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Dorsal Bridge Plate and Screw Fixation for Lisfranc Fracture in a 30-Year-Old Male: A Superior Alternative to K-Wire Fixation

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Abstract
Background: Lisfranc injuries are rare but serious mid-foot trauma involving the tarsometatarsal (TMT) joints. Precise anatomical reduction and stable fixation are crucial to prevent chronic dysfunction. Historically, K-wire fixation was standard, but newer studies support plate and screw constructs for better stability and outcomes.
Case Presentation: A 30-year-old male sustained a Lisfranc fracture-dislocation with associated second metatarsophalangeal joint facture dislocation and third metatarsal shaft fracture after a motor vehicle accident. Surgical intervention was indicated.
Methods: Open reduction and internal fixation were performed using a dorsal bridge plate and transarticular screw for the Lisfranc injury and K-wires for the additional fractures. This method ensured accurate reduction, stable fixation, and early mobilization, overcoming the common drawbacks of K-wire fixation such as limited stability and the need for implant removal.
Results: Postoperative imaging confirmed anatomical alignment and stable hardware placement. The patient had uneventful healing, early mobilization, and excellent recovery, achieving an American Orthopaedic Foot and Ankle Society (AOFAS) mid-foot score of 85 at 12 months. No hardware complications were noted.
Conclusion: Dorsal bridge plating with screw fixation offers distinct advantages over K-wires, including greater stability, reduced cartilage injury risk, and no need for secondary surgery. This technique presents an effective option for young active adults requiring Lisfranc fracture fixation.

Keywords: Lisfranc injuries, tarsometatarsal (TMT) joints, dorsal bridge plate, transarticular screw, open reduction and internal fixation (ORIF), early mobilization

Introduction

Lisfranc fracture-dislocations involve injuries to the bases of all five metatarsals, their articulations with the four distal tarsal bones, and disruption of the Lisfranc ligament complex [1]. These fractures are relatively uncommon, accounting for about 0.2% of all fractures, with nearly 20% initially misdiagnosed [2]. The complex midfoot anatomy and the Lisfranc joint's key role in maintaining weight-bearing and stability make these injuries particularly challenging. Failure to recognize or treat them appropriately can lead to chronic pain, deformity, instability, and post-traumatic arthritis, markedly impairing function and quality of life.

The Lisfranc joint complex includes articulations between the medial cuneiform and first metatarsal, intermediate cuneiform and second metatarsal, lateral cuneiform and third metatarsal, and the cuboid with the fourth and fifth metatarsals. Its stability primarily relies on the Lisfranc ligament, extending from the medial cuneiform to the base of the second metatarsal, which acts as the principal stabilizer of the midfoot. Management typically involves open reduction and internal fixation (ORIF) to restore anatomical alignment and ensure joint stability. Historically, percutaneous K-wire fixation has been used but offers limited stability and higher infection risk. Dorsal bridge plating provides rigid fixation across the tarsometatarsal joints, preserves articular surfaces, maintains reduction, and allows early mobilization.

We report a case of a 30-year-old male with a Lisfranc fracture-dislocation managed successfully with ORIF using a dorsal bridge plate and a transarticular screw, with favorable clinical recovery consistent with current evidence supporting dorsal plating.

Case Report

A 30-year-old male presented to the emergency department following a high-energy road traffic accident, during which his left foot sustained axial loading and twisting forces. He complained of severe midfoot pain, swelling, and an inability to bear weight. On clinical examination, there was marked swelling and tenderness over the midfoot and forefoot region. A visible dorsal prominence over the medial column suggested a joint disruption. Capillary refill and distal pulses were intact, and no neurovascular deficit was observed.

Initial anteroposterior, oblique, and lateral radiographs of the left foot demonstrated diastasis of more than 2 mm between the first and second metatarsal bases, misalignment of the second metatarsal base with the medial cuneiform, and the presence of a fleck sign indicative of Lisfranc ligament avulsion. Based on these findings, the injury was classified as a Myerson Type B2 Lisfranc fracture-dislocation [3]. Associated injuries included fracture dislocation of the second metatarsophalangeal joint and a fracture of the third metatarsal shaft.

Fig 1: Index trauma causing left lisfranc fracture dislocation with second metatarsophalangeal joint fracture dislocation and third metatarsal shaft fracture

After adequate limb elevation and soft-tissue optimization, the patient underwent open reduction and internal fixation. With the patient in the supine position, the knee flexed, and the ankle in neutral alignment, a 5 cm longitudinal dorsal incision was made through the first dorsal web space between the first and second metatarsals, extending towards the midtarsal region. The dorsalis pedis artery and deep peroneal nerve were identified, protected, and gently retracted. The superficial peroneal nerve branches were also preserved. Reduction of the Lisfranc joint was achieved under fluoroscopic guidance using Kirschner wires.

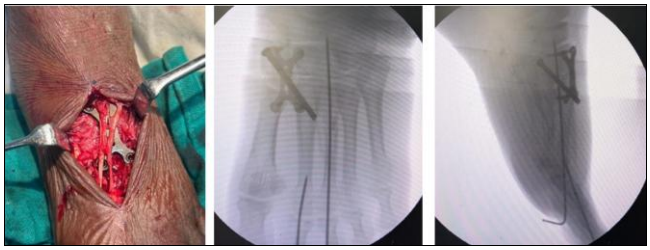

Fig 2: Intraoperative image showing dorsalis pedis artery and fluroscopic images

A low-profile 2.4 mm dorsal locking plate was contoured and applied across the first and second tarsometatarsal joints, taking care to avoid articular cartilage surfaces. Screws were placed extra-articularly to restore the alignment of the medial column. An additional oblique "home-run" screw was inserted from the medial cuneiform to the base of the second metatarsal to enhance medial column stability. The dislocated second metatarsophalangeal joint and the third metatarsal shaft fracture were reduced and stabilized with Kirschner wires.

Fig 4: Postoperative radiograph (Ap/lat)

The wound was thoroughly irrigated and closed in layers, followed by application of a below-knee posterior slab. Postoperatively, intravenous antibiotics were administered for 48 hours, and the patient was maintained on non-weight-bearing mobilization for six weeks. Partial weight-bearing was initiated at eight weeks after radiographic confirmation of maintained reduction. At six months, the patient achieved pain-free ambulation with restoration of the normal foot contour. At one-year follow-up, he had returned to his pre-injury occupation. The AOFAS Midfoot Score was 85, indicating excellent functional outcome with minimal residual discomfort.

Discussion

Lisfranc fracture-dislocations represent a complex injury continuum that critically undermines the structural integrity and functional biomechanics of the midfoot. Achieving precise anatomical reduction and rigid internal fixation is paramount to restore normal load transmission and prevent long-term sequelae including post-traumatic arthritis, persistent pain, progressive deformity, and functional disability. The intricate osseoligamentous configuration of the tarsometatarsal (TMT) joints poses considerable technical challenges for the surgeon striving for perfect congruity and durable stability [1]. Dorsal bridge plating has emerged as a preferred fixation modality owing to its low-profile, extra-articular design that preserves the articular surface, enhances construct stiffness, and promotes biological healing through multi-column stabilization [4]. This sustained stability is critical in preventing late collapse or secondary malalignment, both of which correlate strongly with suboptimal functional outcomes.

From a clinical perspective, results with dorsal bridge plating are encouraging. American Orthopaedic Foot & Ankle Society (AOFAS) midfoot scores frequently exceed 80, indicative of near-normal gait mechanics, significant pain relief, and restoration of pre-injury occupational and

recreational capacities. These outcomes align with the present young patient's postoperative course. A recent meta-analysis reported lower incidences of implant failure, symptomatic hardware, and wound complications with dorsal plating versus screw fixation, while underscoring the necessity for careful soft-tissue preservation to reduce infection risk [5].

Despite generally favorable results, 10–20% of patients in extended follow-up develop radiographic degenerative changes suggestive of post-traumatic arthritis. Such changes often relate to initial injury severity or residual malalignment, emphasizing the need for serial imaging surveillance even when patients remain asymptomatic. Decisions regarding hardware removal must balance symptomatic relief against the inherent risks of re-operation [6]. Timing of definitive fixation remains a key surgical variable affecting final outcomes. Early intervention within two weeks is optimal, limiting soft tissue compromise and facilitating anatomical restoration. In cases with extensive swelling or open injury, a staged protocol—comprising initial temporary external fixation followed by delayed open reduction and internal fixation (ORIF) after resolution of soft tissue insult—has demonstrated superior outcomes with reduced wound morbidity [7].

Primary arthrodesis of the medial column is a strategic alternative in purely ligamentous injuries or chronic presentations, with evidence suggesting it reduces the need for re-intervention and mitigates arthrosis progression. However, it sacrifices tarsometatarsal joint mobility. In young patients with combined osseous and ligamentous injury—such as the present case—ORIF with dorsal bridge plating preserves midfoot motion, maintains flexibility, and facilitates superior functional adaptation over time [8].

Conclusion

Dorsal bridge plate and screw fixation offer a reliable and anatomically favorable technique for Lisfranc fracture-dislocations, surpassing traditional K-wire fixation. This method preserves articular cartilage and maintains joint congruity, significantly lowering the likelihood of post-traumatic arthritis and enhancing long-term functional outcomes. Clinical evidence indicates improved AOFAS midfoot scores, superior radiological maintenance of reduction, and a decreased incidence of hardware-related complications compared to K-wires. Additionally, earlier mobilization facilitated by bridge plating leads to reduced joint stiffness and accelerated rehabilitation. Collectively, these findings support the adoption of dorsal bridge plating as a superior stabilization strategy for Lisfranc injuries requiring robust fixation and joint preservation. Future longitudinal studies are warranted to confirm the sustained benefits of this approach.

Conflict of Interest

Not available

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Not available

Reference

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