

# Functional Outcome of External Fixator in Grade 11& 111 Open Fractures of Tibia in Children

Abbas Memon, Mehtab Ahmed Pirwani and Shakeel Ahmed

## ABSTRACT

**Objective:** To assess the functional outcome of external fixator in children with open tibial fracture in the department of Orthopaedics Surgery of LUH Hyderabad/ Jamshoro

**Study Design:** Observational / descriptive study.

**Place and Duration of Study:** This study was conducted at the Orthopaedic Department of LUMHS from June 2014 to March 2015.

**Materials and methods:** In this study, 60 children (younger than 12 years) suffering from Gustilo grade II and III open fracture of tibia were admitted at the emergency department of the center and evaluated. All the cases were treated with external fixation, after complete counseling their parents or their attendants. While the children were admitted at the emergency department of the hospital, they underwent prophylaxis using antibiotic. All patients underwent washing and primary debridement operation at the emergency department. According to the attending surgeon, the patients were treated either using external fixator after hospitalization. After management union of the fracture was assessed through clinical examinations such as lack of pain, tenderness, and radiography of both lateral and anteroposterior (AP) views during the follow-up period.

**Results:** In this study mean age was found  $10.3 \pm 3.6$  years, male were found in majority 42(80.67%). Road traffic accident was the most common cause of mechanisms of injury was in 35(67.31%). Cases with grade III type of fracture found in majority 57.69%. Union after management was achieved 98.8% of the cases, superficial infection was found in 06(11.53%) cases, while deep infection, Malunion and delayed union were found 03(5.76%), 07(13.46%) and 05(9.61%) respectively. While non-union was found only in one case.

**Conclusion:** External fixator is very safe, insignificant intrusive, get short surgical time, following by short hospital duration as well as can be applicable as unequivocal & effective administration of open fractures of tibia among children.

**Key Words:** Open Fracture, external fixators, Tibia, Children

**Citation of article:** Memon A, Pirwani MA, Ahmed S. Functional Outcome of External Fixator in Grade 11& 111 Open Fractures of Tibia in Children. Med Forum 2016;27(6):44-47.

## INTRODUCTION

Tibial fractures have been 3<sup>rd</sup> commonest pediatric long-bone fracture after forearm & femoral fractures. About half of pediatric tibial fractures take place among distal 3<sup>rd</sup> of tibia,<sup>1</sup> it is followed by as; midshaft fractures of tibia (39%), and least frequently of the proximal 3<sup>rd</sup> of tibia is engaged.<sup>1</sup> Fractures of tibia in the skeletally undeveloped patients can be managed without surgical treatment but tibial fractures resulting from high energy traumas are of special importance considering type of the selected treatment method affecting the children future.<sup>2,3</sup> Manipulation and casting are regarded as definite treatments for children tibial fractures.<sup>4</sup>

Department of Orthopaedic Surgery, LUMHS, Jamshoro

Correspondence: Dr. Shakeel Ahmed  
Orthopaedics Surgery Unit 1, LUMHS, Jamshoro  
Contact No: 0313- 2851728  
Email: dr.sajidain@gmail.com

Received: March 13, 2016; Accepted: April 16, 2016

Tibial Open fractures in pediatric populace can be correlated with prominent morbidity, including however not restricted to nonunion, deep infectivity, compartment syndrome, and even amputation.<sup>5-7</sup> Though a few clinicians profess that these traumas can possibly behave in same pattern in adults & children, others consider that these traumas are tolerated better among children, specially young ones.<sup>6</sup> In most of accessible literature appears to exhibit that higher Gustillo type fractures (among children & adult) likely comprises few expected outcomes and more complications.<sup>5-7</sup> Though, most of these studies having less numbers, in this way, it is not easy to demonstrate a statistically significant variance even if one undeniably exist. Tibial open fractures management in young kids is a challenging issue. Conventional techniques to manage these fractures, for instance closed treatment through plaster casts, have came out from casting, debridement & open irrigation, either segregated or via plaster & pins and, newly; internal or external fixation techniques.<sup>8</sup> External fixators are applied at open complex fractures, as a result of high energy traumas plus cases of numerous damages.<sup>9</sup>

Early administration via external fixation is well recognized however, additional alternative comprises internal fixation by plates, immobilization in cast or intramedullary nailing.<sup>10</sup> The best stabilizing technique of Gustillo level II&III fracture is uncertain. External fixator is widely preferred by the majority of surgeons as an option for treatment of category III of open fracture of tibia.<sup>11</sup> External fixators propose numerous benefits in managing open fractures of tibia. This study aims at evaluating the functional outcome of external fixator within children having open fractures of tibia at the department of Orthopaedics LUH Hyderabad/Jamshoro.

## MATERIALS AND METHODS

This cross sectional study was conducted at orthopaedic department of LUMHS, with duration of time from June 2014 to March 2015. In this study, 60 children (younger than 14 years) sobering from Gustilo grade A and B III open fractures of tibia, were admitted at the emergency department of the center and evaluated. Children having Gustilo II,III grade of tibial open fractures were selected. Children with history of lower extremities fractures, systemic and metabolic diseases, and skeletal congenital diseases were excluded. The children were matched considering age, gender, damage mechanism, and open fracture type (grade III) and associated damages as well as complications were recorded for all patients. All the cases were treated with external fixation, after complete counseling their parents or their attendants. While the children were admitted at the emergency department of the center, they underwent prophylaxis using antibiotic. All patients underwent washing and primary debridement operation within the first 6 hours of admission at the emergency department. According to the attending surgeon, the patients were treated either using external fixator after hospitalization. After management union of the fracture was controlled through clinical examinations such as lack of pain, tenderness, crepitus at the fractured area as well as using radiography of both lateral and anteroposterior (AP) views during the follow-up period. Delayed union was regarded as non-union for more than 6 months.

## RESULTS

In this study mean age was found 10.3+3.6 years, male were found in majority 42(80.67%) as compare to females 10(19.33%). Road traffic accident was the most common cause of mechanisms was in 35(67.31%) following by fall and machine injury with the percentage of 12(23.07%) and 05(09.62%) respectively. Table:1

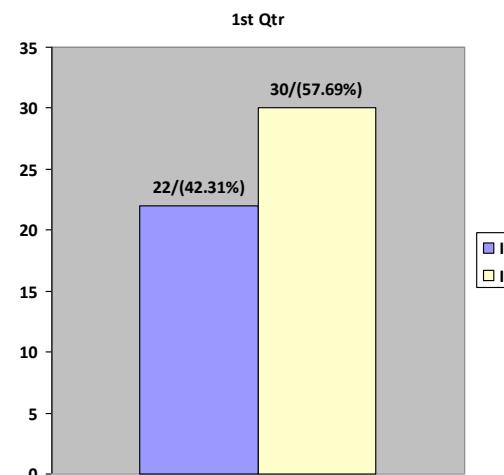
Cases with grade III type of fracture found in majority 57.69% while grade II were found 42.31%. Figure: 1.

According to the complications superficial infection was found in 06(11.53%) cases, while deep infection, Malunion and delayed union were found 03(5.76%), 07(13.46%) and 05(9.61%) respectively. While non union was found only in 1 case Table:2

According to the followup 7 cases were not comes, while in the remaining 45 cases mean time of the bone healing was found in grade II fractures 10.4 weeks, while in grade III it was found 12.5 weeks. Table:3.

**Table No.1. Demographic variables (n=52)**

Variables	No. of patients / (%)
<b>Age (mean<math>\pm</math>SD)</b>	10.3 $\pm$ 3.6 years
<b>Gender</b>	
Male	42(80.67%)
Female	10(19.33%)
<b>Mode of Injury</b>	
RTA	35(67.31%)
Fall	12(23.07%)
Machine injury	05(09.62%)



**Figure No.1: Fracture distribution according to grades (n=52)**

**Table No.2: Complications after management (n=52)**

Variables	No. of patients / (%)
Superficial infection	06(11.53%)
Deep infection	03(5.76%)
Malunion	07(13.46%)
Delayed union	05(9.61%)
Non union	01(1.92%)

**Table No.3: Fracture Healing Time (n=45)**

Fracture Type	Mean Time of Bone Healing
Type II	10.4 Weeks
Type III	12.5 Weeks

## DISCUSSION

A complex span of tibia in relation to the randomness of open fracture (soft tissue traumas as well as fractures themselves are influencing factors of fractures therapy, union duration as well as impediments) made fractures of this category tricky to treat.<sup>12</sup> Tibia is the

commonly affected bone among open fractures as well as correlated with considerable economic, social, and psychological repercussion. In administration of these fractures, external fixator is applicable as an ultimate pattern of fixation to deal with the mutual trauma of soft tissues as well as bone.<sup>13,14</sup> In this study mean age was found  $10.3 \pm 3.6$  years, male were found in majority 42(80.67%) as compare to females 10(19.33%). Similarly, Hossein Aslani et al.<sup>15</sup> proposed that mean age of the children having open tibial fracture was  $10.5 \pm 3.2$  in the external fixator group. Furthermore, Hossein Aslani et al.<sup>15</sup> mentioned male were in the majority 55.5% and female 44.5%. It can possibly be because of the variance among life style for instance: male children are concerned highly in outdoor activities (playing outdoor games, bicycle and schools away from house) in contrast with female children; therefore, they are additional susceptible to risk concerning open fractures.

Outcome of this study exhibited that RTA is widespread reason of fractures in 35(67.31%) out of total cases. Mirjat AH et al.<sup>16</sup> reported that RTA is general affect of open fracture relating tibia, as 65.0%. This may due to ignorance traffics regulations, rough driving, deprived roads states of society. Likewise, a few authors stated alike observations for instance, C.M. Brown et al<sup>17</sup> observed TRA within 90% of cases as well as Sultan Set al<sup>18</sup> came across with 87.6% of RTA cases.

In this study according to the complications superficial infection was found in 06(11.53%) cases, while deep infection, Malunion and delayed union were found 03(5.76%), 07(13.46%) and 05(9.61%) respectively. Mean time of the bone healing was found in grade II fractures 10.4 weeks, while in grade III it was found 12.5 weeks. In this study non union was found only in one case. Similarly in some others studies also found comparable results as : Hull et al<sup>19</sup> evaluated diaphyseal fractures of femur & tibia administered via external fixation during 1987 &1994 among 48 children. The signs of external fixation comprise failed conservative administration, manifold traumas, open fractures, as well as unstable fracture patterns. All fractures cured without additional surgical involvement, as well as the frequency of critical complications had been low, though pin track sepsis has been widespread. Myers et al<sup>20</sup> mentioned the application of external fixation among thirty tibial fractures of high energy (11 closed, 19 open) among children having a mean age of 11.9 years, followed 60 weeks. The mean duration of union was 4.8 months, while the fixator was reserved *in situ* for 3.2 months. A high incidence of complications has been observed: with delayed union 4/30 (13%), nonunion 2/30 (6.7%), following malunion as 3/30 (10%), and leg length discrepancy 3/30 (10%), after that with pin track contamination 8/30 (27%), and with

wound infection 3/30 (10%) as well as 2/30 (6.7%) developed osteomyelitis.

We found union in 98.8% of the cases and non union only in 1.92% of the cases. As well as NE Gouglias et al<sup>21</sup> stated that external fixation has been applied in total fractures of 536 cases out of this figure 82% had grade-3 open traumas. In each fracture, soft-tissue coverage was delay for above 72 hrs. Union was observed as a mean of 37 weeks with high union rate (94%). The occurrence of delayed union, (union following 6 months), was 24% like among an overall 392 fractures.

## CONCLUSION

External fixator may efficiently be applied as fixation definitive mean in open tibial fractures in children with general injury to soft tissue . External fixator is very safe, insignificant intrusive, get short surgical time, following by short hospital duration as well as may be applied as explicit as well as effectual management of open fractures of tibia in children.

**Conflict of Interest:** The study has no conflict of interest to declare by any author.

## REFERENCES

1. Setter KJ, Palominob KE. Pediatric tibial fractures: current concepts. *Curr Opin Pediatr* 2006;18:30-5.
2. Galano GJ, Vitale MA, Kessler MW, Hyman JE, Vitale MG. The most frequent traumatic orthopaedic injuries from a national pediatric inpatient population. *J Pediatr Orthop* 2005; 25(1):39-44.
3. Mashru RP, Herman MJ, Pizzutillo PD. Tibial shaft fractures in children and adolescents. *J Am Acad Orthop Surg* 2005;13(5):345-52.
4. Vallamshetla VR, De Silva U, Bache CE, Gibbons PJ. Flexible intramedullary nails for unstable fractures of the tibial in children. An eight-year experience. *J Bone Joint Surg Br* 2006;88(4): 536-40.
5. Fujita M, Yokoyama K, Tsukamoto T, Aoki S, Noumi T, Fukushima N, et al. Type III open tibial fractures in children. *Eur J Orthop Surg Traumatol* 2001;11(3):169-175.
6. Jones BG, Duncan RDD. Open tibial fractures in children under 13 years of age—10 years experience. *Injury* 2003;34(10):776-780.
7. Song KM, Sangeorzan B, Benirschke S, Browne R. Open fractures of the tibia in children. *J Pediatr Orthop* 1996;16(5):635-639.
8. Baldwin KD, Babatunde OM, Huffman GR, Hosalka HS. Open fractures of the tibia in the pediatric population: a systematic review. *J Child Orthop* 2009;3(3):199-208.

9. Vallamshetla VR, De Silva U, Bache CE, Gibbons PJ. Flexible intramedullary nails for unstable fractures of the tibial in children. An eight-year experience. *J Bone Joint Surg Br* 2006;88(4): 536-40.

10. Court-Brown CM, Wheel Wright EF, Christ J, Mcqueen MM. External fixation for type 111 open tibial fracture. *J Bone Joint Surg* 1990;72(5):801-4.

11. Bhandari M, Guyatt GH, Swionkowski MF, Schemitsch EH. Treatment of open fractures of the shaft of tibia: A systematic overview and meta-analysis. *J Bone Joint Surg Br* 2001;83:62-8.

12. French B, Tornetta P. High-energy tibial shaft fractures *Orthop Clin N Am* 2002;33:211-30.

13. Bhandari M, Guyatt GH, Swionkowski MF, Schemitsch EH. Treatment of open fractures of the shaft of the tibia: a systemic overview and meta-analysis. *J Bone Joint Surg Br* 2001;83: 62-8.

14. Christian CA. General principles of fracture treatment. In: Canale ST, editor. *Campbell's Operative Orthopedics*. 9th ed. St Louis: Mosby; 1998.

15. Aslani H, Tabrizi A, Sadighi A, Mirbok AR. Treatment of Open Pediatric Tibial Fractures b External Fixation Versus Flexible Intramedullary Nailing: A Comparative Study. *Arch Trauma Res* 2013;2(3): 108-112.

16. Mirjat AH, Bhutto IA, Memon SA. AO external fixator; a treatment option for open tibial diaphyseal fractures (type II, IIIa). *Professional Med J* 2016;23(3):279-283

17. Court-Brown CM, Wheel Wright EF, Christ J, Mcqueen MM. External fixation for type 111 open tibial fracture. *J Bone Joint Surg* 1990;72: 801-4.

18. Sultan S, Shah AA. Management of open tibial fractures at Ayub teaching hospital Abbottabad. *J Ayub Med Coll* 2001;13: 22-23.

19. Hull JB, Sanderson PL, Rickman M, Bell MJ, Saleh M. External fixation of children's fractures: use of the Orthofix Dynamic Axial Fixator. *J Pediatr Orthop B* 1997;6:203-206.

20. Myers SH, Spiegel D, Flynn JM. External fixation of high-energy tibia fractures. *J Pediatr Orthop* 2007;27:537-539.

21. Gougloulias NE, Khanna A, Maffulin N. Open tibial fractures. Are children small adults? *Hippokratia* 2009;13(3):147-153.