

# Combination of Compound Divergent Lisfranc Injury, Displaced Calcaneal Tuberosity Fracture and Distal Third of Tibia Fracture: A Case Report

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## ABSTRACT

The combination of compound divergent lisfranc fracture dislocation, displaced calcaneal tuberosity fracture and fracture of distal tibia is a very rare injury. We report a 55 years old male patient with above mentioned injury treated with multiple Kirshner wires (K wires) for lisfranc fracture dislocation, 4 mm cannulated screws for displaced calcaneal tuberosity fracture and minimally invasive percutaneous plate osteosynthesis (MIPPO) for distal tibia fracture in single anaesthetic exposure. K wires were removed 2 months after surgery and the patient started weight bearing as tolerated. The post-operative wound complications were uneventful and he was walking with mild pain.

**KEY WORDS:** Calcaneal tuberosity fracture; Distal tibia fracture; Lisfranc injury; Rare injury.

## INTRODUCTION

Tarso-metatarsal injuries are rare and carry considerable potential for longterm disability<sup>1</sup>. The association of lisfranc injury with fracture of calcaneal tuberosity and distal third of tibia is very uncommon. Along with direct and indirect forces that cause the lisfranc injuries probably the rotational forces transmitted along the leg may cause distal end of tibia and calcaneal tuberosity fracture. Compound lisfranc injury due to the direct crush injury with a heavy load is associated with high degree of soft tissue damage and carries even more poor prognosis<sup>2</sup>. Hence it is a real challenge to treat the compound lisfranc injury which is associated with distal tibia and calcaneal tuberosity fractures. Emergency surgical intervention with thorough debridement, reduction and fixation of metatarsal fracture dislocation with multiple K wires, fixation of calcaneal tuberosity with partially threaded screws and fixation of closed tibia fracture with minimally invasive percutaneous plate osteosynthesis (MIPPO)

technique seems better management option even though there are various other treatment methods. However, outcomes of treatment are guarded whatever methods we follow.

## CASE REPORT

A 55 years old male patient came to our hospital with history of road traffic accident resulting the open wound of foot along with pain, swelling, and deformity. On examination, there was swelling, diffuse tenderness, gross deformity and open wound on medial and lateral aspect of foot with intact neurovascular status. In addition there was swelling, tenderness and mild deformity on distal tibia.



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Figure. 1 X-ray of foot ankle and distal leg showing divergent lisfranc injury, displaced calcaneal tuberosity and comminuted distal tibia fractures.



Figure. 2 Closure of wound on medial aspect of foot and leg at the end of surgery.

The patient was immediately sent for X-ray examination. X-ray showed that there was divergent variant of lisfranc fracture dislocation of foot, displaced calcaneal tuberosity fracture, and comminuted fracture of distal third of tibia. Patient was immediately transferred to operation theatre for surgical intervention. Thorough debridement and cleaning of foot was performed with 5 litres of normal saline. After debridement, first tarso-metatarsal joint was reduced and fixed with two K wires passing through the first metatarsal, medial cuneiform and navicular bone. Now fifth tarso-metatarsal joint was reduced and fixed with two K wires holding base of fifth metatarsal to cuboid and talar head. Similarly other fractured metatarsal bones were fixed separately with K wires as shown in figures 2 and 3. Wound on the posterior aspect of foot was extended proximally to expose the fractured calcaneal tuberosity. Calcaneal tuberosity was reduced and

fixed temporarily with 2 mm K-wire. After that it was fixed with two 4 mm cannulated partially threaded cancellous screws. Finally displaced comminuted fracture tibia was reduced and fixed with locking plate by (MIPPO) technique under C-arm guidance. The foot and ankle was stabilized in posterior slab for 21 days. After 3 weeks he was applied below-knee cast for further six weeks duration.

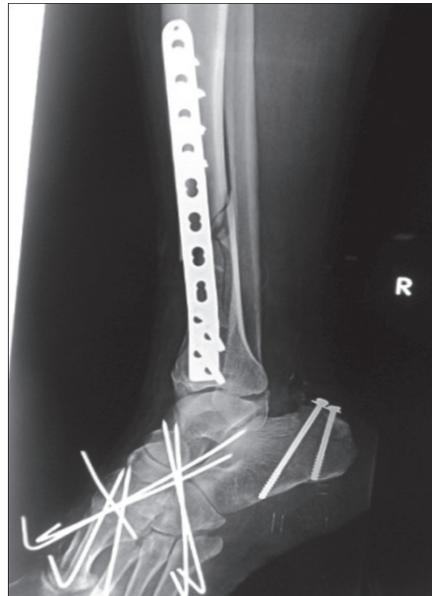


Figure. 3 Immediate post-operative X-ray showing fixation of lisfranc fracture dislocation with multiples K wires, fixation of calcaneal tuberosity fracture with 4 mm cannulated partially threaded screws and fixation of distal tibia with MIPPO technique.

Nine weeks after surgical intervention, the cast along with K-wires on the dorsum of foot were removed and patient was advised for partial weight bearing with the help of crutches.

## DISCUSSION

A combination of compound lisfranc fracture dislocation of foot, calcaneal tuberosity fracture and distal tibia fractures is a real challenge to orthopedic surgeon. Early surgical intervention with good clinical assessment and appropriate surgical techniques are utmost factors for the good outcome of patients. For managing this type of injury which is combination of open fracture in foot and closed fracture in leg, we can use external fixators for closed tibia fractures until soft tissue healing and swelling subsides. However temporary stabilization with external fixators is not

only cumbersome to the patients but also it is needed to proceed multiple surgical interventions and it takes long time for healing of fractures. So it needs proper assessment of soft tissue status of foot and ankle to complete surgery whether in one stage by using the locking plate in distal tibia fracture or two stages with use of external fixators for temporary stabilization.

There are many articles in the literature regarding the management of lisfranc injury, calcaneal tuberosity and distal tibia fractures separately. However combination of all these fractures in a patient is a very rare injury and is not clearly described in the literature based on mechanism of injury. Mechanism of injury can be direct and indirect for lisfranc fracture dislocation. Direct forces crush metatarsal towards plantar direction and displace either medially or laterally. Indirect injury occurs as a result of twisting or rotational forces on a plantar flexed forefoot. Dorsal aspect of foot is relatively weak as compared to the plantar aspect and hence resist much less force to cause dislocation of lisfranc joint<sup>2,3,4</sup>. At the time of impact, when the foot is in relatively fixed state on the ground, external or internal rotational forces that could play on the leg may cause distal tibia or calcaneal tuberosity fractures. There is still controversy for the fixation of lisfranc fracture dislocation with K-wires or screws. There are number of authors who use K-wires for fracture fixation<sup>5</sup> while others rely on screws<sup>6</sup>. Although screw fixation is stronger and allows more stable construct<sup>7</sup>, K-wires are usually preferred for comminuted fracture of metatarsal base with disrupted soft tissue of foot, and patients with multiple injuries<sup>8</sup>. Because of disrupted soft tissue we reduce and fix the fractures with multiple K-wires to both lateral and medial column of foot. Anatomical reduction is the most important predictor in patients with lisfranc fracture dislocation.

Simple extra-articular fractures of calcaneal tuberosity are best managed with screw fixation. In our case we extended the incision posteriorly towards achillis tendon from the already present wound on the foot and fracture is reduced and fixed with two cannulated partially threaded screws. MIPPO is well established technique for both extra-articular and intra-articular

distal tibia fractures<sup>9,10</sup>. Fixation of tibia fracture with plate instead of external fixator in this case avoids repeated surgical intervention and gives the definitive treatment in single anaesthetic exposure.

This type of fracture combination is a very atypical pattern with unique mechanism of action that needs early surgical intervention, anatomical reduction of tarso-metatarsal joints, proper selection of implants and careful clinical assessment to complete the surgery either in one-stage or two stages depending upon the condition of soft tissue.

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