

Management Of High Energy Tibial Fractures Using The Ilizarov Apparatus

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Abstract

Forty-two high-energy tibial fractures (18 closed and 24 open) in 41 patients were treated with the Ilizarov apparatus between 1999 and 2004. Open wounds were debrided and tension free primary closure using interrupted nylon sutures was attempted wherever appropriate. In others, either split thickness skin grafting or local gastrocnemius flaps were used. Corticotomy and bone transport was instituted in patients with significant bone loss. Early weight bearing with range of motion exercises of ankle and knee joints were encouraged. Average fracture healing time was 5.3 months (range 3.5 - 8.5 months). Complications included pin site inflammation / infection (40.4 %), muscle transfixation (2 cases), shortening (3 cases), ankle joint stiffness (2 cases) and wire fracture (1 case). Based on Johner and Wruh's Criteria, there were 34 excellent, 6 good, 2 fair, and no poor results. The Ilizarov device provided early and definitive fixation for high-energy tibial fractures with good results.

INTRODUCTION

Fractures of tibia are very common in patients with trauma (1). Their treatment, prognosis, and outcome are mainly determined by the mechanism of injury, degree of resulting comminution, soft tissue injury and displacement (2). Fractures produced by indirect trauma have a better prognosis than those produced by direct trauma (3,4). The risk of delayed union and nonunion in closed (1,4) and open treatment is increased with comminution (5). Open fractures have a higher infection rate than closed fractures (6) and the rate increases with the increasing severity of the soft tissue injury (7,8). Minimally displaced fractures allow more simple treatment than displaced fractures (1). Therefore high-energy injuries have added to the number and complexity of fractures of long bones, especially those of tibia and so have the treatment modalities addressing them. We evaluated the use of Ilizarov device as the initial and definitive mode of fracture stabilization of these fractures.

MATERIALS AND METHODS

From 1999 to 2004, 42 high-energy tibial fractures in 41 patients (37 male, 4 female) were treated primarily with Ilizarov apparatus. Grade III open and/or comminuted tibial fractures was the major inclusion criteria. Exclusion criteria included low energy fractures; grade 3C open fractures and patients who found the apparatus aesthetically unacceptable. The mean age was 39.1 years (range, 14-65 years). Road

traffic accidents were responsible for majority of cases (33). Three of the fractures were segmental, and 1 was bilateral. Four patients had multiple traumas. There were 18 closed fractures and 24 open fractures. Using the Gustilo and Anderson (9) classification, 4 were Grade I, 3 were Grade II, 8 were Grade IIIA and 9 were Grade IIIB. There were 21 proximal metaphyseal, 17 diaphyseal and 3 distal metaphyseal fractures.

Informed consent was obtained in all cases. All open wounds were irrigated copiously with normal saline followed by debridement of all the devitalised bone and soft tissue. Antibiotic treatment was initiated in the emergency room with Cefazolin given intravenously for all open fractures and additional gentamycin for Grade III open fractures. The antibiotics were given for 3 days in type I and II wounds and for 5 days for type III wounds. Tension free primary closure using interrupted nylon sutures was attempted wherever appropriate. If safe closure could not be accomplished, the size of the wound was minimised by mobilization of the adjacent tissues over the bone with or without additional split thickness skin grafting. All the Grade IIIA fractures were closed successfully with no wound complications. Of the Grade IIIB fractures, 2 wounds could be successfully approximated and four cases required a gastrocnemius flap. Two patients with a Grade IIIB comminuted fracture presented late after injury with wound infection. A thorough debridement of all the devitalized bone, soft tissue and the

especially when it has been performed for more severe fractures (2,9). Tibial nailing though in popular use also has its own share of complications. Malunion occurs after up to 37% of tibial nailing procedures (10) and it is particularly common following fractures of the proximal third of the tibia (11). Severe comminution further adds to the complication. Twenty one (51%) proximal tibial comminuted fractures were treated with Ilizarov fixator with only one case of malunion. Intramedullary nail insertion is also shown to interfere with circulation in the diaphyseal cortex (12,13). Current debate concerns the use of reamed and unreamed intramedullary nailing because both techniques, to varying degrees negatively affect the circulation of cortical bone (14,15). In patients with an open fracture, this has significant implications. When the intramedullary blood supply is destroyed, it leads to necrosis of diaphyseal bone. The vascular system will reconstitute in 2 to 3 weeks, during which time the presence of dead bone and an open fracture wound may increase the risk for infection. External fixator only provided a temporary measure with the additional morbidity associated with pin tract infections. Moreover early weight bearing could not be encouraged.

Ilizarov fixator was chosen to primarily fix those fractures that produced high rate of complications with most conventional methods of fixation. For over half a century the Ilizarov device has been used for treatment of acute fractures and non-unions (16). The structure is stable and enables the patient to bear weight on the affected limb straight away even in very comminuted fractures (17), not easily achievable by other methods of fixation. The Ilizarov device is minimally invasive with little interference in the biology of fracture while at the same time providing optimal skeletal stability. It also provides opportunity for wound care and management of open fractures. The timing of soft tissue coverage is a subject of controversy. The standard teaching has been that open fractures remain open until the patients is returned to the operating room for a secondary debridement to ensure that adequate debridement of necrotic tissue from the wound has done prior to wound closure (18). This recommendation recently has been challenged, with authors advocating primary closure of open wounds in some cases. Shtarker et al. (19) used primary suturing and Ilizarov fixation in the treatment of open tibial fractures with good results. Delong and associates (20), reported on the study of open fractures with immediate primary closure of the open fracture wound after a thorough debridement. Early wound closure either by primary suture or other means of wound cover after a thorough debridement was the hallmark of this

series.

Our protocol encouraged patient to partially weight bear within 48 hours progressing to full weight bearing within the limits of pain (usually within the first week). General condition of the patient and the presence of other associated injuries also influenced the decision to weight bear. An Ilizarov fixator enables the surgeon to correct malalignments and in case of bone loss, to perform adequate limb lengthening (21). Only three cases of malunion (7.3%) occurred in this series because necessary adjustments with the rods were made in the earlier stages. All the fractures in this series united. Tucker et al. (22) reported 100% union of 26 tibial fractures in 23 patients treated with the Ilizarov fixator. The average union time was 25.6 weeks. Shtaker (19) reported 32 open tibial fractures treated with Ilizarov fixator. Healing time was 21.9 weeks in patients with a single injury and 25.7 weeks with multiple trauma similar to the results reported by Schwartzman et al (23).

This series is unique with respect to the complexity of the fractures considered. The specific category of fractures subjected to Ilizarov fixation was with the view to clearly define the role of the fixator in primary management of tibial fractures. Even though the circumstances were adverse with respect to the fracture pattern, the union time was not unduly prolonged. However cases that required corticotomy and distraction, necessitated prolongation of the time on the fixator. This is an additional option with the Ilizarov fixator that makes it so versatile.

CONCLUSION

We recommend the usage of Ilizarov apparatus to provide primary definitive fixation for high-energy tibial fractures. Early weight bearing even in severely comminuted fractures is the key factor that separates it from other methods of fixation. It promotes early functional recovery, eliminating fracture disease. Dynamisation and correction of deformities in any plane is easily accomplished. Frame constructs could be modified to facilitate wound cover and access. Therefore it lends the much-needed flexibility in complex fractures.

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