

Outcome of Nonunion Femur with Ilizarov Technique

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ABSTRACT

Objective To find the outcome of Ilizarov technique in nonunion femur patients.

Study design Descriptive case series.

Place & Duration of study Department of Orthopaedic Surgery Dow University of Health Sciences / Civil Hospital Karachi, from 1999 to 2014.

Methodology All patients with nonunion of femur with and without bony defect were included in this study. Bone loss cases because of other reasons like congenital causes and bone tumors, were excluded.

Results Forty-eight patients with nonunion femur were included in this study. The number of males was 44 and females 4. The mean age of patients was 27 year (range: 07 year to 59 year). The mode of injury was road traffic accident in fifteen patients, firearm injury in five, crush injury in earthquake in one, postsurgical implant infection in nineteen and chronic osteomyelitis in seven. Nonunion was in proximal femoral segment in three patients, mid-shaft in sixteen and distal femur in twenty-nine cases. Segmental bone loss was present in thirty-one patients. Preoperative shortening was noted in thirty-four patients. Ilizarov external fixator yielded excellent and good outcome in majority of the patients for the gap nonunion of femur. Bone transport was needed in few cases.

Conclusions Ilizarov external fixator yielded excellent and good outcome in majority of the patients for the gap nonunion of femur. Bone transport was needed in 10 cases.

Key words Ilizarov technique, Femur-nonunion, Femur-bone loss.

INTRODUCTION:

The fracture ends become dead and sclerotic in case of bone infection. Achieving union with the infection is difficult and challenging.¹ Chronic osteomyelitis can occur after compound fracture and surgery for its eradication is a real challenge.² Whatever the reason of the chronic osteomyelitis, it may lead to

bone loss.³ Bone defect can be filled with bone transport procedure. Bone transport can be carried out with the help of Ilizarov and monorail external fixator.^{4,5}

Ilizarov mentioned the principle of "law of the traction tension". The principle states that the gradual traction on living tissue originates load that can stimulate and maintain active growth and regeneration.^{6,7} In 1982 at Lecco Italy, Association for the Study and Application of Method of Ilizarov (ASAMI) was established.⁸ Ilizarov external fixator initially was used in Kurgan for acute trauma patients.⁹ Later it was used to treat bone loss, aseptic and septic

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nonunion, lengthening, deformity correction and joint contractures.¹⁰

Ilizarov external fixator is unique in providing resistance to torsion and bending forces but adopting to axial load, it allows micromotion at fracture site.^{11,12} This study was conducted to report the outcome of Ilizarov technique in our set up in terms of functional outcome.

METHODOLOGY:

This was a descriptive case series conducted in the Department of Orthopaedic Surgery at the Dow University of Health Sciences / Civil Hospital Karachi, from 1999 to 2014. The data was collected prospectively. All patients with nonunion of femur with and without bony defect, were included. Patients in whom the cause of bone defect was either congenital, due to bone tumor etc, were excluded. The descriptive statistics like frequencies and percentages were used for data presentation.

RESULTS:

A total of 48 patients with nonunion femur were treated during the study period. This included 44 male and 4 female patients. The age ranged from seven year to 59 year with mean age of 27 year. The nonunion of the femur was the outcome of road traffic accidents in 15 patients, firearm injury in five, crush injury during earthquake in one case, postsurgical implant infection in 19 and chronic osteomyelitis in seven patients.

Most common sites of nonunion were distal femur

in 29 patients and mid-shaft femur in 16. Proximal femur was involved in three patients only. Segmental bone loss was found in 31 patients. Preoperative shortening was present in 34 patients. Surgeries performed previously in these patients included debridement, sequesterctomy, removal of nail, plate and external fixators.

Immediate reduction and gradual compression was performed in 38 patients. Ten patients also needed bone transport. Lengthening was attempted in three patients. In seven cases of gap nonunion femur, corticotomies were performed in three patients at sub trochanteric region and in mid-diaphysis in seven patients. Average length of regenerate was 5 cm with a range of 3 to 9 cm. The average time of external fixator application was eight months with the range of 6 to 14 months. Complications are given in table I.

Secondary surgical intervention were needed in few patients. Two patients needed debridement, five required wire removal and in seven cases readjustment was performed. Results assessed according to the ASAMI criteria are given in table II.

DISCUSSION:

Gupta published prospective study of forty patients of long bones nonunion managed with Ilizarov. Mono focal transport was carried out in 27 cases and bifocal in 13 patients. Duration of treatment was 10.7 months and length of regeneration on average was 3.8cm (2.2 to 07cm). Four cases of femoral

Major Complications	No. of Patients (n)	Minor Complications	No. of Patients (n)
Osteomyelitis at pin site	2	Pin track infection	All
Delayed consolidation	8	Edema	15
Premature fusion	1	Depression	3
Axial deviation	3	Hypertrophic scar	4
Nonunion	2	Joint stiffness	4
Skin invagination	1		

Bone Results	No. of Patients (n)	Functional Results	No. of Patients (n)
Excellent	15	Excellent	10
Good	30	Good	25
Fair	0	Fair	7
Poor	2	Poor	5

nonunion were treated with Ilizarov with 05 to 08cm defect. In these healing time was from 08 to 24 months, with re-fracture and stiff knee in one patient.² In comparison to the above studies our results according to ASAMI bone results were excellent in 15 and good in 30 patients and functional results were excellent in 10.

Arora treated eight patients with infected nonunion femur. Six cases united, one had nonunion and in one patient fixator was removed because of intractable pain.³ In a 10 year long study conducted in Croatia thirty infected femoral nonunion patients were treated with Ilizarov. Regeneration range was 2.5 to 21cm. Bone results were excellent in thirteen, good in nine, poor in five and fair in two. Functional results were excellent in five, good in ten, fair in eight and poor in six.⁹ A multicenter retrospective study showed union in 37 cases with bone graft used at docking site after bone transport.¹⁰

In a study, 110 patients with infected nonunion of tibia and femur were treated with bone transport. Size of the defect on average was 6.5 cm (range: 03 - 18 cm). All patients achieved bony union with no infection recurrence. Time of bone transport took a mean of 67.50 days. Bone results were good in twenty-eight, fair in twelve and poor in two patients and functional results were excellent in 37, good in 42 and fair in 21 with no poor result.¹¹ In comparison to above studies infection rate was higher in our study as the open fracture and osteomyelitis patients were also included but still the bony and functional results are comparable.

We treated 13 patients with infected nonunion of the distal femur and bone loss, who had been treated by radical surgical debridement and the application of an Ilizarov external fixator. All had severely restricted movement of the knee and a mean of 3.1 previous operations. The mean length of the bony defect was 8.3 cm and no patient was able to bear weight. The mean external fixation time was 309.8 days. According to Paley's grading system,¹⁴ eight patients had an excellent clinical and radiological result and seven excellent and good functional results. Bony union, the ability to bear weight fully and resolution of the infection were achieved in all the patients.

Patil and Montgomery treated 78 femoral and tibial nonunions in twelve years.¹⁵ In our series most of the cases were complex because of infection, bone loss and failed previous surgery. The complex cases were all treated with Ilizarov frames. At a mean time of 14.1 months, 39 had healed successfully with

excellent results in 17 patients. Six patients were lost to follow-up and two had amputations so functional assessment was not applicable to them.

Catagni et al treated 19 patients with hypertrophic nonunion by using the Ilizarov apparatus in distraction. Six of these patients had associated chronic osteomyelitis. Ilizarov treatment ranged from four to 12 months (mean, 6.5 months). Stable union was achieved in all patients. The sole complication was axial collapse of regenerate bone in one patient with subsequent loss of 2 cm of lengthening after premature removal of the Ilizarov fixator. Distraction osteogenesis in the treatment of stiff hypertrophic nonunions offers the most complete method of providing optimal limb function.¹⁶ Same were our observations.

CONCLUSIONS:

Ilizarov external fixator is one of the best methods for the gap nonunion of femur. Bone transport may be needed at times.

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