Management of Gap Nonunion Tibia by Ilizarov Ring Frame

Zamir Soomro, Zulfiqar Soomro, Azizullah, Rashid Muhammad, Saeed Samo

ABSTRACT

Objective: To determine the effectiveness of Ilizarov circular frame in the management of gap nonunion of tibia.

Methods: This is descriptive study conducted from July 2008 to May 2015. Patients of either gender with age ranging from 15 to 65 years, having nonunion (clean and infected nonunion) in tibia with defect of 3.5 to 18cm due to trauma or firearm injury were included. Outcome was assessed using ASAMI (Association for the Study and Application of the Methods of Ilizarov) criteria.

Results: 46 patients were included in this study. Outcome was observed on the basis of radiographs and clinical assessments. On the basis of radiographs 26 (56.52%) patients showed excellent response, 14 (30.43%) patients showed good response and, 4 (08.69%) patients showed fair response and in 2 (04.34%) patients showed poor response. On the clinical assessment response was excellent in 18 patients (39.13%), good in 22 patients (47.82%), fair in 4 (08.69%) patients and poor in 2 patients (04.34%).

Conclusion: Ilizarov ring fixator is excellent and useful in the treatment of gap nonunion of tibia for intercalary bone transport. Bone transport by Ilizarov was found good with consolidation due to early full weight bearing, but it needs adequate preplanning, patient's selection and proper postoperative management.

Key words: Gap nonunion, Bone Transport, Ilizarov ring fixator.

INTRODUCTION

Managing non-union is really a difficult task to deal when It is associated with bony defect. Despite of advancement in medical sciences and continued research on generation of newer implants and treatment modalities, it is still a challenging job for an orthopaedics surgeon to deal with [1]. When the Deformity, discharging sinuses, limb length discrepancy and soft tissue defects are adjutant problems it makes non-union more difficult to deal. In the management of Gap non-unions of tibia [2]. Various treatment modalities are developed to treat limb shortening and establishment of normal functioning limb, e.g., cancellous bone graft, vascularized fibular graft and bone transport with Ilizarov, intramedullary nail and uniplanar external fixator system.

Ilizarov ring fixator has revolutionized the fracture management especially bone defects and deformities simultaneously. Ilizarov technique by means of distraction osteogenesis has proved itself useful in patients suffering from infection, limb deformity, shortening, and loss of soft tissue coverage and development of contracture [3]. Since the advent of Ilizarov technique in World War II it has gained popularity all over the world and it is very commonly practiced in Pakistan as well.

This study was conducted on the usefulness of Ilizarov in managing patients with nonunion tibia in our institute and to delineate different problems encountered during treatment of the patients.

METHODS

After taking complete history and examination patients were admitted after informed. consent from the patients, this descriptive study was conducted from July 2008 to May 2015. 46 patients of either gender, age ranging from 15 to 65 years, diagnosed as non-union tibia (infected or clean), with gap of 3.5 to 18cm were studied. immunocompromised patients , patients with tuberculous osteomyelitis and those with psychological disorders were excluded from this study.

Assistant Professor, Department of Orthopaedic Surgery, Shaheed Mohtarma Benazir Bhutto Medical University & Chandka Medical College, Larkana
Correspondence: Zamir Soomro
Email: soomzamir@gmail.com

Patients were admitted through OPD. After taking all the adequate preoperative X Rays, Complete blood picture, blood sugar, hepatic and renal profile and pus culture and sensitivity in infected non-union were done. Standard 4 and 4 and half Ilizarov ring fixator was applied to all patients. in infected non-unions adequate debridement done. Intravenous antibiotics given as per culture report for period of 10 to 15 days. Unifocal bone transport was done in gap non unions of 5 to 8 cm and bifocal bone transport in gap non unions of more than 8 cm and bifocal transport was done. After latency period of 7 to 12 days, transport was started at 0.25 mm per 6 hours. Patients were mobilized with crutches with partial weight bearing by 1st postoperative day and were educated regarding pin tract care and rate of distraction. After assuring patients understanding they were discharged home and advised for follow-up on every 15th day 2 months then every 4th week for 6 months and every 3rd month till radiological and clinical evidence of union was achieved. AP and lateral X Rays were repeated at every follow-up visit and patients were given further advice regarding transport. When the phase of transport was complete and gap was filled, at docking site gradual compression done initially for 8 to 10 weeks, which was followed for consecutive compression and distraction for another 6 to 8 weeks. Connecting rods were made loose and union was assessed clinically both at regenerate site and docking site to allow consolidation of the regenerate. Once clinical and radiological evidence of union was achieved the cast was applied above knee for a period of 2 weeks after removal of the fixator.

Data was collected in terms of age of the patient, gender, side of fracture (right or left), size of defect, type of nonunion (clean or infected), cause of fracture, type of bone transport (unifocal or bifocal) and complications (pin tract infection, knee stiffness, foot stiffness, peroneal nerve injury and refracture). Outcome variables were according to ASAMI (Association for the Study and Application of the Methods of Ilizarov) scoring system radiological and functional [4].

Mean was calculated for quantitative variables as age of the patient, size of the defect, whereas percentage and frequency was calculated for qualitative variables as gender, complications, and side of fracture, mode of injury, type of transport and outcome variables as poor, fair, good and excellent.

RESULTS

Out of 46 patients, males were 38 (82.6 %) and females were 8 (17.3%). Age ranged from 15 to 65 years with a mean of 33 years. Infected non-union was seen in 32 (69.56%) patients and clean non-union was seen in 14 (30.43%) patients. 25 (54.3%) patients suffered from right tibial nonunion and 21 (45.65%) of left tibia. 26 (56.52%) patients had history of road traffic accident, 12 (26.08%) patients had fire arm injury and fall was the cause in 8 (17.39%) patients. The mean defect was 8 cm. Unifocal bone transport was done in 28 patients (60.86%) and in 18 (39.13 %) bifocal bone transport was done. Outcome variables were as ASAMI criteria. Which checks effectiveness of treatment on radiological and clinical basis.

Table 1: Radiological results

Results	No: of patients	Percentage
Excellent	26	56.52%
Good	14	30.43%
Fair	4	8.69%
Poor	2	4.34%

Table 2: Clinical results

Results	No: of patients	Percentage
Excellent	18	39.13%
Good	22	47.82%
Fair	4	8.69%
Poor	2	4.34%

Table 3: Complications during the course of treatment were also encountered.

Complication	No: of patients	Percentage
Pin tract infection	16	34.7%
Knee stiffness	06	13.04%
Stiff Ankle/foot	08	17.39%
Peroneal nerve injury	01	2.1%
Refracture	01	2.1%

DISCUSSION

Ilizarov S. Rozbruch, 2007 [5] showed that the use of this system reduced treatment time, the cost of treatment, and disability payments significantly. When used for the treatment of fractures and posttraumatic non-unions, primary disability was decreased by 3-5 times, and 8 fold compared with traditional treatments in the case of open fractures. This meant that more patients were able to return to work sooner, which is advantageous for the economy of the country. We got good results from this technique in the management of gap nonunion of tibia. Overall union was achieved in about 95.56%, which is quite comparable to results of other studies.

On clinical assessment response was excellent in 14 (47%) patients, good in 9 (30%), fair in 5 (17%) and poor in 1 (3%) patient. In a study by Chaddha 2010 [6] union was achieved in 92%. Radiologically response was excellent in 13 patients, good in 1 patient and poor in 11 patients. Clinical assessment showed excellent response in 6, good response in 9, fair response in 4 and poor result in 6 patients. Sen, C 2006 [7] showed an excellent response in 16 patients and good response in one patient as assessed by the radiographs. Response was excellent in 15 patients and good in two patients as assessed clinically.

In a study reviewing 78 cases of tibia and femur nonunion by S. Patel 2006 [8]. response was excellent in 17 patients, good in 14 patients, fair in 4 patients and poor in six patients as assessed by means of radiographs. The clinical response to the treatment was also assessed which showed an excellent response in 14 patients, good response in 14 patients, fair response in 2 patients and poor response in 2 patients. In a study by Farmanullah 2007 [9] out of 58 patients 33 (58.89%) patients showed excellent response, 12 (20.68%) patients showed good response, 8 (13.79%) patients showed fair response and response was poor in 5 (8.62%) patients. Response was also assessed on clinical basis, which was found to be excellent in 33 patients (56.89%), good in 18 patients (31.05%), fair in 4 (6.89%) patients and poor in 3 patients (5.17%). In a study by MP Magadum 2006 [10] 28 patients were included in this study, which showed that mean 10 cm of lengthening was achieved and mean union time was 6.3 months. 19 patients showed excellent response and response was good in 5 patients. Older patients needed more time for union. Laursen [2000] treated 16 patients of them 15 patients suffered no any fracture and infection and were satisfied with treatment [11].

Tibial non-unions are also being treated with intramedullary nails as surgical implant generation network SIGN nail with ring fixator for segmental bone transport, which shows good results. In one study by Razaq M 2009 union rate was 97.83% [15].

CONCLUSION

Ilizarov Ring fixator is Excellent treatment option for the treatment of tibial gap non-unions. It results in bone union, deformity correction, infection control, achievement of limb length and restoration of limb function, but its success depends upon good skill at surgeon's part and patient compliance in terms of proper visits for followup and good understanding regarding the counselling done by the attending surgeon.

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