

# Complex Midfoot Injuries

## Management Principles

UCSF Trauma 2022

James R Ficke, MD FAAOS COL (ret)  
Professor and Chair  
Department of Orthopaedic Surgery  
Johns Hopkins Hospital

THE JOHNS HOPKINS HOSPITAL

# Conflict of Interest Disclosure

- I have no financial conflicts with this presentation
- Disclosures:
  - *Research Funding: U.S. Dept of Defense*
  - *Forum for Medical Preparedness for Disasters, National Academy of Sciences, Engineering, Medicine*



# Principles

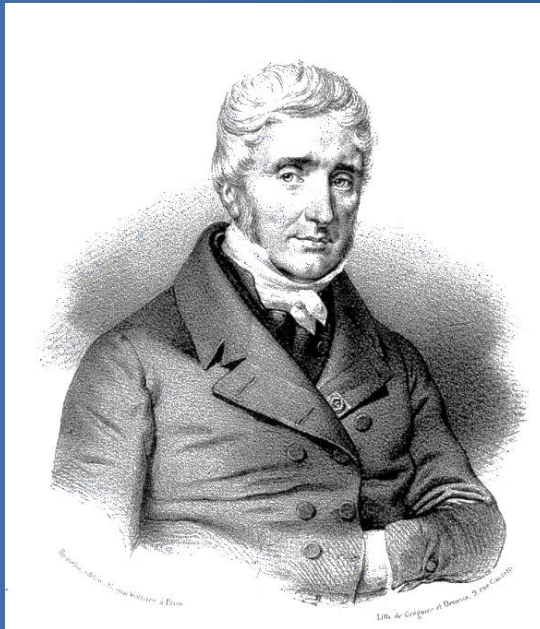
- History
- Anatomy
- Diagnosis
- Indications
- Techniques
- BAD ones...



# History



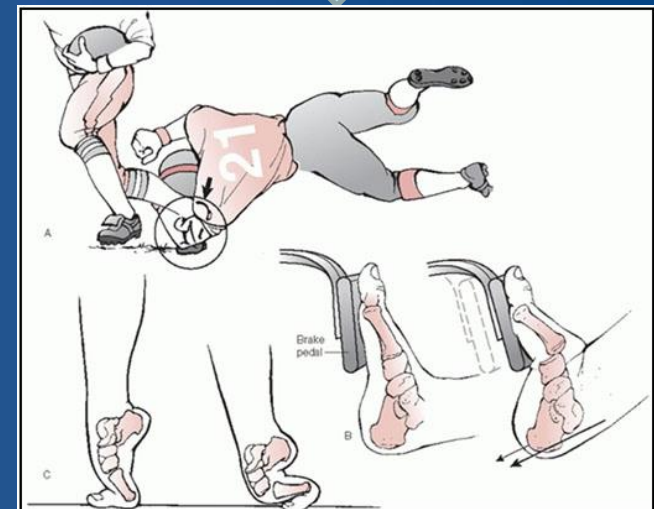
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Jacques Lisfranc de St.  
Martin



<https://sjrhem.ca/lisfranc-injury-we-have-pocus-but-do-we-still-need-the-cavalry/>

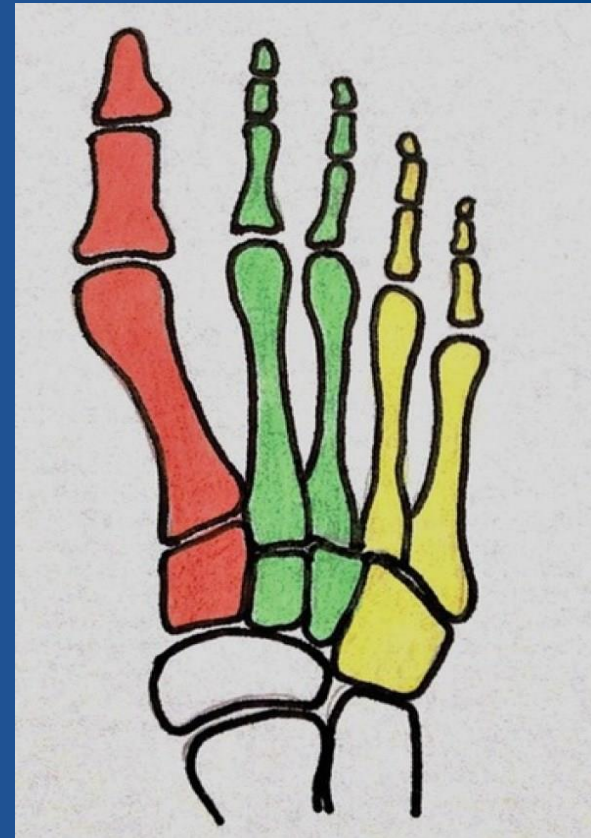


Rockwood and Green



# Midfoot Anatomy

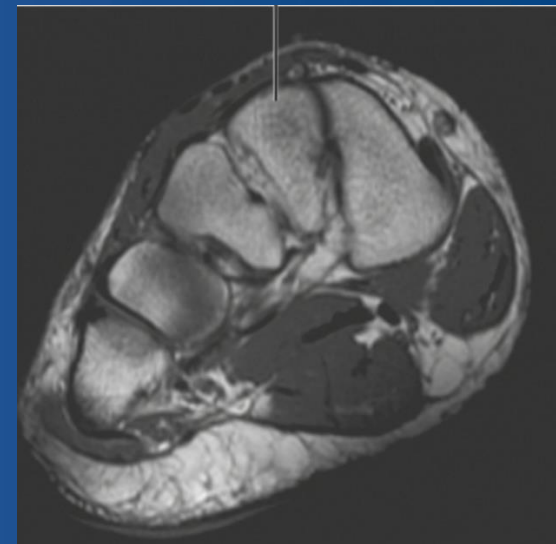
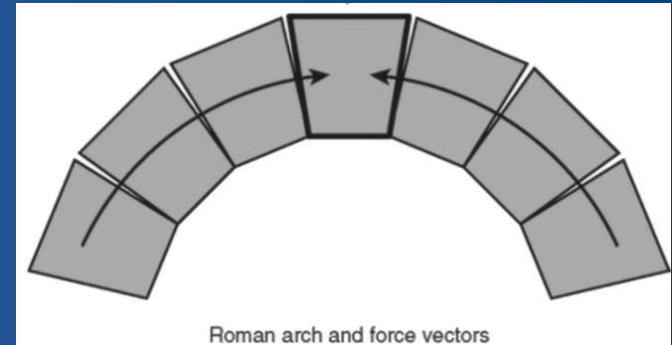
- Medial column
- Intermediate column
- Lateral column



<https://musculoskeletalkey.com/chapter-7-midfoot-and-forefoot-arthritis/>

# Midfoot Anatomy

- Medial column
- Intermediate column
- Lateral column



# Lisfranc Ligament vs Joint Complex

- 5 Metatarsals
- 3 Cuneiforms
- Cuboid

Articular Surfaces  
Ligaments

SKIN!



# Lisfranc Anatomy

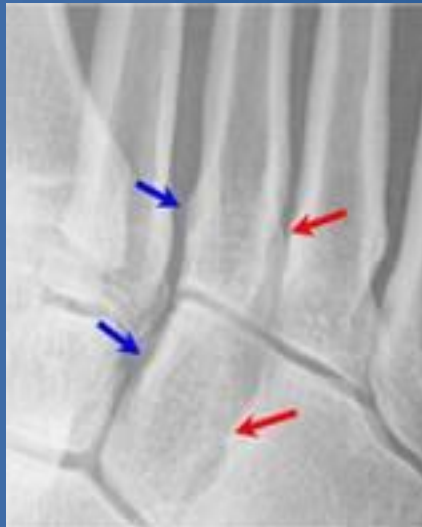


# Diagnosis

- History & injury mechanism
- Gross subluxation/displacement rare
- Swelling/ inability to bear weight
- Plantar ecchymosis
- Imaging
  - *Consider stress films*
  - *CT?*



# Imaging Normal Foot



# Fleck Sign



# Indications/ Timing for Surgery

- Instability
- Open injury
- Vascular Injury
- Skin Compromise



# Restore Anatomy

## Medial / intermediate column

- First metatarsal varus and plantarflexion
- Probe intercuneiform joint for instability
- Medial column carries 40-50% body weight during stance
- Use radiographic markers
- Constructs: plates vs screws



WB



# Restore Anatomy

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# Restore Anatomy

## Lateral column

- Preserve mobility for shock absorption
- Constructs: spanning plates vs k-wires



# Soft Tissue Considerations

- Thin skin, minimal overlying muscle
- Free tissue transfer options:
  - *radial forearm flap*
  - *medial sural artery perforator flap*
  - *anterolateral thigh flap*
  - *pedicled TFL flap*
  - *gracilis flap*
  - *latissimus dorsi flap*



Noaman, Soroor. Foot salvage using microsurgical free muscle flaps in severely crushed foot with soft tissue defects. Injury 50S5 (2019) s17-S20.



# Soft Tissue Considerations



57 yo male, forklift crush injury at work

# Soft Tissue Considerations



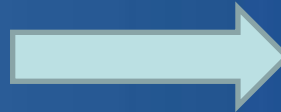
8 weeks  
post-injury



# Soft Tissue Considerations



6 weeks postop



Medial sural artery  
perforator flap

# Foot Compartment Syndrome





- 
- Plantar digital branches of tarsal nerve
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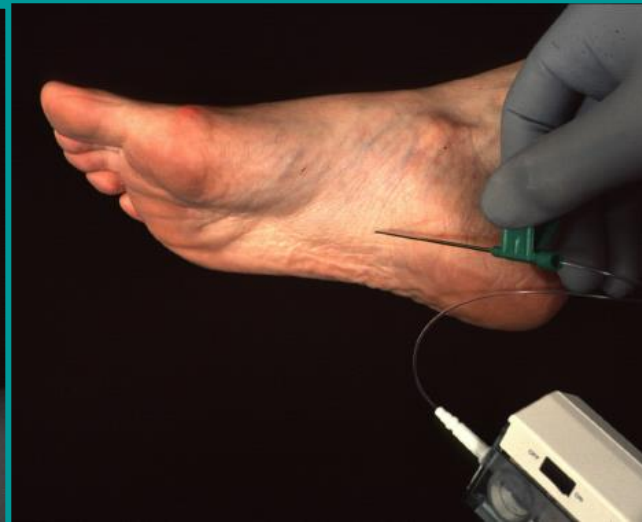


# Diagnosis

Diagnosis based upon  
clinical exam: Pain....

All of these injuries can be  
extremely painful

Or pressure monitor



# Foot Compartment Syndrome

## Treating Sequelae

- Clawtoes
  - *FDL, FDB tenotomies*
  - *PIP joint resections*
  - *Flexor to extensor transfers difficult, SCARRED !*
- Cavus and Heel varus
  - *1<sup>st</sup> metatarsal osteotomy*
- Nerve Injury- Complex Regional Pain-  
most difficult issue to treat



# Sequelae

- Fixed contractures
  - *Equinus? Gastrocnemius*
  - *Clawtoes? Intrinsic minus*
  - *Pes Cavus? Posterior tibialis*  
*or fibrosis of quadratus plantae*
- Neural deficits
  - *Sensibility*
  - *Complex Regional Pain Syndrome*



# Foot Compartment Release

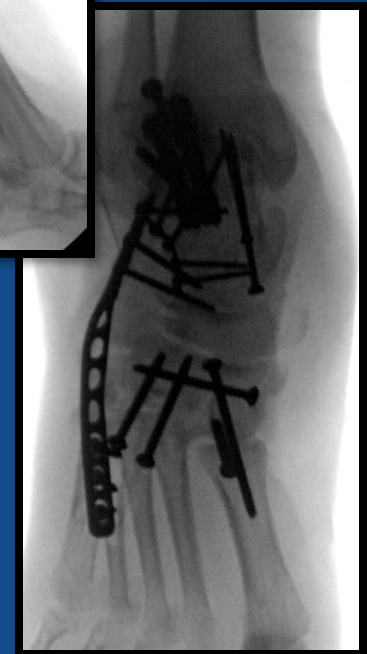
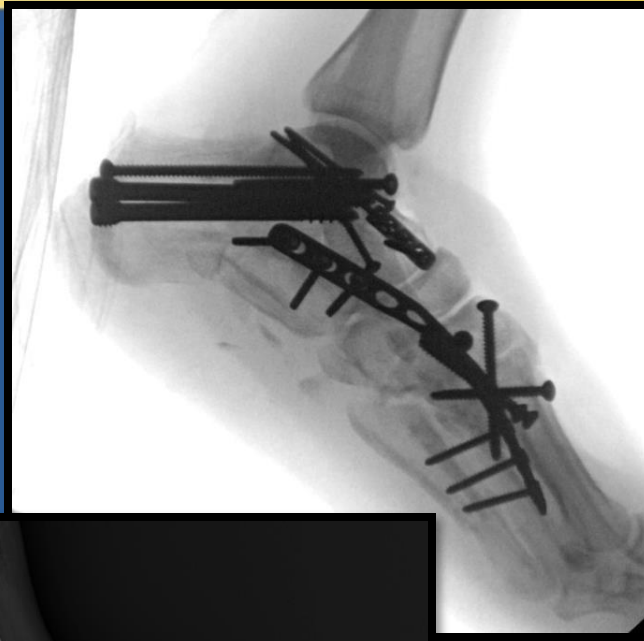
- *Ischemia is bad...*
  - If the muscle is ischemic, release
  - If unknown, look
  - If release will compromise reconstruction, consider consequences.
- *CRPS might be worse*



# Mangled Foot



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# LEAP Foot ankle Salvage

- 182 open severe foot/ ankle (130 feet)
  - 66 *immediate/ early amputation*
  - 116 *limb salvage*
- Sickness Impact Profile significantly higher with ankle arthrodesis or flap
- Higher rehospitalization



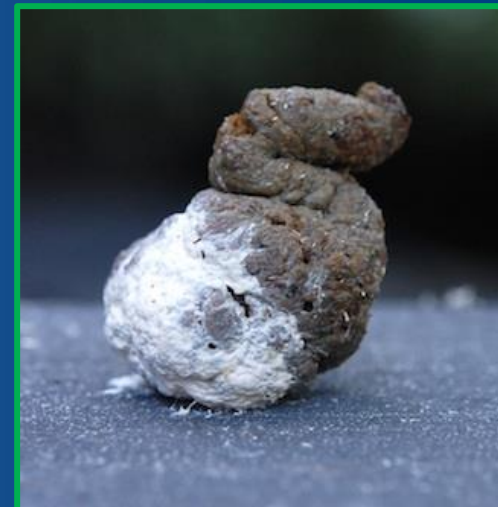
# The Mangled Foot and Leg: Salvage Versus Amputation

Scott B. Shawen, MD<sup>a,b,c,d,\*</sup>, John J. Keeling, MD<sup>b,c,e,f,g</sup>,  
Joanna Branstetter, MD<sup>h</sup>, Kevin L. Kirk, DO<sup>i,j</sup>, James R. Ficke, MD<sup>k</sup>

- Soft Tissue status most important
- Studies suggest amputation less bad results



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# Key Points

- Midfoot injuries involve multiple TMT joints
- Restore 1<sup>st</sup> metatarsal varus & plantarflexion
- Ensure medial/intermediate column stability
- Preserve motion at 4<sup>th</sup> and 5<sup>th</sup> TMT joints
- Consider soft tissue constraints



# Questions?

