



Isolated floating Second Metatarsal: A rare Variant of Lisfranc Injury

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ABSTRACT

Isolated Bipolar dislocation of second metatarsal is a rare injury. Second metatarsal joint is stabilized by bony and soft tissue restraint that requires significant trauma to produce a dislocation. We herein report an isolated floating second metatarsal while discussing the mechanism of injury and treatment strategies.

KEYWORDS

Floating Metatarsal; Lisfranc injury; Isolated Bipolar dislocation

INTRODUCTION:

The isolated floating second metatarsal is an extremely rare type of injury in which the second metatarsal is dislocated both proximally and distally. Associated injuries and especially metatarsal fracture appear to be rules rather than exceptions. We here are reporting bipolar dislocation second metatarsal without associated other foot injuries, makes an exceptional case. When examining a patient with metatarsophalangeal joint injury, one should always look for injury at the tarsometatarsal joint and vice versa, because various concomitant injuries are possible and misdiagnose can cause long-term secondary disability. Leibner et al first described this unique entity in 1997 (1). Since the first description of this injury there have been only a few case reports in the literature, and this entity remains quite rare. In all the cases reported until now (1-4), there were associated fractures of the other metatarsals. We herein report an exceptional case in which the only injury was dislocation of the second metatarsal both proximally and distally, without any metatarsal fractures— isolated floating second metatarsal.

CASE REPORT:

A 34-year-old male patient came to trauma center after a road traffic accident for an injury of his left foot. On examination, there was swelling, tenderness and on the dorsomedial aspect of the midfoot. There was an obvious deformity with the head of the second metatarsal palpably prominent on the dorsomedial aspect of the foot and a gap felt between phalanx and metatarsal head and base of second metatarsal felt dorsomedially. Radiographs showed lateroplantar dislocation of the metatarsophalangeal joint and dorsal dislocation of the base of second metatarsals (fig 1). Under general anesthesia, closed reduction first on the proximal side was possible but difficult and very unstable. Through a dorsal incision, second tarsometatarsal joints were explored. The reduction appeared unstable, so internal fixation using Kirschner wires was performed. The metatarsophalangeal joint was reduced by closed manipulation consisting in traction with a dorsomedial force direction applied to the base of the proximal phalanx. This was stable and below knee cast was applied for 6 weeks. Kirschner wires were then removed and full weight bearing was permitted. The patient was able to resume his daily activities at 8 weeks and full sporting activities at 4 months. At 2 years follow-up patient have good clinical and functional results. Informed consent was taken from the patient for publication.

Figure 1. Preoperative radiograph showing latero-plantar dislocation of the metatarsophalangeal joint and dorsal dislocation of the base of second metatarsals



Figure 2. Line Diagram showing mechanism of injury in our case with dorsomedial displacement of base of second Metatarsal and lateroplantar dislocation of head of second Metatarsal under the shaft of third Metatarsal

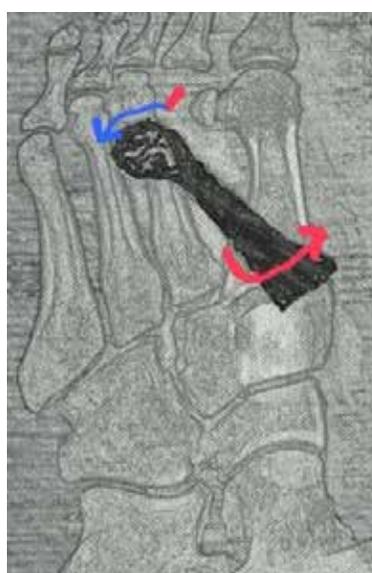


Figure 3. Postoperative radiograph tarsometarsal joint after reduction was unstable so fixed with K-wire and metatarsophalangeal joint was stable after reduction



DISCUSSION:

The tarsometatarsal articulation consists of three functional units, previously referred to as columns [7]. The medial column, formed by the base of the first metatarsal and the medial cuneiform, allows approximately 3.5 mm of dorsal plantar movement. The second metatarsal and the middle cuneiform with the third metatarsal and lateral cuneiform form the middle column. The second metatarsal is held rigidly between the bases of the first and third metatarsals; it has minimal sagittal movement, approximately 0.6 mm, and is dovetailed to articulate with these metatarsals and the surrounding cuneiforms. The lateral column is formed by the fourth and fifth metatarsals and the cuboid. It moves considerably more than does the medial or middle column in both the sagittal and horizontal planes, to 13 mm in the sagittal plane, as well as in pronation and supination [8].

Fracture and dislocation may occur secondary to either direct or indirect forces. With indirect trauma, the forces produced are generally longitudinal and are applied to the foot with elements of torque, rotation and compression. The foot is usually plantar flexed at the time of impact, rupturing the weaker dorsal constraints of the tarsometatarsal joint. The dislocation is complete when the base of the metatarsal fractures or the plantar capsuloligamentous structures rupture. The foot generally pronates with impact, and the added abduction force on the forefoot produces additional lateral displacement [9].

One of the mechanisms of Lisfranc joint injuries is axial load-

ing associated with compression forces [5]. Dislocations of the lesser metatarsophalangeal joints are produced by axial forces usually during hyperextension of the toes. This type of trauma is not common and reduction of the dislocation of these joints is easily achieved with traction, dorsiflexion, and plantarflexion, but it has been reported that closed reduction is successful in 50% of cases [5].

Simultaneous dislocation of the tarsometatarsal and metatarsophalangeal joints in an isolated second ray is extremely rare, and to the best of our knowledge, only one case reported [6]. English first reported an association between Lisfranc joint and metatarsophalangeal joint dislocations [13]. He described a patient who had concomitant dislocations of the tarsometatarsal joint of a ray and the metatarsophalangeal joint of the adjacent ray. English used the term "linked toe metatars" to describe the condition and proposed the theory that traction on the soft tissue, especially the first dorsal interosseous muscle after dislocation of the tarsometatarsal joint, causes the metatarsophalangeal joint to dislocate. He based his theory on the observation the reduction of the metatarsophalangeal joint was impossible before reduction of the tarsometatarsal joint.

However, the opposite has also been proposed [8]. An alternative theory is that most metatarsophalangeal dislocations are caused by axial loading during dorsiflexion of the toes and if axial loading continues with plantarflexion of the foot, the tarsometatarsal joint will dislocate as well.

Another similar case report is by Mobarake et al. [6], but that case also had third tarsometatarsal dislocation. In our case metatarsophalangeal joint was not reducible before tarsometatarsal joint, so we had to go for open reduction of tarsometatarsal joint as closed reduction was not possible due to soft tissue interposition. We herewith agree with English theory.

Though Mobarake et al. [6] noted that the metatarsophalangeal dislocation was easily reducible before the tarsometatarsal joint which disagrees with English's theory. Either of these theories could have been the mechanism and still remains controversial issue. Associated injuries occur in 32–68% of Lisfranc joint fractures and dislocations [11]. Our case no associated injuries were found, which makes it an exceptional case. At 2 years follow-up of the patient have good clinical and functional results.

CONCLUSION: Isolated Bipolar dislocation of second metatarsal is a rare injury. Second metatarsal joint is stabilized by bony and soft tissue restraint that requires significant trauma to produce a dislocation. One single theory is not conclusive of mechanism of injuries. It requires sound clinical examination to plan strategy for reduction and fixation.

KEY MESSAGE: Injury to foot has complex mechanism and requires sound clinical examination, strong clinical suspicion and radiological examination to rule out these injuries and avoid long term complications as degenerative arthritis.

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Conflict of Interest: Nil

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