

Study of efficacy of ilizarov external fixation in infected non union tibial fractures

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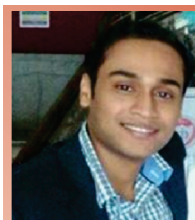
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Abstract: Introduction: Non union of tibia associated with infection have always been a challenge to Orthopaedic surgeons. Conventional methods do address the multiple complex problems. Ilizarov method has been a boon for such cases.

Aims and Objectives: Assess the efficacy and safety of ilizarov fixator method of treatment in infected non-union tibia and various complications associated with ilizarov external fixation.

Methods: 21 patients, 20 males and only one female, minimum 20 years & maximum age 75 years, average age 36.8 years with infected non union of tibia treated by Ilizarov methods and principles have been analysed. 2 fractures were in proximal 1/3rd, 6 in the mid 1/3rd, 3 in the junction between mid and distal 1/3rd, 7 in distal 1/3rd and 3 were segmental / comminuted. They were all treated with debridement, excision of the non union & fibular partial excision was done as required. Acute docking in 6 patients & acute shortening was done in others. Corticotomy was done at same time or if infection was severe, it was performed after two weeks.

Results: The most common complication was pin tract infection which healed by antibiotic usage & pin tract dressings. Knee & ankle stiffness was seen in several patients due to the seriousness of the cases. According to Dror Paley's bony criteria, results were excellent in 3, good in 12, fair in 4 and poor in 2 cases.

Conclusion: Ilizarov technique gives satisfactory results in infected non union of tibia. Considering the complexity of the condition it is the choice of treatment. It addresses to the problems of non union, infection, correction of deformity and lengthening of the limb.

Key Words: Fracture Shaft Tibia, Infected non-union, Ilizarov external fixation, limb length discrepancy, distraction osteogenesis.

THESIS SUMMARY

Introduction

Infected non-union of tibia per se is a challenge to treat. Secondary skeletal defects due to infected non-union may require bone

grafts¹, extensive debridement and local soft tissue rotational flaps^{2,3}, packing of the defects with Papineau-type open cancellous bone grafting⁴, tibiofibular synostosis^{5,6}, and free microvascular soft tissue and bone

transplants⁷⁻⁹. Subcutaneous bone causes susceptibility to compartment syndrome, non-responsive infection, non-union, fibrosis, sinuses, deformities, shortening and various other sets of problems which are associated

with it. There is flaring of the infection and various antibiotics not acting frustrate the patient as well as the surgeon. Patient getting depressed and the huge burden of cost of different modalities make life miserable. Ilizarov method addresses all the above problems simultaneously. The stability of the fixation allows weight bearing ambulation and joint mobilisation. Progressive bone histogenesis following corticotomy and bone transport helps in filling bone gaps eradicating infection and promoting fracture union. Infection control is achieved by radical debridement of the infected tissues including bone and followed by bone transport to reconstruct the residual bone defects.

Method

23 patients with established infected non-union of the tibia were evaluated prospectively for the study. Clinical history including co-morbidities, social habits including smoking and alcohol consumption, previous treatment offered for the fracture, complications, duration of non-union. All patients had preoperative full-length radiographs of the affected leg for assessment of the level and type of fracture non-union, plane of deformity, bone quality and presence of sequestrum. All patients were counselled about the procedure to be performed, and the expected outcome of treatment. All patients were optimized preoperatively for the proposed operation. Culture swabs from draining sinuses and open wounds were carried out in all patients and appropriate antibiotic therapy was initiated. This was repeated whenever necessary throughout the duration of treatment. The site of non-union was in the distal, middle and proximal thirds in 14, 6 and 3 patients respectively. The initial diagnosis was closed fracture in 3 Gustilo type 1 open fractures in 2, Type 2 in 5 and type 3 in 13 patients. Type of fixation before Ilizarov surgery was Intra-medullary nail in 9 and Plate and screw fixation in 3 and, 11 had external fixation followed by plaster immobilization as definitive treatment. The co morbidities were Diabetes in 2 patients. Limb shortening ranged from 1-8 cm (2.75cm avg) Pus culture in all patients obtained pre operatively, revealed a mixed a bacterial growth. The Ilizarov frame was constructed pre-operatively in all patients and modified intraoperatively. All patients had debridement combined with ring fixator application as a single stage procedure. 8 patients had bifocal osteosynthesis (compression of the fracture site with bone transport following corticotomy) and 15 patients underwent monofocal osteosynthesis. Bone marrow infiltration was done in 67% of our cases but no bone grafting was needed. 8 patients had proximal tibial corticotomies. Postoperatively all patients had radiographs of tibia and fibula for assessment of the corticotomy and position of the wires. Corticotomy site distraction was initiated between 5-7 days at the rate of 1 mm per day and compression and distraction technique. Follow up x-rays were done at 3 weeks for assessment of the regenerate and at 4 weeks interval thereafter until fracture union. and distraction rate was reduced to 0.5mm/day until satisfactory appearance on x-rays. Patients were mobilised partial weight bearing, within comfort by a trained physiotherapist. Patients were discharged upon satisfactory compliance and followed up in the fracture clinics at monthly intervals for assessment of fracture union, regenerate progress and ensuring compliance with physiotherapy. Fixator was retained further for the duration equal to the period of bone

transport after bone docking. Bone union was confirmed by conventional radiographs and the fixator was removed under anesthesia. The operated limb was protected in a functional cast brace for at-least twice the duration of bone transport. The period of follow up after fracture union ranged from 6 months. The outcomes were assessed using the Association for the Study and Application of Methodology of Ilizarov [ASAMI] criteria.

Results

The study group consisted of 23 patients in the age group of 16 - 75 years [Average: 38.87]. There were 21 male and 2 female patients. 1 patient expired with fixator in situ so couldn't be evaluated for results. All patients had limb oedema, equinus deformity of the ankle, and sub-talar and knee joint stiffness. Fracture union was achieved in 22 patients without the need for bone grafting. The problems and complications in the cohort of patients studied are as per Table 1. Bony and functional results [Tables 2 and 3] were evaluated as laid down by the ASAMI Criteria. Of 22 patients in the study, Average bone gap was 2.75 cm (1-8cm). Average length of the regenerate was 2.56 cm (0.5 to 6cm). Average duration of fixator period was 8.6 months (1.5-14months). According to ASAMI bony criteria, results were excellent in 13(59%), good in 6(27%), fair in 2(9%), and poor in 1(4.6%) cases and functional results were excellent in 15(68%), good in 2(9%), fair in 2(9%) and poor in 3(13%).

Discussion

Reconstruction of segmental bone defects remains a difficult problem. Bone transport is one of the most innovative contributions of Ilizarov to orthopaedic surgery^{10- 17} With the different methods of segmental bone transport, long osseous tissue can be reconstructed without the need for bone grafting. The newly formed bone rapidly ossifies and becomes corticalized .

A fracture non-union is a significant problem to the patient and the surgeon. In many instances the patient has undergone one or more surgical procedures, has lost considerable time from his job or her life style, and has been forced to alter his or her life style. Furthermore, the psychological and physical trauma to the patient when faced with the prospect of another surgery is often underestimated. The problems facing the surgeon are no less formidable. In many instances consolidation of the non-union must be achieved with correction of axial and rotational malalignment¹⁸. The mixed organism growth from bacterial cultures of nosocomial origin required repeated hospitalisations and expensive antibiotics for infection control. Despite being advised about proper pin site care, very few patients strictly adhered to the instructions. We have followed the criteria laid down by ASAMI. Treatment time with Ilizarov is lengthy with a considerable risk of complications. Bone grafting at the docking site is recommended in order to shorten the duration of treatment and to prevent re-fracture and non-union. No patient required bone grafting in our cohort of patients. Patients tolerate docking well up to 5 cm of shortening and the bony and functional results were uniformly poor beyond 5 cm. However, it may help shorten the duration of treatment and thus ensuring compliance. No patient in our study had neurovascular deficits. In our study, all patients had varying degrees of knee, ankle and sub-talar joint

stiffness. Though knee stiffness was largely overcome with physiotherapy, foot and ankle stiffness persisted and worsened despite bony union.

Conclusion

Ilizarov technique gives satisfactory results in infected non union of tibia. Considering the complexity of the condition it is the choice of treatment. It addresses to the problems of non-union, infection, correction of deformity and lengthening of the limb.

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