

## Divergent Lisfranc injury with dislocation of great toe interphalangeal joint: A rare case report

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Injury to the Lisfranc joint is an uncommon event and requires keen evaluation to diagnose it early for the optimal outcome following adequate treatment. Many classifications describe the divergent pattern of this injury as separate entity and even rarer in incidence. The associated ipsilateral great toe interphalangeal dislocation along with the rare divergent pattern of Lisfranc fracture dislocation makes our case unusual. The case was managed by reduction of the great toe interphalangeal dislocation with percutaneous reduction and fixation of Lisfranc injury with screws and multiple K-wires, resulting in a good clinical outcome on follow up. No single case similar to ours is reported previously to the best knowledge of the authors.

**Keywords:** foot, injury, dislocation, Lisfranc joint, tarsometatarsal joint, interphalangeal, management, fixation

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Injury to the Lisfranc joint (Tarsometatarsal joint) is a rare event with reported incidence of 0.1 to 0.4% of fracture cases [1]. Early identification and meticulous management, often surgical, is required for optimal outcome as the conservative approach has been linked to poor results [2]. Quenu and Kuss did instrumental work to highlight the anatomical and clinical understanding of Lisfranc joint along with description of the “Lisfranc ligament bundle” bridging second metatarsal and first cuneiform bone as key stabilizing structure of tarsometatarsal (TMT) joint [3]. The classification given by the same authors is widely used and it describes three types of the injury; homolateral, isolated and divergent. Divergent dislocation was described as a complete disruption of the TMT joint with first ray and lesser rays displaced in the opposite direction. Another classification by Hardcastle et al modified the abovementioned classification on the basis of radiological evaluation

into three types – complete, partial and divergent [4]. Type C or divergent variant was noted with medialisation of first metatarsal and lateral translation of variable number of rest of the metatarsals. The literature is scant about this rare pattern of injury as compared to other types.

### Case Report

A 28-year-old male patient was brought to us with a history of injury to his right foot a few hours earlier. There was swelling and pain after the patient sustained an injury to the foot by the jumping off a moving bus. He reported he lost his balance and his foot was twisted before he fell to hard ground. The exact position of the foot at the time of impact is not properly recalled by the patient.

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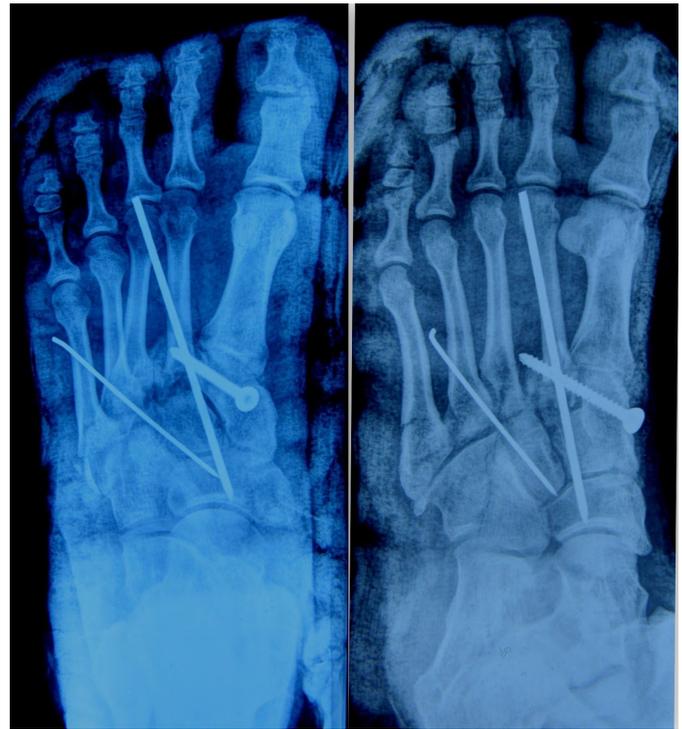
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**Figure 1** Preoperative radiograph showing great toe interphalangeal dislocation with divergent Lisfranc fracture dislocation.

There was visible deformity over medial aspect of foot and great toe suggesting presence of underlying significant bony or soft tissue injury. The radiograph of the affected foot showed fracture dislocation of Lisfranc joint along with inter-phalangeal dislocation of ipsilateral first toe. The pattern of Lisfranc injury was divergent with medial dislocation of first TMT joint and lateral dislocation of the rest of the TMT joint (Figure 1). There was also a fracture of the fifth metatarsal base with minimal displacement. Following informed consent, the patient was planned for urgent reduction of aforementioned injury with internal fixation. The rarity of the injury pattern was explained to the patient with additional written consent for future publication.

The closed reduction of the interphalangeal dislocation was easily achieved under anesthesia which was later confirmed under fluoroscopy and the closed reduction of Lisfranc injury was achieved under fluoroscopic guidance. Two K-wires (2.0 mm) were introduced, one along the second metatarsal into the tarsal bones transfixing the Lisfranc joint. The other K-wire (1.0 mm) was introduced along the lateral TMT joints for added stability.



**Figure 2** Postoperative radiograph showing the fixation of the Lisfranc injury with K-wire and screw from medial aspect along with reduced interphalangeal dislocation.



**Figure 3** The follow up radiograph showing healed Lisfranc injury at the time of final hardware removal.

The additional cortical screw (3.5 mm) was used for added stability from medial aspect and fixing the Lisfranc joint (Figure 2). The small wounds were dressed and a well-padded below knee plaster protection splint was applied following the confirmation of satisfactory alignment and fixation of the injuries. Elevation and non-weight bearing protocols were advised. Active toe and knee joint range of motion exercises were encouraged throughout the follow up. Gradual healing of the injury was noted in the follow-up along with reduction of swelling, pain and discomfort. The hardware were sequentially removed between 18-26 months postoperatively (Fig.3). The plaster splint was removed after eight weeks as swelling and pain were minimal. The only complication noted was hardware prominence of the medial screw that loosened over time and later was managed by its removal. The removal of K-wires and screw was uneventful at four and six month follow up. There was no re-dislocation of great toe noted and the patient was performing activities of daily living.

## Discussion

Meticulous clinical and radiological assessment is critical for the diagnosis of Lisfranc injuries as these are notoriously missed in emergency settings and may be the reason for later medico-legal issues [5]. The divergent dislocation, as in our case, have characteristic radiographic deformity that makes it hard to miss and the diagnosis is evident. The divergent Lisfranc fracture dislocation is stated to be associated with fractures of other bones in the foot like the cuneiforms and navicular [6]. The subtle injuries, the doubtful diagnosis and the requirement of looking for interposed structure interfering with reduction calls for use of imaging like computerized tomogram (CT) or magnetic resonance imaging (MRI) [7,8]. Our patient refused further imaging due to financial issues and urgent operative intervention was initiated. Open reduction-internal fixation (ORIF) and primary arthrodesis are two common techniques. Our method with use of closed reduction and percutaneous fixation with wires and screws resulted in primary arthrodesis of Lisfranc joint. The reported incidence of secondary procedures for complications has been found to be minimal with primary arthrodesis [9]. Studies have also shown good outcome of primary arthrodesis in comparison with

ORIF in the long term [9,10]. Primary arthrodesis also obviates need for secondary arthrodesis in case of arthritis following either modality of treatment. Our minimal invasive approach resulted in early discharge and avoided wound complications.

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