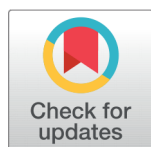


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Role of Ilizarov's ring fixator for treatment of infected nonunion of Tibia

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Abstract

Infection is the most dreaded complication of the surgery and management of the infected non-union bones is also a challenging task. The aim of our study is to evaluate the efficacy of Ilizarov's ring fixator in the treatment with infected nonunion of tibia. 17 patients were included in our study. Rate of union was 100%. 10 patients had excellent results, 5 patients had good result and 2 patients had fair result. The minimal duration for union was 9 months with average duration lasting for 12 months. One patient needed a bone marrow injection at 2 month follow-up. Ilizarov ring fixator is an effective tool in treating Infection Non Union of Tibia and is a limb salvage procedure.

Keywords: Ilizarov's ring fixator; infected nonunion; tibia

1 Introduction

Infection is still one of the most dreaded complications of any surgery. Even though utmost precautions are taken, chance of infection cannot be ruled out in any orthopaedic procedure involving an implant. Closed fractures of tibia have comparatively less prevalence of infection, with an incidence of 2.5%. There is a 5-7 fold increase in infection when the primary trauma is associated with an open injury⁽¹⁾. Such infection at the fracture can hamper the union leading to infected non union⁽²⁾. Management of such infected non union is challenging task.

Various modalities of management have been proposed in the past. Yet Ilizarov ring fixator has shown to provide very good treatment option for such infected non unions. It has also added

advantages such as correction of deformities, regaining length in case of bone loss or shortening. Vascularity plays a major role in treatment of infection. With Ilizarov ring fixator vascularity could be increased with the help of corticotomy and also distraction osteogenesis⁽³⁻⁶⁾.

Even though Ilizarov fixator has many advantages, prolonged duration of treatment has been a main concern with this modality. This study was intended to evaluate the role of Ilizarov's ring fixator in treating infected non union.

AIM:

To study prospectively the efficacy of Ilizarov's ring fixator in the treatment of patients with infected nonunion of tibia.

Methods

Patients who presented to the outpatient department with sign of pus discharge and infection following a tibial

fracture were screened. Patients fulfilling the inclusion criteria were selected and evaluated further. All routine blood investigations including TLC, CRP and ESR were also done prior to surgery. Radiological evaluation was done using Xray.

Wound swab from the discharge was sent for culture. Infected non union was classified using G.S Kulkarni classification (table).

GS Kulkarni's classification of non union	
Type I	Fragments in apposition with mild infection and with or without implant
Type II	Fragments in apposition with severe infection with large or small wound
Type III	Severe infection with a gap or deformity or shortening
IIIa	Defect with loss of full circumference
IIIb	Defect in >1/3rd of cortex
IIIc	Infected non-union with deformity

The patients who were diagnosed to have infected non union of tibia were counseled and treated with Ilizarov ring fixator during the period between Jan 2009 and October 2019. This included 17 patients, 7 females and 10 males. Mode of injury included RTA (n=15) and fall from height (n=2). 14 patients had an open fracture as primary injury, which was treated initially with external fixation in 11 cases and primary internal fixation in 3 patients. 3 patients had a closed fracture which got infected following internal fixation.

Inclusion criteria:

- Age 18-60 years
- Un united tibia shaft fractures with infection
- Duration of primary injury more than 4 months

Exclusion criteria

- Poly trauma/multiple fractures
- floating knee
- age < 18 and > 60 years
- patient with contraction of foot and ankle
- intra articular fractures

Pre operative culture was taken and started on appropriate antibiotics. Ilizarov frame was constructed prior surgery with the help of radiographs. Intra operatively, the previous hardware, if any were removed and fracture ends freshened. Thorough debridement of the non union site done with antibiotic lavage. Intra medullary reaming was also done wherever needed. Sclerotic bone from fracture ends was excised and freshened, aligned and stabilize with the ring fixator. Final adjustments were done using C Arm guidance. Fracture site were acutely docked and cortico cancellous bone grafting done. Corticotomy was done to help improve blood

supply and to burn the infection when needed. one patient who had a shortening of >4 cm, corticotomy and distraction osteogenesis was done.

Post operatively appropriate IV antibiotics was continued. Regular dressing and pin site care given. Patients were started on early weight bearing, knee and ankle ROM exercise.

Distraction of the corticotomy site was started on day 7 and same was taught to the patient. Patients were followed up on regular intervals were evaluated using ASAMI scoring system. Ring fixator was removed when good consolidation at the fracture site was noticed and cortical continuity in three of four cortex noted. Protective casting for the limb was done for 2 months following Ilizarov removal.

2 Results

In our study 17 patients were evaluated and no patients were lost in follow up. Patients were evaluated according to Association for the study and Application of the Method of Ilizarov (ASAMI)⁽⁷⁾. All 17 patients had full follow up. All patients had good union.

Rate of union was 100 %. As per ASAMI criteria, 10 patients had excellent results, 5 patients had good result and 2 patients had fair result. The minimal duration for union was 9 months with average duration lasting for 12 months. One patient needed a bone marrow injection at 2 month follow-up.

Table 1. ASAMI score - bone

RESULTS	DESCRIPTION	SCORE
EXCELLENT	Union, no infection, deformity <7 degree, limb length discrepancy <2.5cm	10
GOOD	Union with any two of the following: absence of infection, deformity <7, LLD< 2.5 CM	2
FAIR	Union with any one of the following: absence of infection, deformity <7, LLD< 2.5 CM	0
POOR	Non union/refracture/union+ infection+ deformity>7+ LLD > 2.5	0

Table 2. ASAMI score -functional results

RESULTS	DESCRIPTION	SCORE
EXCELLENT	Active, no limp, minimal stiffness <15 loss, no RSD, insignificant pain	6
GOOD	active, with one or two of the following: limp, stiffness, RSD, significant pain	4

RESULTS	DESCRIPTION	SCORE
FAIR	active, with three of the following: limp, stiffness, RSD, significant pain	2
POOR	inactive	0

3 COMPLICATIONS

All patients had a successful union. One patient had a re-fracture due to a fall after complete union was achieved, after removal of the protective cast. Pin tract infection was a common complication with 14 patients having PTI. Infection settled with first debridement in all patients. One patient needed a bone marrow injection at 2 months, and united well at 1 year.

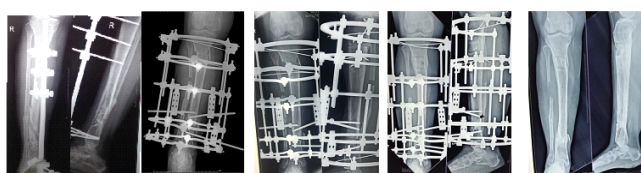


Fig 1. A 42 year old female, infected non union oftibia on external fixator treated with Ilizarov ring fixator, corticotomy and transport. Complete union achieved with correction of shortening

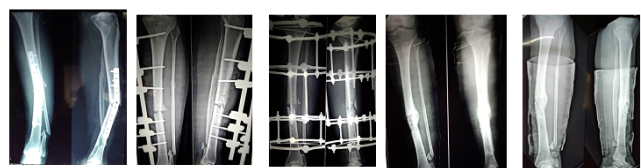


Fig 2. A 36 year old male, with infected tibia nonunion, implant failure, united well with Ilizarov ring fixator with bone grafting

4 Discussion

Failure of fracture union is the result of multiple factors affecting the union. This includes mechanical instability, bone loss, infection, osteoporosis, soft tissue damage and loss of blood supply⁽⁸⁾. Management of such fracture non union is itself difficult. Infected fracture non union, mainly involving the distal third of tibia is even more challenging to treat, because of the poor blood supply. Ilizarov technique is an effective tool in treating such infected non union.

Management of any infection needs thorough debridement of the local site. In case of a non union, a thorough debridement involves resection of the sclerotic bone ends and surrounding infected tissue. Culture sensitivity was sent for all patients. Most common organism was Staph Aureus. Culture was negative for 8 patients due to prior antibiotic course. This can sometime leave a bone defect at the fracture site. With Ilizarov technique this can be managed using distraction osteogenesis principle. Distraction osteogenesis has shown to be an effective treatment option in LLD and segmental fractures⁽⁹⁾.

Bone grafting plays an important role in treating non union. Vascularised bone grafts have been used successfully in treating infected non union⁽¹⁰⁾. Even though cortical grafts such as fibula can be used for bone defects, failure rate is high with fibular strut graft. Distraction osteogenesis again helps in such cases in regaining the limb length without sacrificing the fibula⁽⁹⁾.

Ilizarov fixator also helps in correction of deformity and shortening⁽¹¹⁾. Early weight bearing and soft tissue management. Corticotomy has shown to be a good technique in improving the blood supply and is said to burn the infection by increasing the vascularity. Joint mobilization and weight bearing can be started early and minimize stiffness.

In our study, 10 patients (58%) had excellent result. 5 patients (30%) had good result and 2 patient (12%) had fair result. This was comparable with other studies⁽¹²⁾. Pin tract infection was the common complication encountered involving 14 patients. The main problem was counseling the patient during each visit about the prolonged treatment and pin site care. One patient, who had a good union, had a re fracture due to injury post removal of the protective cast. Patient was re-casted and managed conservatively.

5 Conclusion

Ilizarov ring fixator is an effective tool in treating Infection Non Union of Tibia and is a limb salvage procedure. The only downside is the duration of treatment (average of 9-12 months). Patients have to be counselled prior to surgery and regularly at every follow up in order to overcome this lengthy treatment time. Correction of deformity and regaining the length are again additional advantages. Ilizarov still is the best option available in these infected non unions.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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