

# Tarsometatarsal Injury

by Evelyn C Weir, Thomas E Carline

## INTRODUCTION

A patient presented at a sports injury clinic with pain, swelling and bruising over the medial longitudinal arch. The diagnosis was found to be a tarsometatarsal injury. Tarsometatarsal fractures account for 0.2% of all fractures.<sup>1</sup> Accurate diagnosis of injuries of this type may be difficult,<sup>2</sup> and, although obvious injury will be detectable by radiographs, subtle subluxations may go undetected.<sup>3</sup> While the radiographic criteria for diagnosis have been detailed in many studies,<sup>3,5</sup> the *clinical* diagnosis of this type of injury has received little attention.<sup>3</sup> This illustrative case demonstrates the clinical findings evident to the podiatrist upon examination of the foot, which may aid in the diagnosis of the more subtle presentation of this type of injury.

## CASE HISTORY

A 31-year-old male teacher presented with a bruised, tender and painful right foot. He was a part-time soldier in the Territorial Army, and reported a fall that occurred while training on apparatus in an assault course. The particular apparatus was a see-saw walkway, which was 5 feet at its maximum height. He climbed the resting arm of the seesaw toward the pivotal point and as he crossed the centre he lost his balance, stepping off to the right and falling approximately 4 feet. Although in some discomfort, he completed the course, but remembered experiencing extreme pain whilst descending the following obstacle, a scramble net.

## EXAMINATION FINDINGS

The passive pronation abduction stress test was painfully positive, and a bilateral equinus foot-type was noted. Weightbearing and non-weightbearing anteroposterior and lateral oblique radiographs showed evidence of subluxation of the metatarsocuneiform joint, with hairline fracture of the second metatarsal base. It has been suggested that such a fracture signifies disruption of the Lisfranc ligament,<sup>5</sup> and thus midfoot instability. Examination revealed the foot was neurovascularly intact, with severe bruising of the area around the medial longitudinal arch coupled with diffuse bruising on the dorsal surface of the foot around the metatarsocuneiform joints.

## TREATMENT

Following interdisciplinary discussion, treatment was by open reduction internal fixation and a short weightbearing cast. Traditionally, K-wires have been used for fixation, but problems in maintaining anatomic reduction have been described.<sup>4</sup> Consequently, the use of 3.5mm cortical screws is recommended.<sup>3</sup> A cancellous screw was placed across the first tarsometatarsal joint, and a second screw from the first cuneiform to the second metatarsal. The cast was removed at

7 weeks, and progressive weightbearing continued until the wires were removed at 16 weeks. A permanent soft arch support was inserted into the footwear, and 6 months later the patient is continuing rehabilitation with good results.

## DISCUSSION

The tarsometatarsal joint can be described as an articulation between the midfoot and the forefoot, the medial-to-lateral line that traverses between the three cuneiforms and cuboid proximally and the bases of the five metatarsals distally. The base of the second metatarsal is described as the keystone, and is held between the medial and lateral cuneiforms, thus limiting frontal and transverse plane motion. The stability of the joint depends on the ligaments, which limit motion. The dorsal ligaments are generally considered to be weaker than the plantar ligaments.

The misdiagnosis of a tarsometatarsal subluxation is common,<sup>6</sup> and as many as 20% of cases may be overlooked.<sup>1</sup> Misdiagnosis may lead to grave chronic instability,<sup>6</sup> and late midfoot collapse is a common result of the untreated injury along with pain and major debilitation.<sup>2,5,7</sup> There is often a delay between injury and diagnosis, with up to 13 years post-injury discovery being reported.<sup>8</sup>

In this case, bruising was a clue to diagnosis. Ross *et al* have described the plantar ecchymosis sign (PES), which can be seen as a clearly delineated stellate ecchymotic area on the plantar surface of the foot.<sup>2</sup> The PES was present in this case. In the event of non-remarkable radiographs, the evidence of the PES should encourage the podiatrist to further evaluate the history of the injury.

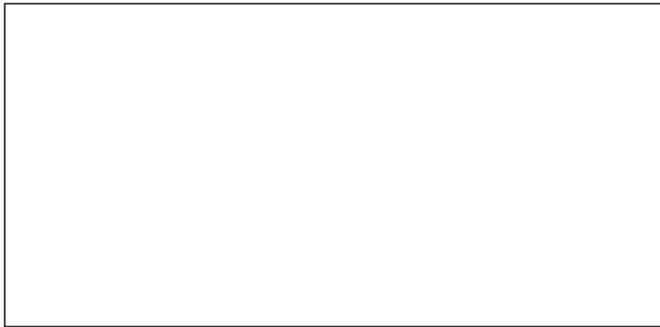
Local swelling of the dorsal surface of the foot was present in this case, and may be regarded as warranting further evaluation.<sup>5</sup> Passive pronation that elicits pain is also an indicator and appears to be specific for tarsometatarsal injuries.<sup>2,3,5</sup>

The patient in the present study fell from a height, which can be a further indicator as tarsometatarsal injury is often associated with falls and is a common fall injury.<sup>5,9-11</sup> Radiographic evidence is crucial but often inconclusive, with computer tomography used for equivocal cases.<sup>3,9</sup> If there has been a long period between injury and radiological examination there may be a spontaneous partial or complete relocation of joint disruption, rendering recognition difficult.<sup>5</sup> Even when fractures are radiographically evident,<sup>12</sup> there is no correlation between results of radiographic assessment and the severity of the individual's symptoms.

The patient in this case had injury to the second metatarsal. This is accepted to be the most common tarsometatarsal injury,<sup>11,13</sup> and may be due to the ligamentous arrangement of the tarsometatarsal joint, as there is no ligamentous attachment between the first and second metatarsal base (*Figures 1, 2*).<sup>5</sup> The dorsal ligaments around this joint are



**Figure 1** Dorsal view of ligamentous support at the tarsometatarsal line (adapted from Ref 5).



**Figure 2** Plantar view of ligamentous support at the tarsometatarsal line (adapted from Ref 5).

weaker than the plantar ligaments, and this may go some way towards explanation of the dorsal metatarsal dislocation found in association with indirect injury. In addition to the ligamentous support, the plantar aspect of the tarsometatarsal joint is stabilised in part by the plantar fascia, the intrinsic muscles and the plantar tendons, while the dorsal aspect does not benefit from similar structures.<sup>14</sup>

It is apparent that there is a subtle spectrum of injury that may affect the tarsometatarsal joint. The podiatrist should therefore be aware of the clinical features of this type of injury, and combine subjective symptoms and objective signs with a detailed history, particularly inquiring about falls from height. Unusual cases of tarsometatarsal dislocation, however, have illustrated that height need not be a factor.<sup>14,15</sup> Tarsometatarsal injury and fracture has been reported in a 42-year-old female who first felt pain while depressing the brake pedal in her car.<sup>14</sup> A further case details an 82-year-old male who presented with a painful, swollen ecchymotic midfoot and no history of a recent fall.<sup>15</sup> The spontaneous dislocation of the non-neuropathic tarsometatarsal joint in this case was attributed to osteoporosis and ligamentous changes. These two cases should be considered atypical in the non-neuropathic foot, as the majority of discussions in recent literature do implicate a fall of some type as a factor.<sup>5</sup> The subjective self-report relies on memory, and it has been demonstrated that the presentation of symptoms may take some time and may not be immediately connected to a previous fall.

The tarsometatarsal joint is a complex articulation of midfoot and forefoot. Tarsometatarsal injuries are both complex and diverse in pattern, and misdiagnosis or delays in treatment can cause severe morbidity.<sup>14</sup> In the presence normal x-ray results, PES, a swollen midfoot and a history suggestive of a tarsometatarsal injury, the podiatrist must seek further evaluation.

## ACKNOWLEDGEMENTS

The authors wish to extend grateful thanks to Mr SW McCreath FRCS, Consultant Orthopaedic Surgeon and Clinical Director of Orthopaedics, Southern General Hospital NHS Trust, Glasgow, for his support and helpful comments on an earlier draft of this manuscript.

## REFERENCES

- Rosenberg GA, Patterson BM, Tarsometatarsal fracture-dislocation. *Am J Orthop*, **2**, pp7-16, 1995.
- Ross G, Cronin R, Hauzenblas J, *et al*, Plantar ecchymosis sign: a clinical aid to diagnosis of occult Lisfranc tarsometatarsal injuries. *J Orthop Trauma*, **10**, pp119-122, 1996.
- Myerson M, The diagnosis and treatment of injuries to the Lisfranc joint complex. *Orthop Clin North Am*, **20**, pp655-664, 1989.
- Arntz CT, Veith RG, Hansen ST, Fractures and fracture dislocation of the tarsometatarsal joint. *J Bone Joint Surg*, **70**, pp173-181, 1988.
- Early JS, Bucholz RW, Lisfranc injuries and their management. *Current Orthop*, **10**, pp169-173, 1996.
- Englanoff G, Anglin D, Hutson HR, Lisfranc fracture-dislocation: a frequently missed diagnosis in the emergency department. *Ann Emerg Med*, **26**, pp229-233, 1995.
- Felder-Johnson KL, Murdoch DP, McGanity P, Lisfrancs fracture dislocation. A literature review and case presentations of tarsometatarsal joint injuries. *Clin Podiatr Med Surg*, **12**, pp565-568, 1995.
- Faciszewski T, Burks RT, Manaster BJ, Subtle injuries of the Lisfranc joint. *J Bone Joint Surg*, **72**, pp1519-1522, 1990.
- Brown DD, Gumbs RV, Lisfranc fracture-dislocations: report of two cases. *J Natl Med Assoc*, **83**, pp366-369, 1991.
- Vuori JP, Aro HT, Lisfranc joint injuries: trauma mechanisms and associated injuries. *J Trauma*, **35**, pp40-45, 1993.
- Trevino SG, Kodros S, Controversies in tarsometatarsal injuries. *Orthop Clin North Am*, **26**, pp226-232, 1995.
- Brunet JA, Wiley JJ, The late results of tarsometatarsal joint injuries. *J Bone Joint Surg*, **69**, pp437-440, 1987.
- Mantas JP, Burks RT, Lisfranc injuries in the athlete. *Clin Sports Med*, **13**, pp719-730, 1994.
- Kaplan JD, Karlin JM, Scurran BL, *et al*, Lisfranc s fracture-dislocation. *JAPMA*, **81**, pp531-537, 1991.
- Spinner S, McDonald TD, Lisfranc s fracture-dislocation. An unusual case presentation. *JAPMA*, **84**, pp82-85, 1994.

## Correspondence to:

Evelyn C Weir, Lecturer in Podiatry, Department of Podiatry and Radiography, Queen Margaret College, Leith Campus, Duke Street, Leith, Edinburgh EH6 8HF. Tel: 0131 317 3485; fax: 0131 317 3308; email: E.Weir@leith.qmced.ac.uk