

# Charcots Arthropathy in Diabetics : An Experience in Treatment with Ilizarov External Fixator Technique

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Year of Acceptance: 2012

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**Abstract:** Background: A case of diabetic foot with charcots joints is an unfavourable situation of soft tissues due to associated neuropathy and vascular compromise. Fusion of the neuropathic ankle joint is extremely difficult and associated with many complications. The use of the Ilizarov fixator in ankle fusion for patients with neuropathic arthropathy is not clear. We aimed to evaluate the results of the Ilizarov method for ankle arthrodesis in diabetic patients with charcots arthropathy.

Methods: From 2009 to 2011, 25 surgeries were performed with the Ilizarov apparatus in diabetic foot with charcots joints (eichenholtz stage II & III). The mean age of the patients was 51 years (range, 35-67 years), all patients were diabetic. Deformity and instability of the ankle resulting in a nonplantigrade foot was the operative indication.

Results: Solid fusion was obtained in all patients except one, at an average of 16.1 weeks (range, 12-20 weeks). At final follow-up, excellent results were obtained in eighteen patients, good in four, fair in two, and poor in one. No major complication occurred.

Conclusion: The Ilizarov fixator presents a successful, alternative and effective means for management of diabetic foot with charcots arthropathy where complications of neural and vascular compromise preexist, especially when the usage of internal fixation methods have limitations. In our series all patients were plantigrade with foot ulcers healed.

Keywords: Charcot joint, single step management, ilizarov, diabetic joint, Successful management.

## THESIS SUMMARY

### Introduction

Diabetic charcots joints is a potentially limb threatening disorder developing in a patient with long standing diabetes mellitus and associated sensory neuropathy. Both vascular and neuropathic complications make it a dreaded disorder to treat.

Since the weightbearing articular area of the tibia is involved, the aim of treatment is directed towards achieving bony stability, soft tissue preservation and early mobilisation. Hence, limited internal fixation along with external fixation has become the favourite treatment of choice.

In charcot's joints with non-healing wound and infection, we advocate the fusion

primarily at the ankle and subtalar joint.

We undertook a prospective study of ilizarov treatment of patients with charcot's arthropathy and analysed the longterm clinical and radiological outcome, improvement in vascularity with achievement of a weightbearing plantigrade foot and associated complications.

### Aims and Objectives

1. To study diabetic foot with charcots arthropathy using maryland foot score system.
2. To review the literature
3. To study biomechanics and surgical

technique of ilizarov external ring fixator. To evaluate the clinical and functional outcomes of ilizarov external ring fixator in management of diabetic foot in our patients and compare them with those in the literature.

### Methods

(A) SOURCE OF DATA :

K.B.Bhabha Municipal General Hospital, Mumbai. A tertiary health care center located in prime sub-urban area of metropolitan city of Mumbai. This serves as first contact for the patients residing in and near by places.

(B) STUDY POPULATION :

1. All adult male / female patients attending out-patient department (o.p.d.) between the age of 25 years and above.
2. All adult male / female patients between age 25 years and above admitted in in-patient ward.
3. Population includes both urban/ rural/slum dwellers.

**(C) SAMPLE SIZE:**

25 cases of diabetics foot with charcots arthropathy.

**(D) DATA COLLECTION PROTOCOL:**

1. Mode of collection – direct interview
2. Parameters for data collection
  - a) Registration number
  - b) Name of patient
  - c) Age of patient
  - d) Sex – male / female
  - e) Address of residence
  - f) Occupation of patient
  - g) Diabetic status (controlled)
  - h) Duration of illness
  - i) Radiographs of ankle (frontal and lateral views) and foot (frontal and oblique)
  - j) Staging of disease by eichenholtz staging
  - k) Foot score – maryland foot score system –pre operative and post operative

**(E) INCLUSION CRITERIA :**

All adult patients with eichenholtz stage II ( coalescence stage) and III (reconstructive stage) at presentation.

**(F) EXCLUSION CRITERIA :**

- All adult patients with eichenholtz stage I ( developmental /resorptive stage)
- All those patients who found the apparatus aesthetically unacceptable.

**(G) INVESTIGATIONS:**

Pre-operatively all necessary routine investigations pertaining to anesthesia fitness were done and specific investigations of all associated medical illness were carried out.

The routine investigations done were –

- Haemogram (hb,tlc,dlc)
- Bleeding time \ clotting time.
- Serum creatinine
- Serum bilirubin (direct and indirect)
- Blood sugar level – fasting & post prandial
- HIV \ HBsAg.
- Radiograph of the chest
- Radiographs of ankle (frontal and lateral views) and foot (frontal and oblique)

**(H) PREOPERATIVE PLANNING:**

The following necessary implants and instruments were checked

- Wires 1.5 mm , 1.8 mm , olive wires , cancellous & cortical wires

- Rings (160mm,180mm,200mm) – half rings , 5/8th rings
- Other ilizarov appliances – rancho cubes, male & female posts, wire fixation bolts, nuts & bolts, washers, connecting rods
- Wire tensioner / Dynamometer
- Hand drill set / power drill set.
- Image intensifier machine ('c' arm machine).
- Tourniquet set.
- All necessary operation theatre equipments including bone

grafting set.

An intravenous line was secured and patient shifted to the operating room

**(I) SURGICAL TECHNIQUE :**

- Anaesthesia – spinal anesthesia is given and pre-operative antibiotic 3rd generation cephalosporin
- 4 to 6 external rings of different sizes–160 half, 180 half, 5/8th rings, foot frame
- Ankle joint arthrodesis with the help of ilizarov ring fixator with bone grafting
- Procedure involved for ankle fusion
  - o Ankle joint was exposed by anterior approach
  - Incision is made on the anterior aspect of the leg 7.5 to 10 cm proximal to the ankle and extend it distally to about 5 cm distal to the joint.
    - Divide the deep fascia in line with the skin incision.
    - Isolate, ligate, and divide the anterolateral malleolar and lateral tarsal arteries, and carefully expose the neurovascular bundle and retract it medially.
    - Incise the periosteum, capsule, and synovium in line with the skin incision, and expose the full width of the ankle joint anteriorly by subcapsular and subperiosteal dissection.
      - o Preparation of talus and tibia for fusion by scraping their articular surfaces and exposing raw bone
      - o When the talus is completely destroyed then the calcaneus articular surface is freshened
      - o The talus and the tibia are then docked and stabilized by k –wires
      - o Bone grafting is performed from the iliac crests and inserted in the area of arthrodesis.
      - Skin closure is performed, if possible in layers
      - Erection of ilizarov ring fixator frame is performed using two full rings in the distal tibia and a foot frame, consisting of a ½ ring for the forefoot placed in a coronal plane and a 5/8th ring for the hindfoot.
        - The wires used in the upper ring of tibia is posteromedial to anterolateral and another wire passed posterolateral anterior to fibula to anteromedial. The wires of the lower ring are inserted in the same way but the lateral wire is passed through the fibula and parallel to the ankle joint.both rings should be parallel to each other. The wire in the forefoot is passed through the 1st & 5th metatarsal heads and tensioned on the ½ ring to prevent footdrop.
- Two wires are passed through the calcaneum and tensioned
  - Compression is performed at the arthrodesis site by 2mm
  - Debridement of ulcers is performed
  - Wound and pin tract dressings are given

**(J) POST OPERATIVE CARE :**

- Limb elevation
- Distal neuro-vascular status monitoring
- Intravenous antibiotics for 48 hours
- Wound dressing after 48 hrs
- Daily/alternate day dressing-of the debrided ulcers ,as the situation may be
  - Pin tract care (taught to patient and performed twice daily from 48 hours post operatively))
  - Ring compression/distraction as the situation may be

- Full weight bearing is started as early as possible ( within 2 to 5 days)

#### (K) FOLLOW UP:

Patients will be followed up regularly after discharge from hospital at opd using parameters of maryland foot scoring system.

#### (L) DATA ANALYSIS:

Analysis of the study was done by direct observation by means of proportions, Kruskal Wallis test was done to assess the significance of change.

#### (M) TYPE OF STUDY:

Non randomized prospective clinical trial.

### Result

Radiological improvement of charcots arthropathy in diabetic foot was achieved in 24 patients , at an average of 15 weeks, with improvement of ulcers and ability to bear weight on a plantigrade foot. One patient developed non-union.

22 patients required ankle (tibio-talar) arthrodesis and 3 required tibio-calcaneal fusion. Ulcer on the foot healed in 24 patients of which five required another sitting of debridement. 1

patient had ulcer remaining on the foot after three debridements , which was then kept on regular dressings. Full weight bearing was achieved in all patients by the end of 18 weeks. 11 patients had 1 to 3 cm limb length deformity and showed short limb gait were treated by shoe raise, rest did not complain of limb length deformity.

### Discussion

- Diabetic foot is associated with multiple problems like
  - Ischemia
  - Neuropathy
  - Infection
- To perform surgeries using internal fixation and modalities other than ilizarov ring fixator causes further damage to an already compromised limb
- Principles of Ilizarov and Ilizarov technique of external ring fixator increases the survival chances of foot and avoids amputation
- In our series all patients can be salvaged from amputation and 96% achieved healing of ulcers completely
- Up until recently the diabetic foot has defeated every health care system in the world
- Advances in our understanding have led to improvements in care
- Ulcers are now healed and amputations can be prevented with help of Ilizarov fixator

The ilizarov external fixator presents a successful alternative for the management of diabetic foot with charcots joints where complications of neural and vascular compromise preexist.

### Clinical Message

From the conducted study, we are convinced that ilizarov ring fixator for the management of diabetic foot with charcots arthropathy is a successful alternative for the management of diabetic foot with charcots joints where complications of neural and vascular compromise preexist.

We recommend the following guidelines to achieve excellent

results –

- a. There should be a selection of patients , eichenholtz stage II & III for the following procedure, since in stage I the acute setting does not allow immediate weight bearing, making the whole surgery not worthwhile.
- b. The procedure should be performed by an experienced orthopaedician, after a thorough study of the ilizarov ring fixator application and planning of the technique.
- c. We recommend the use of two full rings in the distal tibia and a foot frame consisting of a ½ ring for the forefoot placed in a coronal plane and a 5/8th ring for the hindfoot.
- d. Acute docking of the talus with the tibia should be done, reduction can be held with k wires. Cancellous bone grafting done and the frame is constructed.
- e. The wires used in the upper ring of tibia is posteromedial to anterolateral and another wire passed posterolateral anterior to fibula to anteromedial. The wires of the lower ring are inserted in the same way but the lateral wire is passed through the fibula and parallel to the ankle joint, both rings should be parallel to each other. The wire in the forefoot is passed through the 1st & 5th metatarsal heads and tensioned on the ½ ring to prevent footdrop. Two wires are passed through the calcaneum and tensioned.
- f. Further study on the subject to be conducted with large sample size along with comparison with other standard methods of treatment of such injuries.

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Conflict of Interest: Nil  
Source of Support: None

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#### How to Cite this Article:

Sheikh F, Sheikh I, Shah S, Menon A. Charcot's Arthropathy in Diabetics :An Experience in Treatment with Ilizarov External Fixator Technique. *Journal Medical Thesis* 2014 May-Aug ; 2(2):12-17