MIDFOOT INJURIES-ARE WE UNDERTREATING IT?

Mr Rajiv Limaye
Mr Prasad Karpe
University Hospital of North Tees

3rd Foot and Ankle Symposium

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

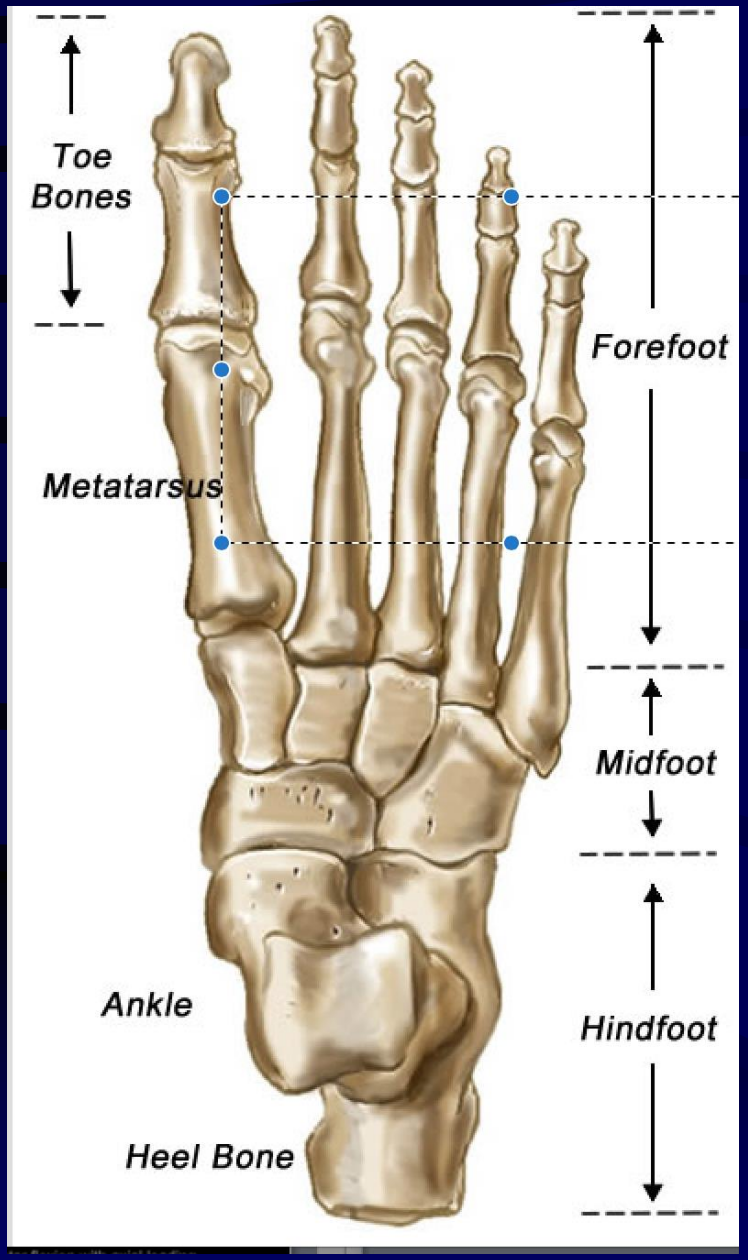
- Identify the injury patterns
- Identify why we can miss them
- Distinguish between bony and ligament injuries
- Define indications of surgery
- Effective physio management

Late Collapse

Contents

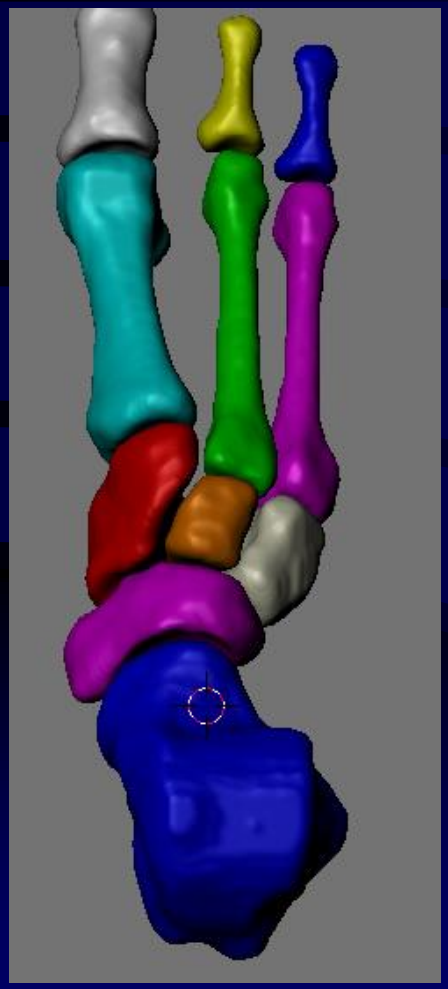
- Midfoot Anatomy
- Lisfranc Injury

- Navicular and cuboid fractures
- (Mr Karpe)


Toe Bones
Forefoot
Metatarsus
Midfoot
Ankle
Hindfoot
Heel Bone


Lisfranc Joint
Chopart Joint

Midfoot –Column Anatomy



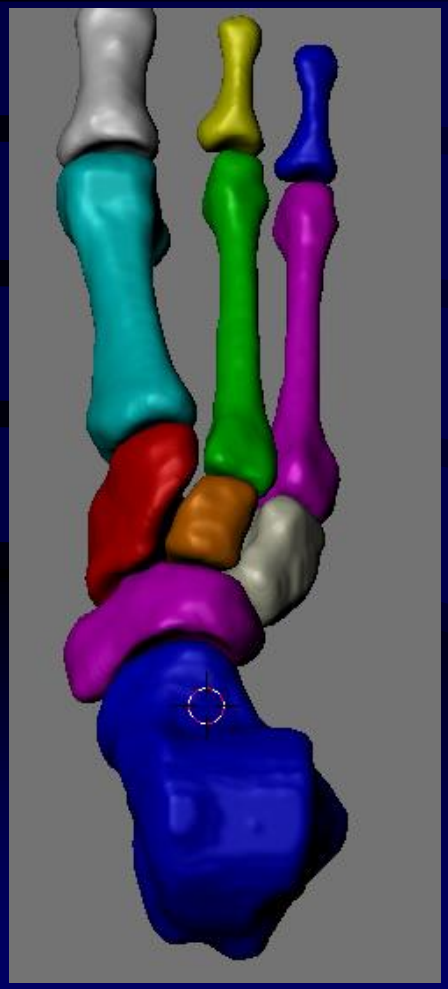
Medial column

-talonavicular joint

-cuneiforms

-medial three rays of the forefoot.

Midfoot –Column Anatomy

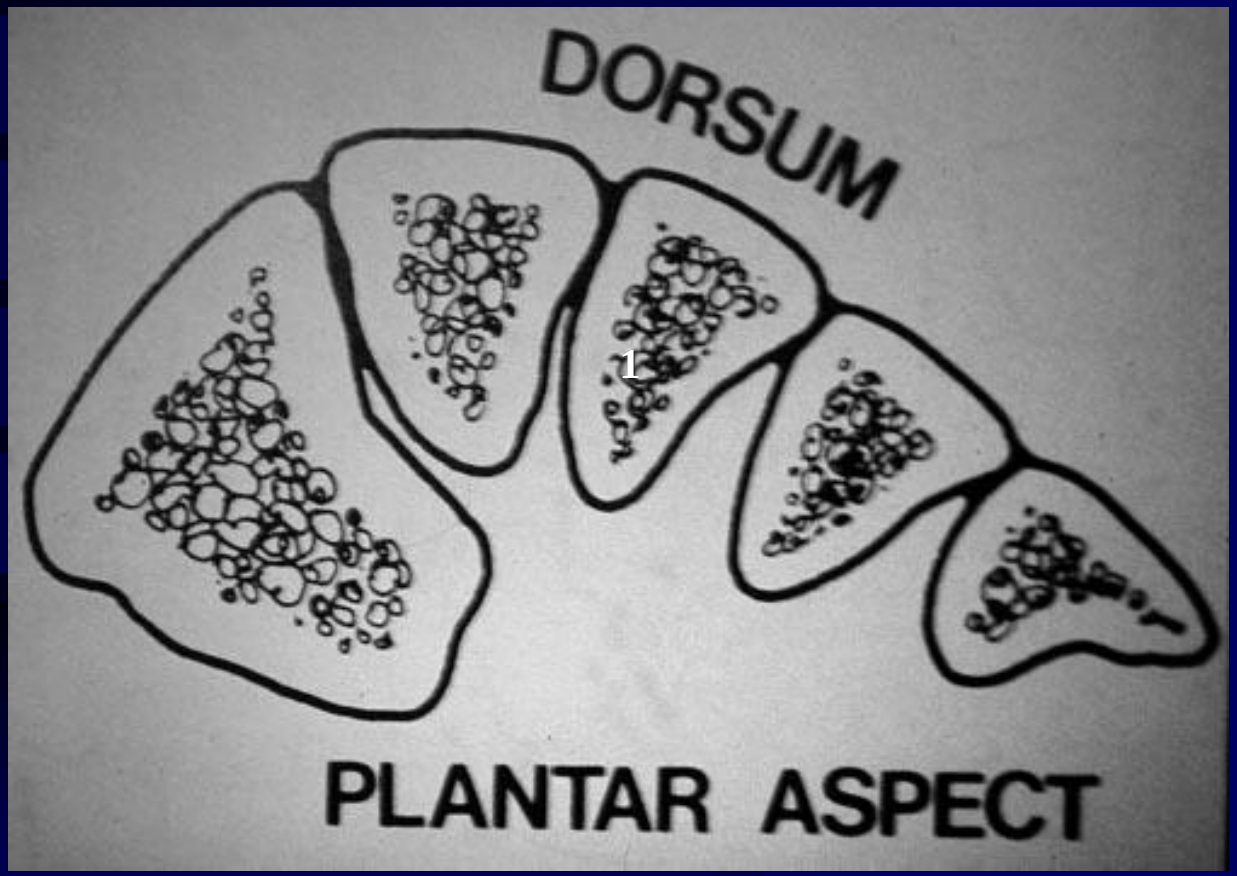


Lateral column

-calcaneocuboid joint

- fourth and fifth metatarsals.

Midfoot Anatomy

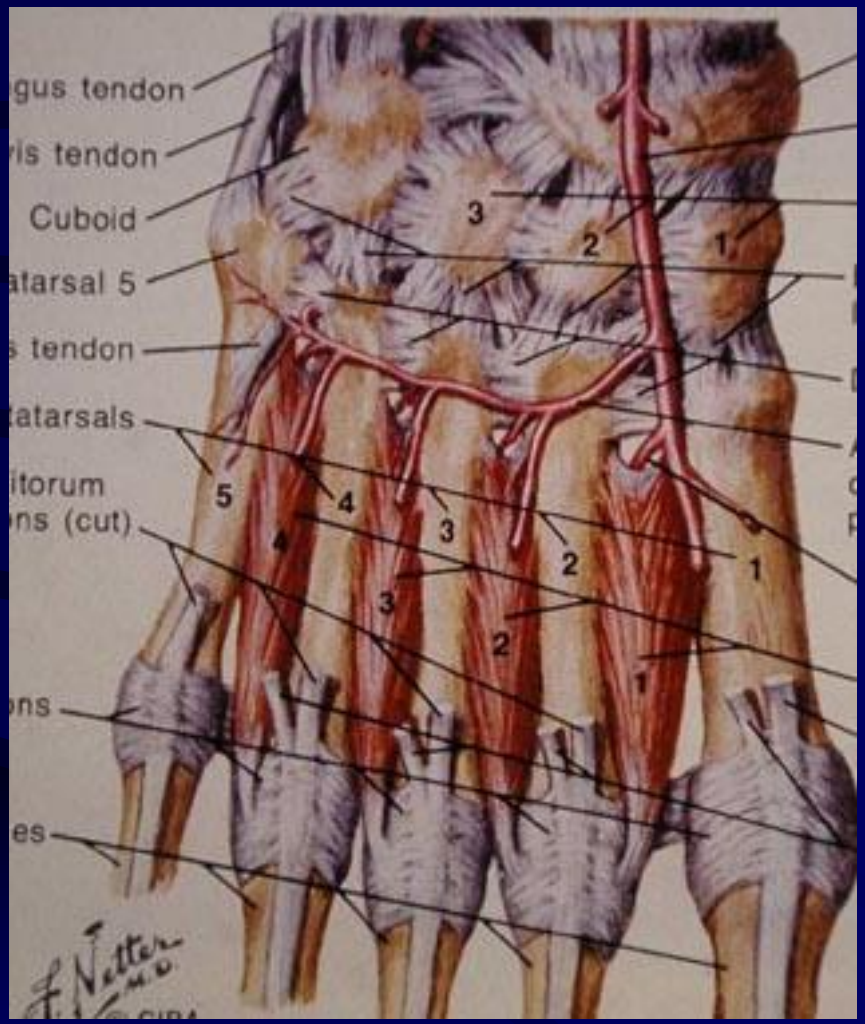


Midfoot Anatomy

Medial column joints need to be aligned and stiff

Lateral column joints need to be mobile

Mid-foot Anatomy



Lisfrancs Anatomy

Lisfranc joint complex consists of three articulations

-Tarsometatarsal

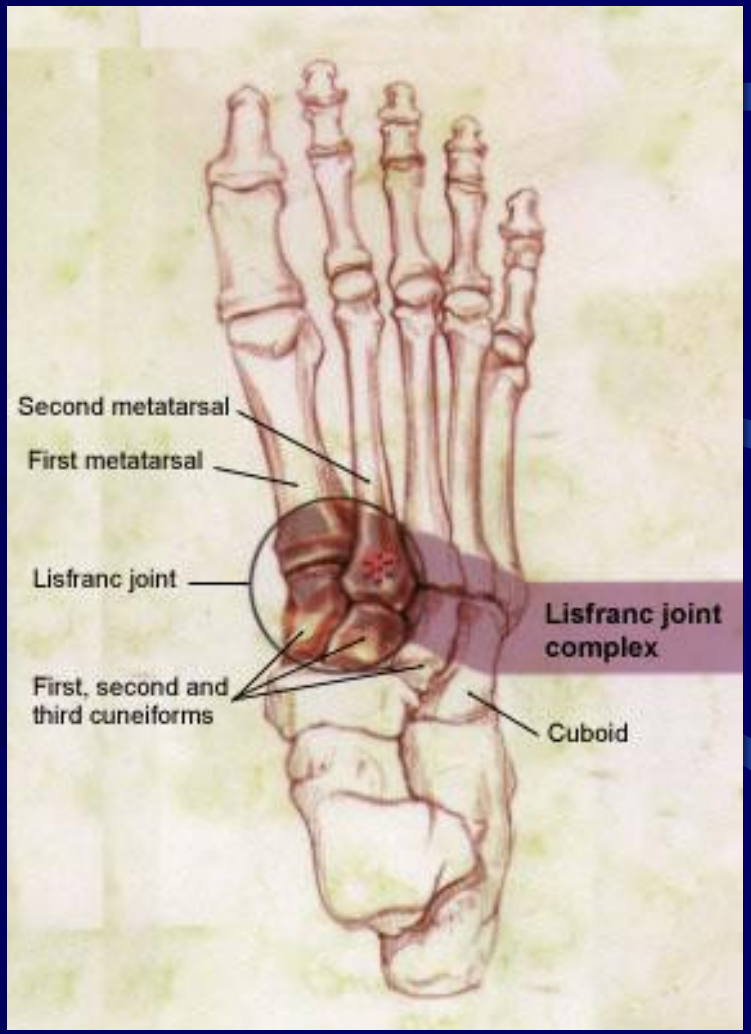
-Intermetatarsal

-Intertarsal

Lisfrancs Anatomy

Inherently stable joint

- BONY
- LIGAMENTOUS

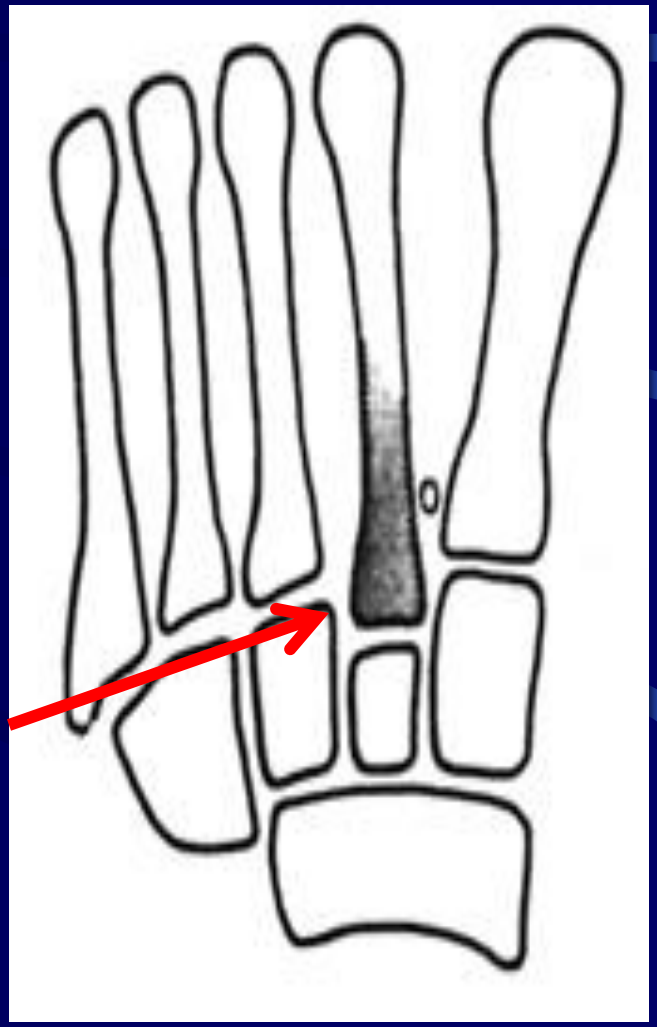


Lisfrancs Anatomy

Inherently stable joint

•BONY

“ keystone configuration”



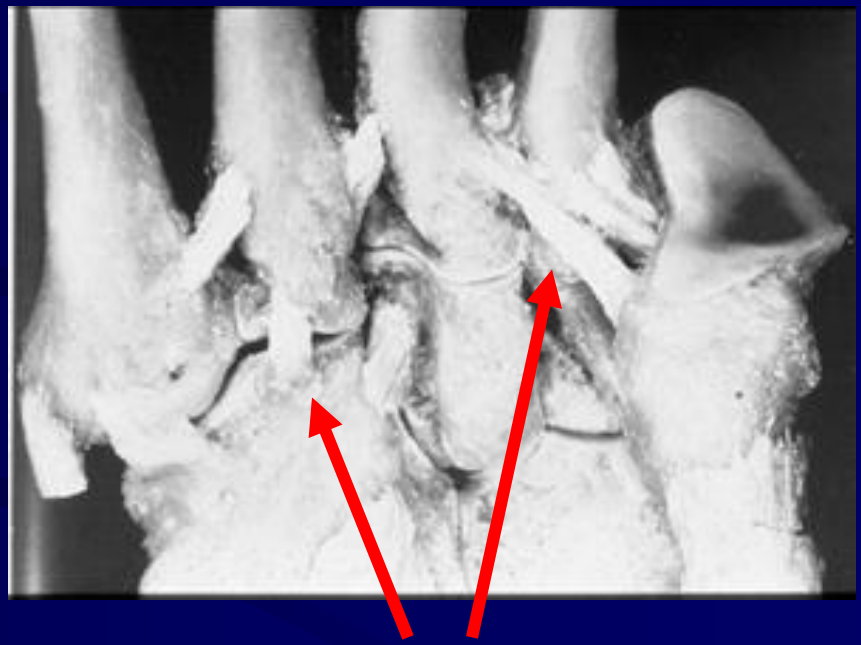
Lisfrancs Anatomy

LIGAMENTOUS

- Lisfranc's ligament
- Dorsal and plantar tarso-metatarsal ligament
- Inter-metatarsal ligament

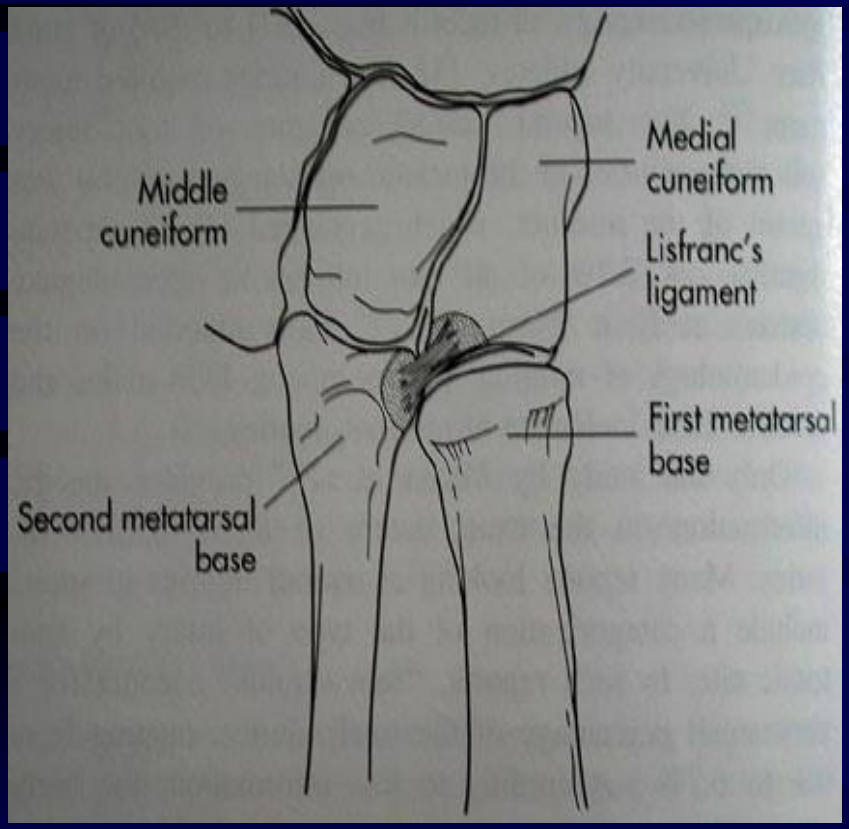
Midfoot Anatomy

Dorsal Capsule

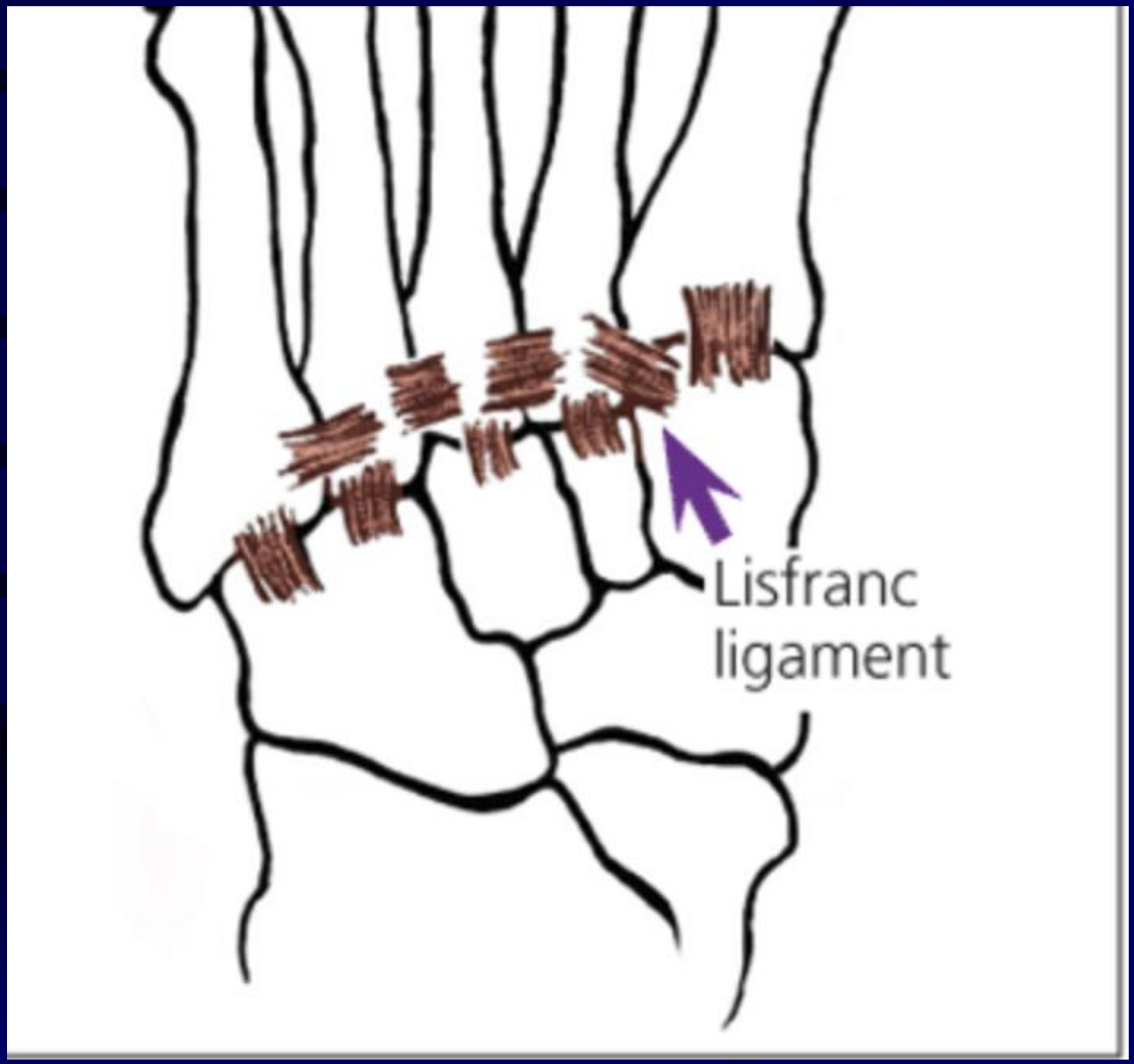


Plantar Ligaments

Lisfranc's ligament:

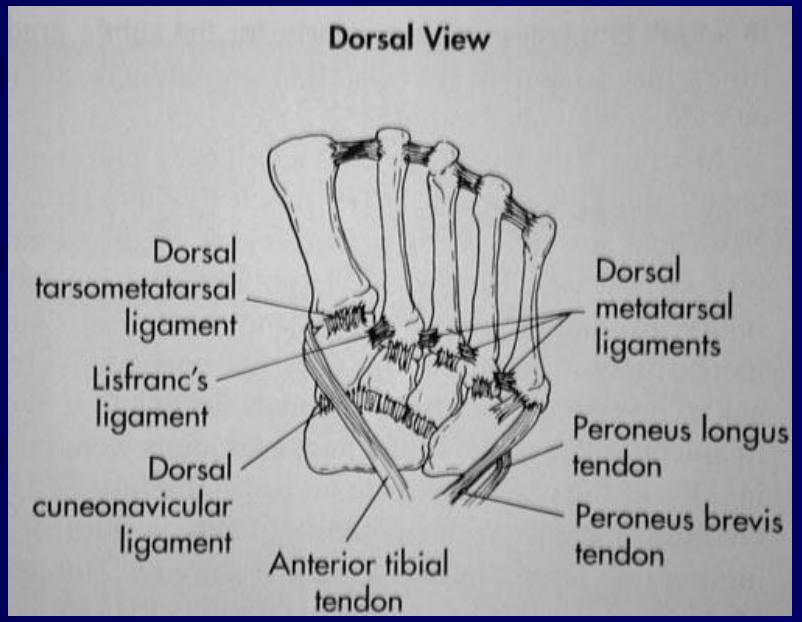


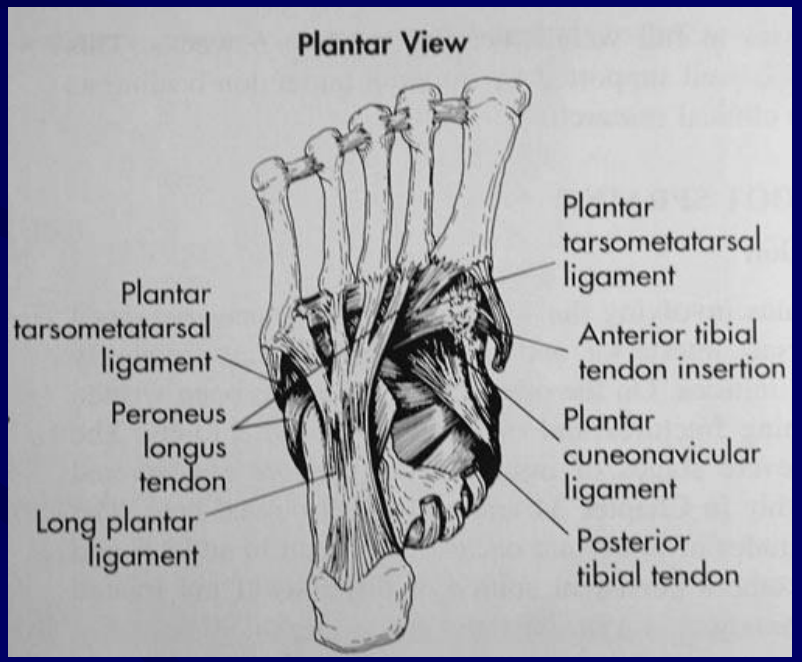
- Large oblique ligament that extends from the plantar aspect of the medial cuneiform to the base of the second metatarsal
- There is no transverse metatarsal ligament between the first and second metatarsals)


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
  - Intrinsincs





Lisfranc Injury (Tarsometatarsal fracture-dislocation)

…….easily missed and leads to deformity, chronic pain and dysfunction


L
2: foot Lt DP/OBLI AP (Series 3)
L


LEFT
2: LAT (Series 3)
LEFT


L


2: LAT (Series 3)
L

As many as 20 percent of Lisfranc joint injuries are missed on initial anteroposterior and oblique radiographs.[2–4]

•2. Englanoff G, Anglin D, Hutson HR. Lisfranc fracture-dislocation: a frequently missed diagnosis in the emergency department. *Ann Emerg Med*. 1995;26:229–33.

•3. Mantas JP, Burks RT. Lisfranc injuries in the athlete. *Clin Sports Med*. 1994;13:719–30.

•4. Trevino SG, Kodros S. Controversies in tarsometatarsal injuries. *Orthop Clin North Am*. 1995;26:229–38.

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 gynecolo gist.

Pioneered .....

- Lithotomy
- Amputation of Cervix Uteri
- Removal of Rectum

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

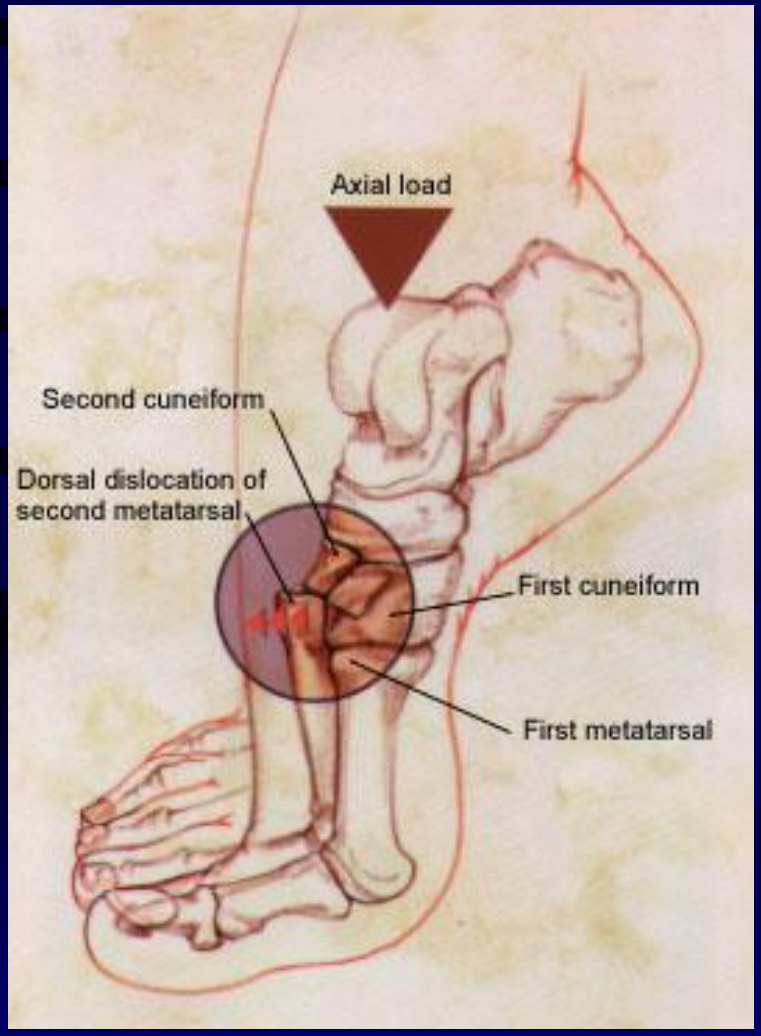
Lisfranc Joint Injuries

- 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

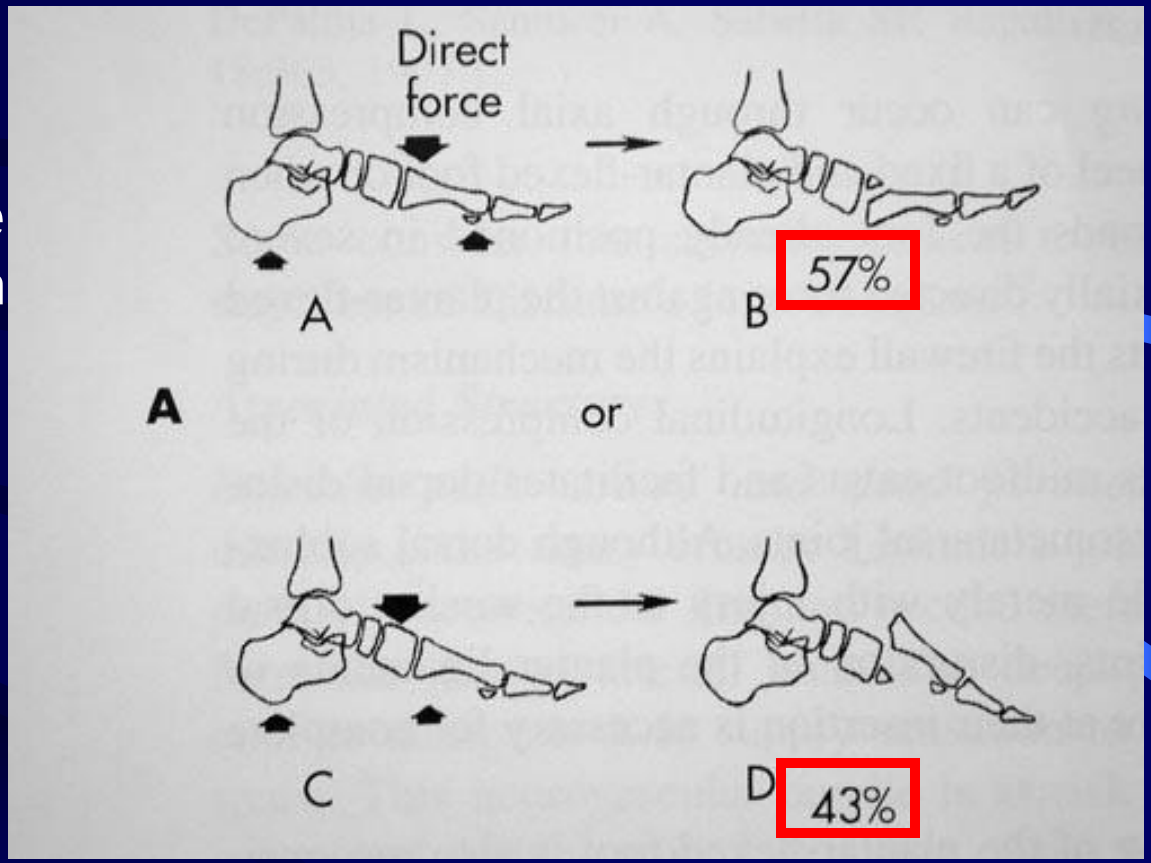


Mechanism of Injury-Direct

- Less common (crush)
- Compartment syndrome more common than with indirect

Mechanisms of Injury: Direct

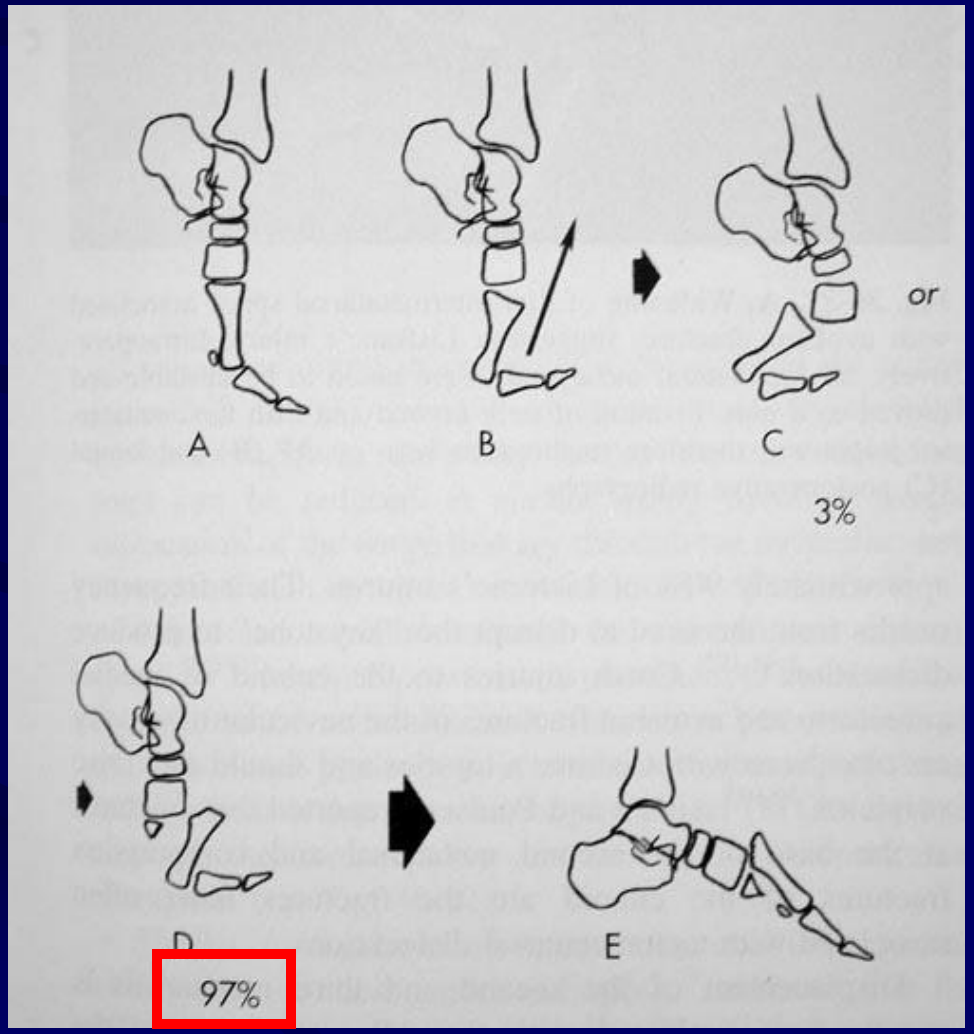
Force applied directly to the TMT (Lisfranc's) articulation on the dorsum of the foot.



Mechanisms of Injury: Indirect

Axial loading or twisting → 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***

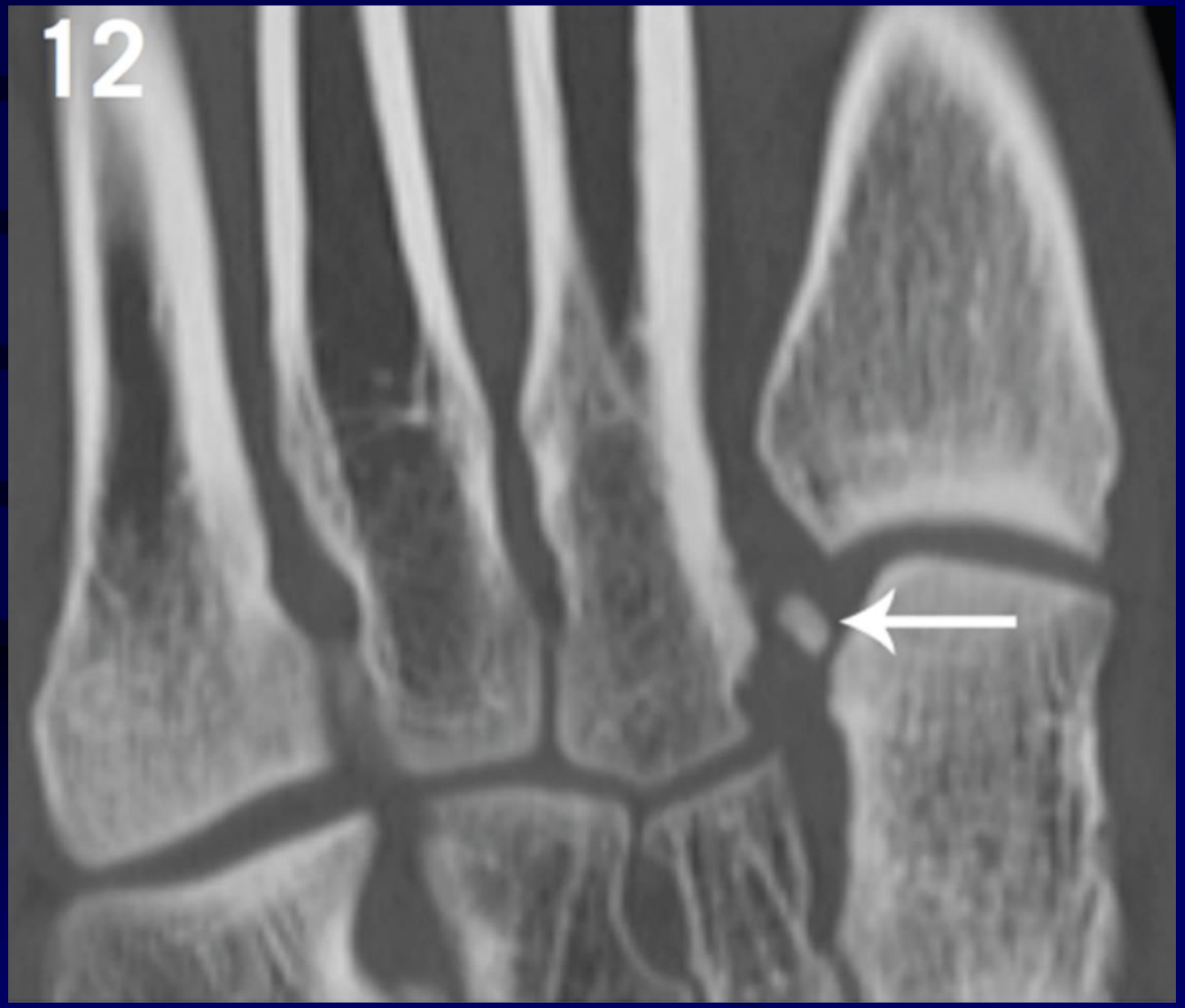
- Stress views (ligamentous Lisfranc)

Lisfranc Injury – AP X RAY

Lisfranc Injury –oblique view

Lisfranc Injury –lateral view

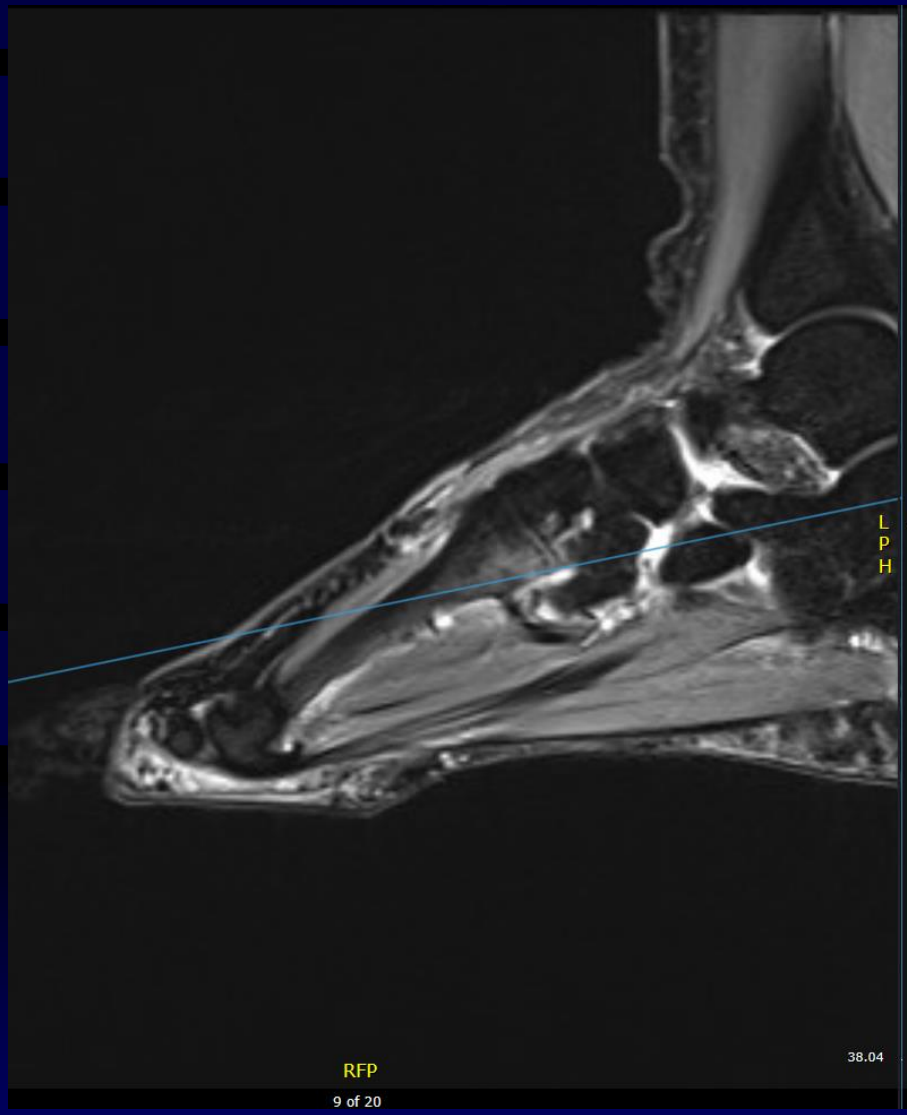
Lisfranc Injury –CT scan

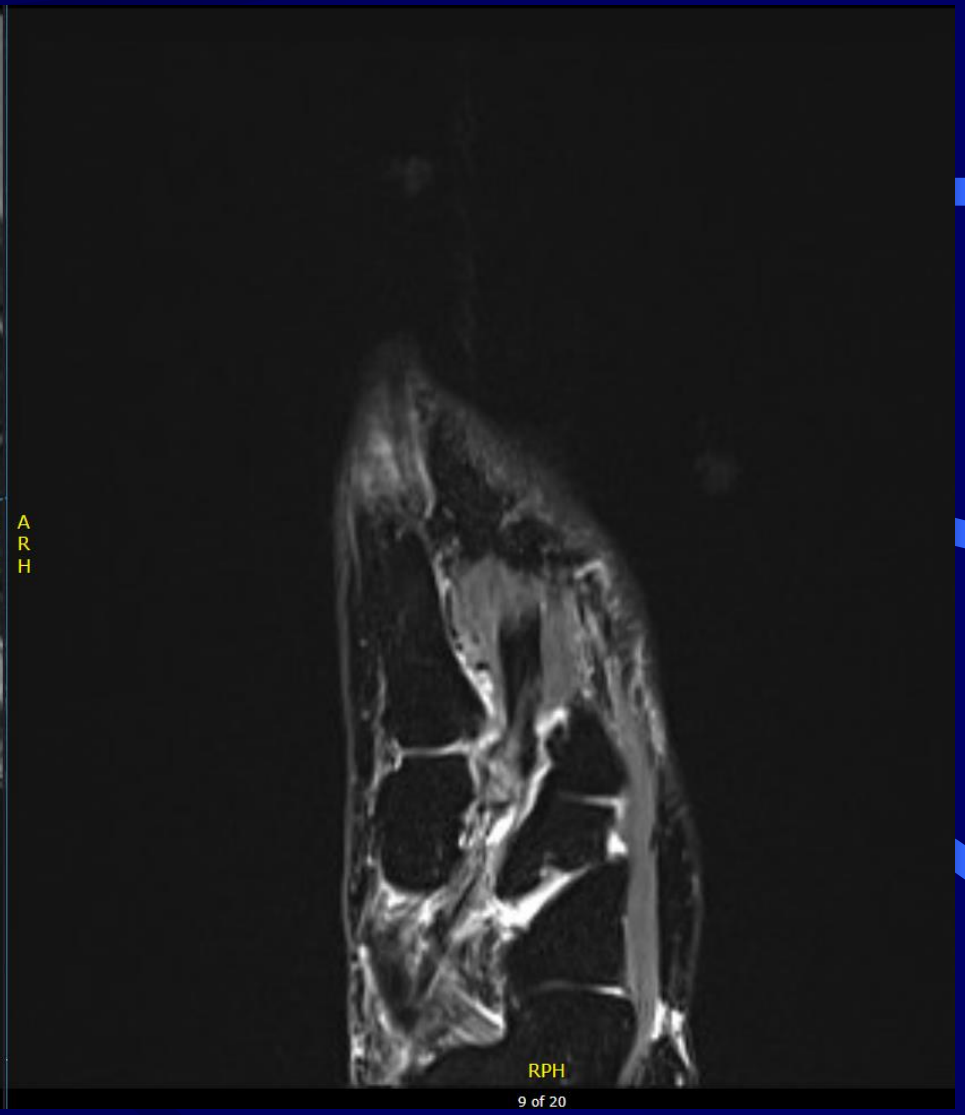


Lisfranc Injury –MRI scan

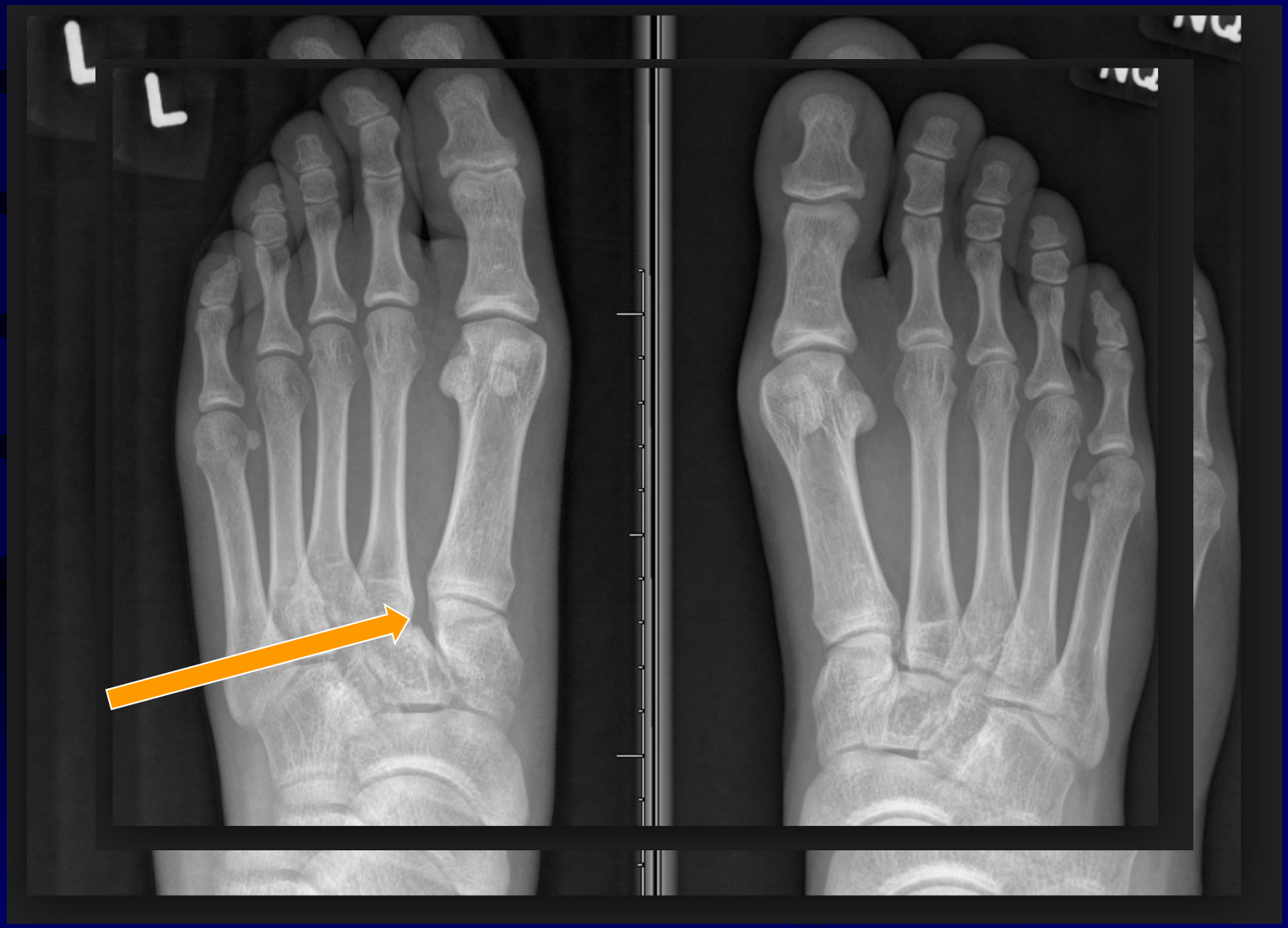

L


L

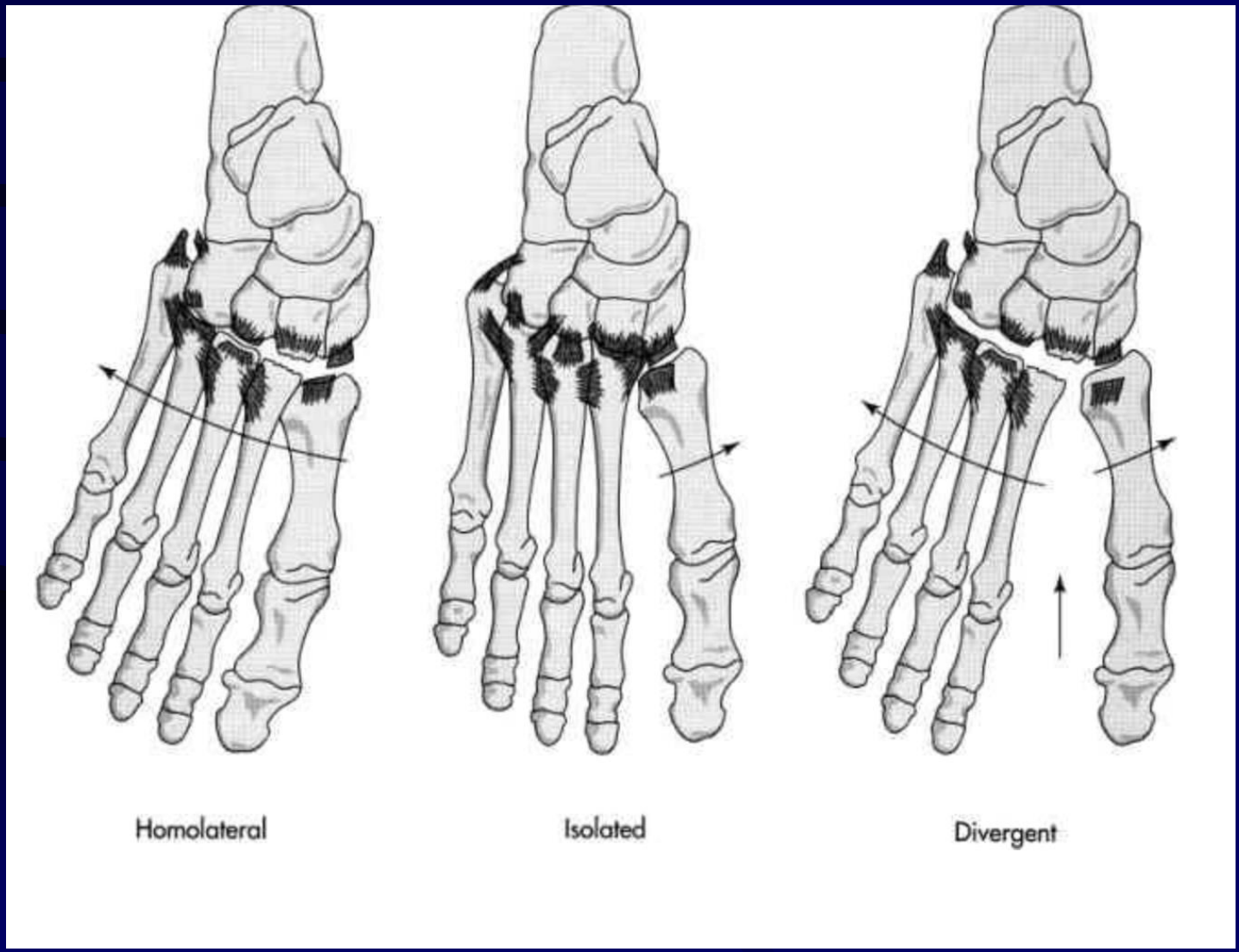

L
P
H
A
R
H
RFP
38.04
9 of 20


RPH
9 of 20

Lisfranc Injury –Weight Bearing X rays



Lisfranc Injury –Classification



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

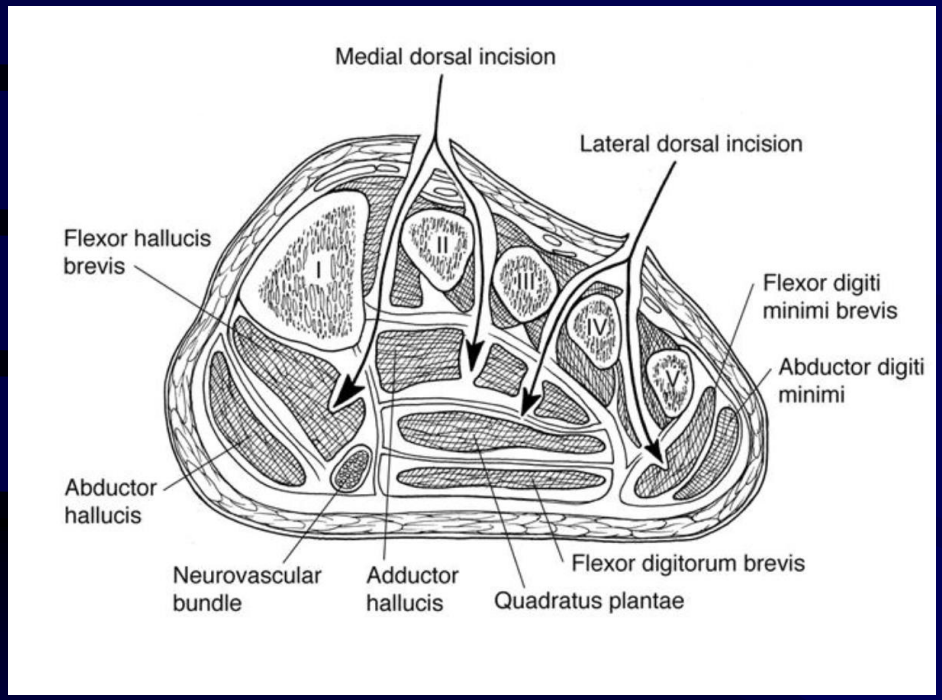
- 4,5 TMT joints need mobility
  - Flexible or temporary fixation

Lisfranc Injury –Operative treatment

Surgical emergencies:

1. Open fractures
2. Vascular compromise (dorsalis pedis)
3. Compartment syndrome

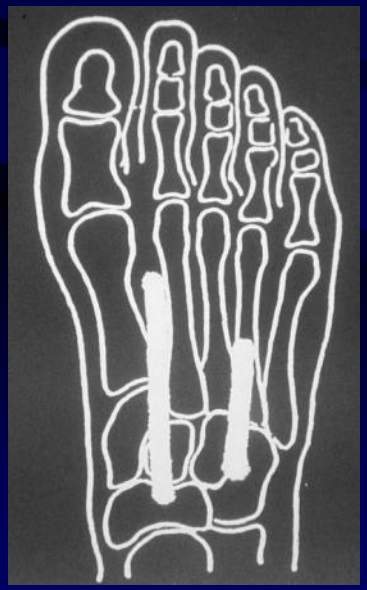
If present with compartment--emergency decompression.



Lisfranc Injury –Operative treatment

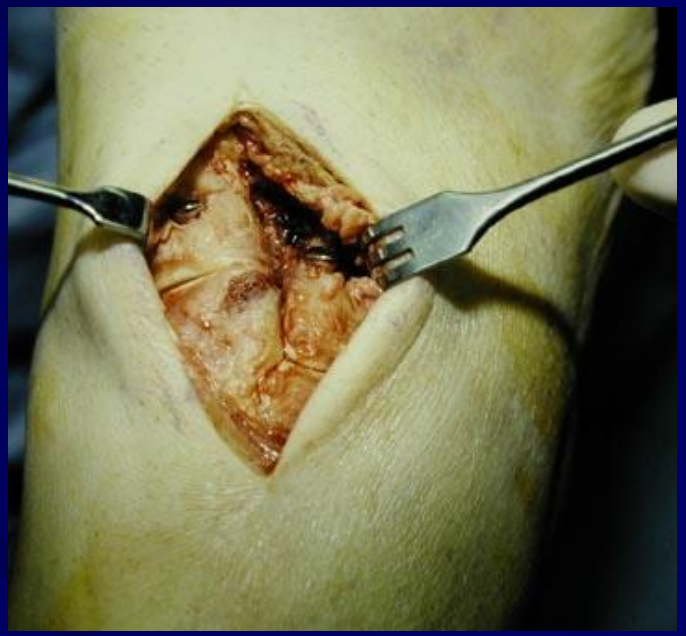
Dorsal incisions

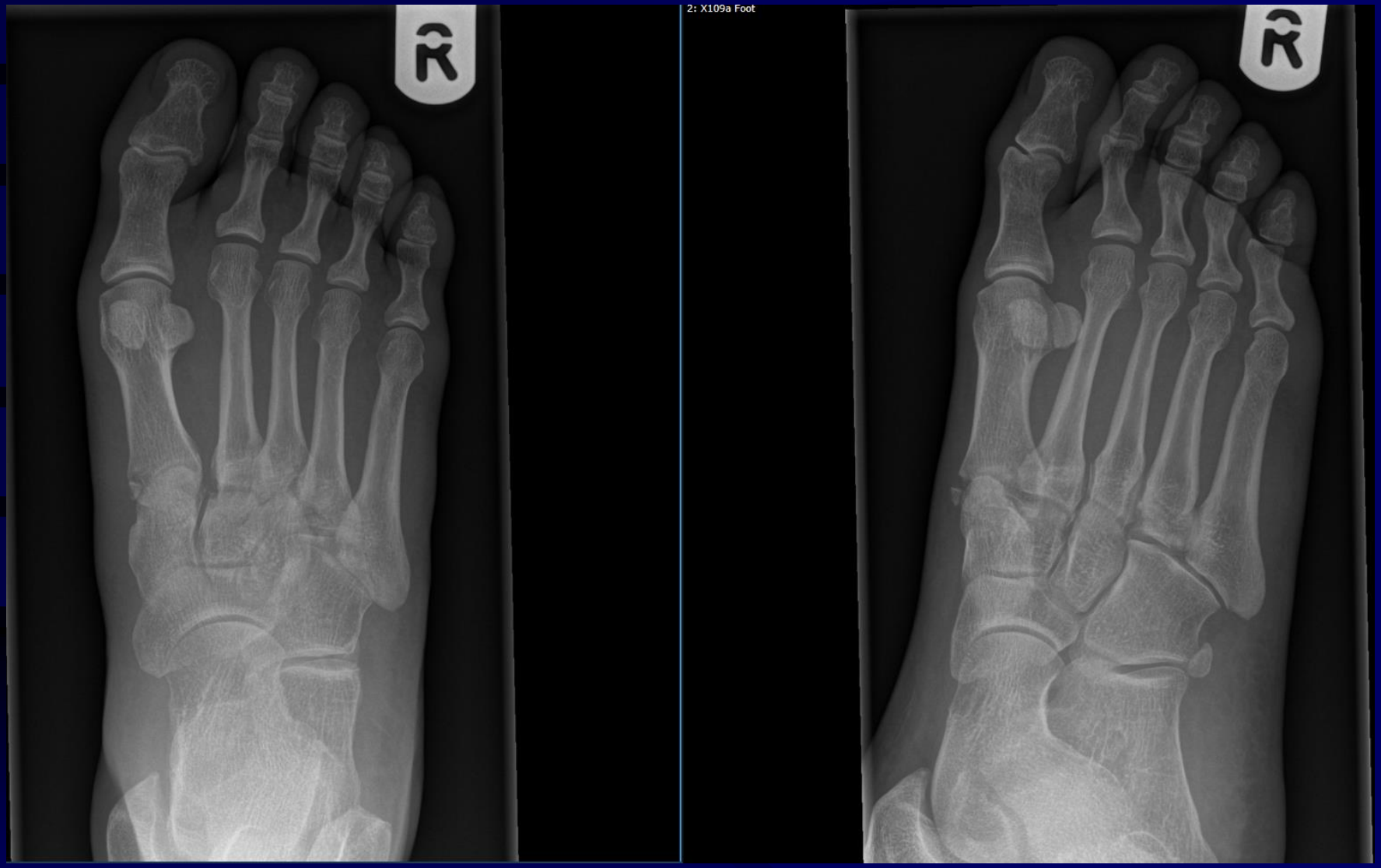
- 1st incision centered at TMT joint and along axis of 2nd ray, lateral to EHL tendon
- Identify and protect NV bundle

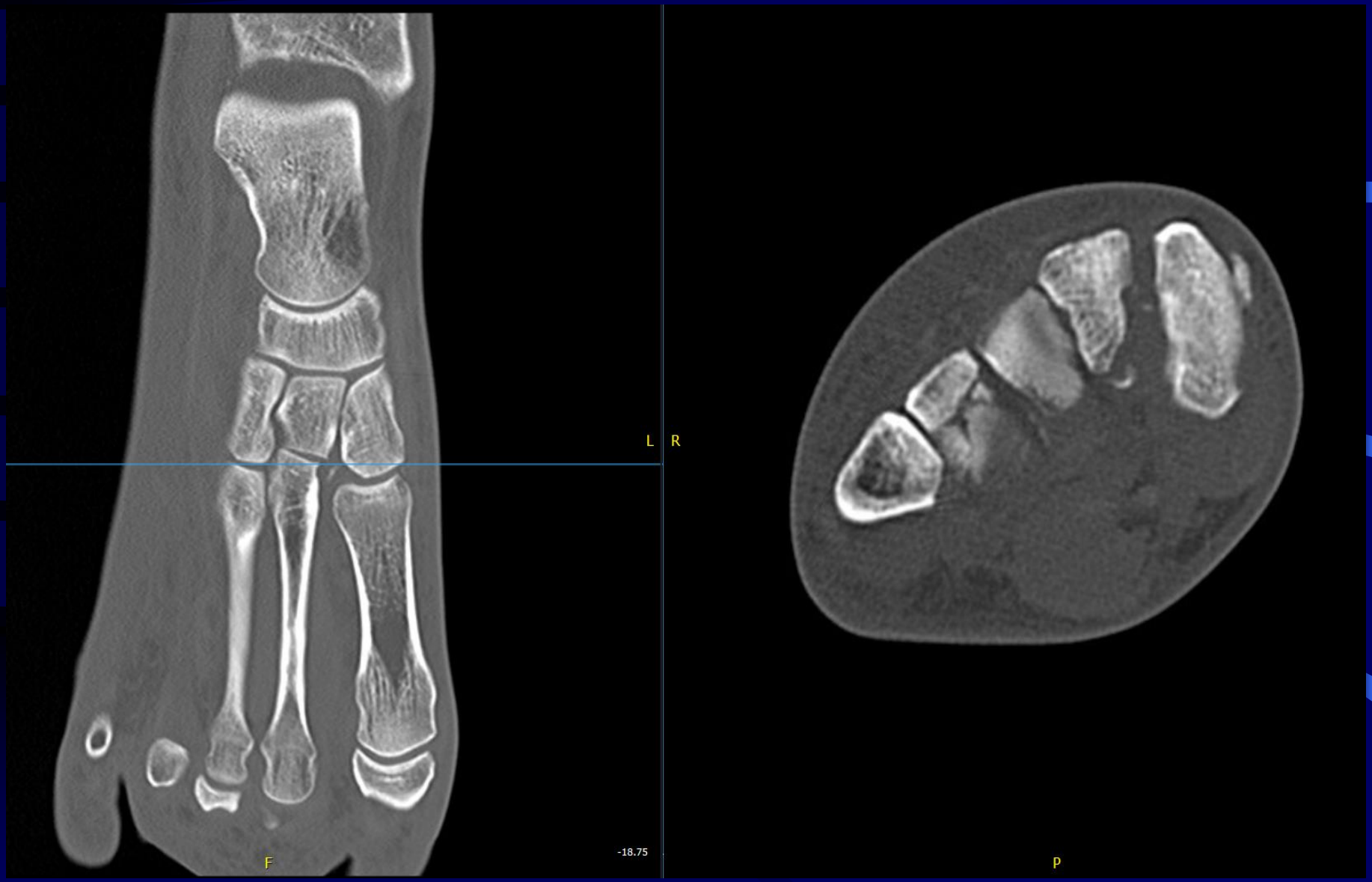


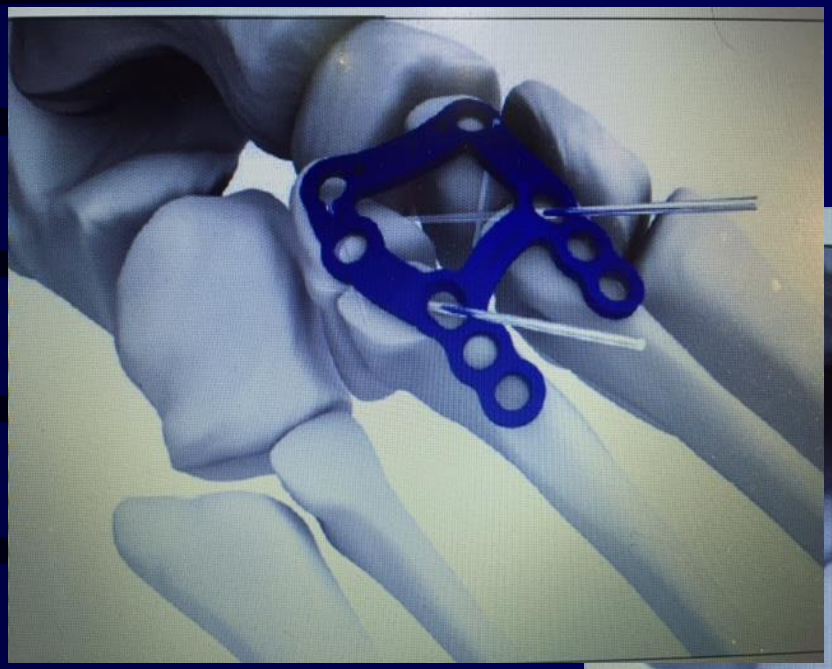
Lisfranc Injury –Operative treatment

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



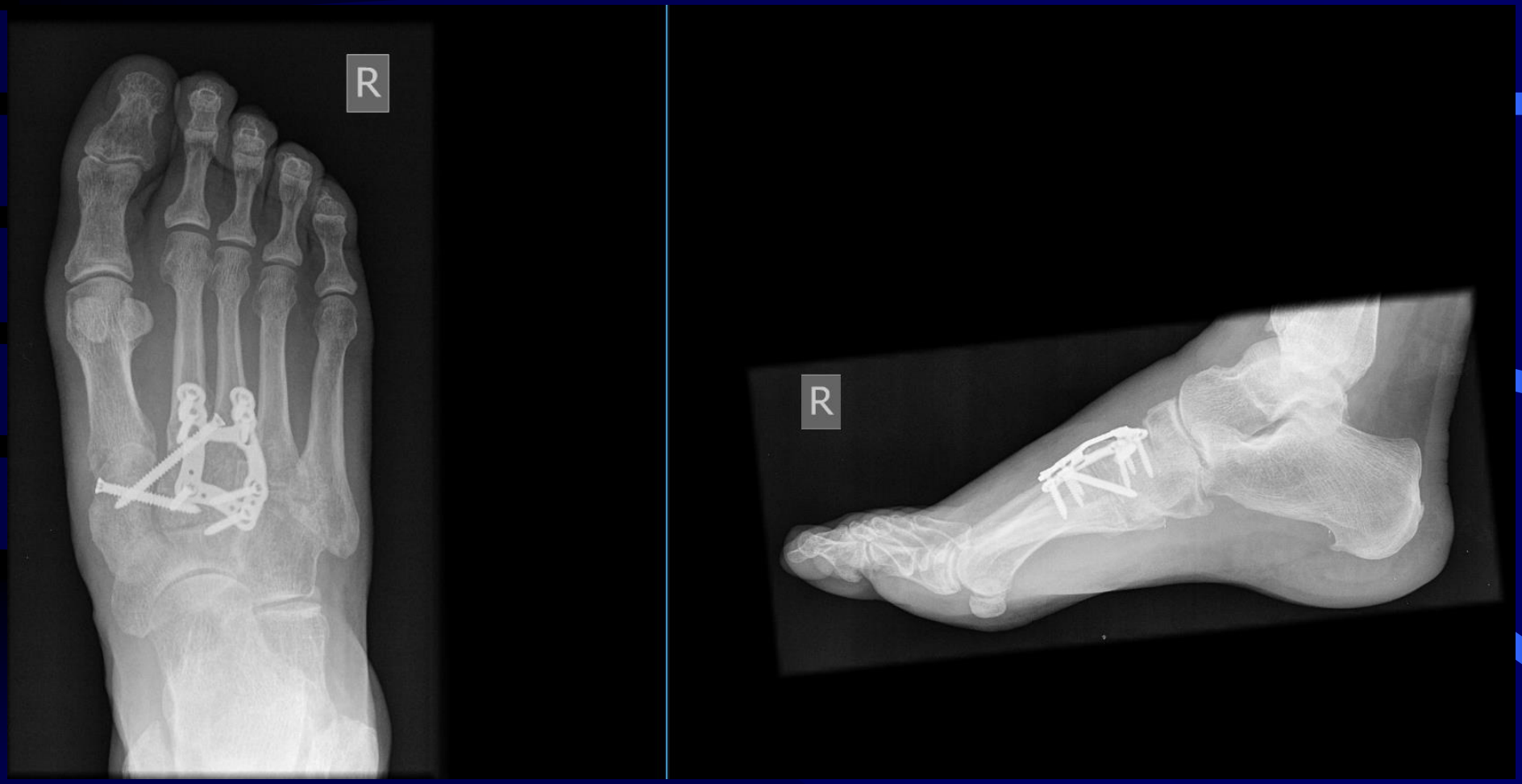

2: X109a Foot


L
R
F
-18.75
P



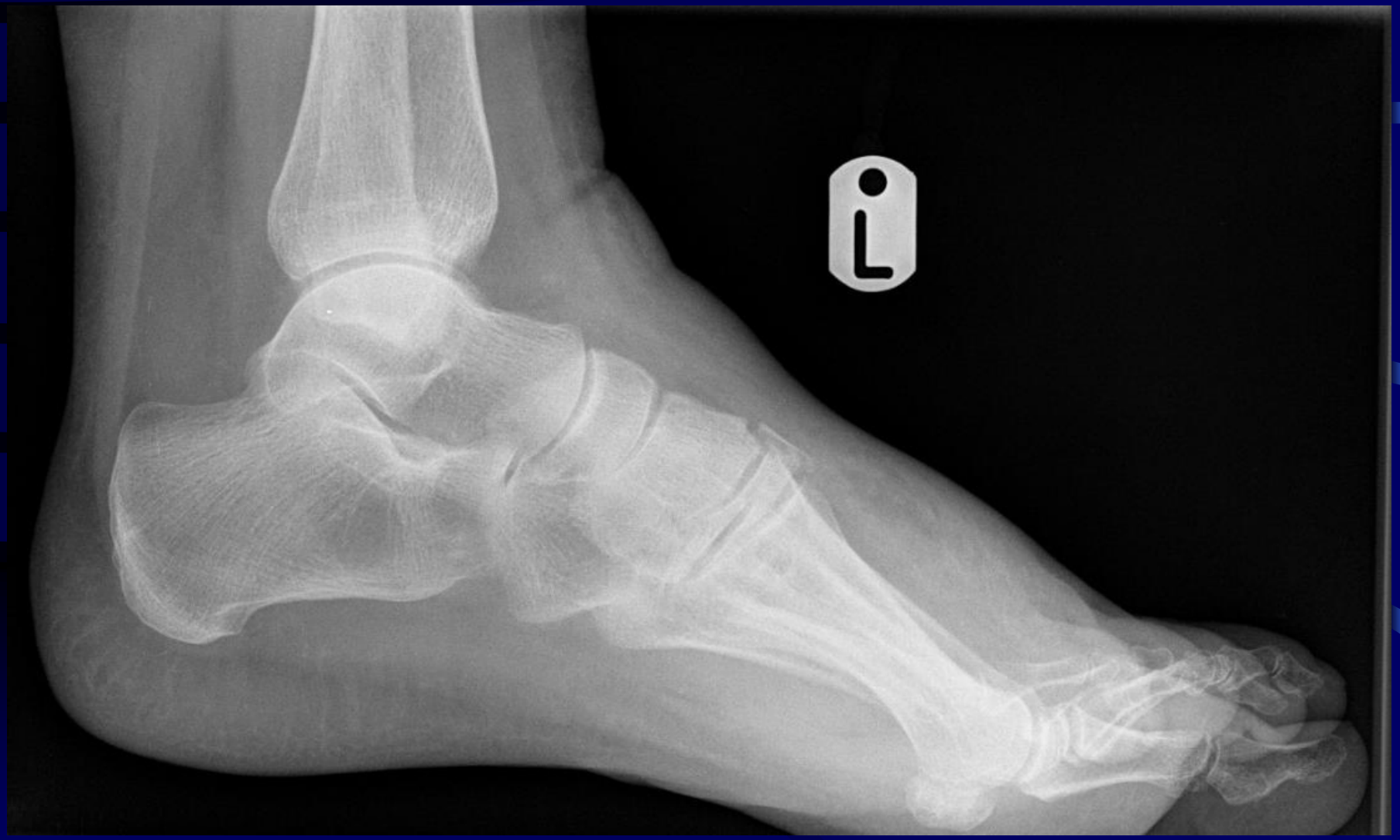

Right


Right


R
R


L


RED DOT
L




(Series 5)
L
2.35
20 of 44


4: Bone 2.0 Sagittal (Series 6)
26 of 45


2: Oblique

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.

Foot Ankle Int. 2005 Jun;26(6):462-73.

Ligamentous Lisfranc joint injuries: a biomechanical comparison of dorsal plate and transarticular screw fixation.

Lisfranc Injury –Primary arthrodesis

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.

- J Bone Joint Surg Am. 2006 Mar;88(3):514-20.
- **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 ($p = 0.02$)

  - Calder JD, Whitehouse SL, Saxby TS. Results of isolated Lisfranc injuries and the effect of compensation claims. JBJS-B 2004.

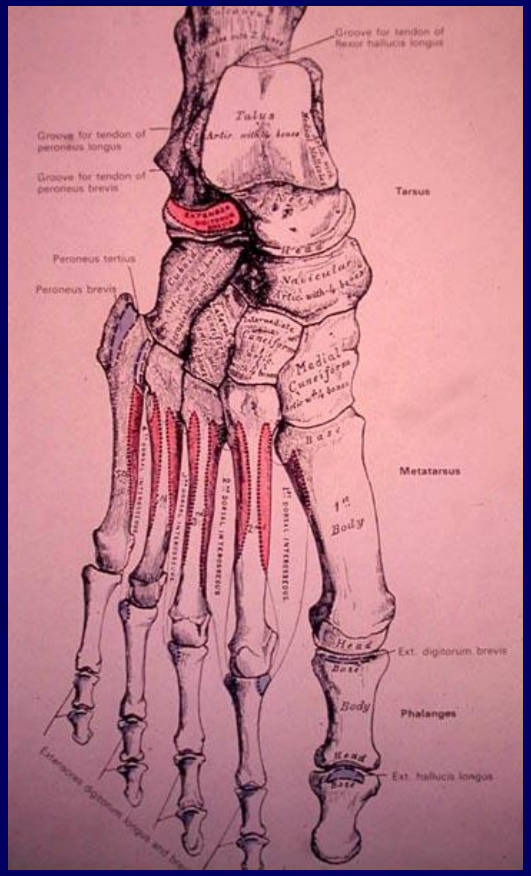
Prognosis

- 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

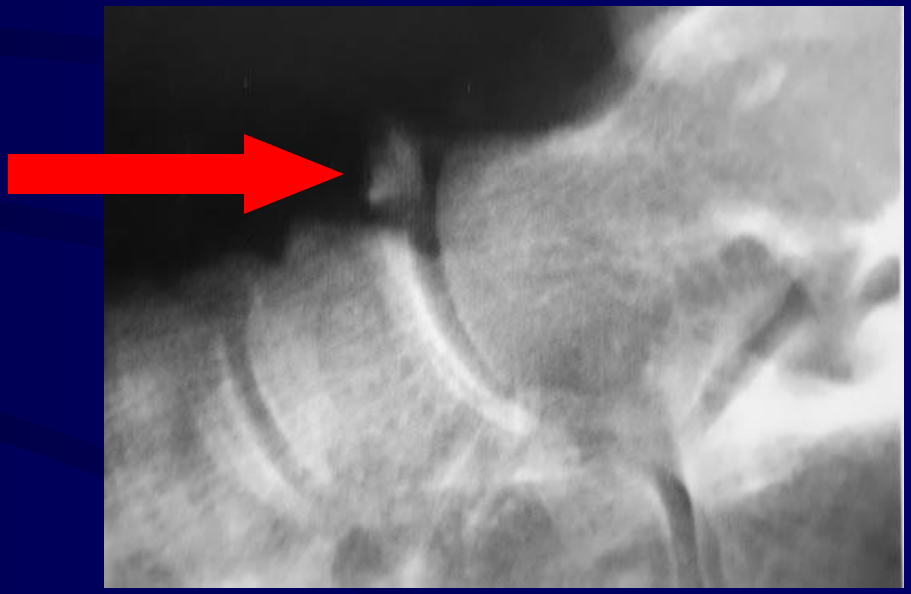
Navicular Fractures

- 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

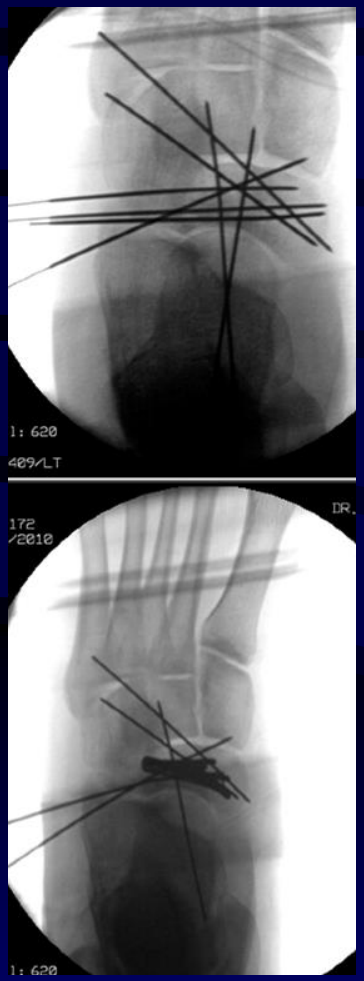
- Tuberosity fractures: avulsion by posterior tibial tendon and spring ligament
- Usually minimally displaced
- May have associated calcaneocuboid impaction

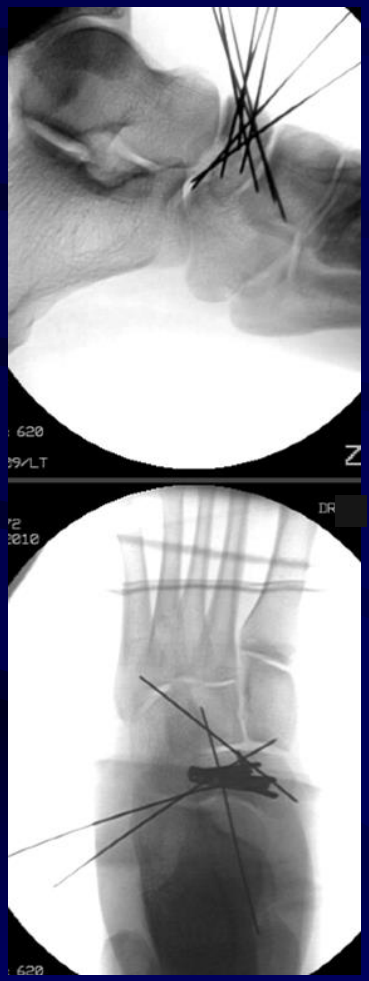
- ORIF depending on degree of displacement (>5mm)

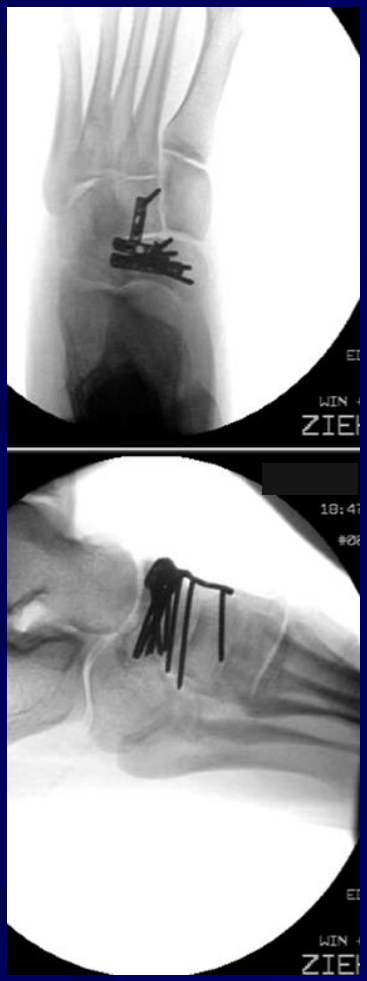
Navicular Fractures

- 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

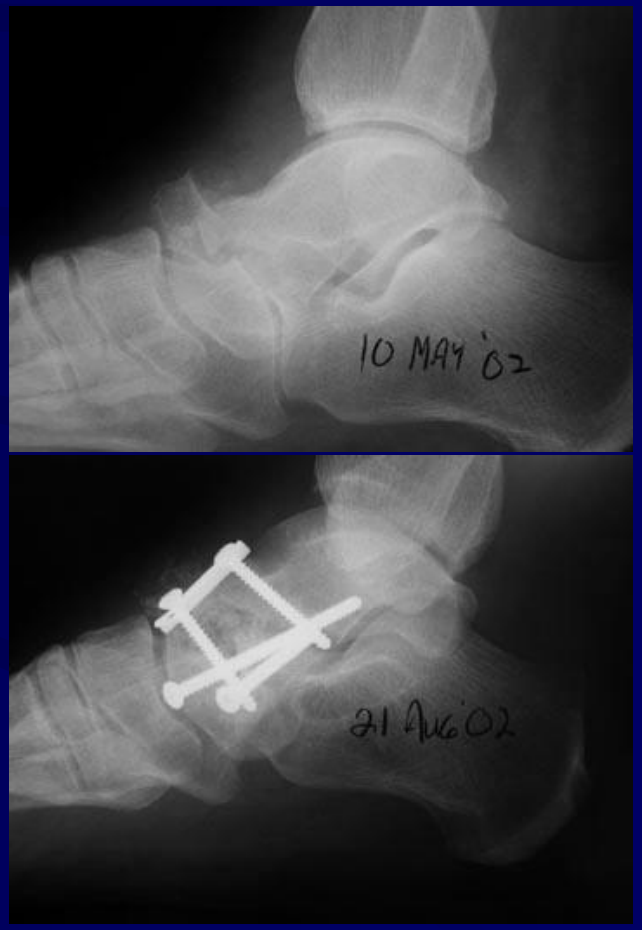






Navicular Body Fractures

- 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”

- Sangeorzan BJ, Benirschke SK, Mosca V, Mayo KA, Hansen ST Jr. Displaced intra-articular fractures of the tarsal navicular. JBJS-A 1989.

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)

Cuboid Fractures-Avulsion fractures

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