

EVALUATION OF AO EXTERNAL FIXATOR IN THE MANAGEMENT OF OPEN DIAPHYSIAL FRACTURE OF TIBIA GUSTILO TYPE IIIA AND IIIB

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ABSTRACT

Background: Initial management by external fixation is well-established but high incidence of pin tract infections, thermal necrosis of bone and potential of mal-union and non-union are the main complications. This study was conducted to evaluate the result of AO external fixator in open diaphysial fracture of tibia Gustilo type IIIA and IIIB.

Material & Methods: This descriptive cross-sectional study was carried out in Department of Orthopaedic Surgery and Traumatology Unit-I, Liaquat University Hospital, Hyderabad, Jamshoro, from October 2010 to September 2012. Thirty patients with open diaphysial fracture of tibia Gustilo type IIIA and IIIB as assessed by pre-operative workup and operative findings were treated by AO external fixator. After admission, history, clinical examination, routine investigations and x-ray findings were noted. Data was entered in a proforma and analyzed by SPSS software.

Results: Out of 30 patients, 25(83.3%) were males and 5(16.7%) females; with male to female ratio of 5:1. The mean age was 34.75 ± 5.8 years. Regarding mode of injury, 23(76.66%) patients sustained injury following road traffic accident, 6(20%) following fall and one (3.33%) with a firecracker injury. The type of fracture was Gustilo type-III A in 11(36.66%) and IIIB in 19(63.33%) cases. Regarding anatomical location of fracture, middle-third of the tibia in 18(60%), distal-third in 7(23.33%) and Proximal-third in 5(16.66%) cases. Complications seen were pin track infection in 2(6.66%), wound infection in 4(13.33%), non-union in one (3.33%), mal-union in one (3.33%) and delayed union in 3(10%) cases.

Conclusion: AO external fixator is simple and safe to apply and can be used as successful management of type III open tibial fractures confidently.

Key Words: Tibia; fracture; External fixator; Diaphysial.

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INTRODUCTION

Tibia is one of the long bone of the skeleton, located in the lower extremity. It is destined to support weight and plays an important role in the act of standing and walking. With the poor coverage of soft part, it is subcutaneous in the antero medial area. It provides with precarious irrigation if it is compared with other long bones which are surrounded by powerful muscles. Its unique anatomy makes this bone more vulnerable to trauma and high risk to fractures. Therefore its fractures are common among the long bones.^{1,2} An open fracture is contaminated

and usually results from a high energy injury, which may threaten limbs and occasionally life. The limb salvage is the initial aim, medium and long term problems with soft tissue cover, infections and union are all too common and results in serious disability.^{3,4}

The initial management by external fixator is well established but other options include immobilization in cast, internal fixation with plates or intramedullary nailing.⁵ The choice of technique for stabilization of fracture has not been analyzed. It is not clear which is the best method for stabilization in Gustilo type II and III fractures. Initial management by external fixation is popular and well established because of relative ease of patient and limited effect on blood supply of tibia, acceptable stability and good access to soft tissue, but high incidence of pin tract infections, thermal necrosis of bone at the time of pin insertion and potential of mal union and non union are the main complications.^{6,7}

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The aim of this study was to assess the role of AO external fixator in open type III A and III B fractures as a definite treatment.

MATERIAL AND METHODS

This descriptive cross-sectional study was carried out in Orthopaedics Unit-I, Liaquat University Hospital Hyderabad / Jamshoro, from October 2010 to September 2012. A total of 30 patients admitted through the outpatient department, as well as from casualty department of orthopaedic Unit-I Liaquat University Hospital, Hyderabad / Jamshoro.

This is prospective observation study of open diaphysal fracture of tibia Gustilo type IIIA and IIIB as assessed by pre-operative workup and operative findings treated by AO external fixator. All patients underwent for base line investigation. Inclusion criteria were open diaphysal fracture of tibia Gustilo type IIIA and IIIB, age 08 to 65 years, both gender and Fresh Fracture. In exclusion criteria were open diaphysal fractures of tibia Gustilo type I, type II and type IIIC, Intra articular fractures, associated with severe chest or abdominal injuries and non ambulatory patients.

RESULTS

Out of 30 patients, 25 (83.33%) patients were males and 5 (16.66%) patients were females. Minimum age of the patient was 8 years and the maxi-

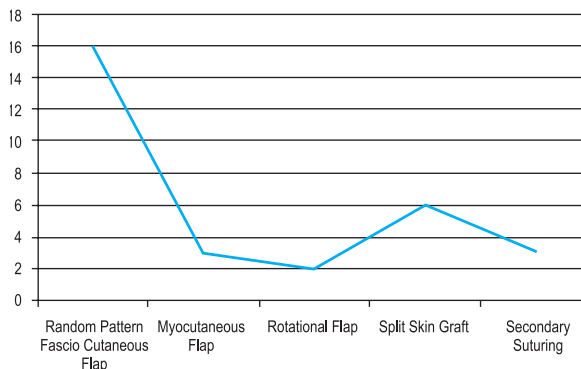


Figure 1: Methods of wound coverage.

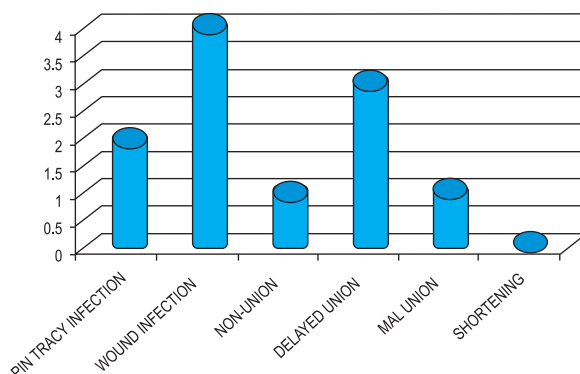


Figure 2: Post-operative Complications.

mum age was 65 years. Mean age of the patient in the study was 34.75 ± 5.80 . The tibial shaft fractures were common in the age group of 31-40 years in the present study. In our study, 23 (76.66%) of patients sustained injury following road traffic accident and 6 (20%) patients sustained injury following fall. There was one patient (3.33%) with a firecracker injury. The most common type of open diaphysal fracture of tibia was Gustilo type-IIIA in 11 (36.66%) cases and Gustilo type-IIIB in 19 (63.33%) cases. The commonest anatomical location of fracture was at the middle-third of the tibia 18(60%) cases, followed by distal-third in 7 (23.33%) and Proximal-third in 5(16.66%). In our study additional procedure done for wound closed were random pattern fascio cutaneous flap in 16 (53.33%), myocutaneous flap in 3 (10%), rotational flap in 2 (6.66%), Split Skin Graft in 6 (20%) and secondary suturing in 3 (10%). (Fig. 1)

Union time ranged 18 to 28 weeks in both Gustilo type-IIIA and IIIB. The mean healing time in Gustilo type IIIA was 18 ± 2.1 weeks while in Gustilo type IIIB was 20 ± 1.6 weeks. The complications seen in this study were Pin Track Infection in 2 (6.66%), wound infection in 4(13.33%), Non-union 1(3.33%), Malunion in one (3.33%) and delayed union in 3 (10%). (Fig. 2)

DISCUSSION

The fractures of the tibia are among the most difficult fractures to treat effectively. The status of the soft tissues, the degree of comminution and articular damage sustained at the time of injury affect the long term clinical results. The goal of operative treatment is to obtain anatomic realignment of the joint surface while providing enough stability to allow early motion. This should be accomplished using techniques that minimize osseous and soft tissue devascularization in the hopes of decreasing the complications resulting from treatment.⁸

In our study majority of patients were males. Out of 30 patients, 83.33% patients were males and 16.66% were females with male to female ratio was 5:1. This can be attributed to our Pakistani setup where the female population largely work indoor or in agricultural field and do not travel much. The higher rate of fracture in male clearly correlated with the life style of male, especially in our part of world. The males are more involved in outdoor activities and the young male are more enthusiastic about life and careless drivers. Female usually have sedentary life style and less involved in driving which is a common cause. However the male to female ratio given by Camacho et al⁹ is 4:1 and Ozturkmen Y¹⁰ is 2.1:1.

In this study the minimum age of the patient was 08 years and the maximum age was 65 years. Mean age of the patient in the study was 34.75 ± 5.80 . The tibial fractures were most common in the 2nd

and 3rd decades in our study. The other series also show higher incidence of fractures in younger age groups. However Kataria H showed age range from 20 to 60 year with the mean age was 32 years¹¹ and Shrestha BK¹² showed average age was 37 years.

The road traffic accident is the most common cause of fracture of tibia¹³. Due to limited sources of income, motorbike is the main mode of transportation of middle class, tibia is commonly affected. The farmers, house wives, retired people have a comparatively lesser fracture rate as they do not travel frequently, where as workers and labourers tend to have violent injuries commonly due to industrial accidents, automobile accidents, housewives sustaining fractures through fall from height, when they climb up ladder or stool to pickup objects from the shelves.

The present study showed the most common mechanism of tibial fractures as road traffic accident and 6(20%) patients sustained injury following fall. There was 1 patient (3.33%) with a firecracker injury. In the study of Ngim NE¹³, road traffic accident (RTA) was the leading cause of limb injury accounting for 76.8% of cases. Most of the RTAs (52.8%) involved motorcycles with the patient either as rider or passenger. Assault was the cause of injury in 10.1%, fall in 4.3% and gunshot in 5.8% and other causes (hit by an object, trampled upon) in 2.9% of patients.

In our study fractures were classified according to Gustilo classification, most common type of open diaphysal fracture of tibia was Gustilo type-IIIa in 11(36.66%) cases and Gustilo type-IIIB in 19(63.33%) cases. However In a study by Makhdoom A¹⁴ of 30 patients of tibia fractures, 5 (16%) had type I, 6(20%) had type II, 12(40%) had type IIIa and 7(23%) had type IIIB fractures. In a study conducted by Ocguder DA¹⁴ fractures were classified according to the Gustilo-Anderson classification. 8, 12, and 13 fractures were grade I, II, and III respectively.

In our study the commonest anatomical location of fracture was at the middle-third of the tibia 18(60%) cases, followed by distal-third in 7(23.33%) and Proximal-third in 5(16.66%). While in the study of Asadullah Makhdoom¹⁵ reported Middle 3rd 36(52.94%) was most common followed by distal 3rd 24(35.29%) and proximal 3rd 08(11.76%).

Soft tissue coverage procedure are performed to provide a close wound to promote revascularization of injured bone and soft tissue. The type of flaps used for coverage of soft tissue defects generally is chosen on the basis of anatomical consideration, specifically the location of the defect on the leg, the size of defect and availability of local tissue for coverage. In our study out of 30 cases wound closed were random pattern fascio cutaneous flap in 16(53.33%), myocutaneous flap in 3(10%), rotational flap in 2(6.66%), Split Skin Graft in 6(20%) and secondary

suturing in 3(10%). While in the study of Pahore MK¹⁶ reported that out 56 cases 32(57.1%) required soft tissue coverage by local random pattern fascio-cutaneous flaps, 3 cases (5.3%) by myocutaneous flaps, 7 cases (12.5%) by skin release incisions and secondary suturing and 14 cases (25%) by split thickness skin grafting. Comparing with others Fischer et al¹⁷ reported 43 patients of type IIIB open fracture, out of whom 12 (27.9%) covered with local muscle rotation flaps, 12 cases (27.9%) were covered with free flaps and remaining 19 cases(49%) with split thickness skin grafting.

Fracture healing depends upon systemic and local factors. Multiple patient factors have been shown to contribute in delayed union and nonunion of fractures. One of them is malnutrition, which often goes unrecognized. Adequate protein is required for healing, and inadequate caloric intake has been shown to contribute to delayed union and nonunion. Cigarette smoking has been shown in numerous clinical and experimental studies to have an adverse effect on fracture healing.¹⁸ In our study we achieved union time range 18 to 28 weeks in both Gustilo type-IIIa and IIIB. The mean healing time in Gustilo type IIIa was 18+2.1 weeks while in Gustilo type IIIB was 20+1.6 weeks. Comparable with study by Shoaib M¹⁹ which shows union in 25 (83.33%) patients out of 30 within 12 to 20 weeks.

The complications seen in this study were pin tract infection in 6.66%, wound infection in 13.33%, non-union 3.33%, mal-union in 3.33% and delayed union in 10%. However in the study Pahore MK reported the complications of tibia fracture were wound infection in 8.92%, delayed union in 22.6%, non-union in 8.9%, mal-union in 3.5%, shortening in 3.5% and pin tract infection in 33.9%.¹⁶

CONCLUSION

Type IIIa&B Open Tibial fractures are surgical emergencies needs aggressive approach for surgical debridement, early stabilization and soft tissue cover. AO external fixator is simple and safe to apply, cost effective, minimal invasive, needs less operating time and gives good access to soft tissue and can be used as definite and successful management of type III open tibial fractures confidently, combined with early bone grafting it gives excellent results. However they allow very little adjustment after application, without replacing the pins.

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CONFLICT OF INTEREST
Authors declare no conflict of interest.
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None declared.