ORIGINAL ARTICLE (APMC – 475) DOI: 10.29054/APMC/18.475

Frequency of Infection After Immediate Intramedullary Nailing Versus External Fixator in Open Tibial Shaft Fractures

Muhammad Saeed Akhtar, Sohaib Anwar, Muhammad Javaid Iqbal, Subhan Shahid

ABSTRACT

Objective: The purpose of this study was to have a comparison of frequency of infection between two procedures i.e immediate intramedullary nailing and external fixation in the treatment of type II open fracture of shaft of tibia. **Study Design:** The study design was a randomized controlled trial. **Place and Duration of Study:** The study was done at the Department of Orthopedic Surgery, Sir Ganga Ram Hospital Lahore over 1-year period from January 2017 through December 2017. **Methodology:** This included 40 patients of both genders aged between 19-51 years with type II (Gustilo and Anderson) open fracture of shaft of tibia. These patients were randomly divided in two groups with draw methods with A&B Groups. The patients who were put in group A were treated with External fixator with two half pins on either side of the fracture and patients with Group B allocation were treated with intramedullary nailing. The Frequency of infection was noted and compared between two groups in first 4 weeks after injury. Before including each patient in study a written informed consent was taken. **Results:** The age of the patients ranged from 19 years to 51 years. There were 32 (80.0%) male and 8 (20.0%) female patients in the study cohort with a male to female ratio of 4:1. Infection was observed in 3 (7.5%) patients. The frequency of infection with IM nail was lower than that of external fixator (5.0% vs. 10.0%; p=0.759). Similar insignificant difference was observed across various age and gender groups. **Conclusion:** Frequency of infection was lower in intramedullary nailing group as compared to external fixation group so immediate intramedullary nailing is preferred method in type II open tibial fractures.

Keywords: Tibial Shaft, Open Fractures, External Fixator, Intramedullary Nail, type II open fracture.

Corresponding Author
Dr. Muhammad Saeed Akhtar
Associate Professor, Orthopedic Surgery
Sir Ganga Ram Hospital, Lahore
Contact: +92 333-4266123
Email: drsaeedakhtar765@gmail.com

Submitted for Publication: 23-02-2018 *Accepted for Publication: 14-03-2018*

Article Citation: Akhtar MS, Anwar S, Iqbal MJ, Shahid S. Frequency of Infection After Immediate Intramedullary Nailing Versus External Fixator in Open Tibial Shaft Fractures. APMC 2018;12(1):80-2.

INTRODUCTION

Open tibial shaft fracture is a common injury owing to the subcutaneous anteromedial surface of shaft of tibia resulting in complications and prolonged recovery. The overall rate of open fracture of shaft of Tibia in Pakistan has been reported as 44% being commonest 62% between age groups 20-40 years[1]. The practice in open tibial shaft fractures is external fixation until the wounds heal after which internal fixation is done to avoid infection[2]. But the method also has its demerits like prolonged hospital stay, undue pain and pin tract infection[3]. The recent studies have documented a very low and acceptable infection rate of 1.6% to 4% with immediate internal fixation which is comparable to the rate in external fixation[4,19]. The results of the study claimed immediate internal fixation to be at least as safe as external fixation as far as infection is concerned. In another study Kumar et al[7] found that the rate of infection was even lower with intramedullary nailing 7% vs 20% as compared to the external fixation. In the light of this evidence immediate internal fixation with intra-medullary nailing appears to be better or at least comparable to the external fixator in terms of infection yet avoiding external fixation and its associated demerits. At the moment no study was available in Pakistan therefore this study was done to see the infection rate in the immediate intramedullary nailing in Pakistani population and if the results were promising, this method should be encouraged to replace the external fixation to avoid prolonged hospital stay and complication related to the external fixation like pin tract infections.

METHODOLOGY

Study Design: It was a randomized controlled trial.
Study Setting: Research was conducted at Department of Orthopedic Surgery, Sir Ganga Ram Hospital Lahore.
Duration of Study: Duration of study was 1 year from January 2017 through December 2017.
Sample Size: Sample size of 40 cases; 20 cases in each group was calculated with 80% power of test, 5% level of significance taking expected frequency of infection to be 43%[8] with IM nail and 5.0%[9] with external fixator in open tibial shaft fractures.
Sampling Technique: The patients were selected by the method of non-probability consecutive sampling.
Sample Selection:
Inclusion criteria:
Patience of both gender with age range 19 to 51 years with gustilo type II open fracture of Tibia were included.
Exclusion criteria:
Patient presenting after 6 hours of injury, polytrauma patience, patience with fractures too low or too high or extending into metaphysis or with intraarticular extension, pathological

fractures in Diabetic, osteoporotic or osteomalacia patients were excluded.

Data Collection Procedure: Patience with gustilo type II open tibial shaft fracture are included which presented within 6 hours of injury. The patients were randomly put in two equal groups of 20 each by draw method. Group A patients were treated with uniplanar external fixators with 4 half Paints which were inserted by stab method drilling and manual insertion of Shanz screws (AO External fixator). In group B intramedullary nailing was done within 6 hours then patients were followed up in OPD weekly to see the infection during the first 4 weeks. Infections was labelled if there was a pus discharge, redness and pain around the wound and body temperature 100ºc or more.

Data Analysis Procedure: Numerical variables like age of the patients were presented by mean ± SD, categorical variables like Gender and infection were presented by frequency and percentage Chi square test was applied to compare the infection in both groups taking p-value equal or less than 0.05 as significant. Data has been stratified for age and gender to address effect modifiers. Post stratification Chi square test was applied taking p-value equal or less than 0.05 as significant.

RESULTS

A total of 40 cases fulfilling the inclusion/exclusion criteria were enrolled to compare the frequency of infection with intramedullary nailing (IMN) and external fixator for management of open fracture of tibia. Age of the patients ranged from 19 to 51 years. Age of the patients was distributed showing that 45% (n=9) in group A and 50% (n=10) in group B was between 20-35 years of age while 55% (n=11) in group A and 50% (n=10) in group B were between 36-50 year of age. (Table-1)

Table 1: Age distribution (n=40)

Age in Years	Group A External Fixator (n=20)		Group B Intramedullary Nailing (n=20)	
	No of Patients	%	No of Patients	%
20-35	9	45%	10	50%
36-50	11	55%	10	50%
Total	20	100%	20	100%

Gender distribution of patients showing male cases as 80% (n=16) in group A and 80% (n=16) in group B while 20% (n=4) in group A and 20% (n=4) in group B were females (Table-2)

Table 2: Gender Distribution (n=40)

Gender	Group A External Fixator (n=20)		Group B Intramedullary Nailing (n=20)	
	No of Patients	%	No of Patients	%
Male	16	80%	16	80%
Female	04	20%	4	20%
Total	20	100%	20	100%

Comparison of infection in both groups was done showing that 10% (n=2) in groups A and 5% in groups B were infected. While 90% (n- 18) in group A and 95% (n=19) in group B were non-Infected (Table-3)

Table 3: Comparison of infection in both groups (n=40)

Infection	Group A External Fixator (n=20)		Group B Intramedullary Nailing (n=20)	
	No of Patients	%	No of Patients	%
Yes	2	10%	1	5%
No	18	90%	19	95%
Total	20	100%	20	100%

DISCUSSION

Tibia is the medial bone of leg spanning between knee and ankle joints with fibula on its lateral aspect. Owing to its subcutaneous anteromedial surface it is exposed to trauma resulting in open fractures most frequently got in some motorcycle accidents that is > 60%[10]. During the past decade the preferred method of treatment has become intramedullary nailing due to its good results and better functional outcome[11-20]. Previously it was believed that external fixation is a better method when treating severe open tibial shaft fractures due to the preservation of its blood supply. It was thought that as the tibial blood supply comes from the nutrient artery which must be interrupted in severe open fractures as endosteal supply is also compromised with its disruption, intramedullary nailing will further compromise the situation[12]. Many studies have compared the two methods of management[13]. The early undreamed nailing minimizes the need of re-operations by avoiding superficial infection malunion and nonunion when compared to external fixation. The current trend is early internal fixation after giving early wound coverage[14]. In addition, high rate of infection occurs if secondary intramedullary nailing is done[15]. The timing of intramedullary nailing is important to avoid infection. Recently, a large number of prospective studies of open tibial shaft fractures show that the early unreamed intramedullary nailing is a safe and preferred method of treatment. In the present study only 3 patients got infection in 30 days after operation yielding the frequency of infection to be 5%. Result of our study match with those of Craveiro Lopez et al[8] in 2016, Singh at al[5] in 2011 (4%) and Bhattacharya et al[6] in 2012 (2.38 %). A similar frequency of infection was observed with external fixation where it was found to be 10%. Our results can be compared to those of Stojilikovic et al[18] and Park et al who reported frequency of infection that is 8.3% and 7% respectively. In external fixation after open tibial shaft fractures Golubovic et at[9] and Yu-X et al[16] reported relatively low frequency of infection that is 5.88% and 7% respectively after external fixation.

CONCLUSION

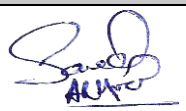
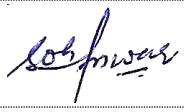
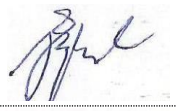
The Frequency of infection after immediate intramedullary nailing is comparable to external fixator in the treatment of type II open tibial fracture. Immediate intramedullary nailing thus appears a method of choice in such patient in future practice.

The immediate intramedullary nailing for open tibial shaft fractures is recommended.

REFERENCES

1. Naeemullah, Shah H, Khan AH, Gul H, Baz KA. Common Organisms and their Sensitivity, in open fractures of the Extremities. Pak J Surg 2012;28 (3):186-192.
2. 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.
3. Bibbo C, Brueggeman J. Prevention and management of complications arising from external fixation pin sites. J Foot Ankle Surg 2010;49 (1):87-92.
4. Yokoyama K, Itoman M, Uchino M, Fukushima K, Nitta H, KojimaY. Immediate versus delayed intramedullary nailing for open fractures of the tibial shaft: A multivariate analysis of factors affecting deep infection and fracture healing. Indian J Orthop 2008;42(4):410–9.
5. Singh D, Garg R, Bassi JL, Tripathi SK. Open grade III fractures of femoral shaft: Outcome after early reamed intramedullary nailing. Orthop Traumatol Surg Res 2011;97(5):506-11.
6. Bhattacharjya B, Ghosh B, Mukhopadhyay K, Hossain ME. Evaluation of results of interlocking nail in the treatment of open fracture shaft femur due to high energy trauma. J Indian Med Assoc 2012;110(11):821-2.
7. Kumar J, Wagan MA, Awais SM. Comparative Study of treatment in open tibia fracture treated by Jugdesh-Awais Solid Tibial Nail (JA-STN) and AO external fixator. Ann KEMU 2010;16:59-63.
8. Craveiro-Lopes N. Treatment of open fractures of the tibia with a locked intramedullary nail with a core release of antibiotics (SAFE DualCore Universal): Comparative study with a standard locked intramedullary nail. J Limb Lengthen Reconstr 2016;2:17-22.
9. Golubovic I, Ristic B, Stojiljkovic P, Radovanovic Z , Petrovic S, Djordjevic N, et al. Results of open tibial fracture treatment using external fixation. Srp Arh Celok Lek. 2016;144:293-9.
10. Tekin AÇ, Saygili MS, Adaş M, Çabuk H, Arslan SM, Dedeoğ outcome of type 3 open tibial diaphyseal fractures managed with a limb reconstruction system: analysis of a 49-patient cohort. Med Princ Pract. 2016;25:270-5.
11. Kakar S, Tornetta P 3rd. Open fractures of the tibia treated by immediate intramedullary tibial nail insertion without reaming: a prospective study. J Orthop Trauma 2007;21(3):153-7.
12. Vallier HA, Cureton BA, Patterson BM. Factors influencing functional outcomes after distal tibia shaft fractures. J Orthop Trauma 2012;26(3):178-83.
13. Giovanninil F, De Palmal L, Panfighil A, Marinelli M. Intramedullary nailing versus external fixation in Gustilo type III open tibial shaft fractures: a meta-analysis of randomized controlled trials. Strat Traum Limb Recon. 2016;11:1–4
14. Okike K, Bhattacharyya T. Trends in the management of open fractures. A critical analysis. J Bone Joint Surg Am 2006;88(12):2739-48.
15. Neto AC, Juniori JG, Pinheiro PP, Neto MLR, Oliveira MP. Comparing Intramedullary Nailing, External Fixation and External Fixation followed by Intramedullary Nailing as management for open fractures of the tibial shaft: a systematic review. Int Arch Med. 2015;8:1-11.
16. Yu X, Li X, Liu L, Wu W. A meta-analysis of external fixator versus intramedullary nails for open tibial fracture fixation . J Orthop Surg Res. 2014;9:75.
17. Hunngria JOS, Mercadante MT.Open tibial shaft fractures. Treatment with intramedullary nailing after provisional stabilization with non penetrating external fixator. Rev Bras Ortop. 2013;48:482-90.
18. Stojiljkovic P, Golubovic Z, Mladenovic D, Micic I, Karalejic S, Kostic I. External fixation in primary treatment of the femoral shaft fracture. Acta Fac Med Naiss 2007;24(1):21-6.
19. Makridis KG. Tosounidis T, Giannoudis PV. Management of infection after intramedullary nailing of long bone fractures: treatment protocols and outcomes. Open Orthop J. 2013;7(2):219-26.
20. Uchiyana Y, Kobayashi Y, Ebihara G, Hamahashi K, Watanabe M. Retrospective comparison of postoperative infection and bone union between late and immediate intramedullary nailing of Gustilo grades I, II, and IIIA open tibial shaft fractures. Trauma Surg Acute Care Open. 2016;1:1-4.

AUTHORSHIP AND CONTRIBUTION DECLARATION

AUTHORS	Contribution to The Paper	Signatures
Dr. Muhammad Saeed Akhtar Associate Professor, Orthopedic Surgery Sir Ganga Ram Hospital, Lahore	Study designing, Writing the manuscript, References	
Dr. Sohaib Anwar Senior Registrar, Orthopedic Surgery Faisalabad Medical University, Faisalabad	Literature review, Proof reading	
Dr. Muhammad Javaid Iqbal Assistant Professor, Orthopedic Surgery Faisalabad Medical University, Faisalabad	References and Discussion writing	
Dr. Subhan Shahid Assistant Professor, Orthopedic Surgery Sir Ganga Ram Hospital, Lahore	Statistical Analysis