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Case Report-Management of Lisfranc Injury with Communited Medial Cuneiform Fracture Using Percutaneous Screws

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Abstract: ***Background**: Lisfranc ligament bundle spans from the first cuneiform to the second metatarsal, as well as the ligament connects the plantar aspect of the medial cuneiform to the bases of the second and third metatarsals, providing substantial stability to the TMT joint line. Mechanisms of injury are varied and may result from both direct and indirect forces. Road accidents are the cause of more than two-third of these injuries, followed by direct crush injuries and falls from a height. A detailed history (mechanism of injury, onset) and clinical examination are supplemented with standardized radiographic imaging to increase sensitivity and specificity, and confirm the diagnosis. Radiographic imaging demonstrates diastasis of the first and second metatarsal with avulsion usually. Treatment depends on the severity of the condition, however most reliable for this particular case was percutaneous fixation with use of partially threaded screws and washer. **Case Presentation**: A 30-year-old male presented to kurla babha hospital casualty with right foot pain and swelling, following a fall from bike few hours before. His right foot showed swelling and forefoot showed decreased range of motion. There was tenderness on palpation of forefoot. Radiographic imaging with AP and Oblique views of the foot showed an oblique communited fracture of the medial cuneiform and widening of the space between 1st and 2nd metatarsal bone. He was given a below knee slab with elevation of foot over pillow. Routine blood investigations were sent and he was scheduled for surgery after swelling decreased. Two screws were placed percutaneously to stabilize the joints. Post-operatively, no complications were observed, and the patient was advised to follow up in the OPD. **Conclusion**: Acute injuries to the Tarsometatarsal or Lisfranc joint are rare accounting for 0.1% to 0.4% of all fractures and dislocations. Despite improvements in diagnosis, missed or overlooked injuries are common. Especially the isolated pure ligamentous TMT instability is misdiagnosed in up to 20%. Insufficient treatment can lead to painful secondary deformity and impaired function. While, nonoperative treatment has been linked to an increased incidence of secondary displacement and inferior functional outcome, primary open reduction and internal fixation has become the preferred method of treatment when there is structural ligamentous instability or fracture–dislocation. However, there is no enough data in the literature regarding surgical treatment, complications and functional outcomes of Lisfranc injuries. More studies are needed to clarify a definitive treatment for patients with ligamentous injuries.***

Keywords: Lisfranc injury, percutaneous screws, communited medial cuneiform fracture

1.Introduction

Appreciation of the functional anatomy of the complex aggregate of osseous and ligamentous structures forming lisfranc joint is imperative to provide an adequate assessment and treatment of Lisfranc fracture–dislocations. The Tarsometatarsal joint complex forms the distal limit between the tarsal and metatarsal units. The term 'Lisfranc dislocation, ' attributed to the French-Napoleonic era field surgeon Jacques Lisfranc de St. Martin, it characterises fracture-dislocation of the tarso-metatarsal joint complex. Due to its positioning, resulting from a relative short intermedial cuneiform and sandwiched between the adjacent medial and lateral cuneiforms, the second metatarsal has been recognized as the keystone within this osseous scaffold. This architectural characteristic accounts for substantial bony stability.

Injury mechanisms are manifold and may result from both direct and indirect forces. Crush injuries create a great variety of fracture and dislocation patterns, and are usually associated with a substantial amount of soft tissue damage. A compartment syndrome is frequently associated with a crush injury and requires prompt attention. Indirect injury, most often axial loading, follows the longitudinal column of the foot, and subjects it to rotational, bending and compressive forces.

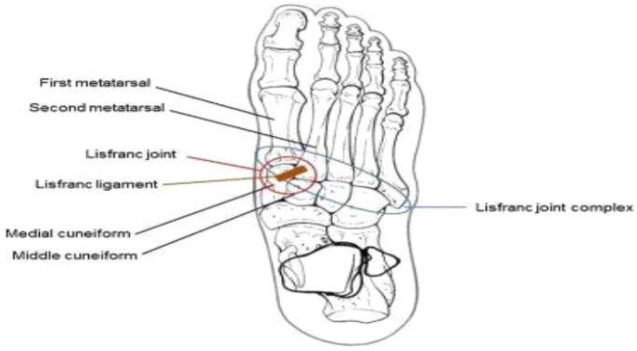

Figure 1: Anatomy of Lisfranc Complex

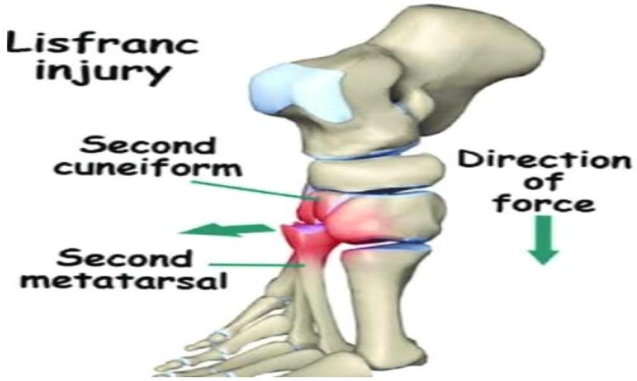

Figure 2: Mechanism of Injury

The most commonly used classification system of Lisfranc fracture - dislocations was introduced into the literature in 1909 by Quénu and Küss. It describes three types of injury pattern: Homolateral, isolated, and divergent. Hardcastle et al. provided a classification system, a modification of the pathologic-anatomical Quénu-Küss classification, which was based on radiographic morphology. Within it, three main groups were distinguished including complete, partial, and divergent dislocation patterns. **Type A (***complete*) fracture–dislocations are characterized by involvement of all parts of the Lisfranc joint complex with dislocation within one plane (sagittal, frontal, combined). In contrast, **Type B (***partial*) fracture–dislocations are identified by partial incongruity of the joint complex. Similarly, the involved joint complex shows dislocation in the sagittal, frontal, or combined plane. A medial dislocation pattern is distinguished from a lateral pattern. In medial dislocation the first metatarsal or a variable number of metatarsals excluding the fifth will be involved. In a lateral dislocation pattern, one or more of the lateral metatarsals are dislocated, while the first ray remains stable and intact. Finally, in **Type C (***divergent*) fracture–dislocations, complete and partial injury patterns can be seen. In the AP projection, medialization of the first metatarsal in conjunction with lateral translation of a variable number of the lateral four metatarsal bones can be found.

In 1986, Myerson introduced a classification, which inthe broadest sense can be considered a modification of the aforementioned systems. However, the Myerson classification incorporates osseous injuries of the medial column of the foot and also differentiates three types of injury pattern. **Type A** injuries include *complete incongruity* of the TMT joint line in any plane or direction. A **Type B1** injury is determined by partial incongruity involving the first ray (*partial–medial incongruity*). Dislocation of one or more of the lateral four metatarsal bones characterizes a **Type B2** injury pattern, also termed partial-lateral incongruity. A **Type C1 (***divergent*) injury has a diverging injury pattern comprised of medialization of the first ray associated with dislocation and partial incongruity of thenlateral metatarsals. A **Type C2** injury has a diverging injury pattern with complete incongruity.

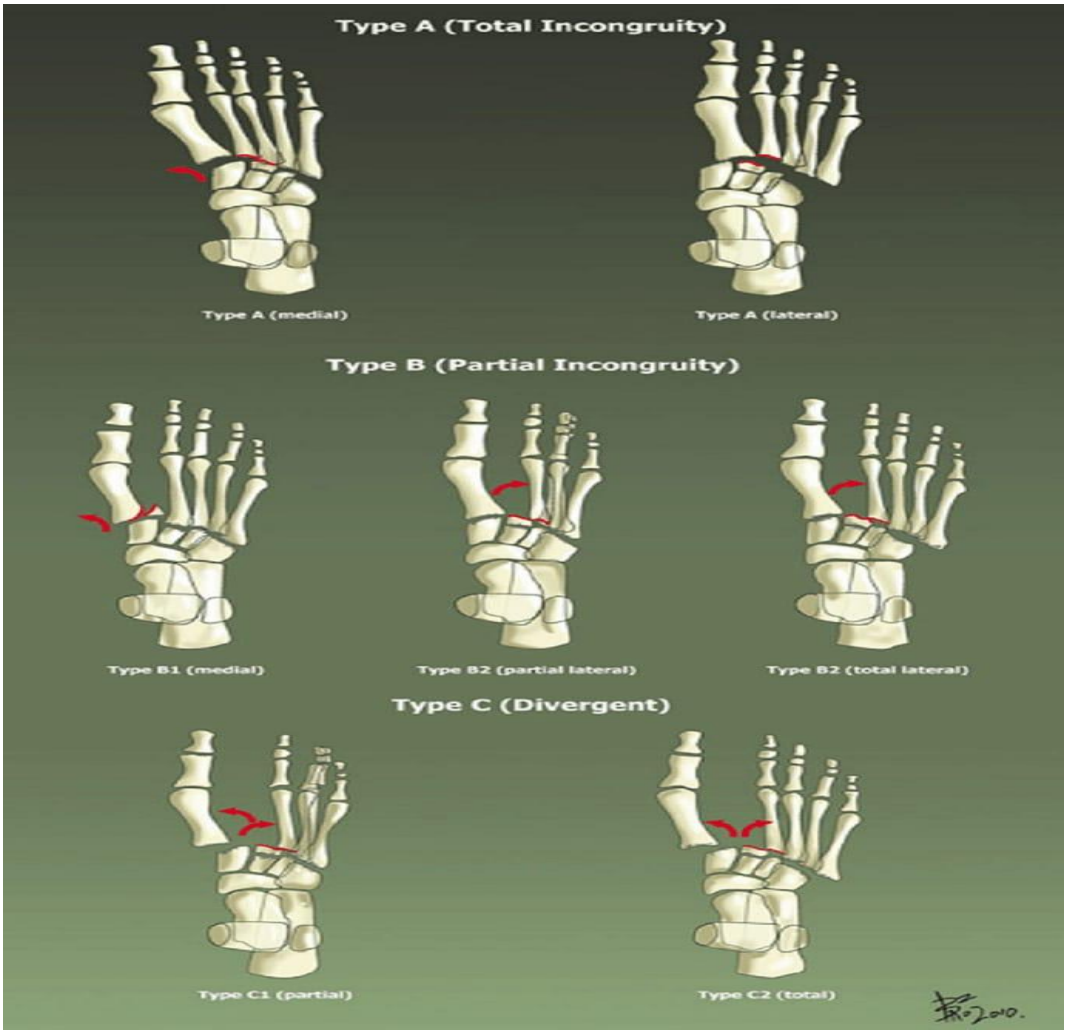

Figure 3: Classification of Lisfranc Injury

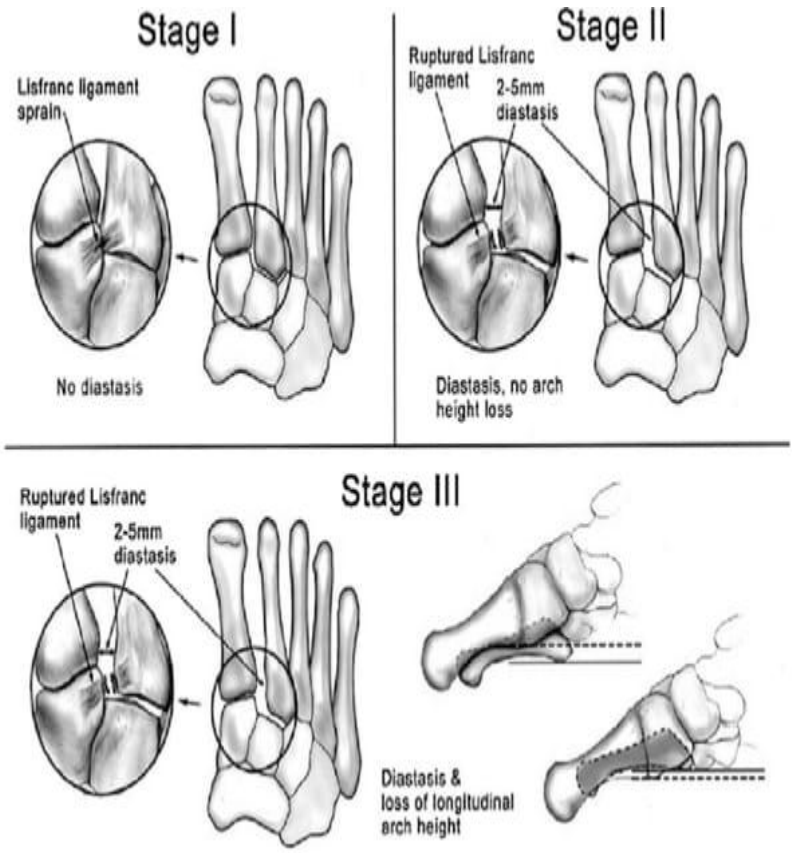

Figure 4: Stages of Injury

These injuries commonly affect males during the third decade of life, because of a fall from a height or a motor vehicle accident. Painful swelling and functional disability (e. g., inability to perform pain free weight bearing or the inability to stand on tip-toe) are common clinical findings. Also, often plantar ecchymosis is present, and this finding should raise suspicion of a TMT injury. Typically, the TMT transition zone will be widened in comparison to the opposite foot. Imaging with radiographs demonstrates diastasis of the base of the first and second metatarsal and a "fleck" sign that represents an avulsion off the base of the Lisfranc ligament.

Figure 5: Clinical Picture and X Ray Finding

CT or MRI reveals occult fractures, dislocations and extent of soft tissue injury. Treatment depends on the severity and cause of the injury. It varies from conservative immobilization, open reduction and internal fixation with K-wires, screws or plate.

2.Case Presentation

A 30-year-old male, labourer by occupation, non smoker with no comorbidities presented to the emergency department with right foot pain after sustaining a fall from bike. During the fall pts foot was caught and pulled in the opposite direction. Pain was very severe, accompanied by swelling few hours later. His pain increased when the right foot was everted. Swelling was noted at the first metatarsal, with tenderness to palpation of the entire foot. There was no sign of infection or inflammation.

AP and oblique radiographs of the right foot were performed (Figure 1). Findings were suggestive of an oblique communited fracture of the medial cuneiform with intraarticular extension. Mild spatial widening was significant between the first and second metatarsal bone, which was suspected as a Lisfranc Injury. Lastly, moderate generalized soft tissue swelling was also observed. A posterior splint was applied to stabilize the joint and prevent further exacerbation. Surgical intervention was scheduled eight days later after the swelling decreased.

Figure 6: PREOP X Ray

Eight days after admission, he was posted for closed reduction and percutaneous cc screw fixation to surgically repair the Lisfranc complex. The patient was given spinal anaesthesia.2 stab incisions were taken. Two partially threaded screws, which measured 4 mm x 30 mm and 4 mm x 40 mm, with washer were utilized percutaneously as the medial cuneiform was communited (Figures 2 and 3). To avoid wound complication and to promote fracture healing no attempt was done to open the fracture site. Stab incisions were closed with ethilon. Sterile dressing was done and splint was reapplied.

Figure 7: Post OP AP View and Oblique View

Post-operatively, the patient was shifted to ward and remained stable without complications. Upon discharge from the surgical ward on 5th post op day, he was advised to keep his limb elevated over pillow. The patient was informed to contact the casualty if complications arose after discharge from the hospital.

Post-operative day 9, the patient was re-evaluated in the outpatient clinic. He had no symptoms of fever, pus discharge or dyspnea. His pain had also decreased. He

ambulated with walker. Upon examination of the foot, wound was healthy with no signs of infection or inflammation. He was advised to follow up after 6 days for suture removal.

3.Discussion

Injuries of the tarso-metatarsal complex are relatively rare, and require high-index suspicion. Lisfranc injuries can be missed in patients with multiple traumas and in cases in which diastasis spontaneously reduces. Physical examination typically reveals swelling, tender forefoot, and plantar ecchymosis. Radiographic imaging for Lisfranc injuries are frequently subtle, easily missed. Standard radiographs including three views of the foot should be obtained. CT can help to determine the extent of injury. An MRI may be helpful for ligamentous damage. Open reduction using parallel incisions in the dorsum of the foot and small fragment screws is the preferred method of choice for medial cuneiform and second metatarsal joint injury but because of communition in medial cuneiform open reduction was not tried and screws were inserted percutaneously in this case. The advantage of screw fixation is a rigid reduction with gentle compression across the joint.

There was no residual subluxation or dislocations during postoperative follow-up with radiographs. The amount of weight bearing allowed varies substantially and depends upon the fracture pattern, injury severity, associated injuries, and patient dependent variables. This patient was advised non weight bearing for 6 weeks post op followed by partial weight bearing for 3 weeks and full weight bearing after 3 months. Dislocations, as compared to fractures, take longer to heal and necessitate more time for joint stability.

4.Conclusion

Irrespective of injury mechanism, injury severity, or patient specific variables, the restoration and maintenance of anatomic alignment and articular congruity are determinants of improved functional outcome. Preservation of anatomical alignment, especially of the medial column, has been linked to a good outcome. Both a delay in treatment and work-related injuries have been correlated with significantly reduced functional outcomes. In the long-run, primary arthrodesis has been shown to result in better functional outcomes when compared to open reduction and fixation at both mid-term (24 months) and long-term (42 months) follow-up. Ly et al showed that after both ORIF and arthrodesis of isolated ligamentous Lisfranc injuries, an improvement in the functional outcome occurred over time. Complications are common and can be separated into early and late-onset complications. In the early stages compartment syndrome, wound infection, and healing disturbances are common. Late-onset complications include post-traumatic or secondary osteoarthritis, healing disturbances such as delayed union or non-union, chronic pain, and hardware problems.

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