



## OPEN TIBIAL SHAFT FRACTURES; TREATMENT WITH EXTERNAL FIXATOR

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**ABSTRACT... Objective:** The purpose of the study was to evaluate the clinical results after operative treatment of open tibia fractures (grade IIIA/B) with external fixator. **Material and methods:** 25 patients with open fractures of the tibial diaphysis, classified as type III A and B, according to the Gustilo classification, were operatively treated in Agency Headquarter Hospital Landikotal. All the patients were treated with an external fixator. The time of the union of the fracture, problems with the union (malunion and nonunion), infection were examined as treatment outcome. Late complications and their treatment was not the object of the study. The follow-up period was at least 8 months. **Result:** The end results of the external fixation of 25 tibial shaft fractures, 18 (72%) men and 7 (28%) women, average age 37.7 (16-65). The union rate was 83%. Nonunion rate was 12%. And malunion rate was 5% (fig-I). Fifteen patients had Gustilo type IIIA injury while 10 patients had type IIIB injury (fig-II). Pins tract infection rate was 10%. The average time of fractures healing was 28.5 weeks (15-22). There were 3 cases with wound infection and no sequestrum formation. **Conclusions:** External fixation is a simple and effective means of treating all types of open tibial shaft fractures.

**Key words:** Open tibia fracture, external fixation, Gustilo Anderson's classification.

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### INTRODUCTION

The treatment of open tibial fractures remains controversial. Nonunions and infection is quite common in tibial fractures owing to the deficient blood supply and soft tissue cover around it<sup>1,2</sup>. Open fractures of the tibial shaft remain to be one of the most complex, problematic and controversial orthopaedic injuries<sup>3</sup>. Among various causes of open tibia fractures bomb blast injury is emerging as the leading cause in our country<sup>5</sup>. The other causes being are motor vehicle accident, fall from height, fall of a heavy object and fire arm injury<sup>4</sup>.

The aim of the operative treatment is to have an anatomically functional extremity which allows early recovery of the patients to the pre-injury status<sup>6</sup>. Surgical treatment of open fractures means treatment of the soft tissue injuries and the stabilization and fixation of the fracture<sup>7</sup>.

Fractures of the tibia can be fixed both externally<sup>8</sup> as well as internally<sup>9</sup> but external fixation is a preferred way of treatment in open tibia fracture. Even most of unstable closed tibial shaft fractures can be treated with method of the external fixation in a more efficient manner than with other methods. Due to its subcutaneous localization is suitable for the application of the external fixator<sup>10</sup>.

Easy applicability and minimal hinderence with the blood supply of the tibia has made external fixation a very popular mode of treatment, but these advantages have been outweighed by the high incidence of pin-track infection, difficulties relating to soft-tissue management and the potential for malunion<sup>11</sup>.

The aim of this study was to determine the outcome of the use of external fixator in the treatment of open tibial shaft fractures in terms of union, nonunion, malunion and pin site infection.

## MATERIALS AND METHODS

From Jan 2011–Jan 2013, 25 patients with III A and B grade open tibial fractures according to the Gustilo classification were operatively treated at the Orthopaedic unit of Agency Headquarter Hospital Landikotal. Patients with type III C open tibial fractures were excluded from the study. All the patients were operatively treated with external fixation. The fractures were classified according to the modified Gustilo classification of 1984 which is widely accepted in surgical practice (table-I). The mean age of the patients was 37.7 years; 18 of them were male and 7 female. The most common cause of injury was road traffic accidents in 15 cases, fall from height in 8 cases and bomb blast injury in 2 cases. The patients were treated in the first 8 hours after admission to the hospital. All the patients were administered antitetanic and antibiotic prophylaxis in the form of cefoperazone and sulbactam.

The first step after admission to the emergency ward was clinical evaluation of the injury, sterile dressing, temporary immobilization and the necessary laboratory and radiology investigations. Standard xrays of the injured extremity were done. Further surgical treatment was performed in the operating theatre. All the patients underwent the same surgical protocol divided into two parts:

1. Surgical debridement of the soft tissue injury, including all devitalized soft tissue and bone fragments with lavage of the wound with a low pressure normal saline solution;
2. Stabilization of the fracture with external fixator.

Postoperatively, wounds were closed with interrupted stitches after thorough wash of the wound with normal saline. All the patients were kept in the hospital for 3 days for injectable antibiotics and first wound dressing change at day 3. The patients were discharge on 4<sup>th</sup> post operative day on oral antibiotics and change of dressing every 2nd day. All the patients were instructed and taught pin site care, knee and ankle

physiotherapy and were told to be mobile on crutches with touch down weight bearing. The follow up protocol was 2nd week, 2 months, 4 months, 6 months and 8 months. Every time the patients were examined for pin site infection, wound infection, malunion, nonunion and union. Union was defined as a bridging callus crossing three of four cortices of both plain radiographs with no pain on palpation over the fracture site or when bearing weight. Nonunion was defined as an absence of a bridging callus across a fracture site after an expected time interval for that injury (8 months in our study). Infection was determined by clinical findings of local erythema, swelling, tenderness, or a pus discharge and a positive bacterial culture. Malunion was defined as a varus or valgus angulation of more than 5 degrees or anterior or posterior angulation of more than 10 degrees.

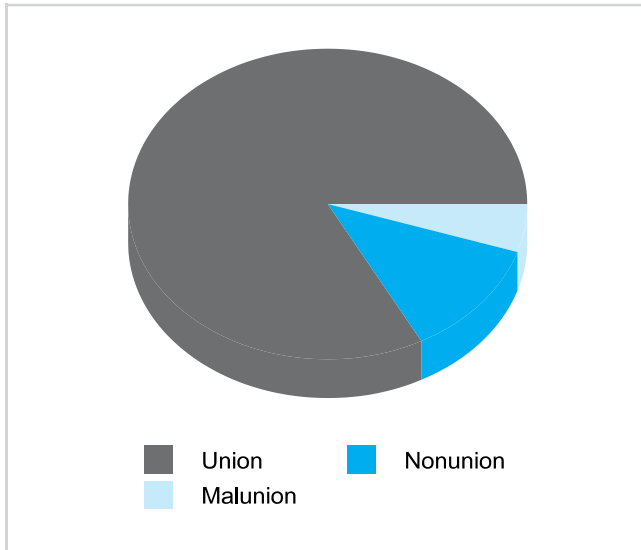
Data was entered into computer software program SPSS version 10.0. Frequency and percentages were calculated for all categorical data.

| Gustilo Grade | Definition   |
|---------------|--|
| I             | Open fracture, clean wound, wound <1 cm in length  |
| II            | Open fracture, wound > 1 cm but < 10 cm in length without extensive soft-tissue damage, flaps, avulsions   |
| III           | Open fracture with extensive soft-tissue laceration (>10 cm), damage, or loss or an open segmental fracture. This type also includes open fractures caused by farm injuries, fractures requiring vascular repair, or fractures that have been open for 8 hr prior to treatment |
| IIIA          | Type III fracture with adequate periosteal coverage of the fracture bone despite the extensive soft-tissue laceration or damage  |
| IIIB          | Type III fracture with extensive soft-tissue loss and periosteal stripping and bone damage. Usually associated with massive contamination. Will often need further soft-tissue coverage procedure (i.e. free or rotational flap)   |
| IIIC          | Type III fracture associated with an arterial injury requiring repair, irrespective of degree of soft-tissue injury.   |

Table-I. Gustilo and Anderson classification<sup>12</sup>

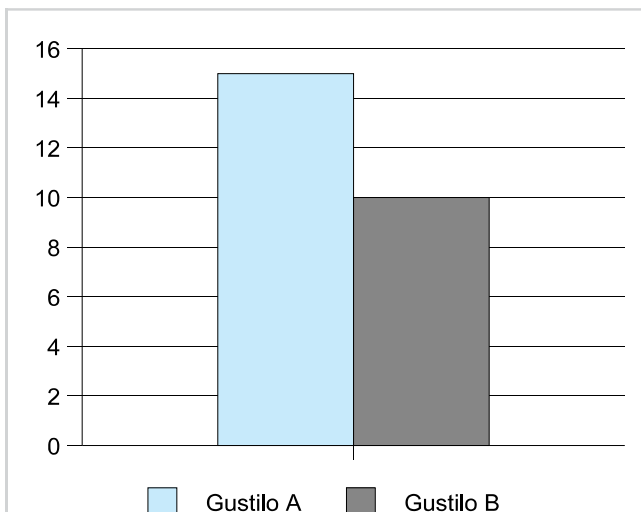
**RESULTS**

The end results of the external fixation of 25 tibial shaft fractures, 18 (72%) men and 7 (28%) women, average age 37.7 (16-65). The union rate was 83%. Nonunion rate was 12%. And malunion rate was 5% (fig-I).



**Figure-1: The union, nonunion and malunion rate after the external fixation of the tibial shaft fractures.**

15 patients had Gustilo type IIIA injury while 10 patients had type IIIB injury (fig-II).



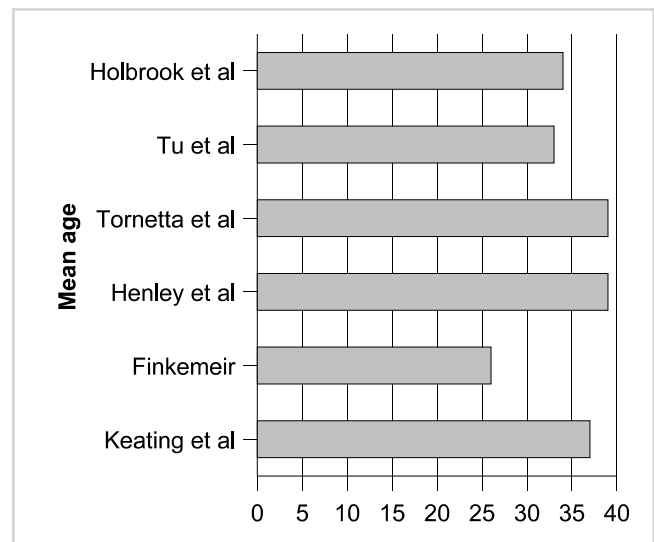
**Figure-2. Type of fracture according to Gustilo Anderson Classification**

Pins tract infection rate was 10%. The average time of fractures healing was 28.5 weeks (15-22). There were 3 cases with wound infection and no sequestrum formation.

**DISCUSSION**

Operative treatment of the tibial shaft fractures usually leads to healing, without any consequences on life and working ability<sup>13</sup>. The most common methods used in treating tibial shaft fractures are intramedullary nail, conventional, AO compression plates and external fixator<sup>14</sup>. The external fixator in open tibial fractures not only solves the problem of managing soft tissue injuries but at the same time provides a reasonable fixation for the bone to heal. With the AO external fixator it is possible to adhere to safe and effective external fixation techniques, avoid damage to vital structures, have access to wound and adopt the fixator so that it is biomechanically compatible with the fractures<sup>15</sup>.

Mean age in our study was 37.7 years which was quite comparable to other studies (fig-III). All these studies show that these injuries occur in a younger age group<sup>16,17,18,19,20,21</sup>.



**Figure-3. Mean age of involvement**

In our study male involvement was in 72% (18 patients) and female involvement was 28% (7 cases) which is almost identical to other studies in the literature (fig-- IV)<sup>12,13,15,16</sup>.

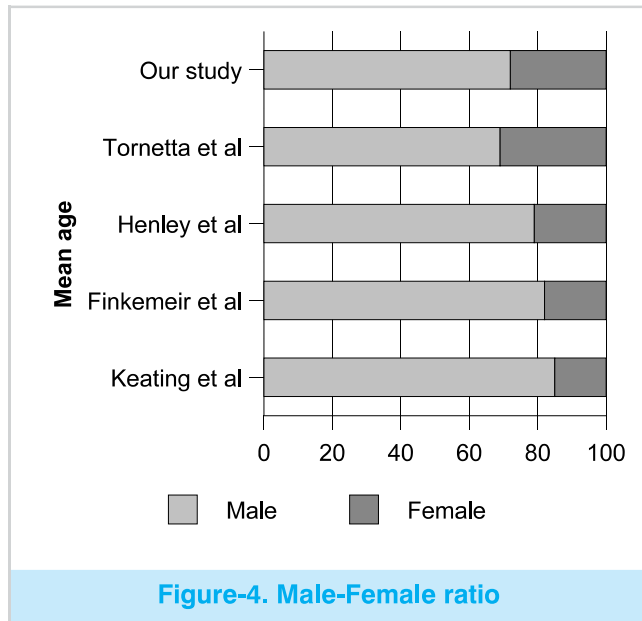


Figure-4. Male-Female ratio

Mean time of fracture healing in our study was 28.5 weeks. Tucker et al<sup>22</sup> and Schatzker<sup>23</sup> in separate studies reported union time of 25.6 weeks and 21.9 weeks respectively. Similarly Wheelwright and Court-Brown<sup>24</sup> and Antich et al<sup>25</sup> reported a union rate of 27.5 weeks and 26 weeks respectively.

The union rate, nonunion and malunion rate in our study was 83%, 12% and 5% respectively (fig-1). Kaftandziev<sup>26</sup> in his study produced union in 71.1% of the patients. Bratislav Stojkovic<sup>27</sup> reported a union rate of 83.68% in his 49 patients.

## CONCLUSIONS

External fixation is a simple and effective means of treating all types of open tibial shaft fractures.

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Knowing when to walk away is **wisdom.**

Being able to is **courage.**

Walking away, with your head held high, is **dignity.**

Unknown

