ORIGINAL ARTICLE

DISTRIBUTION OF OPEN DIAPHYSIAL FRACTURES OF TIBIA GUSTILO TYPE IIIA AND IIIB

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ABSTRACT

Background: The incidence of tibial fractures is increasing. The objective of the study was to determine the frequency and distribution of open diaphysial fracture of tibia gustilo type IIIA and IIIB.

Material & Methods: This cross sectional study was conducted in department of Orthopedics, Dow University Hospital, OJHA Campus Karachi, from January 2015 to December 2016. Sample size was ninety three patients selected through non-probability, consecutive sampling technique. All patients were treated by AO external fixator. Follow up of all these patients was done. Demographic variables were; gender, age in years and age groups. Research variables were; mode of injury, location of fracture, type of fracture, healing time in weeks and healing time groups. Age in years and healing time in weeks were numeric while all others were categorical variables. Mean and SD for numeric whereas frequency and percentages were calculated for categorical variables descriptively.

Results: Out of 93 patients, 87(93.54%) were males and 6(6.45%) were females. Age ranged was 20 to 60 years with mean age was 31.32$\pm$5.14 years. 73(78.49%) cases were due to road traffic accident, 16(17.20%) sustained injury following fall and firecracker injury was implicated in 4(4.30%) cases. Middle third of tibia was fractured in 62 (66.66%) cases, distal one third of tibia in 20 (21.50%) cases and proximal-third in 11 (11.82%) cases. Healing time was 18 to 28 weeks in both gustilo type-IIIA and IIIB. Mean healing time in gustilo type IIIA was 17$\pm$1.1 weeks while in gustilo type IIIB was 18$\pm$2.1 weeks.

Conclusion: Open diaphysial tibial fractures of gustilo type IIIB in the middle third of tibia were common in males of age group 31-40 years. Road traffic accidents were the most common cause.

KEY WORDS: Ao External Fixator; Open Diaphysial Fracture of Tibia; Tibail Fresh Fracture.

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INTRODUCTION

The annual incidence of long bone fractures is 11.5 per 100,000 with 40% occurring at the tibial diaphysis.[1] The incidence of tibial fractures is increasing because of increasing number of road traffic accidents and firearm injuries. Twenty five percent of tibial fractures are open fractures.[2]

Tibial fractures are relatively difficult to treat because of precarious blood supply and soft tissue cover. The anteromedial aspect of tibia is subcutaneous which is responsible for tibia being the most commonly fractured long bone.[3,4] The importance of soft tissue cover in the outcome of tibial fractures was first classified by Gustilo.[3] High energy tibial fractures such as those presenting with articular depression, condylar displacement, dissociation of metaphysis from diaphysis and degloving injuries are very difficult to treat. Stabilization limits gross limb movements and promote healing. The first step in the management of tibial fractures is adequate stabilization to prevent infection and promoting healing. Distal arterial pulses, capillary refill, color of limb and presence of active bleeding sites should be noted. It is suggested that as soon as the patient is stabilized, the open fracture should be dealt with in the operating theatre within 6 hours of injury.[5] With reference to the classification given by Gustilo, type III fractures are most commonly associated with risk of complications. There are four factors which contribute to the high rate of complications. These factors include soft tissue damage with disrupted bony coverage, wound contamination, compromised vascularity and instable fracture.[6]

The AO external fixator is used popularly for the

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management of gustilo type IIIA and IIIB fractures. It is easily available, light weighted, simple to apply and cost effective. These features suggest its increasing use in tibial fractures. Illizaro external fixator is also used in certain modalities and offers good results. External fixation is recently the management of choice in open tibial fractures. The successful treatment following external fixation is possible by the application of the following three principles: external fixation modality used should avoid damage to limb structures, it should allow access to injured areas and must meet the mechanical demands of injury.[7] Some other modailities include casts, braces, plates, intramedullary nails etc. However external fixation methods are increasingly used because of ease of application and limited effect on blood supply of tibia. Soft tissue management is very important for successful treatment of open tibial fractures.[8] The objective of the study was to determine the distribution of open diaphysial fractures of tibia gustilo type IIIA and IIIB.

MATERIAL AND METHODS

This cross sectional study was conducted in department of Orthopedics, Dow University Hospital, OJHA Campus Karachi and department of orthopedics, Civil Hospital, Karachi, from January 2015 to December 2016. Sample size was ninety three patients selected through non-probability, consecutive sampling technique. All adult patients of both genders having fresh open diaphysial fractures of tibia gustilo type IIIA and IIIB were included. Patients age <20 or >60 years, Gustilo type I, type II and type IIIC, associated pelvic fractures, intra articular fractures, chest or abdominal injuries and non ambulatory patients were excluded. All patients were treated by AO external fixator. Follow up of all these patients was done.

Consent was taken from all the participants and ethical considerations regarding privacy and confidentiality of patients were followed. Demographic variables were; gender, age in years and age groups. Research variables were; mode of injury, location of fracture, type of fracture, healing time in weeks and healing time groups. Age groups were from 20-30 years, 31-40 years, 41-50 years and 51-60 years. Mode of injury were; RTA, fall and firecrackers. Location of the fracture was; proximal, middle and distal third of tibia. Type of fracture were gustilo type IIIA and gustilo type IIIB. Healing time groups had attributes of 18-23 and 24-28 weeks. Age in years and healing time in weeks were numeric while all others were categorical variables. Mean and SD for numeric whereas frequency and percentages were calculated for categorical variables descriptively.

RESULTS

Out of 93 patients, 87(93.54%) were males and 6(6.45%) were females. Age range was 20 to 60 years with mean age was 31.32±5.14 years. 73(78.49%) cases were due to road traffic accident, 16(17.20%) sustained injury following fall and firecracker injury was implicated in 4(4.30%) cases. Middle third of tibia was fractured in 62 (66.66%) cases, distal one third of tibia in 20 (21.50%) cases and proximal-third in 11 (11.82%) cases (Table 1).

Table 1: Demographic distribution of open diaphysial fractures of tibia in Karachi (n=93)

Variable	Frequency	Percentage
Gender		
Male	87	93.54%
Female	6	6.45%
Age groups		
20-30 years	26	27.95%
31-40 years	39	41.93%
41-50 years	21	22.58%
51-60 years	7	7.52%
Mode of injury		
R.T.A	73	78.49%
Fall	16	17.20%
Firecracker	4	4.30%
Type of the fracture		
Gustilo type-IIIA	26	27.95%
Gustilo type-IIIB	67	72.04%
Location of fracture		
Proximal-third	11	11.82%
Middle-third	62	66.66%
Distal-third	20	21.50%

Healing time was 18 to 28 weeks in both gustilo type-IIIA and IIIB. Mean healing time in gustilo type IIIA was 17±1.1 weeks while in gustilo type IIIB was 18±2.1 weeks. Results of healing time in weeks are shown in (Table 2).

Table No.2 Healing time in weeks in open diaphysial fractures of tibia in Karachi (n=93)

Healing time in weeks	Gustilo type IIIA (n=26)	Gustilo type IIIB (n=67)
	Frequency and percentage	Frequency and percentage
18 to 23 Weeks	21(27.95%)	58(62.36%)
24 to 28 weeks	5(5.37%)	9(9.67%)

DISCUSSION

Tibial fractures are most common in young individuals. The most common cause for tibial fractures is road traffic accidents. Motor bike is most commonly involved. Motor bike is the main modality of transport among young males. This explains the fact that majority of patients with tibial fractures were males in our study. These results match with various studies. Mean age of patients was 31.32 years in our study. Kataria reports mean age to be 32 years.[9] Mehtab reports mean age to be 34.75 years.[10]

The most common site of tibial fractures in our study was middle third of tibia followed by distal third and proximal third. Results from Mehtab's study are similar which show 60% patients with fracture at the middlle third of tibia followed by distal third in 23.3% cases and proximal third in 16.6% cases.[10] Ocguder reports 53% tibial fractures in the middle third, 35% in distal third and 11.76% in proximal third.[12] Type IIIB fractures were more common in Mehtab's study as compared to type IIIA (63.33% vs 36.66%). Our study reports 72% IIIB fractures and 28% IIIA fractures. Makhdoom reports 16% patients with type 1 fractures, 20% with type II fractures, 40% with IIIA fractures and 23% with IIIB fractures.[11]

Our study reports that with Gustilo type III fractures time for union for 85% patients was between 18-23 weeks while for 15% of patients was between 24-28 weeks. Tabatabai and Shannon report in their studies that mean time of union was 21 and 36.9 weeks respectively.[13,14] Ganji reports mean time of union to be 5.85$\pm$2.13 months but this study was not limited to only Gustilo type III fractures but all types of tibial fractures . Wani and Honsey used Illizaro external fixator and report mean time of union to be 6 months and 5.6 months respectively.[15,16] Sen et al reports mean time of union to be 7.5 months.[17]

Our study shows mean fracture healing time to be 17 weeks for IIIA fractures and 18 weeks for IIIB fractures. Apart from modality used for external fixation, it also depends on nutritional status of patient. Adequate protein and calorie intake promote fracture healing.[10]

External fixation though offers good outcomes but is associated with certain complications. The most common complication is pin-tract infection. Sterile pins cannot cause infection but sterile pins in the presence of inadequate debridement have potential to cause tissue infection and necrosis which is very common in scenario of road traffic accidents causing open fractures. Another associated complication is mal-union or non-union. Papaioannou reports 29.3% non-union in patients of open tibial fractures treated with external fixators.[18] External fixation are difficult to use with intra-articular fractures, segmental fractures and in cases with bone loss.[19] A few studies have reported bad functional results associated with external fixation.[20] Two studies report the efficacy of external fixation to be 20% and 31%.[21,22]

Aggressive debridement and use of antibiotics lowers the rate of infection following tibial fractures. Bhandari treated 202 patients with grade III open tibial fractures using standard management plan. The infection rate was 15% which dropped to 9% during the second half of study in which aggressive debridement was done.[23] The rate of infection can be as high as 50% in grade IIIB open fractures.[23] Second generation cephalosporin can be given within 48-72 hours which provides good antibiotic cover against gram positive and negative organisms. Open diaphysial tibia fracture of gustilo type IIIB in middle third of tibia were common in male gender of age group of 31-40 years.

CONCLUSION

Open diaphysial tibial fractures of gustilo type IIIB in the middle third of tibia were common in males of age group 31-40 years. Road traffic accidents were the most common cause.

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CONFLICT OF INTEREST
Authors declare no conflict of interest.
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