CASE REPORT

A rare Lisfranc-type injury involving dorsal dislocation of the intermediate cuneiform

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Accepted 10 July 2014

SUMMARY

Lisfranc injuries occur at the tarsometatarsal joint resulting from direct or indirect force to the midfoot. They account for only 0.2% of all fractures, with diagnoses easily missed on presentation. The resultant instability is often associated with significant morbidity to the patient. This report describes a Lisfranc injury sustained by a healthy gentleman who suffered indirect trauma to the foot when he fell from a standing height. Plain film radiographs and CT revealed dorsal dislocation of the intermediate cuneiform associated with fractures at the base of the third and fourth metatarsals. He underwent open reduction and internal fixation the following day. His Foot and Ankle Disability Index (FADI) score improved from 16.3 1 week postoperatively to 58.7 6 months postoperatively. This report describes a rare injury pattern resulting from indirect, low-energy trauma. We provide a guide to appropriate radiological imaging and evaluation in the assessment of these complex injuries.

BACKGROUND

A Lisfranc injury is one which involves disruption of the bones or ligaments forming the tarsometatarsal joint complex. They account for just 0.2% of all fractures with an incidence of approximately 1/55 000 of the population per annum.^{1–3} The eponym originates from Jacques Lisfranc (1790–1847), a field surgeon who performed an amputation through the tarsometatarsal joint for gangrene during the Napoleonic Wars.

Lisfranc injuries can result from direct injuries typically from high-energy blunt trauma to the dorsum of the foot such as a crush injury. Alternatively, they can be caused by indirect injuries where sudden rotational forces occur on a plantarflexed forefoot. These may be seen in the athletic population where the midfoot is restrained in a plantarflexed position, for example, windsurfing or snowboarding, and is vulnerable when torsional force is applied to the heel.

This case highlights how a seemingly innocuous mechanism can result in a rare, yet severe, Lisfranc injury pattern and emphasises the importance of accurate clinical and radiographic evaluation to avoid missed diagnoses.

CASE PRESENTATION

A 52-year-old gentleman presented to the A&E department with a right foot injury caused when he suffered a postmicturitional collapse and fell awkwardly from a standing height. He regained consciousness with a visible deformity of his right

foot, severe pain and the inability to weight bear. He was otherwise fit and well and his medical history revealed only previous discectomy for sciatica.

On examination, there was a visible deformity on the dorsal aspect of the right foot with a bony protrusion overlying the medial half of the tarsometatarsal joint complex. The foot was generally tender to palpation with a grossly limited range of movement at the ankle joint. It was a closed injury with no immediate compromise to the overlying skin and there was no neurovascular deficit. Ipsilateral knee movement was preserved and there was no evidence of other associated injuries.

INVESTIGATIONS

Non-stress plain radiographs, anteroposterior, oblique and lateral, were performed ([figure 1A–C](#)) and the patient was placed in a below-knee backslab on high elevation for comfort. The dorsally displaced intermediate cuneiform was diagnosed, as were suspected fractures at the base of the 3rd and 4th metatarsals. He underwent CT ([figure 2A–C](#)) to better visualise the fracture pattern and aid in surgical planning. This scan confirmed the presence of a comminuted fracture through the intermediate cuneiform with complete disruption of the intermediate cuneiform-metatarsal joint with malalignment of the joint spaces in keeping with a Lisfranc ligamentous disruption. There was also an undisplaced fracture through the navicular, medial cuneiform and bases of the third and fourth metatarsals.

TREATMENT

The following day he was taken to theatre for open reduction and internal fixation. Intraoperative stress views under radiographic imaging were undertaken. Initial reduction was achieved with a K-wire through the intermediate cuneiform to restore the length of the second ray. Additionally, a clamp and K-wire were applied between the medial cuneiform and second metatarsal base. For fixation, cannulated screws were used between the medial cuneiform and first metatarsal, medial cuneiform and second metatarsal, intermediate cuneiform and second metatarsal and lastly the lateral cuneiform and third metatarsal. K-wires were used for fixation of the fourth and fifth metatarsals to the cuboid ([figure 3](#)).

OUTCOME AND FOLLOW-UP

Postoperatively, he was placed in a below-knee backslab with high elevation for a further 72 h and was advised to remain non-weight bearing.

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To cite: Kalraiya AJ, Vanhegan I, Cheung A, et al. *BMJ Case Rep* Published online: [please include Day Month Year] doi:10.1136/bcr-2013-203364

Figure 1 (A–C) Initial plain film radiographs of the right foot showing a dorsally translated intermediate cuneiform and fractures to the base of the third and fourth metatarsals; anteroposterior (A), oblique (B) and lateral (C) views.

A review at 1 week revealed a satisfactory check X-ray and he was placed in a full cast. At 6 weeks, the reduction remained satisfactory and the K-wires were removed in clinic; he was placed in an air-cast boot and now allowed to partially weight bear. At 3 months, repeat X-rays showed that the fracture alignment was well maintained. He started full weight bearing at this stage and was referred to physiotherapy. At 6 months, the patient had returned to almost normal activities, his radiographs remained satisfactory and he was discharged from clinic (figure 4A, B).

DISCUSSION

Lisfranc injuries are not only rare but are also commonly undiagnosed with estimates of as many as 20% being initially

missed.^{4–6} It has also been recognised that the missed Lisfranc diagnosis is one of the leading causes for medical malpractice litigation against emergency medicine doctors and radiologists.⁷ Furthermore, Calder *et al*⁸ reported that 50% of patients with Lisfranc injuries had pursued legal claims 2 years from injury, with many of these patients having had poor outcomes.

A review of the literature reveals 17 documented cases of intermediate cuneiform dislocation in the vertical plane, 10 of which were dorsal,^{9–18} and 7 of which were plantar.^{19–25} While this case report also highlights a dorsal dislocation of the intermediate cuneiform, it is one of the few described cases to occur secondary to low-energy force and indirect trauma. Additionally, as it is generally considered that a large degree of force is required to produce a Lisfranc injury,¹⁴ the mechanism

Figure 2 (A–C) Three-dimensional CT reconstruction images of the right foot; anteroposterior (A), lateral (B) and posteroanterior (C) views.

Figure 3 Plain film radiograph of the right foot taken at 1 week postoperatively; anteroposterior view.

on injury sounded highly innocuous at presentation especially compared to the severity of the actual injury. Furthermore, this case report benefits from showing preoperative three-dimensional (3D) CT reconstruction images to better visualise the injury pattern.

In managing these injuries, the clinician must maintain a high index of suspicion from the history and mechanism of injury. After appropriate physical examination, radiological workup should include anteroposterior, lateral and medial oblique views. The importance of adequate films has long been acknowledged and was emphasised in 1933 in the paper by Clark *et al.*⁹ Three important anatomical relationships should be systematically assessed. The most important alignment is that of the second metatarsal and intermediate cuneiform. A step-off between these two bones is indicative of a Lisfranc disruption. Second, malalignment of the fourth metatarsal and cuboid can also be diagnostic of a Lisfranc injury. Finally, the medial cuneiform-second metatarsal space should be evaluated for diastasis or presence of the 'fleck sign', indicating avulsion of the Lisfranc ligament.

If a Lisfranc injury is not clearly seen on plain radiographs but suspected on clinical grounds, further imaging is required. We recommend obtaining full weight bearing views or stress views if the patient is unable to weight bear, which can even be obtained intraoperatively. However, if surgery is not definitively planned but an injury is still suspected clinically, then for further diagnostic accuracy CT remains the gold standard with 3D reconstruction aiding the visualisation of injury. In the event of subtle ligamentous injuries to the Lisfranc joint, MRI can be beneficial in assessing the potential injury of ligaments. Furthermore, Ulbrich *et al.*²⁶ reported that 3D SPACE MRI sequences with secondary reformations detect and distinguish ligaments better than conventional MRI sequences.

This case highlights the importance of maintaining a high clinical suspicion of a Lisfranc injury and investigating patients with appropriate imaging to aid early diagnosis. Timely management ensured that this patient made a good recovery as evidenced by his improvement in the Foot and Ankle Disability Index (FADI) score from 100 preoperatively (indicating no dysfunction) to 8.7 prior to discharge, 16.3 at 1 week and 58.7 6 months postoperatively.²⁷ His left limb remained asymptomatic throughout, meaning these scores were purely related to his injured right foot.

Figure 4 (A and B) Plain film radiographs of the right foot taken prior to discharge from clinic; lateral (A) and anteroposterior (B) views.

Learning points

- This case highlights how a seemingly innocuous mechanism can result in a rare, yet severe, Lisfranc injury pattern and emphasises the importance of accurate clinical and radiographic evaluation to avoid missed diagnoses.
- It has also been recognised that the missed Lisfranc diagnosis is one of the leading causes for medical malpractice litigation against emergency medicine doctors and radiologists,⁷ so in managing these injuries the clinician must maintain a high index of suspicion from the history and mechanism of injury.
- After appropriate physical examination, radiological workup should include anteroposterior, lateral and medial oblique views on plain film radiograph. Furthermore, this case report benefited from showing preoperative three-dimensional CT reconstruction images to better visualise the injury pattern.

Competing interests None.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

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