External Fixation As The Primary Management of Complicated Tibial Fractures

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Statement of Purpose

The purpose of this study is to evaluate the outcome and satisfaction of patients who underwent surgical treatment for midshaft and distal tibia fractures utilizing external fixation as the primary modality. We evaluated pre and postoperative radiographs to evaluate fracture healing.

Introduction

Fractures of the tibia are some of the most complicated and difficult injuries to treat. The management of these fractures poses a therapeutic challenge to surgeons due to high complication rates. The primary objective of the surgeon should be to restore the anatomy of the tibia, repair the epiphyseal area and have the patient return to their pre injury state. Complications are well documented in the literature due to various techniques utilized. Several osteosynthesis methods are available and have been documented in the literature. The most popular techniques include the traditional method of open reduction internal fixation, external fixation, intramedullary nailing and as of recently, minimally invasive plate osteosynthesis. The literature suggests intramedullary nailing is the most common technique used for mid shaft to distal tibial fractures. Literature also shows that external fixation is mainly indicated to manage open fractures or fractures where there is soft tissue compromise. Postoperative complications are the main reason midshaft and distal tibia fractures are the most challenging for the lower extremity surgeon. Despite all of the progress made in surgical technique there is a complication rate of approximately 20-50% of these patients. The most common complication of intramedullary tibial nailing is knee pain. Literature reports that approximately 69% of patients experience knee pain after undergoing the procedure. Other complications include nerve damage to the common peroneal nerve at the fibular neck or sural nerve damage related to insertion of distal cross screws. Although rare, (0.2% incidence) thermal necrosis secondary to excessive force during the reaming process is another reported complication. Soft tissue dissection with open techniques may lead to deep space infections and wound dehiscence. Malunion and Nonunion is a major complication of IM nailing with some studies reporting a 23% nonunion rate. It is of our opinion that external fixation as the primary management of midshaft and distal tibia fractures is a viable alternative, if not primary technique of choice. The use of external fixation as the primary modality to treat tibial fractures eliminates the traumatic soft tissue dissection with typical open techniques. This reduces patient pain, decreases the possibility of implant infection and subsequent removal and allows the patient to bear weight post operatively much sooner than with implanted hardware. The purpose of this paper is to show our indication for midshaft and distal tibial fractures using Ilizarov ring external fixation techniques.

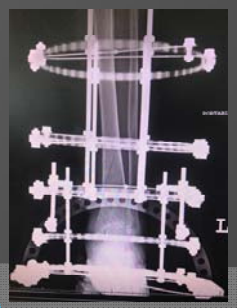

Figure 1: Preoperative and Postoperative films

Procedure

During the years of 2012-2017 a total of 35 patients were selected at our institution to undergo closed reduction with external fixation and manipulation for displaced tibia fractures. Patients were selected based on psychosocial factors, comorbidities and soft tissue compromise. Preoperative radiographs were obtained from the Emergency Department and depending on the severity of comminution computed tomography was also obtained. A total of 25 patients also presented with concomitant fibular fractures. These patients were all treated at the same time with open reduction and internal fixation and fixated with either 1/3 tubular plates or anatomic fibular plates. Fractures of the fibula were fixated prior to application of the external fixator for tibia fracture. External fixator was comprised of at least 3-4 160mm rings and may or may not have included 5/8th ring and a footplate. Intraoperative fluoroscopy was used to locate the fracture and appropriate starting point. External fixator was applied in traction with attempts to get the fracture fragments out to length, but not overly distract the fracture and restore coronal and sagittal alignment as much as able. At least four olive wires were driven proximal to the fracture through the proximal tibia for stability. Depending on the severity of comminution, olive wires were driven through the fracture fragment and were translated with tensioners either medial to lateral or lateral to medial for anatomic reduction and alignment. Intraoperative fluoroscopy was used to note appropriate reduction of the tibia fracture with anatomic alignment of cortices visible on the fluoroscopic display in the anterior to posterior projection as well as the cross table lateral projection. Distal to the fracture, additional olive wires were driven through the tibia. Depending on the stability of the reduced fracture, additional wires were driven through the calcaneus and forefoot. All olive wires were tensioned and locked to the ring fixator. Patients were kept non-weight bearing in the external fixator for 2-4 weeks. Patients were then graduated to partial and full weight bearing based on radiographic evidence of healing. External fixators were removed at the 3-month mark. Patients were followed for 12 months.

Figure 2: Preoperative and Postoperative films

Figure 3: Open fracture and follow up at 3 months and 1 year postoperatively

Figure 4: Preoperative film and postoperative clinical picture

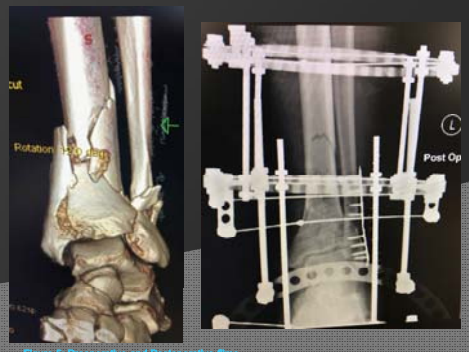

Figure 5: Preoperative and Postoperative films

Results

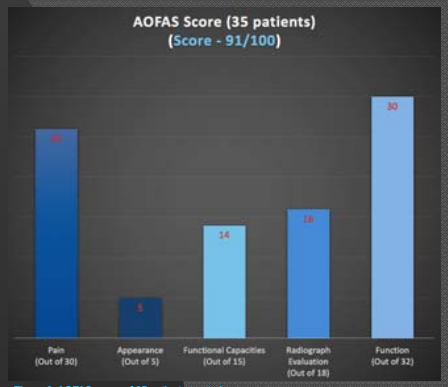

Figure 6: AOFAS score of 35 patients treated

Results (N=35 Patients)	
Mean Age (years)	44 (19-69)
Gender (M:F)	20M : 15F
Active Smoker	2
Open Fracture	2
Fibula Involved	25
Follow Up Time (Months)	12
Delayed Union	2
Non-Union	0
Mal-Union	1
Pin Site Infection	3
Hardware Failure	0

Table 1: Patient demographics and complications

Discussion

We treated patients with external fixation as the primary method of fixation for tibial fractures. Although with a limited sample size we have shown that external fixation provides an adequate alternative if not primary method for fixating midshaft and distal tibial fractures. External fixation offers key advantages to lower extremity trauma surgery including the promotion of stability across several joints, the ability to apply them in the presence of open soft tissue envelope, and postoperative manipulation. In addition, patients have been able to bear weight sooner compared to patients that underwent tibial fracture reduction with open techniques. Other techniques mentioned are associated with increased rates of secondary surgeries as well as revisional surgeries. External fixation as the primary means of tibial fracture reduction allows for preservation of osseous vascular supply without disrupting the periosteum which is of paramount importance to bone healing. It is also important to note the ability to perform wound care with external fixation devices around pin sites as opposed to cast immobilization. It has to be mentioned that external fixation is not indicated for all fractures; however, we found that using external fixation device for treatment of tibial fractures provides great results and patient satisfaction.

References

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Thank you to Jackson North Medical Center