

Case Report

Isolated medial ray dislocation at the naviculocuneiform joint with intra-articular navicular and secondary metatarsal head fractures

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ABSTRACT

Medial dislocation of the first ray at the naviculocuneiform joint is a relatively unusual injury. Early diagnosis and expeditious treatment, by closed or open reduction with transarticular stabilization, are necessary for recovery of normal function. Here, we report a case of medial ray dislocation at the naviculocuneiform joint with intra-articular navicular and secondary metatarsal head fractures in a 22-year-old man, caused by a stumble when running with the right foot in plantar flexion. The injury was treated by open reduction, internal fixation with Kirschner wires, and navicular bone grafting. Four years after injury, the patient showed no discomfort, functional limitation, or degenerative osteoarthritis of the midfoot.

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1. Introduction

Isolated medial dislocation of the medial cuneiform is an unusual injury. Anatomic reduction is recommended to ensure the best functional result and avoid potential degenerative change in the future.^{1,2} The few reported cases of this injury were treated by closed or open reduction, with or without fixation.^{1–9} These cases had two presentations: mainly, pure dislocation of the first ray, and infrequently, pure dislocation of the medial cuneiform at both the navicular and the first metatarsal base articulations. Here, we describe a case of medial ray dislocation at the naviculocuneiform joint and intra-articular navicular and secondary metatarsal head fractures treated by open reduction, internal fixation, and bone grafting.

2. Case report

A 22-year-old male student came to our emergency department from another hospital with a painful, swollen right foot and inability to walk using the injured limb. He had stumbled when running with the right foot in plantar flexion. Clinical examination revealed a swollen (Fig. 1), tender midfoot without evidence of an open wound or neurovascular compromise. Radiographs showed

medial dislocation of the first ray at the medial naviculocuneiform and medial intercuneiform joints with minimal fractures of the distomedial aspects of the navicular and secondary metatarsal head (Fig. 2). No other osseous injuries of the foot and ankle were noted. On the next day, closed reduction with fluoroscopic control under spinal anesthesia was unsuccessful. After exposure by a dorsomedial approach, the medial cuneiform was noted to be subluxated dorsomedially on the crushed articular surface of the navicular. The depressed articular surface was restored with bone graft substitutes. Kirschner wires were used to maintain the reduction (Fig. 3). A posterior molded splint was first applied and replaced with a plaster short-leg cast after 7 days. The cast was removed 1 month later. The patient was allowed to begin a progressive weight-bearing program and active range of motion of the foot and ankle 2 months later. The wires were removed 8 months thereafter. Four years after injury, degenerative osteoarthritis of the midfoot was absent (Fig. 4), and the patient had no discomfort or functional limitation.

3. Discussion

Cuneiform injuries occur more often in combination with tarsometatarsal joint injuries. Isolated cuneiform lesions are rare and have been sporadically reported.^{1,8} The mechanism of injury is similar to that described for isolated tarsometatarsal joint injuries, involving an axial force on a plantar flexed foot or direct crush injury of the dorsum of the foot. A twisting injury of the forefoot

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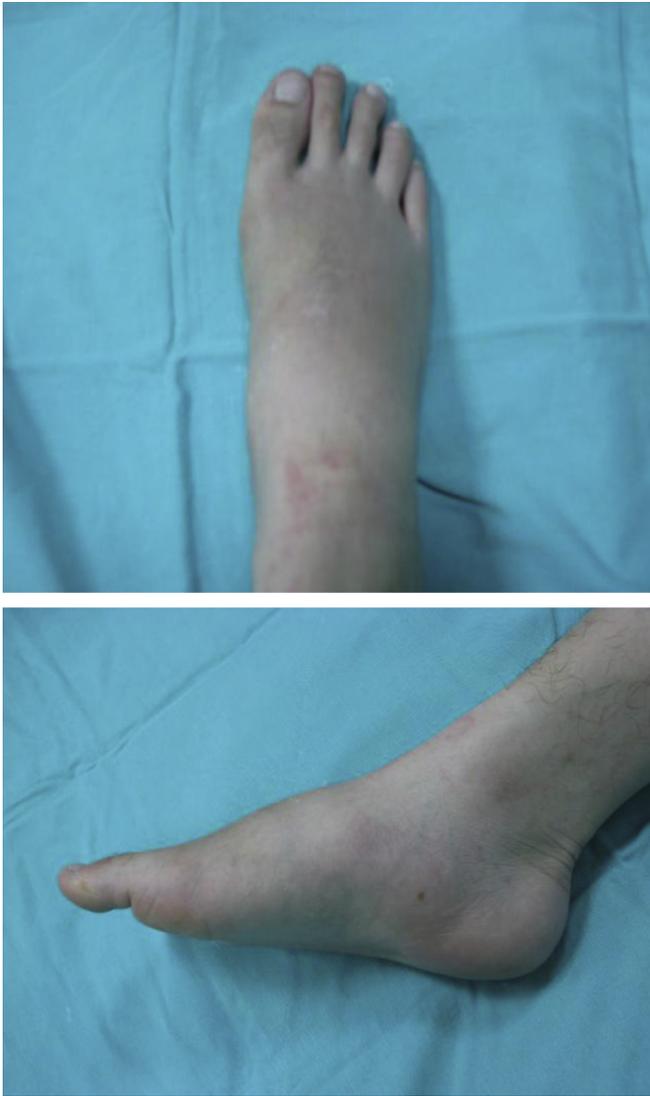


Fig. 1. Clinical photographs show the swollen right midfoot.

during sports participation or a fall can cause shortening of the medial ray because of disruption of the intercuneiform ligaments. The indirect mechanism of axial loading of a plantar flexed foot, which directs the force vector along the first ray, causes an associated intra-articular impaction fracture of the medial naviculocuneiform joint.^{3,4} The mechanism of injury with medial column disassociation may be a combination of both abductory bending forces and axial load upon the first ray.⁵ With increased rigidity and an abduction force, the first ray acts as a “battering ram” when the axial load is transmitted proximally and the first metatarsal–cuneiform complex releases medially. During dislocation, the medial cuneiform impacts the distal osteochondral surface of the navicular, causing an impaction fracture of the navicular.⁴ Therefore, the mechanism of injury in the current case may have been axial loading of the plantar flexed right foot and the subsequent direction of the force vector along the first and secondary rays in combination with an abductory bending force on the first ray.

Closed reduction of the medial cuneiform can normally be performed manually by applying traction to the hallux, with direct pressure on the dislocated cuneiform by using forceps.¹ In some instances, the tibialis anterior tendon may obstruct closed reduction; therefore, open exploration of the joint may be necessary.⁷



Fig. 2. Plain radiographs taken at the initial visit. (A) Antero-posterior and oblique radiographs reveal incongruity of the medial naviculocuneiform and medial intercuneiform joints with minimal fractures of the distomedial aspects of the navicular and secondary metatarsal head. (B) Weight-bearing lateral radiograph reveals subluxation of the first ray.

Anatomic reduction and stabilization of the medial arc are recommended to ensure the best functional outcome and avoid potential degenerative osteoarthritis.^{1,2} Nonanatomic reduction or continued instability should be treated with open reduction and



Fig. 3. Postoperative antero-posterior and oblique radiographs showing internal fixation with three Kirschner wires and navicular bone grafts.

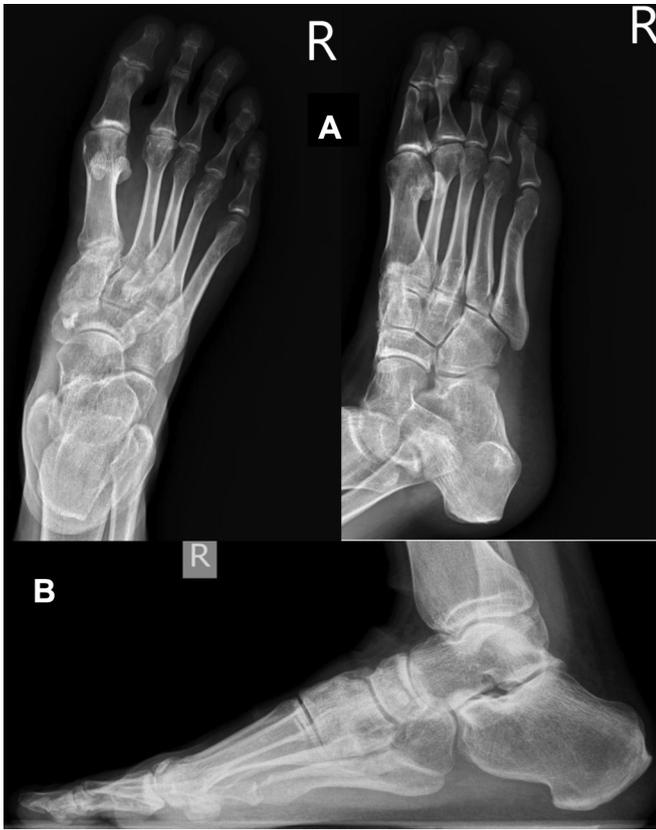


Fig. 4. Plain radiographs taken 4 years after the injury. (A) Antero-posterior and oblique radiographs reveal no degenerative osteoarthritis of the midfoot, no osteonecrosis of the navicular bone graft substitutes *in situ*, and mild collapse of the secondary metatarsal head. (B) Full weight-bearing lateral radiograph reveals preservation of the medial arch and congruity of the naviculocuneiform joint without degenerative osteoarthritis or collapse.

pin or screw fixation into adjacent stable structures.¹⁰ Although screw fixation is stronger and allows a more stable construct, the combination of Kirschner wires assembly and cast immobilization without weight bearing was adequate to maintain anatomic reduction and good stability resulted in the current case.

Some authors advocate arthrodesis when more than 50% of the joint surface is involved or when bone loss is apparent after reduction, but others reported worse results after performing initial arthrodesis for acute Lisfranc fracture-dislocation.^{1,10,11} Arthrodesis of the foot is usually well endured by the patient and causes relatively little functional deterioration when

performed in the appropriate position.¹ The decision to avoid initial arthrodesis in the current case was a cautious one, and the clinical outcome was satisfactory. If the clinical outcome deteriorates, arthrodesis can be performed as a salvage procedure at a later date.^{2,11}

Anteroposterior, lateral, and oblique radiographs of the foot are usually advocated for complete evaluation of such injuries.¹ Additional stress views, including weight bearing and a comparative view with the other foot, should be taken if there is any doubt.¹² In the normal anteroposterior view, the navicular overlaps the three cuneiforms equally and no gap exists between the bases of the first two metatarsals. In the normal lateral view, all the cuneiforms overlap and lie directly in line with the navicular; the metatarsal shafts also overlap and are parallel to each other.^{8,9,12} In our case, the lesion of navicular fracture was clearly visible on plain radiographs, but the marginal impaction fracture pattern was found during surgery. We recommend that CT scans of the midfoot be used for all midfoot dislocations to more clearly define the extent of the injury, even though the lesion was clearly visible on plain radiographs.

References

1. A.M. Hidalgo-Ovejero, S. Garcia-Mata, A. Ilzarbe-Ibero, S. Gozzi-Vallejo, M. Martinez-Grande. Complete medial dislocation of the first cuneiform: a case report. *J Foot Ankle Surg* 44 (2005) 478–482.
2. S.A. Aitken, N. Shortt. Dorsomedial fracture dislocation of the first ray and medial cuneiform: a case report. *J Foot Ankle Surg* 51 (2012) 795–797.
3. J.R. Lynch Sr., L.A. Cooperstein, A.M. DiGioia. Plantar medial subluxation of the medial cuneiform: case report of an uncommon variant of the Lisfranc injury. *Foot Ankle Int* 16 (1995) 299–301.
4. S. Grambart, S. Patel, J.M. Schubert. Naviculocuneiform dislocations treated with immediate arthrodesis: a report of 2 cases. *J Foot Ankle Surg* 44 (2005) 228–235.
5. P.R. Cain, D. Seligson. Lisfranc's fracture-dislocation with intercuneiform dislocation: presentation of two cases and a plan for treatment. *Foot Ankle* 2 (1981) 156–160.
6. D.M. Dines, S.J. Hershon, N. Smith, P. Shelton. Isolated dorsomedial dislocation of the first ray at the medial cuneonavicular joint of the foot: a rare injury to the tarsus. A case report. *Clin Orthop Relat Res* 186 (1984) 162–164.
7. J.P. Compson. An irreducible medial cuneiform fracture-dislocation. *Injury* 23 (1992) 501–502.
8. S. Gopal-Krishnan. Dislocation of medial cuneiform in injuries of tarsometatarsal joints. *Int Surg* 58 (1973) 805–806.
9. M.G. Schiller, R.D. Ray. Isolated dislocation of the medial cuneiform bone—a rare injury of the tarsus. A case report. *J Bone Joint Surg Am* 52 (1970) 1632–1636.
10. J.J. Reid, J.S. Early. Fractures and dislocations of the midfoot and forefoot. In: R.W. Bucholz, C.M. Court-Brown, J.D. Heckman, P. Tornetta III (Eds.). *Rockwood and Green's Fractures in Adults*. seventh ed., Lippincott, Williams and Wilkins, Philadelphia; 2010. pp. 2110–2142.
11. T. Mulier, P. Reynders, G. Dereymaeker, P. Broos. Severe Lisfrancs injuries: primary arthrodesis or ORIF? *Foot Ankle Int* 23 (2002) 902–905.
12. B.P. Levine, R. Stoppacher, T.K. Kristiansen. Plantar lateral dislocation of the medial cuneiform: a case report. *Foot Ankle Int* 19 (1998) 118–119.