Outcome of Segment Transport by Ilizarov Fixation in Case of Bone Loss in Tibia

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ABSTRACT

Objective: To assess the functional and radiological outcome of segmental transport by Ilizarov fixation in case of bone loss in tibia.

Methods: This descriptive study was conducted at King Abdullah Teaching Hospital, Mansehra from 1st January 2016 to 31st February 2019 and comprised 20 patients. Patients fulfilling the inclusion criteria were fixed with were Ilizarove fixator and followed for bone union and functional outcome.

Results: A total of 20 patients with mean age 36.80±8.49 years (range 26-52 years) were included in our study. Male patients were16 (80%) while 4 (20%) were females. The mean tibial gap was 6.05±4.14 cm (range 1.5-13.5 cm) and mean period of Ilizarov treatment was 7.30±1.94 months (range 5-10 months) while mean follow-up was 30.80±7.19 months (range 20-38 months). Post op results were excellent in 6 (30.0%) patients, good in 8 (40%) patients and fair in 6 (30%) patients.

Conclusion: Cases of tibial bone loss treated with Ilizarov produce excellent to good functional and radiological results in majority of patients.

Keywords: Bone loss**,** Ilizarov fixation, Outcome, Segment transport.

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INTRODUCTION

Tibia is the long bone with most of its portion located subcutaneously in leg and enclosed simply by thin layer of skin and subcutaneous tissue and without any thick muscle cuff around.[1]Tibia has various unique fractures which make it susceptible to several complications. This is subcutaneous bone having poor coverage of soft tissue on medial border thus susceptible to high frequency of open fractures. Also, the blood supply of tibia is limited mostly at distal end. Such factors cause higher prevalence of significant damage of soft tissue and vulnerability to infectivity, non union and wound breakdown.[2]

Bone transport is a recognized method for traumatic bone loss management. Bone loss can take place from fragments extrusion at injury time or through debridement of the open fracture once devitalized bone segment are removed. It creates segmental abnormality or space between remaining bone ends.[3] In reconstructive surgical procedure bone transport as per Ilizarov technique is broadly practiced.[4] The device Ilizarov fixator is utilized in the orthopedic surgery to correct or lengthen angular defects in the limb bones, to treat open or compound bone fractures and contaminated non-union fractures.[5] Several external fixators are available that are made to attain surgical objectives to manage bone abnormalities utilizing distraction osteogenesis principles.[6] To rectify all defects including bone transport and lengthening, classic Ilizarov frame is mostly utilized.[7]

Ilizarov method utilizes the effect of slow disruption to allow for fresh soft tissue and bone renewal to fill defect site. It gives benefits of broadening a bone at one site (unifocal broadening) for minimum bone defect cases with good revival potential, or at 2 sites (bifocal broadening) for significant bone defect cases. Based upon recorded cases, highest bifocal tibial broadening was 22 cm while the maximum unifocal tibial broadening was 14.5 cm.[8] Ilizarov technique is also beneficial for fixation of segmental fractures, compound fractures, segmental bone loss and polytrauma.[9]

Ilizarov method provides numerous distinct benefits. First, revitalize the living bone filling the complete width and revitalization takes place steadily

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from an additional site in same bone. Donor site complication is not present and biological union is observed at two living borders. Exact length of limb can be reinstated. Currently, it is documented that distraction osteogenesis is mostly comparable with intra-membranous ossification and excellent type of autograft, and could be the eventual bone graft.[10]

Disadvantages of this method are fixator application for longer duration, pin track infectivity, fixator readjustment and recurrent visits.[11] Most frequent and acute complication of the bone transport is docking site non-union. Because of the poor blood supply and decrease healing potential of tibia, the fixator is applied for prolong period of time.[12]

METHODS

This descriptive study was conducted at King Abdullah Teaching Hospital, Mansehra from 1st January 2017 to 31st February 2019 and comprised 20 patients. Patients of both gender, aged 18 years or above were enrolled. Approval of Institutional Review Board was obtained for conducting the study. Informed written consent was taken from all the participants. Patients that were not able to accept operation and to maintain external fixator device were excluded. Complete medical history was taken, thorough physical examination was done and investigations were performed. All patients were counseled regarding their health conditions which required surgical procedure urgency they had to experience.

Under general/spinal anaesthesia Ilizarove was applied to the tibia with bone loss in a standard recommended fashion.At least 2 or 3 rings on either side of the fracture were applied with osteotomy in either proximal or distal fragment(the longer fragment).Transport started on 10 to 14 days. Patients were followed monthly for initial 6 months and thereafter every 3 months.In each visit xrays were used for assessment of transport and healing and clinical evaluation of the limb. Working criteria for bone transport of tibia are; **Excellent:** good union, full weight bearing, no pain and no swelling, **Good:** good union, full weight bearing, no pain and slight swelling during long walk on ankle joint and **Fair:** good union, full weight bearing, slight pain during long walk and swelling persistent on ankle. The data was entered in SPSS-20 and analyzed.

RESULTS

The mean age of the patients was 36.80±8.49 years (range 26-52 years). Among these patients, only 4 (20%) were females and 16 (80%) were males (Table I). Mean tibial gap was 6.05±4.14 cm (range 1.5-13.5 cm). Similarly mean period of Ilizarov treatment was 7.30±1.94 months (range 5-10 months) and mean follow up was 30.80±7.19 months (range 20-38 months). Results were excellent in 6 (30%) patients and good in 8 (40%) patients while fair in 6 (30%) patients (Table II). Table III demonstrates that among 6 patients who had pin tract infection, 2 (10.0%) had minor complication, 2(10.0%) had major complication and 2 (10.0%) patient had sequelae. Only 2 (10.0%) patient had valgus union. Among 6 patients who had joint stiffness, 4 (20.0%) had minor and 2 (10.0%) had major complications. Likewise among 4 patients who had leg length discrepancy, 2 (10.0%) had major complication and 2 (10.0%) had sequelae. There was 1 (10.0%) patient who had major complication of Schanz screw breakage. According to outcome criteria, 6 (30%) had excellent result, 8 (40%) had good results and 6 (30%) had fair results (Fig. I).

Table-I: Demographic information of the patients (n=20)

Variable	No.	%
Gender		
Male	16	80.0
Female	4	20.0
Age (years)		
Upto 30	6	30.0
> 30	14	70.0
Mean±SD	36.80±8.49	

Table II: Outcome of segment transport by Ilizarov fixation in case of bone loss in tibia

Tibial gap (cm)	Side	Period of Ilizarov treatment (months)	Follow up (months)	Result
13.5	L	6	20	Good
8	L	5	20	Good
3	R	5+4	38	Excellent
8	L	10	26	Fair
1.5	L	7	26	Fair
5	R	9	34	Fair
12	R	9	34	Good
3.5	L	8	34	Good
3	L	5	38	Excellent
3	L	5	38	Excellent

Tibial gap 6.05±4.14
Period 7.30±1.94
Follow up 0.80±7.19

Table III: Complications of segment transport by Ilizarov fixation in case of bone loss in tibia

Complications	Minor	Major	Sequelae	Total
Pin tract infection	2 (10%)	2 (10%)	2 (10%)	6 (30%)

Valgus union	2 (10%)	-	-	2 (10%)
Joint stiffness	4 (20%)	2 (10%)	-	6 (30%)
Leg length discrepancy (LLD)	-	2 (10%)	2 (10%)	4 (20%)
Schanz screw breakage	-	2 (10%)	-	2 (10%)
Total	8 (40%)	8 (40%)	4 (20%)	20 (100%)

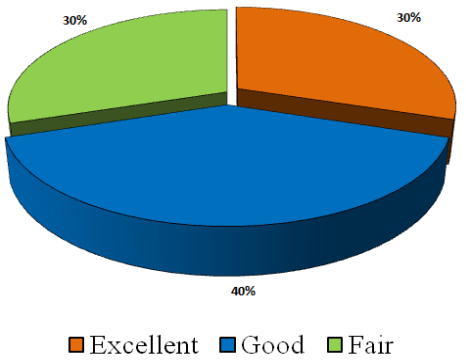

Fig. 1: Outcome of results

Fig. 1: Post Operative

Fig. 2: After 2 weeks of operation

Fig.3: After 6 weeks of operation

Fig.4: After 10 weeks of operation

Fig. 5: Transport complete

DISCUSSION

During reconstructive surgical procedure bone transport as per Ilizarov technique is broadly practiced. Present study was carried out regarding outcome of segment transport by Ilizarov fixation in case of bone loss in tibia at King Abdullah Teaching Hospital, Mansehra. During study 20 patients were included and found that mean age of the patients was 36.80±8.49 years. Among these patients, only 20% were females while most of them were males (80%). A similar study carried out by Zaidi and coworkers[11] showed same scenario that majority (80%) of the patients were male and only 20.0% were females.

This study disclosed that among patients, mean tibial gap was 6.05±4.14 (range 1.5-13.5 cm). The findings of our study are almost comparable with the study carried out by Khan and associates[7] who indicated that mean tibial gap was 6.33 cm (range 2-12 cm). As far as period of Ilizarov treatment and follow up are concerned, study disclosed that mean period of treatment was 7.30±1.94 months and the mean follow-up was 30.80±7.19 months.

When results of Ilizarov method were assessed, it is significant to mention that results were excellent in 30% patients, good in 40% patients and fair in 30% patients. The results of our study are better than the study conducted by Khan[7] reported that results were good in 33.3% patients, satisfactory in 26.7% patients, moderate in 26.7% patients and poor in 13.3% patients. The findings of another study undertaken by Inam and teammates[9] are comparable but exhibited better situation than our study who reported that results were excellent in 57.1% patients, good in 28.6% patients and fair in 14.3% patients.

The present study also assessed the complication among patients and found that 30% patients had pin tract infection, 30% had joint stiffness, 20% had LLD and

10% had valgus union while 10% had Schanz screw breakage. Azeem and colleagues[13] highlighted in their study that 53.3% patients had pin tract infection.[13] A recent study carried out by Soomro and fellows[14] also demonstrated that 34.7% patients had pin tract infection while 13.04% had joint stiffness.

Short sample size and the descriptive nature of our study are the two limitations of our study. We, therefore recommend further well designed studies with a larger sample size on this topic.

CONCLUSION

Cases of tibial bone loss treated with Ilizarov produce excellent to good functional and radiological results in majority of patients. We, therefore recommend this method to treat such fractures.

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Conflict of interests: None

REFERENCES

1. Qureshi PAL, Makhdoom A, Laghari MA, Siddiqui KA. Ilizarov external fixator in the management of fractures of tibia. J Pak Orthop Assoc 2006; 18(1): 71-80.
2. Bari MM, Islam S, AHMA R, Rahman M. Management of segmental fracture tibia by Ilizarov technique. MOJ Orthop Rheumatol 2015; 3(3):97-101.
3. Thakeb MF, Mahran MA, El-Motassem EHM. Bone transport for the management of severely comminuted fractures without bone loss. Strat Traum Limb Recon 2016; 11: 19-24.
4. Iacobellis C, Berizzi A, Aldegheri R. Bone transport using the Ilizarov method: a review of complications in 100 consecutive cases. Strat Traum Limb Recon 2010; 5: 17-22.
5. Al Shahrani AA, Tedla JS, Ahmad I. Effectiveness of ilizarov frame fixation on functional outcome in aseptic tibial non-union cases at Abha, Kingdom of Saudi Arabia: an experimental study. J Taibah Uni Med Sci 2015; 10(2): 216-21.
6. Iacobellis C, Berizzi A, Aldegheri R. Bone transport using the Ilizarov method: a review of complications in 100 consecutive cases. Strat Traum Limb Recon 2010; 5: 17-22.
7. Khan RDA, Maqbool MA, Yasin A., Effectiveness of ilizarov frame fixation on functional outcome in aseptic tibial gap non-union. J Pak Med Assoc 2015; 65: S179-85.
8. Alkenani NS, Alosfoorb MA, Al-Araifib AK, Alnuaim HA. Ilizarov bone transport after massive tibial trauma: Case report. Int J Surg Case Rep 2016; 28: 101-6.
9. Inam M, Saeed M, Khan I, Durrani A, Satar A, Arif M. Outcome of ilizarov fixator in tibial non-union. JPMA 2015; 65: S94-9.
10. Babar IU, Afsar SS, Gulzar M. Osteogenesis. J Postgrad Med Inst 2013; 27(1): 78-82.
11. Zaidi IH, Sahito B, Tariq SM, Kumar D, Ayoub AK, Ali M. Bifocal bone transport (trifocal distraction compression) with ilizarov external fixator for defective bone loss in tibia. Rawal Med J 2016; 41: 209-211.
12. Fürmetz J, Soo C, Behrendt W, Thaller PH, Siekmann H, Bohme J, et al. Bone transport for limb reconstruction following severe tibial fractures. Orthopedic Rev 2016; 8: 6384.
13. Azeem M, Hussain A, Iqbal MZ, Malik MR. Management of gap non-unions of tibia by ilizarov method. JSZMC 2013; 4(3): 488-91.
14. Soomro Z, Soomro Z, Azizullah, Muhammad R, Samo S. Management of gap nonunion tibia by ilizarov ring frame. JPOA 2017; 29(2): 29-32.

Authorship and Contribution Declaration

Assad Mehmood, conception and design of the study, acquisition of data,
Mohammad Ishaq, interpreted the data, drafted the manuscript, final approval of the version for publication
Muhammad Shafique, revised the manuscript critically for important intellectual content