

Management of Open Diaphyseal Fracture of Tibia with Plaster of Paris (Pop) Cast Vs External Fixator in A Tertiary Care Centre

Allah Nawaz Abbasi,^{*} Syed Karam Ali Shah,^{**} Zahoor Illahi Soomro^{***}

ABSTRACT

Objective: To determine the management of open diaphyseal fracture of tibia with plaster of paris (pop) cast vs external fixator in a tertiary care center.

Methods: This study was carried out in the Orthopedic department, Peoples University of Medical and Health Sciences Nawabshah for the period of 18 months, from January 2015 to June 2016. A total of 50 patients were included in the study, selected on the basis of inclusion criteria. Patients were divided in two groups of equal number. 25 patients in Group A, treated by conservative method with plaster of paris cast and 25 patients in group B treated by external fixator. Two groups of patients were randomly selected. All the patients were managed as an emergency and when stabilized, sample for culture and sensitivity was sent if required. Wound debridement and stabilization of fracture with external fixator or plaster of paris (pop) cast. Open fractures were fixed with either of the above said two methods. Post operative antibiotics were changed according to culture and sensitivity report.

Results: Out of 50 patients with tibial diaphyseal fractures, there were 34 males compared to females 16 (2.1:1) (68% vs 32%) with an average age of 41 years. Patients with external fixator applied yielded decreased rates of infection; shorter duration of hospital stay and early union compared to patients with plaster of paris (pop) cast application. However the difference did not reach statistical significant value.

Conclusion: Plaster cast is the initial treatment of modality in patients with open tibial diaphyseal fractures, but these fractures should be managed with external fixation that yields better results.

Key words: Tibial Diaphyseal fractures, External Fixator, POP Cast.

Article Citation: Abbasi AN, Shah SKA, Soomro ZI. Management of Open Diaphyseal Fracture of Tibia with Plaster of Paris (Pop) Cast Vs External Fixator in A Tertiary Care Centre. J Peoples Uni Med Health Sci. 2017;7(1):31-5.

INTRODUCTION:

Tibia is the commonest long bone fractured when patient sustains high velocity injury, soft tissue damage also occurs. 94% of open tibial fractures in adults are a result of motor vehicle accident and involves a significant trauma related energy transfer¹. Open fracture of the tibia in youngsters heals more predictably and with fewer complications than those occurring in adolescents². The incidence of open fractures, in

relation to all tibial shaft fractures comes up to 6 to 7 %, one third of these are second degree and third degree open fractures³. 80 % of these fractures are caused by road traffic accident; in 33% exist multiple fragments. In 1st degree open fractures conservative treatment is generally practiced, while in 2nd and 3rd degree open fractures osteosynthesis often is performed^{3,4}.

Management of open diaphyseal fractures depends on type of fracture and soft tissue damage. Stable fractures and minimally displaced fractures are usually treated with non operative treatment, whenever possible, but unstable fractures of the tibia and fibula may require operative reduction and stabilization by external fixator, specially in elderly patients⁵.

Methods of fixation include percutaneous pins with plaster cast, external fixator, plates and

^{*} Senior Registrar, Orthopaedic Department, PUMHSW, Nawabshah,
^{**} Associate Professor, Orthopaedic Department, PUMHSW, Nawabshah.
^{***} Assistant Professor, Orthopaedic Department, PUMHSW, Nawabshah.

Correspondence to:

Allah Nawaz Abbasi

Senior Registrar, Orthopaedic Deptt. PUMHSW
Nawabshah

Email: dr.zamirabbasi250@gmail.com

Screw fixation and intramedullary nails⁶. However in 3rd degree fractures, stabilization with external fixator is usually required to avoid infection⁷.

Manipulation and casting is reliable treatment for open tibial fractures in adults. For high grade open fractures (Gustillo III) or comminuted fractures, external fixation remains the gold standard⁸.

Majority of isolated open tibial fracture in young adults can be treated by wound debridement and plaster cast immobilization⁹. There is still role for the use of external fixator especially where there is a grossly unstable fracture or extensive soft tissue injury requiring a flap procedure¹⁰.

The most versatile external fixation device for grade II and III open tibial fractures is a unilateral frame. Unipolar devices generally are preferred for adults and elder patients because they allow minor corrections in alignment through modification at both ends of the fixator^{11,12}.

Advantages of the external fixator are avoidance of infection, quick and better rehabilitation and excellent functional outcome. Factors such as the degree of soft tissue damage periosteal stripping that are noticed following wound debridement and velocity of injury are far more important than the wound size^{13,14}. Complications include infection, compartment syndrome, vascular injuries, angular deformities, malrotation, and leg length discrepancy^{15,16}.

In our set up, most of the patients having diaphyseal fracture of tibia are commonly managed with conservative treatment. Plaster cast application is common practice but external fixators are also applied for fixation of tibial shaft fracture in adults. The locally made unilateral fixator and A.O type fixators are used because of socioeconomic constraints. This study was conducted to evaluate the results of open diaphyseal tibial fractures stabilization in adults by plaster of Paris (POP) cast & external fixator in our setup.

METHODS:

After approval was taken from the ethical committee this experimental study was carried out in the Orthopedic department, Peoples University

Of Medical and Health Sciences Nawabshah for the period of 18 months, from January 2015 to June 2016. A total of 50 patients were included in the study, selected on the basis of inclusion criteria.

Inclusion Criteria

1. Adults above 18 years and below 65 years.
2. Fresh open tibial diaphyseal fractures and patients arrived within one week of injury.
3. Gustilo Grade I, II.

Exclusive Criteria

1. Patient below 18 years of age & above 65 years.
2. Old open fractures of tibia (arriving after one week)
3. Infected fractures
4. Grade III A, III B & 3C fractures
5. Pathological fractures
6. Malunited fractures
7. Nonunion fractures

Patients were divided in two groups A and B, comprising 25 patients in each. Group A, treated by conservative method with plaster of Paris cast and patients in group B were treated by external fixator. Two groups of patients were randomly selected. All the patients were managed as an emergency and when stabilized, sample for culture and sensitivity was sent if required. Wound debridement and stabilization of fracture with external fixator or plaster of Paris (POP) cast. Open fractures were fixed with either of the above said two methods. Post operative antibiotics were changed according to culture and sensitivity report. All the data collected was analyzed statistically by using SPSS 20.0 program, and results were tabulated.

RESULTS:

Out of 50 patients admitted with open diaphyseal fracture, there were 34 males compared to females 16 (2.1:1) (68% vs 32%) with an average age of 41 years. However age group most commonly found to have tibial fractures were from 36-50 years. The patients with external fixator applied appeared to have low rate of infection with only 3 patients had it compared to 5 patients in plaster cast. Most of the patients with external fixator applied had one week of hospital stays i-e;

N=17, while the remaining 8 patients had stay for second and third week. The duration of hospital stay in pop cast group was one week in 9 patients, two weeks in 8, and remaining 8 stayed for three weeks or more due to infection they developed during their stay (table-I). The outcome was assessed by early union that occurred in patients with external fixator applied i-e; 15 patients, only 2

Patients with EF applied had non union. The patients with popcast applied had mostly delayed union and non union 8 patients in each, while only 9 patient's ad early union. The chi square applied to assess efficacy of each, but no statistical significant value was found (table-II). There was no mortality in our series.

Table-I: Duration of Hospital Stay

Duration of Hospital stay	POP Cast Applied n=25	External Fixator Applied n=25	P. Value
One Week	9	17	0.077
Two Weeks	8	4	
Three Weeks or Greater	8	4	

Table-II: OUTCOME

Variables	POP Cast Applied n=25	External Fixator Applied n=25	P. Value
Outcome			0.078
Early Union	9	15	
Delayed Union	8	8	
Non Union	8	2	

DISCUSSION:

The tibial diaphyseal fractures are the most common fractures of the lower limb presenting to orthopaedic surgeon. The commonest cause of tibial fractures is road traffic accidents in nearly 76.8% of cases¹⁷. In our study most of the patients had the history of preceding road traffic accident. Increasing incidence of tibial fractures has been seen in males compared to females. Our study also revealed increasing preponderance of tibial fractures among males.

The tibial diaphyseal fractures were treated conventionally by conservative approach i-e; plaster cast irrespective of degree of damage. After low energy fractures pop cast application and immobilization is cornerstone of treatment. However the High-energy injuries are associated with wide-ranging soft-tissue disruption and thus needs treatment surgically. External fixation is also the commonest surgical treatment for the

management of high impact tibial diaphyseal fractures also in the fractures with non unions or delayed unions. Our study also revealed good results in the patients treated for complex fractures by external fixation; however the patients with complex fractures did not revealed better results with plaster cast resulting in non unions or delayed unions. Also the patients overall treated with external fixation have shorter time of hospital stay compared to plaster cast patients that required longer hospital stay. Hussain et al has also found external fixation to be effective in patients with extensive soft tissue injuries¹⁸.

It is evident from literature that delayed management is associated with higher risk of infections. Petrisor et al found the rate of infection to be 62.5% in open fractures¹⁹. Reussand Cole analysed in their study that delayed presentation of fractures greater than 48 hours is also associated with adverse outcome and increased rate of

Infections²⁰. Previous studies on diaphyseal fractures of long bones also reveal that early intervention prevents non union^{17,21}. This study have also found that patients who presented late i.e; greater than 48 hours of injury suffered from delayed union. Although delayed union and increased risk of infection was more in patients with Gustilo II or III tibial fractures together with the longer the duration of hospital stay.

It was thus concluded from the study that patient with Gustilo III should be managed with surgical technique. External fixation should be the treatment of choice in patients with extensive fractures while the patients with Gustilo I or II is potentially cured by Plaster cast application.

CONCLUSION:

Plaster cast is the initial treatment modality in patients with minimal fractures; we suggest that the open tibial diaphyseal fractures should be managed with external fixation that yields better results.

REFERENCES:

1. Lua J, Tan V, Sivasubramanian H, Kwek E. Complications of Open Tibial Fracture Management: Risk Factors and Treatment. *Malaysian Ortho J*. 2017;11(1):18-22. Doi: 10.5704/MOJ.1703.006.
2. Pennock AT, Ellis HB, Willimon SC, Wyatt C, Broida SE, Dennis MM, Bastrom T. Intra-articular Physeal Fractures of the Distal Femur: A Frequently Missed Diagnosis in Adolescent Athletes. *Orthop J Sports Med*. 2017;5(10):23-5.
3. Orthopaedic Trauma Association. Fracture and Dislocation Classification Compendium -2007 Orthopaedic Trauma Association/Classification, Database & Outcomes Committee. Orthopaedic Trauma Association. Available at <http://www.ota.org/compendium/compendium.html>. Accessed May 15, 2009.
4. Fochtmann A, Binder H, Rettl G, Starlinger J, Aszmann O, Sarahrudi K, et al. Third degree open fractures and traumatic sub-/total amputations of the upper extremity: Outcome and relevance of the Mangled Extremity Severity Score. *Orthop Traumatol Surg Res*. 2016;102(6):785-90.
5. Rozell JC, Vemulapalli KC, Gary JL, Donegan DJ. Tibial Plateau Fractures in Elderly Patients. *Geriatr Orthop Surg Rehabil*. 2016; 7(3): 126-34. doi: 10.1177/2151458516651310
6. Wysocki RW, Kapotas JS, Virkus WW. Intramedullary nailing of proximal and distal one-third tibial shaft fractures with intraoperative two-pin external fixation. *J Trauma*. 2009;66(4):1135-9.
7. Eidelman M, Katzman A. Treatment of complex tibial fractures in children with the Taylor spatial frame. *Orthopedics*. 2008;31(10):992.
8. Gustilo RB, Anderson JT. Prevention of infection in the treatment of one thousand and twenty-five open fractures of long bones: retrospective and prospective analyses. *J Bone Joint Surg Am*. 2012;58(4):453-8.
9. Busse JW, Morton E, Lacchetti C, Guyatt GH, Bhandari M. Current management of tibial shaft fractures: a survey of 450 Canadian orthopedic trauma surgeons. *Acta Orthop*. 2008;79(5):689-94.
10. Bhandari M, Guyatt G, Tornetta P 3rd, Schemitsch EH, Swiontkowski M, Sanders D, et al. Randomized trial of reamed and unreamed intramedullary nailing of tibial shaft fractures. *J Bone Joint Surg Am*. 2008;90(12):2567-78.
11. Modhia UM, Dickens AJ, Glezos CD, RJ Gehlert, DeCoster TA. Under-Utilization of the OTA Fracture Classification in the Orthopaedic Trauma Literature. *Iowa Orthop J*. 2014; 34: 50-54.
12. Mears SC, Kates SL. A Guide to Improving the Care of Patients with Fragility Fractures, Edition 2. *Geriatric Orthopaedic Surgery & Rehabilitation*. 2015;6(2):58-120. doi:10.1177/2151458515572697.
13. Wysocki RW, Kapotas JS, Virkus WW. Intramedullary nailing of proximal and distal one-third tibial shaft fractures with intraoperative two-pin external fixation. *J Trauma*. 2009;66(4):1135-9.
14. Kazemian GH, Emami M, Manafi A, Najafi F, Najafi MA. External Fixation vs. Skeletal Traction for Treatment of Intertrochanteric Fractures in the Elderly. *Trauma Monthly*. 2016;21(1):e15477. Doi:10.5812/traumamon.15477.

15. Kazmers NH, Fragomen AT, Rozbruch SR. Prevention of pin site infection in external fixation: a review of the literature. *Strateg Trauma Limb Reconst.* 2016;11(2):75-85. doi:10.1007/s11751-016-0256-4.
16. Tao XMM, Chen NMM, Pan FBS, B. External fixation combined with delayed internal fixation in treatment of tibial plateau fractures with dislocation. *Medicine (Baltimore).* 2017;96(41): e8221.
17. Joseph W, Donald W, Sukhdeep K D, Joseph W B, Richard B, Lauren AB. Factors Associated With Development of Nonunion or Delayed Healing After an Open Long Bone Fracture: A Prospective Cohort Study of 736 Subjects. *J Ortho Trauma.* 2016; 30(3):149-55.
18. Hussain S, Khalid, Khan AS, Afsar SS. External fixator in the treatment of open fractures of tibia. *J Postgrad Med Inst.* 2011;25(1):62-7.
19. Petrisor B, Anderson S, Court-Brown CM. Infection after reamed intramedullary nailing of the tibia: a case series review. *J Orthop Trauma.* 2005;19(7):437-41.
20. Reuss BL, Cole JD. Effect of delayed treatment on open tibial shaft fractures. *Am J Orthop.* Apr 2007;36(4):215-20.
21. Nandra R, Grover L, Porter K. Fracture non-union epidemiology and treatment. *Trauma.* 2016; 18(1): 3-11.