



CLINICAL AND RADIOLOGICAL OUTCOME OF COMPOUND GRADE 3A/B SHAFT TIBIA FRACTURES TREATED WITH EXTERNAL FIXATION AS DEFINITIVE MANAGEMENT

Orthopaedics

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ABSTRACT

Background: This is a study done on 25 patients to determine the outcome of external fixation as the definitive management in compound Grade 3A/B shaft tibia fractures. **Materials and Methods:** 25 cases of open shaft tibia fracture managed with different modes of external fixation were studied. The age group of patients under study was (18-65 years). Follow up was done at 6,9,18 and 24 weeks and all the complications were recorded. Evaluation was done on the basis of LEFS. **Results:** Out of 25 patients 16 had excellent results, 7 patients had good results, 2 patients had fair result according to LEFS. **Conclusion:** External Fixation can become Mainstay as Definitive Management in Patients presenting with open shaft tibia fractures and have local condition unfavorable for Nailing/plating.

KEYWORDS

Shaft Tibia Fractures, External Fixation, Definitive Management, Compound Fractures, Gustilo Anderson Classification, LEFS (Lower Extremity Functional Scale), Wound Debridement, LRS (Limb Reconstruction System), Pin Tract Infections, Biological Fixation

INTRODUCTION :

Shaft tibia fractures occur more frequently than any other long bone fractures, which are increasing in frequency due to road traffic accidents and falls from heights. [1]. Because of the anatomic location with the relatively poor soft tissue cover and precarious blood supply, tibial shaft fractures are vulnerable to nonunion and infection [2]. The management of tibia fractures still remains one of the greatest challenges to orthopedic trauma surgeons. Protection of the surrounding soft tissue, biological fixation, prevention from infection, optimal union, and return to normal function remain elusive goals. Thus, a proper surgical technique for individual stabilization is especially important for tibia fractures.

A variety of treatment modalities have been suggested for this injury, most frequent management options include external fixator, intramedullary nail, and plate fixation. However, each of these treatment options is associated with certain challenges and shortcomings [3]. Historically, plate fixation requires soft tissue stripping which resulted in increased risk of damaging the blood supply and subsequent infection [4]. Furthermore, frequent need for secondary rigid fixation, prolonged healing time and pin tract infection have plagued external fixators as definitive management in closed fractures.[5].

AIMS and Objectives

To Evaluate the clinical and radiological outcome of compound Grade 3A/B shaft tibia fractures treated with external fixation as definitive management.

REVIEW OF LITERATURE:

Milenkovic et al. evaluated the use of unilateral external fixation with convergent orientation of pins in 32 patients with tibial shaft fractures [7]. They reported that external fixation as a definitive management approach for severe and open fractures should be performed 6–18 h from the time of injury with 2 pins in the proximal fragment, 2 pins in the distal fragment. Overall, 10–20% of patients were weight bearing immediately after surgery, and patients were given full-weight bearing status at 9–10 weeks after external fixator application.

Bayrak et al. performed a retrospective case control study of 76 patients with tibial shaft fractures secondary to gunshot wounds. They determined that the Ilizarov type external fixator had decreased hospitalization periods, time to full weight bearing, and time until union than the AO type unilateral external fixator [8].

In addition, in a retrospective cohort study of 93 patients with isolated Gustilo type III injuries stabilized with circular fixator or uniplanar external fixators, the new injury severity score and mean time for fracture healing were decreased in the circular fixator group, while the radiographic union score was increased in the circular frame group [9].

MATERIALS AND METHODS

Study Design: Hospital-based prospective study.

Study area: The study was conducted in the Department of Orthopaedics at Government Medical College Surat.

Study Period: November 2023 to November 2025

Study population: All the patients with Gustilo-Anderson Open type 3A/3B shaft tibia fractures who presented to the orthopaedic outpatient or casualty.

Sample size: The study consisted of a total of 25 patients.

Sampling Technique: Simple Random technique.

Inclusion Criteria:

- 1.Extraarticular Shaft tibia fractures
- 2.Age between 18 to 65 years.
- 3.Gustilo anderson Open type 3A/3B fractures

Exclusion criteria:

- 1.Age less than 18 years and more than 65 years.
- 2.Closed fractures
- 3.Intraarticular fractures
- 4.Surgically unfit patients
- 5.Patient with neurovascular injuries

MATERIALS:

Sterile drape and Gloves
Scalpel with blade
Drill
T handle
Multiple Steinmann pins and schanz pins
Spanner and allen key
Exfix clamps
Rod to rod clamp
LRS rod and clamp
Gauze piece
Povidone iodine and spirit
Olive wire, Rancho cubes, Half ring, Tensioner

METHODS.

Patients were taken to the operating theater and administered anesthesia. Thorough layer-by-layer wound debridement was performed after adequate wound extension. Loose fragments which were smaller and without soft tissue attachments were removed. Fragments with soft tissue attachments were retained as much as possible. Adequate irrigation was done with normal saline. After thorough debridement the wound grading was done as per Gustilo and Anderson method. Then either of the 3 fixation methods were used to fix the fracture.

Method 1: One Steinmann pin was inserted into the calcaneus, one

Schanz pin into the metatarsal neck, and two Schanz pins into the tibial shaft, all secured with external fixation rods and clamps.

Method 2: 3 schanz pin inserted in proximal segment and 3 schanz pin inserted in distal fracture segment and other 3 schanz pin inserted in distal/proximal fragment according to fracture pattern. All schanz pin connected to clamp and clamp finally connected to LRS Rail rod.

Method 3: 3 olive wires inserted in proximal tibia in cross manner and tensioned with Tensioner to the Half ring. This half ring was then fixed with the rods to the distally inserted 2 schanz pins.

Patient were kept non weight bearing for 4 weeks and then gradual weight bearing was started. All the patient were given physiotherapy for knee bending and static quadricep strengthening.

Final Outcome was calculated on Basis of Lower Extremity Functional Score[LEFS] and were grouped accordingly.

Patient were advised for follow up on 6,9,18 and 24 weeks.



RESULTS:

1.1 Age Distribution

The study included a total of 25 patients.

The mean age of the patients was 39 years

1.2 Sex Distribution

There was a clear male predominance in the study population.

* Male patients: 21(84%)

* Female patients: 4(16%)

2. Fracture Characteristics:

2.1 Mode of Injury :

18 patients sustained trauma due to Road traffic accidents.

6 patients had trauma due to Fall down.

1 patient had trauma due to Assault.

2.2 Gustilo Anderson Classification

The fractures were categorized based on the Gustilo Anderson Classification:

* Type IIIA: 5 cases (20%)

* Type IIIB 20 cases (80%)

3. Surgical Management

Hybrid Exfix-5(20%)

LRS-12(48%)

Delta Exfix-8(32%)

4. Outcome according to LEFS

Excellent-16(64%)

Good-7(28%)

Fair-2(8%)

Poor-0

5. Time taken to Surgery

<6 hrs-9 patients.

6-24 hrs-11 patients

>24 hrs-4 patients.

6. Radiological Time to union

18-24 weeks-9 patients

24-32 weeks-7 patients

>32 weeks-9 patients

Skin grafting was needed in 3 patients and 2 patients required flap surgery

COMPLICATIONS

1. Pin tract infections can occur which may lead to pin loosening.

2. Osteomyelitis

3. Knee and ankle stiffness in case of joint spanning external fixation.

4. Non-Union and Delayed Union

5. Malalignment

6. Need for Revision Surgery

7. Sequestration and sinus formation

8. Skin blackening and need for future Flap Surgery/Skin grafting.

CONCLUSION:

Based on a prospective study of 25 patients with severe open tibial shaft fractures (primarily Gustilo-Anderson Type IIIB), external fixation proved to be a highly effective definitive treatment modality. Despite the severe nature of these injuries and the inherent risks of complications such as pin tract infections or joint stiffness, the functional outcomes were overwhelmingly positive, with 16 patients achieving "Excellent" and 7 achieving "Good" results on the Lower Extremity Functional Scale (LEFS), and no patients reporting poor outcomes.

Ultimately, this study demonstrates that external fixation can serve as a reliable mainstay and definitive management strategy for open shaft tibia fractures, particularly when local soft tissue conditions make internal fixation methods like nailing or plating unfavorable.

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