



Case report

Bilateral tarsometatarsal joint injuries: An unusual mechanism producing unusual variants



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HIGHLIGHTS

- Beware unusual mechanisms resulting in tarsometatarsal joint injury such as forced eversion and dorsiflexion on fully supinated feet.
- Look for incongruity between the medial and middle columns extending between the cuneiform bones with or without associated fracture of the cuboid, os calcis or talus.
- Open reduction and internal fixation is recommended using the mechanism to aide reduction technique.

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ABSTRACT

Tarsometatarsal (Lisfranc) joint injuries are rare but potentially devastating conditions requiring anatomical reduction and internal fixation or arthrodesis. We describe an unusual mechanism involving forced eversion and dorsiflexion on both fully supinated feet resulting in bilateral tarsometatarsal joint injury. The injury pattern involved incongruity between the medial and middle columns extending between the cuneiform bones with associated fracture of the cuboid on the right and the cuboid, os calcis and talus on the left. Operative fixation is discussed and the clinical outcome was good at 4 years post-operatively. We believe this introduces an additional and potentially serious mechanism of injury and pattern of ligamentous and osseous disruption into the pantheon of injuries classed as Lisfranc, which surgeons should be aware of. Furthermore, we recommend attention to the mechanism of injury in consideration with classification to aid in operative reduction and fixation.

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1. Introduction

The eponymously named Lisfranc injury refers to a broad spectrum of injuries involving the tarsometatarsal joint (TMTJ) complex, from low-energy sports trauma to high-energy crush injuries [1]. TMTJ injury is rare, accounting for just 0.2% of all fractures [2], and the mechanism of injury is commonly direct axial load applied to the plantarflexed foot or hyperplantarflexion with or without rotational force [3]. Ligamentous disruption is commonly found in association with fracture of the second metatarsal base within the keystone, and in up to 39% associated fractures of the cuneiform bones, cuboid or navicular [4] are identified.

The most recent classification by Myerson et al. [5], based upon the classification first developed by Quénu and Küss [6], offers a broad approach to classifying these injuries. Type A injury involves complete incongruity of the Lisfranc joint, Type B partial incongruity, further subdivided into B1 (medial displacement) or B2 (lateral displacement) and Type C injury involves divergence of the metatarsals, further subdivided as C1 (partial divergence) or C2 (total divergence). However, none of the classification systems consider the mechanism of injury or associated cuneiform, cuboid or navicular fractures. Furthermore, they do not aid the clinician in management or prognosis, and there remains a lack of consensus regarding the surgical treatment of TMTJ injuries, though broadly speaking the best outcome relies upon prompt recognition and anatomic reduction to provide a stable, painless foot [7–10].

We describe a novel mechanism of injury causing bilateral TMTJ type injuries with a resultant pattern of ligamentous and bony injury not described before in the literature. We aim to highlight this potential mechanism and discuss the surgical management of this unique injury.

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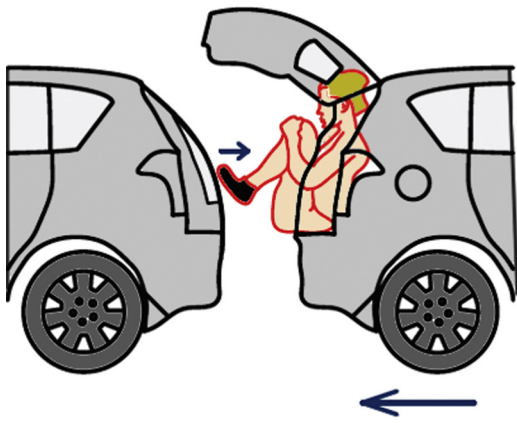


Fig. 1. Graphical demonstration of the mechanism of injury with patient sustaining hyperdorsiflexion and eversion forces to already dorsiflexed and supinated feet.

2. Case report

An otherwise fit and well 38-year-old lady presented to accident and emergency following an unusual injury to both feet. After removing shopping from the boot of her car, which was parked on an incline, she was surprised when the handbrake failed causing the vehicle to roll down the hill, scooping her into the boot with her feet outstretched. In an attempt to stop the car the patient braced both outstretched feet, which impacted against the next parked vehicle. The patient describes holding both feet dorsiflexed and fully supinated as the lateral border of both feet made contact with the parked car resulting in eversion forces on the fully supinated feet with forced dorsiflexion (Fig. 1). Upon presentation in the emergency department there was obvious gross swelling and ecchymosis over the plantar aspect and lateral border of her forefeet bilaterally, with preserved sensation and pulses. No other systemic injuries were identified and she was admitted for elevation and cryotherapy.

Radiographs and computed tomography (CT) of the left foot (Figs. 2 and 3) revealed a small undisplaced fracture of the lateral aspect of the tibia close to the syndesmosis with a small avulsion fracture of the talus inferiorly at its articulation with the os calcis. There was comminuted fractures of the antero-inferior aspect of the calcaneus, comminuted fracture of the superior aspect of the posterior cuboid with multiple avulsion fragments from the medial aspect of the cuboid and lateral cuneiform, with no significant subluxation of the 3rd, 4th or 5th metatarsal bases. Fracture of the base of the second metatarsal with lateral displacement was noted with widening between the middle and lateral cuneiforms and an avulsion fracture from medial cuneiform at its articulation with the 1st metatarsal base.

Imaging of the right foot (Figs. 4 and 5) revealed comminuted fractures of the cuboid, medial and lateral cuneiforms with large displacement between the two main cuboid fragments and subluxation of the articular surface of the cuboid from the anterior os calcis. Bases of the second through fifth metatarsals were markedly laterally subluxed and small avulsion fractures were noted from the bases of the 1st, 2nd and 3rd metatarsals.

2.1. Left foot

Two longitudinal incisions were made, one between the 1st and 2nd TMTJ's and one laterally over the calcaneo-cuboid joint. Extensive soft tissue injury was noted and the fracture configuration was as per radiology. The first and second TMTJ's were directly reduced and screw fixation performed from second metatarsal base into medial cuneiform. The cuboid and lateral column were then



Fig. 2. Anteroposterior (left) and Oblique (right) radiographs of left foot on admission showing Lisfranc injury.

directly reduced to the middle column with compression screw passed from lateral cuboid into medial cuneiform. Accurate and stable reduction of the TMTJ complex was confirmed radiologically (Fig. 6).

2.2. Right foot

Two longitudinal incisions were made, one between the 1st and 2nd TMTJ's and one laterally over the calcaneo-cuboid joint. Extensive soft tissue injury was also noted and the fracture configuration was as per radiology. Initially the first and second TMTJ's were reduced anatomically with screw fixation from the second metatarsal base into the medial cuneiform. Fracture through the middle cuneiform was then reduced and held with screw fixation from distal lateral cuneiform to proximal medial cuneiform. Fracture of the body of the cuboid was reduced allowing reduction of the lateral column and this was held in place with positional screw from lateral cuboid to middle and medial cuneiform bones. A final screw was placed from the lateral cuneiform into the medial cuneiform to maintain reduction of the middle and medial cuneiforms as well as the middle column to the medial column. Accurate and stable reduction of the TMTJ complex was confirmed radiologically (Fig. 6).

Post-operatively both feet were protected in lightweight below knee casts for six weeks and the patient was mobilised non-weight bearing for 12 weeks total. At this stage the patient began to mobilise fully weight bearing bilaterally. At 4 year follow-up the patient was noted to have a good range of motion at both ankles (10 degrees dorsiflexion, 45 degrees plantarflexion bilaterally) and subtalar joints with only occasional mild pain over the plantar aspect of both feet on prolonged walking/weightbearing. Range of motion was reduced at the midtarsal joints (combined subtalar/midfoot inversion 30 degrees left side, 25 degree right side, eversion 20 degrees bilaterally) as would be expected following the severity of

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