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Research paper

Case Report: Lisfranc Fracture Variant Treated with Multiple Modalities of Fixation

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Abstract

Introduction: Lisfranc fractures are rare but serious injuries of the midfoot, with potential long-term consequences such as chronic pain and deformity if not adequately treated. This case report presents a Lisfranc fracture variant treated with multiple fixation modalities, highlighting the effectiveness of combining open reduction and internal fixation (ORIF) with plating, ORIF with cannulated screws (CC screws), and closed reduction with internal fixation (CRIF) using K-wires.
Case Presentation: Case 1: A 39-year-old female sustained high-energy trauma involving the 1st–4th tarsometatarsal joints. She underwent ORIF with plating for the 1st TMT joint, ORIF with CC screws for the 2nd and 3rd TMT joints, and CRIF with K-wire fixation for the 4th TMT joint.
Case 2: A 56-year-old female sustained a comminuted fracture of the medial cuneiform with instability at the naviculo-cuneiform joint, requiring ORIF with plating and CC screw fixation.
Results: Both patients achieved excellent clinical and radiological outcomes, with Foot and Ankle Outcome Scores (FAOS) of 96 and 92, respectively. Radiographs showed proper alignment and stable union, with no hardware-related complications.
Conclusion: This report illustrates the value of individualized, multimodal fixation in Lisfranc fractures, enabling stable reduction, preservation of joint motion, and optimal functional recovery.

Keywords: *Lisfranc Fracture; Open Reduction Internal Fixation; Foot Trauma; Tarsometatarsal Injury.*

1. Introduction

Lisfranc fractures, though rare, are critical injuries to the midfoot, which can result in chronic pain, deformity, and functional impairment if not properly managed (Lau et al., 2017; Welck et al., 2015). The Lisfranc joint complex, involving the tarsometatarsal articulation, is crucial for foot stability and weight-bearing function (Ewalefo et al., 2019).
Lisfranc injuries are relatively uncommon, comprising only 0.2% of all fractures, with around 20% of cases either going undiagnosed or being diagnosed late (Lau et al., 2017). In cases of low-energy trauma, they are often mistaken for simple sprains (Mascio et al., 2022). Prompt and accurate diagnosis is therefore essential. Key structures fixed in Lisfranc fractures include the medial cuneiform, intermediate and lateral cuneiforms, and the Lisfranc ligament, commonly stabilized with a 'homerun screw.'

2. Case Presentations

2.1.Case 1

A 39-year-old female presented following a high-energy road traffic accident with severe pain, swelling, and inability to bear weight on her left foot. Radiographs and CT confirmed a Lisfranc fracture variant involving the medial cuneiform and 1st–4th tarsometatarsal joints, with extension to the navicular bone. (Fig. .1 and Fig. 2)
Surgical Findings and Procedures:

- Medial cuneiform fracture: Reduced; instability at the naviculo-cuneiform joint required extension of fixation to the navicular.
- 2nd metatarsal: Stabilized with a 3.5 mm homerun screw.
- Intercuneiform fixation: 3.5 mm screw placed for midfoot stability.
- 1st TMT joint: Fixed with a 2.7 mm low-profile dorsal locking plate spanning from navicular to 1st metatarsal.
- 3rd TMT joint: Stabilized with a 3.5 mm CC screw.

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- 4th and 5th TMT joints: Temporary stabilization with smooth K-wires.

Outcome: Postoperative radiographs confirmed anatomic reduction. The patient progressed from partial weight-bearing at 4 weeks to full weight-bearing at 6 weeks. At 1 year, she was pain-free, ambulating independently, and had an FAOS of 96. (Fig. 3).

Fig. 1: Case 1: 39-Year-Old Female Presented with Pain in Left Foot. Radiograph Showing the Fracture.

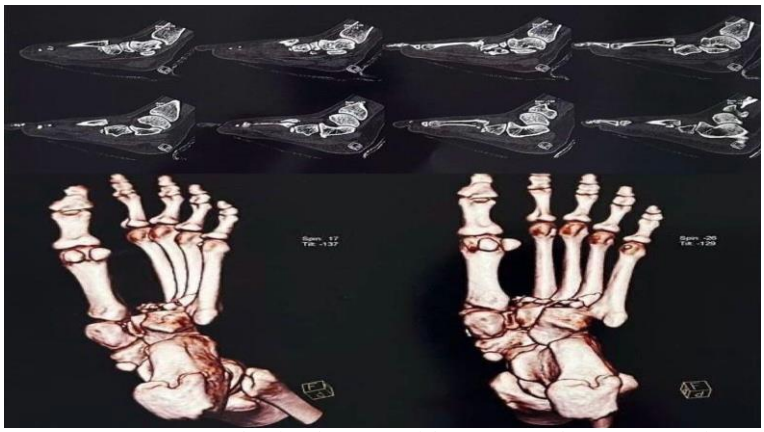

Fig. 2: Case 1: CT scan Showing the Extent of the Fracture and 3D Reconstructions.

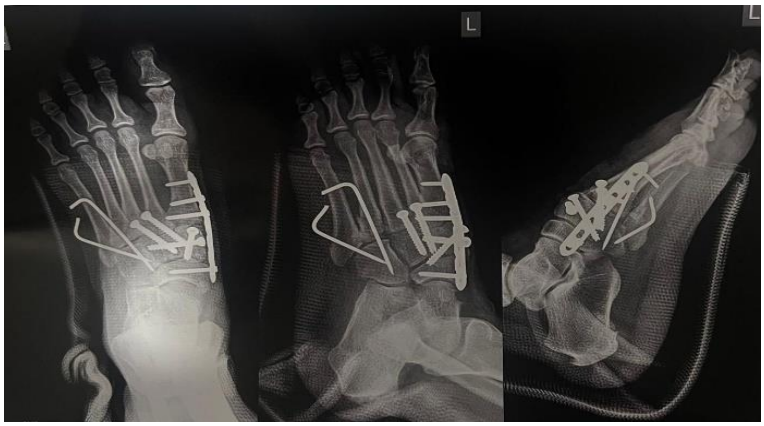

Fig. 3: Case 1: Post-Operative Radiograph Showing Placement of Fixation Hardware.

2.2. Case 2

A 56-year-old female sustained a comminuted medial cuneiform fracture with naviculo-cuneiform instability confirmed using plain radiograph and CT scan (Fig. 4 and Fig.5)

Surgical Findings and Procedures:

- 1st TMT joint: Fixed with a 2.7 mm low-profile dorsal plate from navicular to 1st metatarsal.
- 2nd metatarsal: Stabilized with a 3.5 mm CC screw.

Outcome: Radiographs confirmed satisfactory alignment. The patient transitioned to partial weight-bearing at 6 weeks and resumed daily activities by 3 months with an FAOS of 92. (Fig.6)

Fig. 4: Case 2: 56-Year-Old Female Presented with Pain in Left Foot. Radiograph Showing the Fracture.

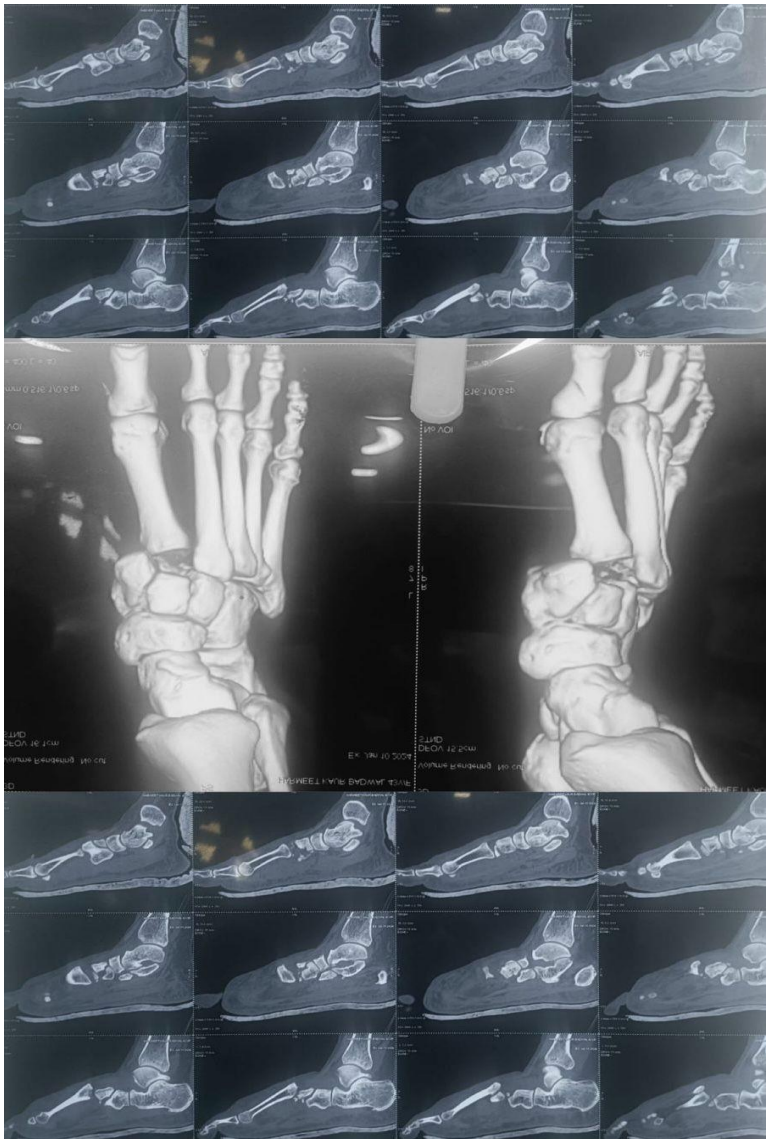

Fig. 5: Case 2: CT scan Showing the Extent of the Fracture and 3D Reconstructions.

Fig. 6: Case 2: Post-Operative Radiograph Showing Placement of Fixation Hardware.

3. Discussion

This report demonstrates the successful treatment of Lisfranc fracture variants with individualized multimodal fixation. Unlike single-modality strategies (e.g., isolated K-wires, transarticular screws, or primary arthrodesis), the combined use of plating, CC screws, and K-wires provided stability while preserving joint motion, facilitating faster rehabilitation. Nithyananth et al. (2001) and Chandran et al. (2006) reported residual pain and deformities when using K-wires and external fixation, indicating less optimal outcomes compared to the combination technique used in this case.

Although our patients had uneventful recoveries, potential complications of Lisfranc fixation include hardware failure, screw loosening, soft-tissue irritation, infection, and post-traumatic arthritis (Kirzner et al., 2018; Lau et al., 2016). Hardware removal is common when screws traverse joints. Recognizing these risks underscores the importance of follow-up and patient counseling.

Our findings are limited to two cases, but they align with larger series demonstrating that joint-specific multimodal fixation improves functional outcomes compared to traditional methods (Alberta et al., 2005; Kirzner et al., 2018; Lau et al., 2016)Further prospective multicenter studies are needed to validate these results across diverse populations.

Hardware selection was based on fracture morphology and biomechanics:

- Plates: 2.7 mm low-profile locking plates minimized irritation while providing rigid medial column stability.
- Screws: 3.5–4.0 mm cannulated cancellous screws facilitated precise fluoroscopic reduction of 2nd and 3rd TMT joints.
- K-wires: Applied laterally to provide temporary stabilization without creating excessive rigidity.

Preoperative CT with 3D reconstructions allowed accurate mapping of fracture complexity, guiding implant selection and screw trajectories. From a biomechanical perspective, distributing fixation across multiple joints reduced focal stress and improved midfoot load sharing. Recent studies reinforce the effectiveness of combined fixation. Mascio et al. (2022) emphasized tailored fixation to reduce complications (Mascio et al., 2022). Kirzner et al. (2018) and Lau et al. (2016) demonstrated improved outcomes with plate-and-screw constructs over isolated screw fixation (Kirzner et al., 2018; Lau et al., 2016). Modern advances, including low-profile implants and fluoroscopic navigation, further support individualized multimodal fixation as a preferred strategy in complex Lisfranc injuries.

4. Conclusion

This case report illustrates the effectiveness of using multiple modalities of fixation—ORIF with plating, ORIF with CC screws, and CRIF with K-wires—in the management of Lisfranc fractures. Individualized fixation strategies based on joint anatomy and fracture pattern provided stable reduction, preserved mobility, and enabled early mobilization. Given the potential for poor outcomes with Lisfranc injuries, a comprehensive, multimodal approach should be considered in complex cases.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this case report.

Informed Consent

Written informed consent was obtained from the patients for the publication of this case report and accompanying images.

Financial Support

No financial support or sponsorship was received for this study.

Authors' Contribution

SSG designed the study and conducted research. SJ provided research materials. VN collected and organized data. USD analyzed and interpreted data. PPP wrote the initial and final draft of the article. RA provided logistical support. All authors have critically reviewed and approved the final draft and are responsible for the manuscript's content and similarity index.

Use of AI

Artificial intelligence was used in a limited capacity to assist with grammar refinement and formatting. All scientific content, clinical interpretation, and conclusions were generated and reviewed solely by the authors.

Ethical Approval

This case report was conducted in accordance with the Declaration of Helsinki. Institutional ethical approval was not required for a single case report.

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