

AO external fixator in the management of open fracture of tibia

Sanaullah, Salik Kashif, Bahadar Ali, Awal Hakeem, Israr Ahmed, Mohammad Arif Khan

Department of Orthopedic and Spine Surgery Hayatabad Medical Complex, Peshawar, Pakistan

Objective: To evaluate the outcome of AO external fixator in open tibial fractures.

Methodology: This prospective study was carried out at Department of Orthopedic and Spine Surgery, Hayatabad Medical Complex, Peshawar, Pakistan from January 2013 to June 2015. Forty two patients with open fracture of tibia Gustilo type II, IIIA and IIIB were included in the study. After initial resuscitation and pre operative workup, all were treated with wound debridement, irrigation with normal saline and fixed with AO external fixator.

Results: Out of 42 patients, 35(83%) were males and 07(17%) females; with male to female ratio of 5:1. The mean age was 32±15 years. Mode of injury was road traffic accident in 28 (67%)

patients, fire arm injury in 8(19%), fall from height in 2(5%) and bomb blast injury in 4(9%) patients. The type of fracture was Gustilo type-II in 7 (17%), Gustilo type-IIIA in 17(40%) and IIIB in 18(43%) cases. Middle-third of the tibia was involved in 24(57%), distal-third in 13(31%) and Proximal-third in 5(12%) cases. Complications seen were pin track infection in 13(31%), wound infection in 6(14%), non-union in 3(7%), mal-union in 3(7%) and delayed union in 4(10%) cases.

Conclusion: AO external fixator is simple and safe to apply and can be used for successful management of type II and III open tibial fractures. (Rawal Med J 201;41:459-461)

Key Words: Fracture, tibia, external fixator.

INTRODUCTION

Management of open fractures is more demanding than close fractures as soft tissue trauma, blood loss, tissue loss and contamination are the associated problems.¹ The initial aim is limb salvage. Later problems are soft tissue cover, infections and non union which cause serious morbidity.

Antero medial aspect of tibia is subcutaneous and hence is the commonest bone involved in open fractures.^{2,3} Management options for open fractures are open reduction and internal fixation with plate⁴ or nail,^{5,7} closed reduction and nailing or percutaneous plating (MIPPO technique), POP casting, AO external fixation⁸ and ilizarov external fixation.⁹ As open fracture is a relative contra indication for internal fixation, AO external fixator becomes the ultimate easy choice in such situations. Bone grafting or skin grafting, if required later on can be done easily without disturbing the fixator. Many previous studies has shown external fixation as treatment of choice in open fractures of tibia.¹⁰ However, there are some complications and limitations of this mode of fixation. External fixation is technically demanding in upper and lower ends of tibia particularly intra articular fractures are difficult to be fixed with this

mode. Segmental fractures and fractures with bone loss also pose great problems. Main complications are mal-alignment, malunion, non union, soft tissue infection, pin tract infection and osteomyelitis.¹¹ Also, external fixations is not advisable in psychiatric patients, osteoporotic and medically unfit patients. The aim of this study was to evaluate the outcome of AO external fixator in open fractures of tibia (type II, type III A and III B fractures).

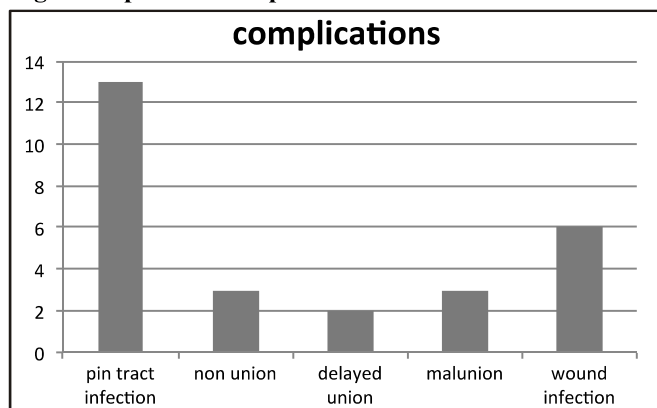
METHODOLOGY

This prospective study was carried out at Department of Orthopedic and Spine Surgery, Hayatabad Medical Complex, Peshawar, Pakistan from January 2013 to June 2015. Forty two patients with open fracture of tibia Gustilo type II, IIIA and IIIB with age 6-65 years were included in the study. All the patients, after initial resuscitation and pre operative workup were shifted to operation theater and treated with wound debridement, irrigation with normal saline and fixed with AO external fixator. Type I and type IIIc fractures, acute chest, abdominal and head injury patients, intra articular fractures, psychiatric and medically unfit patients were excluded from the study.

RESULTS

Out of 42 patients, 35(83%) were males and 07(17%) females; with male to female ratio of 5:1. The mean age was 32 ± 15 years. Mode of injury was road traffic accident in 28(67%) patients, fire arm injury in 8(19%), fall from height in 2(5%) and bomb blast injury in 4 (9%) patients. The type of fracture was Gustilo type-II in 7(17%) Gustilo type-IIIa in 17(40%) and IIIB in 18(43%) cases. Middle-third of the tibia was involved in 24(57%), distal-third in 13(31%) and proximal-third in 5(12%) cases.

Fig. Post operative complications.



Additional plastic surgical procedure was done for wound closure with local random fascio cutaneous flap in 9 (21%), split skin graft in 6(14%), rotational flap in 2(5%), myocutaneous flap in 2(5%) and skin release & secondary suturing in 4 (10%). 39(93%) patients achieved healing with AO fixator in-situ. Three (7%) fractures were not healed at the end of study, in all these AO fixator was removed and were managed by multiple procedures including ilizarov fixator. Union time for fracture healing ranged from 16 to 32 weeks. Commonest complications seen was pin track infection (Fig.).

DISCUSSION

In our series, male to female ratio of 5:1 which is similar to other studies.¹²⁻¹⁴ Mean age of the patients in our study was 32 years, which is almost same in previous studies.^{12,15} However, another study reported an average age was 37 years.¹⁶ Road traffic accidents was the chief cause of trauma in our series

(67%), which is similar to another study.¹⁷

We used Gustilo Anderson system for classification of open fractures of tibia. Seventeen (40%) patients had type IIIa fractures while 18(43%) of the patients had type IIIB fractures of the tibia. However, Makhdoom et al¹⁸ in his series of 30 open fractures of tibia had different values, type I fractures were 16%, type II fractures were 20%, type IIIa fractures were 40% and type IIIB fractures were 23%. In our study, type I injuries were not included while early presented and minimally contaminated type II fractures were considered for internal fixation which may be the cause for higher number of type III fractures.

Middle-third of the tibia was involved in 57%, which is almost similar to study by Makhdoom et al.¹⁹ Additional plastic surgical procedure done for wound closure. Our figures in most of plastic surgical procedures are comparable to figures in other studies by Fischer et al²⁰ and Pahore MK.²¹

Fractures healed with AO external fixator in 93% patients. Our results were better than series by Shoaib et al²² and Piwani et al.¹² Pin tract infection was the commonest complication. Other complications in our series were comparable study by Edwards et al²³ and Caudle et al.²⁴ Strength of our study is that we had an adequate number of patients. Limitation of our study was that patients related outcome was not taken into account. In future, separate studies on pediatric and adults open fracture with emphasis on clinical and radiological outcome are recommended.

CONCLUSION

AO external fixator is simple and safe to apply and can be used for successful management of type II and III open tibia fractures.

Author Contributions:

Conception and design: Sanaullah
 Collection and assembly of data: Bahadar Ali
 Analysis and interpretation of the data: Awal Hakeem
 Drafting of the article: Salik Kashif
 Critical revision of the article for important intellectual content: Sanaullah
 Statistical expertise: Israr Ahmed
 Final approval and guarantor of the article: Mohammad Arif Khan
Corresponding author email: Salik Kashif: salikkashif@hotmail.com
Conflict of Interest: None declared
 Rec. Date: Dec 8, 2016 Accept Date: Aug 25, 2016

REFERENCES

1. Sisk TD. External fixation: historic review, advantages, disadvantages, complications and indications. *Clin Orthop Relat Res* 1983;180:15-22.
2. Nicoll EA. Fractures of the tibia shaft. A survey of 705 cases. *J Bone Joint Surg* 1964; 46:373-87.
3. Gustilo RB, Mendoza RM, Williams DM. Problem in the managements of type III (severe) open fractures. A new classification of type III open fracture. *J Trauma* 1983;24:792-96.
4. Erik NK, Eric F, Eric S, Kenneth AE. The Evolution of Locked Plates. *J Bone Joint Surg* 2006;88:189-200.
5. Alho A, Benetertud JG, Hogevoold HE. Comparison of functional Bracing and locked intramedullary nailing in the treatment of displaced tibial fractures. *Clin Orthop* 1992; 277:243-50.
6. Antich-Adrover P, Martin-Garin D, Murias-Alvarez J, Puente-Alonso C. External fixation and secondary intramedullary nailing of open tibial fractures. *J Bone Joint Surg (Br)* 1997;79-B:433-7.
7. Henley MB, Chapman JR, Agel J, Harvey EJ, Whorton AM, Swiontkowski MF. Treatment of type II, III A, and III B open fractures of the tibial shaft: a prospective comparison of unreamed interlocking intramedullary nails and half-pin external fixators. *J Orthop Trauma* 1998;12:1-7.
8. Behrens F, Searls K. External fixation of tibia. Basic concepts and prospective evaluation. *J Bone Joint Surg Br.* 1986;68:246-54.
9. Ocgiider DA, Ozer H, Solak S, Onem RY, Aooolu S. Functional results of the Ilizarov circular external fixator in the treatment of open tibial fractures. *Acta Orthop Traumatol Turc* 2005;39:156-62.
10. Johnson B, Ricardo CJ, Pacheco J, Saleh M. Open tibial shaft the role of external fixation in trauma. *Trauma* 2004;6:143-60.
11. Teeny SM, Wiss DA: Open reduction and internal fixation of tibial plafond fractures. Variables contributing to poor results and complications. *Clin Ortho Relat Res* 1993; 292:108-17.
12. Piwani M, Bhutto IA, Ahmed I. Evaluation of AO external fixator in the management of open diaphyseal fracture of tibia Gustilo type IIIA and III B. *Gomal J Med Sci* 2015;13: 66-9.
13. Thakur AJ, Patnakar J. Open tibial fractures Treatment by uniplanar external fixation and early bone grafting. *J Bone Joint Surg (Br)* 1991;73-B:448-51.
14. Ozturkmen Y, Fiukur E. Calcium phosphate cement augmentation in the treatment of depressed tibial plateau fractures with open reduction and internal fixation. *Acta Orthop Traumatol Turc* 2010;44:262-9.
15. Kataria H, Sharma N, Kanojia RK. Small wire external fixation for high-energy tibial plateau fractures. *J Ortho Surg* 2007;15:137-43.
16. Shrestha BK, Bijukachhe B, Rajbhandary T, Uprety S, Banskota AK. Tibial plateau fractures: four years review at B&B Hospital. *J Kathmandu Uni Med* 2004;2:315-23.
17. Ngim NE, Udosen AM, Ikpeme IA. Review of seventy consecutive cases of limb injuries in calabar. The role of motorcyclecyclists. *Nigerian J Ortho Trauma* 2006;5:38-40.
18. Makhdoom A, Laghari MA, Qureshi PAL, Siddiqui KA. Management of open diaphyseal fractures of tibia treated by naseer awais external fixator. *J Pak Orthopaedic Asso* 2006; 18:1-4.
19. Makhdoom A, Qureshi PAL, Laghari MA, Akhund MA, Siddiqui KA. Outcome of distal tibia fractures treated by ilizarov external fixatorv/s t-clamp naseer awais external fixator. *Medical Channel* 2009;15:117-24.
20. Fischer MD, Gustilo RB, Varecka TF. The timing of flap coverage, bone-grafting, and intramedullary nailing in patients who have a fracture of the tibial shaft with extensive soft-tissue injury. *J Bone Joint Surg Am* 1991;73:1316-22.
21. Pahore MK, Pirwani MA, Laghari MA, Makhdoom A, Saeed G, Shaikh AR. Role of external fixator in the management of type IIIA & B open tibial fracture. *Medical Channel* 2010;16:460-4.
22. Shoaib M, Shabir M, Sahibzada AS, Gul R. Outcome of close reduction and casting in close tibial diaphyseal fracture. *J Med Sci* 2005;13:154-6.
23. Edwards CC. Staged reconstruction of complex open tibial fractures using Hoffman external fixation: Clinical decisions and dilemmas. *Clin Orthop* 1983;178:180.
24. Caudle RJ, Stern PJ. Severe open fractures of the tibia. *J Bone Joint Surg Am* 1987; 69: 801-7.