MIDFOOT INJURIES-ARE WE UNDERTREATING IT?

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Introduction

• Increasing sports injuries
• RTA and traumatic injuries

• We are seeing more of these injuries, but as the spectrum is so wide, these injuries still fall into a group of ‘missed injuries’
Purpose

- Identify the injury patterns
- Identify why we can miss them
- Distinguish between bony and ligament injuries
- Define indications of surgery
- Effective physio management
Late Collapse
Contents

- Midfoot Anatomy
- Lisfranc Injury
- Navicular and cuboid fractures
- (Mr Karpe)
Midfoot – Column Anatomy

Medial column

- talonavicular joint
- cuneiforms
- medial three rays of the forefoot.
Midfoot – Column Anatomy

Lateral column

- calcaneocuboid joint

- fourth and fifth metatarsals.
Midfoot Anatomy
Midfoot Anatomy

Medial column joints need to be aligned and stiff

Lateral column joints need to be mobile
Mid-foot Anatomy
Lisfranc joint complex consists of three articulations:
- Tarsometatarsal
- Intermetatarsal
- Intertarsal
Inherently stable joint

- BONY
- LIGAMENTOUS
Lisfrancs Anatomy

Inherently stable joint

• BONY

“keystone configuration”
Lisfrancs Anatomy

LIGAMENTOUS

- Lisfranc’s ligament
- Dorsal and plantar tarso-metatarsal ligament
- Inter-metatarsal ligament
Midfoot Anatomy

Dorsal Capsule

Plantar Ligaments
Lisfranc’s ligament:

- Large oblique ligament that extends from the plantar aspect of the medial cuneiform to the base of the second metatarsal.

- There is no transverse metatarsal ligament between the first and second metatarsals.
Lisfranc ligament
• **Interosseous ligaments:**
  - Connect the metatarsal bases
  - ONLY 2-5, not 1-2
  - Dorsal and plantar
  - Plantar are stronger and larger

• **Secondary stabilizers:**
  - Plantar fascia
  - Peroneus longus
  - Intrinsics
Lisfranc Injury (Tarsometatarsal fracture-dislocation)

......easily missed and leads to deformity, chronic pain and dysfunction
As many as 20 percent of Lisfranc joint injuries are missed on initial anteroposterior and oblique radiographs.\textsuperscript{2–4}

Jacques Lisfranc

• Jacques Lisfranc (1790-1847) devised a new amputation technique that saved time by avoiding bones. He followed a series of joints which now is collectively called the Lisfranc joint.

• He did not describe the injury patterns. Jacques Lisfranc
Jacques Lisfranc

Pioneering French surgeon and gynecologist.

Pioneered ............... Lithotomy

Amputation of Cervix Uteri

Removal of Rectum

The Lisfranc joint and the Lisfranc fracture are named after him.
Lisfranc Joint Injuries

• Generally considered rare
  – 1 per 55,000 people per year
  – 15/5500 fractures

• As index of suspicion increases, so does incidence

• ~20% of these injuries overlooked
  – Especially in polytraumatized patients!!
Mechanism of Injury - Indirect

- More common (typical athletic injury)
- Rarely associated with open injury or vascular compromise
Mechanism of Injury
Mechanism of Injury - Direct

- Less common (crush)

- Compartment syndrome more common than with indirect
Mechanisms of Injury: Direct

Force applied directly to the TMT (Lisfranc’s) articulation on the dorsum of the foot.
Mechanisms of Injury: Indirect

Axial loading or twisting $\rightarrow$ hyper-plantarflexion and ligament rupture.

More common than direct.
Lisfranc Injury

• 1 in 350 fractures
• Bony or ligamentous
• Requires a high degree of clinical suspicion
  – 20% misdiagnosed
  – 40% no treatment in the 1st week
• Be wary of the diagnosis of “midfoot sprain”
Lisfranc Injury - Diagnosis
Lisfranc Injury - Diagnosis
Lisfranc Injury -Diagnosis

Check neurovascular status
Possible compromise of dorsalis pedis artery
Deep peroneal nerve injury

..................COMPARTMENT SYNDROME
Lisfranc Injury – X rays/CT scan

• AP, Lateral and **Oblique**

• **Stress** views (ligamentous Lisfranc)
Lisfranc Injury – oblique view
Lisfranc Injury – lateral view
Lisfranc Injury – CT scan
Lisfranc Injury – MRI scan
Lisfranc Injury – Classification

Homolateral

Isolated

Divergent
Lisfranc Injury – Classification
Lisfranc Injury - Treatment

- **Early recognition** is the key to preventing long term disability

- **Anatomic reduction** is necessary for best results:
  - Displacement >1mm or gross instability of tarsometatarsal, intercuneiform, or naviculocuneiform joints is unacceptable

- Goal: obtain and/or maintain anatomic reduction
Lisfranc Injury - Treatment

- Depends on severity
- RICE
Lisfranc Injury - PRINCIPLES

• Rule out compartment syndrome/neurovascular compromise

• Early recognition is the key to preventing long term disability

• Anatomic reduction is necessary for best results:
  – Displacement >1mm or gross instability of tarso-metatarsal, inter-cuneiform, or naviculo-cuneiform joints is unacceptable
Lisfranc Injury – Non op treatment

- Short leg cast
- 4 to 6 weeks NON weight bearing
- Repeat x-rays (stress X rays) to rule out displacement as swelling decreases
- Total treatment 2-3 months
Lisfranc Injury – Operative treatment

• 1, 2, 3 TMT joints have limited motion
  – Rigid fixation

• 4, 5 TMT joints need mobility
  – Flexible or temporary fixation
Lisfranc Injury – Operative treatment

Surgical emergencies:

1. Open fractures
2. Vascular compromise (dorsalis pedis)
3. Compartment syndrome
If present with compartment emergency decompression.
Lisfranc Injury – Operative treatment

Dorsal incisions

- 1st incision centered at TMT joint and along axis of 2nd ray, lateral to EHL tendon
- Identify and protect NV bundle
Lisfranc Injury – Operative treatment

- First reduce and provisionally stabilize 2\textsuperscript{nd} TMT joint
- Then reduce and provisionally stabilize 1\textsuperscript{st} TMT joint
- If lateral TMT joints remain displaced, proceed with 2\textsuperscript{nd} or 3\textsuperscript{rd} incision(s)
Our experience

• 15 Lisfranc’s injuries over last 2 years
• Age group between 19-65
• Average time of fixation was 8 days post injury
• VAS pain score 9 dropping to 2 at 3 months postop
• One secondary OA
Lisfranc Injury – Plate or screw fixation?

- Transarticular screws and dorsal plates showed similar ability to reduce the first and second TMT joints after TMT and Lisfranc ligament transection and to resist TMT joint displacement with weightbearing load.

- Screws can break and may increase the chance of arthritis as penetrate the joint.


Ligamentous Lisfranc joint injuries: a biomechanical comparison of dorsal plate and transarticular screw fixation.
A primary stable arthrodesis of the medial two or three rays appears to have a better short and medium-term outcome than open reduction and internal fixation of ligamentous Lisfranc joint injuries.

- Treatment of primarily ligamentous Lisfranc joint injuries: primary arthrodesis compared with open reduction and internal fixation. A prospective, randomized study.
Outcomes

• 46 patients, followed for 2 years
• 13 had poor outcomes and needed employment change
• The presence of a **compensation claim** was associated with a poor outcome \( (p = 0.02) \)

Prognosis

- Long rehabilitation (> 1 year)
- Incomplete reduction leads to increased incidence of deformity and chronic foot pain
  - Loss of rigidity
  - Incidence of traumatic arthritis (0-58%)
• Over to Mr Prasad Karpe
Navicular Fractures

• Anatomy
  – Horseshoe-shaped bone between talus and cuneiforms
  – Numerous short ligaments attach dorsally, plantarly, and laterally
  – Deltoid attaches medially
Navicular Fractures

• Avulsion fractures: usually dorsal lip (essentially severe sprain)

• Treatment:
  – Immobilization & progressive weight bearing
  – Excision of fragment only if painful
Navicular Fractures

- Tuberosity fractures: avulsion by posterior tibial tendon and spring ligament
- Usually minimally displaced
- May have associated calcaneocuboid impaction
- ORIF depending on degree of displacement (>5mm)
Navicular Fractures

• Body Fractures:
  – High energy trauma with axial foot loading
  – Frequently associated with talonavicular subluxation
  – CT scans helpful for preop planning
  – Anatomic reduction essential
Navicular Body Fractures-ORIF
Navicular Body Fractures

- May require stabilization or fusion to cuneiforms
- Avoid fusion of essential talonavicular joint if at all possible
Navicular Body Fractures-Outcomes

With adequate reduction most have good result, but few are “normal”

Cuboid Fractures

• Isolated fractures are rare

• Most often associated with other fractures

• Two types of fractures usually seen:
  – Avulsion
  – Nutcracker (axial loading with plantar flexion and forefoot abduction)
Plantar avulsion fractures are usually seen at the ligamentous attachment of the plantar calcaneocuboid ligament.
Cuboid Fractures-Nutcracker fracture

Caused by *compression* of the cuboid between the calcaneus and the lateral metatarsals during force abduction.
Cuboid Fractures-Surgery

- 2 mm displacement of articular surface
- Cuboid subluxation with weight bearing or stress x-rays
- Loss of bony length
Summary

- High index of suspicion in diagnosis
- If needed, ask for more investigations like CT or MRI
- Weight bearing or stress views in ligamentous Lisfranc’s
- Outcome is fairly good when anatomically reduced
- Council patients for arthritis in future
Thank you