



Success rate of ilizarov fixator method in patients presenting with infected non-union of tibia

Muhammad Sajid¹, Muhammad Adeel-Ur-Rehman¹, Asad Ali¹, Tahseen Riaz¹, Muhammad Mansoor Hafeez²,
Sobiya Alyas, Qurban Ali² and *Arif Malik²

¹ Orthopedics Unit 1, Jinnah Hospital, Lahore-Pakistan

² Institute of Molecular Biology and Biotechnology, University of Lahore, Lahore-Pakistan

Corresponding Author: arifuaaf@yahoo.com

Abstract: Background: Fractures of long bones are not only complex surgical problems but also chronic and at times debilitating conditions. Nonunion is a serious complication of a fracture and may occur when the fracture moves too much, has a poor blood supply or gets infected. Ilizarov method addresses all the above problems simultaneously and offers a panacea for infected non-unions. **Objective:** To assess the frequency of success of Ilizarov fixator in patients presenting with infected non-union of tibia. **Methodology:** It was descriptive case series study. For the current study 60 patients (n=60) were selected after taking the approval of research ethical committee of Jinnah hospital Lahore. An informed written consent was obtained from the patients undergone Ilizarov method of fixation in unit II, department of orthopedic surgery, Jinnah hospital Lahore. Patients undergo surgery by a single surgical team under spinal anesthesia. After surgery the patients were followed up. Excellent, good, fair and poor outcome labeled using ASAMI criteria. All the collected data was entered and analyzed on SPSS version 21. **Results:** In this study the mean age of the patients was 40.80±13.82 years, male to female ratio of the patients was 4:1. ASAM criteria found excellent result among 32(53.3%) patients, good in 17(28.3%) patients, fair in 8(13.3%) patients and poor in 3(5.0%) patients and the success was achieved in 49(81.67%) patients. **Conclusion:** According to this study the Ilizarov fixator is valuable and useful tool with high success rate in patients presenting with infected non-union of tibia.

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Keywords: Ilizarov fixator, tibia, fracture, infection, non-union

Introduction

Fractures of long bones are not only complex surgical problems but also chronic and at times debilitating conditions [1]. Nonunion of long bones is not only a source of functional disability but also can lead to economic hardship and loss of self esteem [2]. The incidence seems to be increasing, especially in view of increasing high velocity trauma, which is more frequently treated with internal fixation [3]. Tibial nonunion ranges from 2-10% of all tibia fractures [4]. The fracture ends become dead and sclerotic in case of bone infection. Achieving union with the infection is difficult and challenging [5]. Difficult or resistant infections usually require a more radical debridement of the septic bone and soft tissues in addition to the application of stable fixation to enhance soft tissue healing and bony union. There are many alternatives available in the management of chronic diaphyseal infection [6]. Bone defect can be filled with bone transport procedure. Bone transport can be carried out with the help of Ilizarov and monorail external fixator [7]. Farmanullah *et al.*, [8]

reported that the success of Ilizarov fixator was achieved in 87.9% patients of infected nonunion of tibia. Khan *et al.*, [9] also reported that the success of Ilizarov fixator was achieved in 86.96% patients of infected nonunion of tibia. Zaidi *et al.*, [10] concluded that Ilizarov external fixator yielded excellent and good outcome in majority of the patients for the gap nonunion of long bone. But Madhusudhan *et al.*, [11] reported that the success of Ilizarov fixator was achieved in 59.1% patients of infected nonunion of tibia. Akhtar *et al.*, [12] also reported that the success of Ilizarov fixator was achieved in 57.8% patients of infected nonunion of tibia.⁴ Rationale of this study is to assess the success of Ilizarov fixator in patients presenting with infected non-union of tibia. Through literature, it has been found that Ilizarov fixator is highly successful in >85% cases. But, variable results have been noticed in literature especially in local

literature. So we want to conduct this study to confirm the success rate of Ilizarov fixator in local population, so that we may be able to implement the results of this study in local setting and recommend the Ilizarov fixator for management of infected nonunion tibia. This will improve our practice and will also help us to get local magnitude which we will use for future to implement the Ilizarov fixator for infected non-union tibia.

Material And Methods

60 patients fulfilling the selection criteria were included in this study from OPD of Department of Orthopedic Surgery, Jinnah Hospital, Lahore. An informed consent was obtained. Demographic profile (name, age, gender, BMI, anatomical side and duration of previous surgery) was also obtained. Then patients undergo surgery by a single surgical team under spinal anesthesia. After surgery patients were be shifted in post-surgical wards and were be discharged from there. Patients were followed-up in OPD for 24weeks. All patients were be assessed by using the ASAMI criteria. If there were be excellent to good outcome on ASAMI criteria, then success were labeled (as per operational definitions). All the information was collected through a preforms. All the data was entered and analyzed through SPSS version 21. The quantitative variables like age, BMI and duration of previous surgery was presented as mean & SD. The qualitative variable like gender, anatomical side and success was presented as frequency and percentage. Data was stratified for age, gender,

duration of previous surgery, BMI and anatomical side. Post-stratification, chi-square test was used to compare stratified groups. P-value<0.05 was considered as significant.

Inclusion Criteria

Patients of age 16-60 years of either gender presenting with infected non-union tibia.

Exclusion Criteria

- Patients with failed Ilizarov method (on medical record)
- Patients with diabetes (BSR>186mg/dl)
- Patients with rheumatoid arthritis (on medical record)
- Known case of peripheral vascular disease and defect>10cm (on clinical evaluation)
- Bilateral cases

Results

In this present study total 60 cases were enrolled in which 48 (80%) patients were male and 12 (20%) patients were females. Male to female ratio of the patients was 4:1. The mean age of the patients was 40.80±13.82 years with minimum and maximum ages of 16 & 60 years respectively. Mean BMI of the patients was 26.29±4.37 kg/m² with minimum and maximum values of 20.25 & 34.87 kg/m² respectively. Patients included in this study have mean duration of previous surgery 7.88±1.44 months with minimum and maximum duration of 6 & 10 months respectively (table 1).

Table 1

	n	Mean	SD	Minimum	Maximum
Age	60	40.80	13.82	16	60
BMI	60	26.29	4.37	20.25	34.87
Duration of Previous surgery	60	7.88	1.44	6	10

In current study the left side tibia fracture was noted in 29 (48.3%) patients and right side tibia fracture was found in 31 (51.7%) patients. Result of current study evaluated on ASAM criteria revealed

excellent result among 32 (53.3%) patients, good in 17 (28.3%) patients, fair in 8 (13.3%) patients and found poor in 3 (5.0%) patients. (table 2).

Table 2

		Frequency	Percent
Side of fracture	Left	29	48.3
	Right	31	51.7
ASAM	Excellent	32	53.3
	Good	17	28.3
	Fair	8	13.3
	Poor	3	5.0

Thus according to the ASAM criteria the success rate of current study is 81.67% (49 patients).

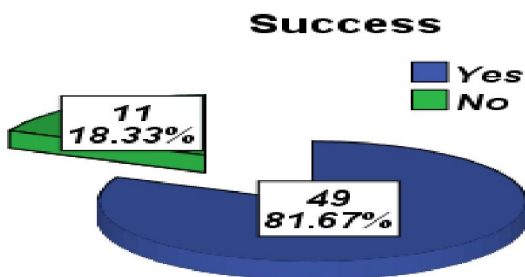


Figure-1

In this study the patients with age 16-30 years were 18 in which success achieved in 14 cases, the patients with age between 31-45 years were 13 in which success achieved in 10 cases, similarly the patients with age between the 46-60 years were 29 in which success achieved in 25 cases. Statistically insignificant difference was found between the success with age i.e. p -value=0.441. The study results showed that the male patients were 48 in which success achieved in 40 cases, similarly the female

cases were 12 in which success achieved in 9 cases. Statistically insignificant difference was found between the success with gender i.e. p -value=0.677. If we stratify the BMI in different groups then the results obtained are statistically significant. Patients with normal BMI were 28 in which success achieved in 19 cases, the patients with overweight BMI were 17 in which success achieved in 15 cases, similarly the patients with obese BMI were 15 and success achieved in 15 cases. Statistically significant difference was found between the success with BMI of the patients i.e. p -value=0.007. When site of fracture take into account, study results showed that the patients with left side fracture were 29 in which success achieved in 24 cases and the patients with right side fracture were 31 in which success achieved in 25 cases. Statistically insignificant difference was found between the success with fracture side of the patients i.e. p -value=0.833. Similarly no statistically significant association is found between the success rate and the duration of onset of symptoms (p -value=0.178), as in this study the patients with duration of symptoms 6-8 months were 37 in which success achieved in 28 cases and the patients with duration of symptoms between 9-10 months were 23 in which success achieved in 21 cases (Table 3).

Table 3. Comparison of success of different variables

		Success		Total	p-value
		Yes	No		
BMI	Normal	19	9	28	0.007*
	Overweight	15	2	17	
	Obese	15	0	15	
Side Of Fracture	Left	24	5	29	0.833
	Right	25	6	31	
Duration Of Symptoms	6-8months	28	9	37	0.178
	9-10months	21	2	23	
Gender	Male	40	8	48	0.677
	Female	9	3	12	
Age	16-30	14	4	18	0.441
	31-45	10	3	13	
	46-60	25	4	29	

Discussion

This present descriptive case series study was carried out at Unit II, Department of Orthopedic Surgery, Jinnah Hospital, Lahore to assess the frequency of success of Ilizarov fixator in patients presenting with infected non-union of tibia. Non-union, particularly infected non-union, is one of the most challenging problems faced by an orthopaedic

surgeon. Failure of union may be due to an inappropriate mechanical environment or due to infection and in some cases there is no apparent reason. The prevalence of non-union in closed tibial fractures is 2.5% and it increases five to seven fold for open fractures with gross contamination and extensive soft-tissue damage.^{11, 12} In this study the left side tibia fracture was noted in 29 (48.3%) patients and right

side tibia fracture was found in 31 (51.7%) patients. The ASAM was found excellent among 32 (53.3%) patients, it was found good in 17 (28.3%) patients, it was found fair in 8 (13.3%) patients and found poor in 3 (5.0%) patients. The success was achieved in 49 (81.67%) patients. A study done by Naveed Bashir Wani *et al.*, [13] showed similar results as current study [13]. In his study results were excellent in nine, good in 11, fair in five and poor in one. Pain site inflammation was the most common problem and occurred in 23 (88%) patients [13]. There were no major complications or neurovascular complications. They concluded that debridement combined with Ilizarov ring fixator with or without partial fibulectomy is a reliable method of treatment of infected non-unions of tibia. Farmanullah *et al.*, [8] and Khan *et al.*, [9] reported that the success of Ilizarov fixator was achieved in 87.9% and 86.96% patients of infected nonunion of tibia respectively [8,9]. Zaidi *et al.*, [10] concluded that Ilizarov external fixator yielded excellent and good outcome in majority of the patients for the gap nonunion of long bone [10]. Marsh DR in his study documented that Ilizarov method is valuable, and the degree of satisfaction correlated strongly with the degree of improvement in pain and function, but research is needed to overcome the problems of delayed maturation of the regenerate and slow or insecure healing of the docking site [14]. Wani N *et al.*, [15] demonstrated in their study that application of the Ilizarov fixator constitutes an excellent management of open tibial fractures, especially types II, IIIA and IIIB, due to good functional and radiological results. Despite the technical difficulties and some complications (which are mostly minor) Ilizarov external fixator (IEF) may be the preferred method in open tibial fractures, especially types II and III. Another study by Bansal *et al.*, [4] revealed in their study results that Ilizarov technique was found to be useful to progressively lengthen the extremity, achieve union without bone grafting and to correct deformities in infected non-union with or without bone gap. In their study of 18 cases, 11 (61.11%) patients had excellent, 2 (11.11%) good, 5 (27.77%) fair and none had poor results [16]. But Madhusudhan *et al* reported that the success of Ilizarov fixator was achieved in 59.1% patients of infected nonunion of tibia [17]. He concluded treatment of infected non-unions of Tibia with Ilizarov ring fixation is effective but for optimal results the treatment needs to be individualized by the treating surgeon with due consideration of the socio-economic factors. Similarly Akhtar *et al* reported that the success of Ilizarov fixator was achieved in 57.8% patients of infected nonunion of tibia [4].

Conclusion

According to this study the Ilizarov fixator is valuable and useful tool with high success rate in patients presenting with infected non-union of tibia.

References

1. Vignes GS, Arumugam S, Ramabadrnan P. Functional outcome of infected non-union tibia fracture treated by Ilizarov fixation. *Int J Sci Study* 2014;2:87-92.
2. Bansal A, Bansal S, Singh R, Walia J, Brar B. Role of Ilizarov ring fixator in infected non union tibia. *IJMDS* 2014;3(2):451-9.
3. Yin P, Zhang Q, Mao Z, Li T, Zhang L, Tang P. The treatment of infected tibial nonunion by bone transport using the Ilizarov external fixator and a systematic review of infected tibial nonunion treated by Ilizarov methods. *Acta Orthop Belg* 2014;80(3):426-35.
4. Akhtar A, Shami A, Sarfraz M. Functional outcome of tibial nonunion treatment by Ilizarov fixator. *Ann Pak Inst Med Sci* 2012;8(3):188-91.
5. Gupta SV, Govindappa C, Reddy MR. Treatment of infective non-union of diaphyseal fractures with Ilizarov external fixation. *OA Orthopaedics* 2014;2:4.
6. Samanta AK, Ghosh S, Chaudhuri A, Mondal SC. Ilizarov ring fixator in treatment of infected nonunion of tibia. *Saudi J Sports Med* 2016;16(2):159.
7. Agrawal HK, Jaiman A, Khatkar V, Sharma VK. Application of monorail fixator for femoral gap nonunion. *Chinese J Traumatol* 2014;17(4):239-41.
8. Farmanullah KM, Awais SM. Evaluation of management of tibial non-union defect with Ilizarov fixator. *J Ayub Med Coll Abbottabad* 2007;19(3):35-6.
9. Khan MS, Rashid H, Umer M, Qadir I, Hafeez K, Iqbal A. Salvage of infected non-union of the tibia with an Ilizarov ring fixator. *J Orthop Surg* 2015;23(1):52-5.
10. Zaidi IH, Sahito B, Tariq SM, Kumar D, Arsalan MA. Outcome of Nonunion Femur with nions of the tibial shaft. *Journal of Trauma and Acute Care Surgery* 2008;65(3):685-91.
11. Frost H. The biology of fracture healing. An overview for clinicians. Part II. Clinical.
12. Wani N, Baba A, Kangoo K, Mir M. Role of early Ilizarov ring fixator in the definitive management of type II, IIIA and IIIB open tibial shaft fractures. *International orthopaedics* 2011;35(6):915-23.
13. Phieffer LS, Goulet JA. Delayed unions of the tibia. *JBJS* 2006;88(1):205-16.

14. Wani NB, Syed B. Ilizarov ring fixator in the management of infected non-unions of tibia. SICOT-J 2015;1.
15. Marsh D, Shah S, Elliott J, Kurdy N. The Ilizarov method in nonunion, malunion and infection of fractures. J Bone Joint Surg Br 1997;79(2):273-9.
16. Bansal A, Bansal S, Singh R, Walia JS, Brar B. Role of Ilizarov ring fixator in infected non union tibia. International Journal of Medical and Dental Sciences 2014;3(2):451-9.
17. Madhusudhan TR, Ramesh B, Manjunath K, Shah HM, Sundaresh DC, Krishnappa N. Outcomes of Ilizarov ring fixation in recalcitrant infected tibial non-unions—a prospective study. J Trauma Manag Outcomes 2008;2(1):6.

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