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Lisfranc Injury: A Case Report and Literature Review

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Abstract **Case Report**

Lisfranc injuries are relatively rare, accounting for only 0.2% of all injuries, and few case reports have been published on this topic. In this report, we present a case of a Lisfranc injury in a healthy 30-year-old male who fell down a staircase, landing on his left foot. The diagnosis was made using X-rays and computed tomography (CT). The X-rays showed dislocation of the tarsometatarsal joint with lateral displacement of the M4, M3, M2, and M1 metatarsals. The CT scan revealed a fracture-dislocation of the second metatarsal, with detachment of intra- and extra-articular bone fragments associated with a fracture of the medial cuneiform bone. Surgical management, in the form of open reduction and internal fixation, was performed. The patient followed an expected postoperative course and was doing well, without pain or limitation of activities, at his 3-month postoperative visit. Additionally, we provide a brief review of similar published cases and an overview of Lisfranc injuries.

Keywords: Tarsometatarsal Fracture-Dislocations, Lisfranc Fracture-Dislocations, Foot Injuries.

INTRODUCTION

A Lisfranc injury is a term that describes any damage to the tarsometatarsal joint (TMT) complex, ranging from a simple ligamentous subluxation to devastating unstable open fractures of the bony structures [1]. Occurrences of TMT injuries are rare, accounting for approximately 0.2% of all fractures; some authors attribute this to misdiagnosed cases, reaching nearly 35%, as this injury is often overlooked, especially in polytrauma patients [2, 3]. TMT injuries can be caused by direct or indirect forces [3]. The former usually results from crush injuries to the foot, while the latter is due to overloading a plantar-flexed foot or forced abduction of the forefoot [3]. Diagnosing this injury can be challenging, as 11% of these injuries are subtle and not easily detected on standard radiographs [3]. Radiological findings can be supplemented by clinical examination results, including localized tenderness and positive rotation and stress tests [3]. In this case report, we present a case of a Lisfranc injury in a young individual.

CASE PRESENTATION

A 30-year-old man with no significant medical history presented to the emergency department in March 2024 after falling down several stairs and landing on his left foot. His ankle was in dorsiflexion, and he reported not twisting his ankle joint. He could bear weight, but with pain. On examination, his foot was visibly swollen in the medial dorsal area, and he had tenderness in the medial hindfoot during passive joint flexion. He was able to perform minimal active range of motion, but with pain. Despite the swelling, he had a positive wrinkle test, indicating that he was fit for surgery at that time. X-rays of his foot were taken, revealing a subtle Lisfranc injury to the left foot with dislocation of the tarsometatarsal joint and lateral displacement of the M4, M3, M2, and M1 metatarsals (see Figure 1).

Figure 1: Anteroposterior x-ray view of to the left foot

Unfortunately, no true lateral view was obtained at the time of the injury. The CT scan showed a fracture-dislocation of the second metatarsal, with detachment of intra- and extra-articular bone fragments associated with a fracture of the medial cuneiform bone (see Figure 2). Magnetic resonance imaging (MRI) was not requested as the bony Lisfranc injuries in the midfoot were evident. Additionally, there was concern about the progression of swelling if the intervention was delayed to obtain an MRI.

Figure 2: A 3D-reconstructed image of the computed tomography (CT) scan that was done to the left foot

The foot was immobilized with a splint to relieve pain and prevent further displacement and swelling. The decision was made to treat this patient surgically under general anesthesia. The patient underwent open reduction with internal fixation using cannulated screws. A longitudinal incision was made over the tarsometatarsal (TMT) joint between the first and second metatarsals (MT), and dissection was performed in layers until the joint was exposed.

Once the reduction was achieved and visually confirmed under fluoroscopy (C-arm), the medial and intermediate cuneiform bones were fixed first, followed by the fixation of the first metatarsal to the medial cuneiform, and then the second metatarsal to the medial cuneiform. All reductions were confirmed under the C-arm. The skin closure was performed in layers, and the skin was closed with Monocryl. A below-knee splint was then applied. The surgery was successful, and no complications were reported during the operation. Postoperative X-rays showed an acceptable reduction.

DISCUSSION

Lisfranc injuries encompass a wide range of lesions to the tarsometatarsal (TMT) complex, ranging from ligamentous subluxation to unstable fractures [1]. The bony and ligamentous structures ensure the stability of the midfoot. Injuries to these structures can cause instability and lead to displacement of the tarsometatarsal joints [5]. These injuries can be caused by either direct or indirect forces [3]. The former result from crush injuries to the foot, while the latter occur due to forced abduction of the forefoot or overloading of a plantar-flexed foot [3].

Diagnosing Lisfranc injuries can be challenging, as conventional foot radiographs do not show ligamentous subluxations or subtle injuries. Consequently, treatment may be delayed, leading to prolonged pain, post-traumatic arthritis, and flatfoot [6-8]. The sensitivity of conventional radiographs is only 84% [7]. Computed tomography (CT) and magnetic resonance imaging (MRI) are some of the modalities used to evaluate the tarsometatarsal joint (TMTJ) and are superior to radiographs. CT scans can provide continuous images, and MRI is the gold standard as it visualizes soft tissues and ligamentous injuries [6-9]. It is documented that MRI has a sensitivity of 90% compared to intraoperative findings [7]. The choice of treatment option depends on the severity and level of displacement of the lesion.

Radiological findings can be supplemented by clinical examination results. These may include midfoot swelling, plantar ecchymosis, localized tenderness, positive rotation and stress tests, a positive piano key test, and pain or instability with passive abduction of the midfoot while stabilizing the tarsometatarsal joint [3-10]. The piano key test is performed by moving the head of the affected metatarsal while firmly holding the midfoot, which can help isolate the exact affected TMTJ [10]. In patients who are able to bear weight, as in our patient,

midfoot stability can be assessed by asking the patient to attempt to stand on tiptoe on one foot [10].

Surgical treatment is indicated for unstable or displaced Lisfranc injuries, as demonstrated by many retrospective case series over the past years. Furthermore, it has been shown that one of the factors influencing functional outcomes after surgery is the quality of the reduction; anatomical reduction being the goal (< 2 mm). In the case of unstable Lisfranc injuries in the presence of ligamentous injury alone, primary arthrodesis is commonly preferred over traditional open reduction and internal fixation (ORIF). A randomized prospective study conducted by Ly and Coetzee determined that pure ligamentous injuries of the Lisfranc joint should be managed with primary partial arthrodesis (PA) due to the low healing potential of the ligament-bone interface [11]. Another key factor noted is that these injuries have higher rates of secondary arthritis compared to those with a bony element as well [4].

Table 2 highlights several studies comparing open reduction and internal fixation (ORIF) to partial arthrodesis (PA) for pure ligamentous Lisfranc injuries. Although the number of studies remains limited, evidence shows that partial arthrodesis is favorable in terms of functional outcomes, economic advantages, and reoperation rates. Unstable Lisfranc injuries of a mixed osseous/ligamentous pattern remain a source of controversy regarding operative management. While it is clear that operative management is necessary and that the goal of anatomical reduction is vital, the method by which this is achieved remains subject to debate.

Several methods exist for ORIF in these cases, for example, the use of dorsal bridging plates and transarticular screws. The main studies identified comparing primary partial arthrodesis (PPA) to ORIF are highlighted in *Table 3*. This shows that current evidence is not strong enough to favor ORIF or PPA as a single treatment option. Therefore, the authors advocate that this decision should remain at the discretion of the individual case.

Table 2: Main studies comparing primary partial arthrodesis versus open reduction and internal fixation for purely ligamentous Lisfranc injuries.

Authors	Year	Number of Patients	Comments
Albright *et al*., [11]	2018	No patients, cost-effective Analysis	ORIF failed to show either functional or long term financial benefits. Therefore PPA recommended Treatment strategy.
Ly and Coetzee [12]	2006	21 ORIF 20 PA	PPA appeared to show better short and medium term outcomes than ORIF. PA lower rate of Secondary surgery and less pain at final follow up.
Kuo *et al*., [4]	2000	15 Total	PPA subgroup favourable outcomes compared to ORIF. Assessed using American Orthopaedic Foot And Ankle Midfoot Score (AOFAS), average 4 year follow up.

Table 3: Main studies comparing primary partial arthrodesis versus open reduction and internal fixation for unstable Lisfranc injuries

Authors	Year	Number of Patients	Comments
Henning *et al*., [13	2009	40	No statistically significant difference in functional outcome scores between PA and ORIF subgroups.
Sheibani-Rad *et al*., [14]	2012	193	Whilst AOFAS scores were higher in the PPA group versus ORIF; this was only measured up to 1 year
Smith [15]	2016	Systematic review	Whilst ORIF led to increased hardware removal, could not advocate a single procedure as superior as

In the case of our patient, we decided to proceed with operative management in the form of open reduction and internal fixation using cannulated screws. The surgery went well, with excellent results. At 5 months post-operation, the patient had returned to his baseline level of activity without any activity limitations or pain.

Our current study has several limitations. First, it is a case report, which is the weakest form of evidence. Second, preoperative lateral radiographic images were not available, and no MRI was performed to further assist in the diagnosis. Third, our patient requires further follow-up to determine his long-term outcome.

CONCLUSIONS

In this study, we reported a rather unlikely injury, where a healthy young man developed a Lisfranc injury of the left foot. Additionally, similar cases described in the literature were mentioned, along with some of the available literature to provide an overview of Lisfranc injuries. In conclusion, due to the ongoing debate between ORIF and primary arthrodesis, we recommend further studies on this subject, and for now, leaving the choice to the lead surgeon.

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