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OUTCOMES OF EXTERNAL FIXATORS IN TIBIA SHAFT FRACTURE

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ABSTRACT

The management of shaft of the tibia is always an important consequence as it is one of the most common sites of an open fracture. A sequential protocol of managing open fractures is initial debridement, external fixation and closure of the wound followed by intra-medullary interlocking nail. The aim of the current study is to evaluate the functional outcome of external fixator as primary and definitive treatment for open tibial shaft fractures. This is an observational analytical study conducted from 1st July 2014 to 1st January 2015 at a tertiary care hospital. A total of 104 patients with open tibial shaft fractures were included in the study. After surgical debridement external fixator was applied to all the patients under general anesthesia. Fracture healing was assessed by standard radio graphics and after the confirmation of union, external fixator was removed and functional outcome was recorded. The average age of the patients was 37.22+13 years, mean hospital stay was 12.87+4.27 days, the time for union was 82.9+9.14 days and the rate of infection was 18.3%. it is concluded that external fixator can be effectively used as definitive mean of fixation in open fractures of tibia with extensive soft tissue damage.

Keywords; Open tibial shaft fracture, External fixator, Fracture union

INTRODUCTION

The shaft of tibia is one of the most common sites of an open fracture [1]. Tibial fractures particularly open and complex injuries, often involve complications which may include acute compartment syndrome, neurovascular injuries and infection. Fat emboli may complicate any type of tibial fracture, ranging from complex fractures treated surgically to simple fractures treated non-operatively. Although, tibial fractures due to low energy mechanism such as those sustained during sports, have lower complication rates, even these are susceptible [2]. It may or may not involve infection, usually of two types. One is pin tract infection such as erythema without exudates responding to oral antibiotics/ pin tract release and another is deep infection which often require hospital admission along with I.V antibiotics and surgical debridement hardware removal.

A sequential protocol of managing open (compound) fractures are initial debridement, external fixation, closure of the wound, followed by intra-medullary interlocking nail. The disadvantages of such a protocol is the need of several operative procedures (fracture union time 38.5±5days) [3-5]. Similarly, the infection rate of fractures which were primarily treated by external fixation and then with intra-medullary nailing was significantly much higher than those fractures treated with intra-medullary nailing alone [6-7]. Furthermore, the results of use of external fixator as a definitive treatment in open tibial shaft fractures hav been promising (hospital stay 12±6 days, fracture union 25±7 weeks, infection 13 %, malunion 2%) [8-9]. Reported studies suggested several means of open type II and type III tibial shaft fractures such as angle-stable (locking) plate fixation, primary IM nailing, primary external fixation followed by conversion to IM nailing or external fixation as definitive treatment [10].

The aim of the study presented was to evaluate the functional outcome of external fixator as primary and definitive treatment for open tibial shaft fractures (Gustillo type 2 and 3a).

METHODOLOGY

It is an observational and analytical study conducted in a tertiary care hospital from 1st July 2014 to 1st January 2015. The sample size was calculated using WHO soft ware for sample size determination which was 104 [10] using non probability consecutive technique.

Inclusion criteria: included the following;

1. Age of the patients should be between 18-50 years of both genders.
2. All the enrolled patients must have open tibial shaft fracture which should confirmed by X-rays, AP and lateral views.
3. Fractures in first week of the incidence should be presented.
4. Fractures classified as type 2 and 3 a of Gustillo-anderson classification of open tibial fractures.

Exclusion criteria included the following

1. Patients with existing co-morbidities such as diabetes mellitus and hypertension, etc.
2. Patients with intra-articular tibia fracture.
3. Patients with concomitant ipsilateral femur fracture
4. Fracture with neuro-vascular compromise or compartment syndrome.

Data collection: the study was approved by the ethical committee of the concerned hospital and the patients fulfilling inclusion criteria were enrolled and provide with written consent forms and futher information was gathered from causality department.

After the appropriate emergency treatment or management, tibial radiographs (AP and lateral views) were obtained. External fixators were applied to the patients under general anesthesia, after required surgical debridement and management of soft tissue cover. At the removal of the implant, the functional outcome such as fracture union time, hospital stay, pin tract / deep infection were recorded in approved proforma.

DATA ANALYSIS

Data was analyzed using SPSS version 20. Age, hospital stay and fracture union presents as mean with standard deviations. Gender, infection, side of leg, type of fracture was analyzed as proportions and percentages and compared between fracture types using chi-square test. Continuous outcome variables such as hospital stay and union time were compared using independent sample t test. p value $\leq$ 0.05 was considered as significant.

RESULTS

A total of 104 with open tibial shaft fractures were included in the study in which 61(58.65%) were male and 43(41.35%) were female. Mean age was 37.22+13 years was calculated presented in figure-1. 63(60.58%) had type 2 and 41(39.42%) got type 3A as shown in figure-2.

The average hospital stay was 12.87+_4.27 days and mean time of fracture union was 82.9+9.14 days. Moreover, the rate of infection was 18.3% (19 out of 104) in which 9 had pin tract infection and 10 got deep infection.

Hospital stay and deep infection was significantly high in 41 to 50 years as

compare to the younger group while functional outcome was not significant between genders and type of fracture.

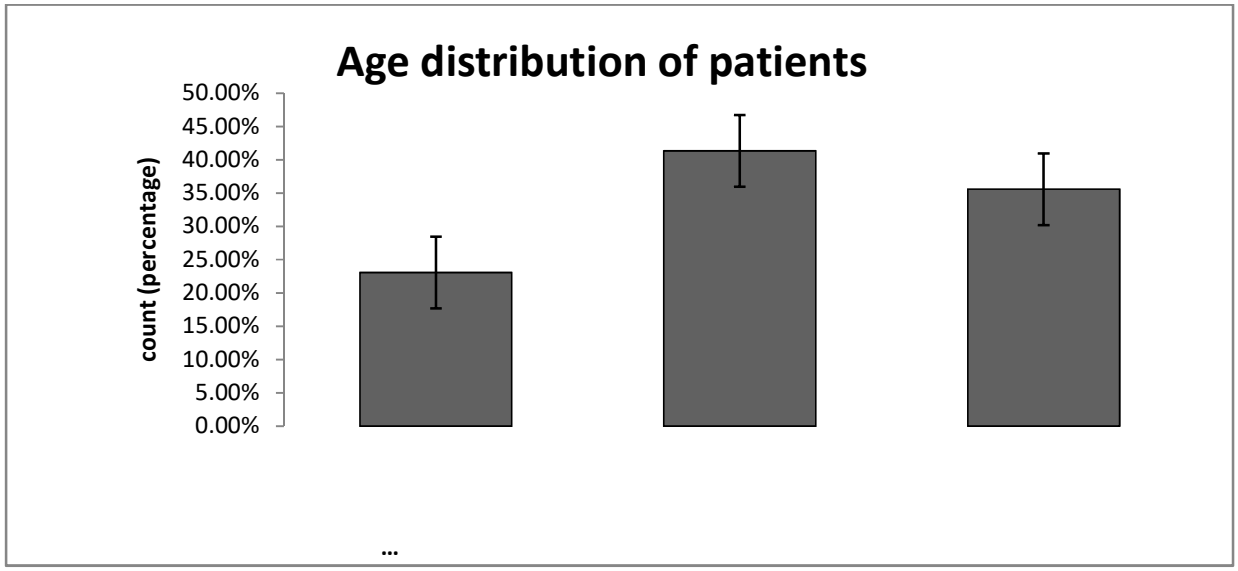

Figure1-: Age distribution among patients

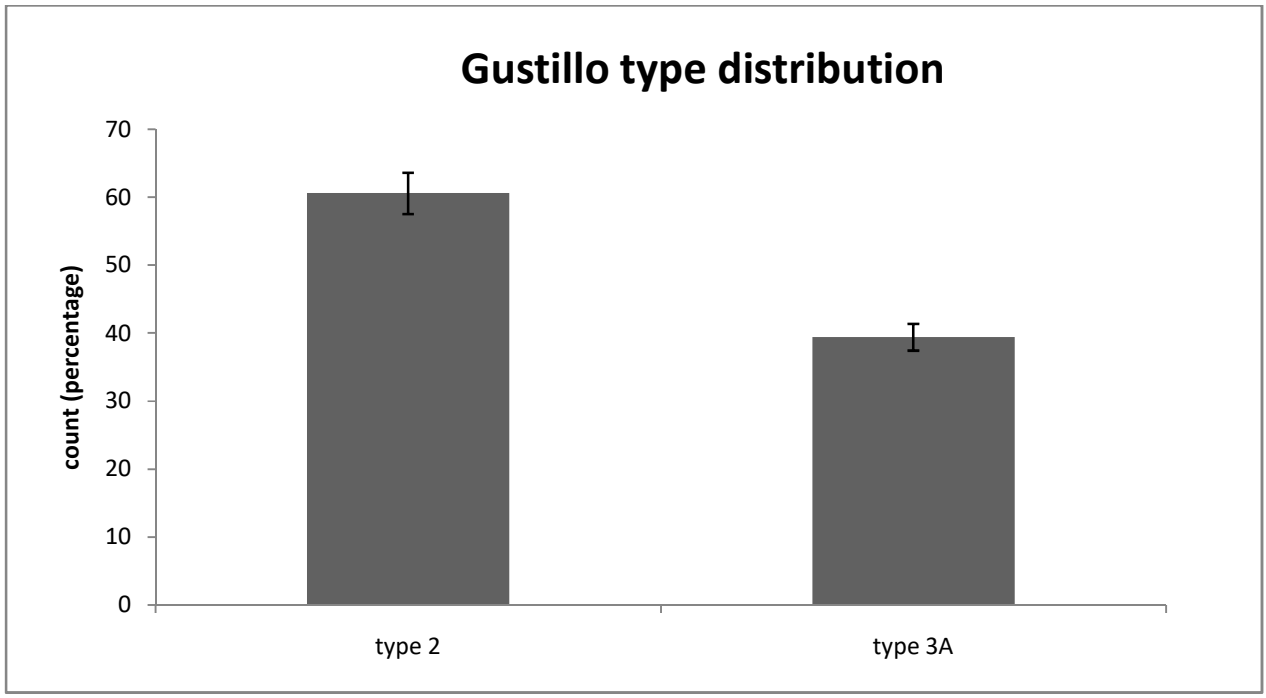

Figure-2: Gustillo type distribution

Table-1: Functional outcomes with respect to age groups

Functional outcome	Group-1 (≤30 years) N=24	Group-2 (31-40 years) N=43	Grou)p-3 (41-50 years) N=37	P value
Hospital stay (mean + SD)	10.72+4.44	12.02+4.36	15.22+2.8	0.0005
Time of union (mean + SD)	80.25+12.87	83.88+7.38	83.49+7.97	0.26
Pin tract infection (n with %)	1(4.2%)	3(7%)	5(13.5%)	0.39
Deep infection (n with %)	0	1(2.3%)	8(24.3%)	0.001

Table-2; Functional Outcomes With Respect To Gender

Functional outcome	male N=61	Female N=43	P value
Hospital stay (mean + SD)	12.41+4.55	13.51+3.78	0.19
Time of union (mean + SD)	82.36+10.94	83.67+5.74	0.47
Pin tract infection (n with %)	5(8.2%)	4(9.3%)	0.84
Deep infection (n with %)	5(8.2%)	5(11.6%)	0.55

Table-3; Functional Outcomes With Respect To Gustillu Type

Functional outcome	TYPE 2 N=63	TYPE 3A N=43	P value
Hospital stay (mean + SD)	13.03+4375	12.61+4.15	0.62
Time of union (mean + SD)	82.90+9.28	82.90+9.03	0.99
Pin tract infection (n with %)	8(12.7%)	1(2.4%)	0.06
Deep infection (n with %)	6(9.5%)	4(9.8%)	0.96

DISCUSSION

External fixation is one of the modern management of trauma and proved to be utilized in different conditions of injury even for multiple trauma with soft tissue problems in war causalities [11-12].

In our study, the mean age of the patients was 37.22+13 years and 60.58 % of the patients showed type 2and 39.42% had type 3A fracture. In the study presented, higher percentage of male patients (58.65%) was facing the fractures of tibial shaft. It had also observed in other study that male populations suffered this injury and more exposure of high energy trauma due to many reasons such as more frequencies of males in traffic accidents, violent sports, occupational accidents and war causalities [13].

In this study, the mean hospital stay was 12.87+4.27 days and time taken for fracture union was 82.9+9.14 days. Moreover, infection reported were in 18.3% in which 8.65 was pin tract infection and 9.62% was deep infection. Therefore, our results are supported by different studies which showed very close results (hospital stay; 12+6 days, fracture union time; 25+7 weeks and

infection reported percent was 13%) to our presented research [8-9].

However, if pin tract infection is focused which is one of the most common complications of external fixator application, our study showed better results as compare to the other applications [67]. It had also been reported by Pankaj et al. and Richard et al. that 0% infection in the cohort is possible when different modifiers kept under control such as awareness in patients to seek early treatment and early aggressive debridement by the surgeon [14-15].

CONCLUSION

External fixator can be effectively applied as definitive mean of fixation in open fractures of tibia with extensive soft tissue damage. It is also effective and safe method in management of open fracture tibia shaft where internal fixation with interlocking nailing is not feasible due to the lack of facilities of image intensifier or high risk of infection.

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