignment and length in a single treatment with fewer complications. It also reduces complications associated with bone transport and is safe for larger tibial defects; no neurovascular complications were encountered during acute docking or follow-up. The rate of severe pin-tract infection was very low, because from the early on during treatment, stability is shared between the acute compression site and the fixator. No secondary operations (such as bone grafting) were needed to achieve union at the docking site. Moreover, during the whole treatment course, no secondary adjustments were performed on the frame. The technique requires good compliance and cooperation from the patient, who should understand the procedure fully and be mentally prepared. [9]

Biomechanics of Ilizarov external fixator