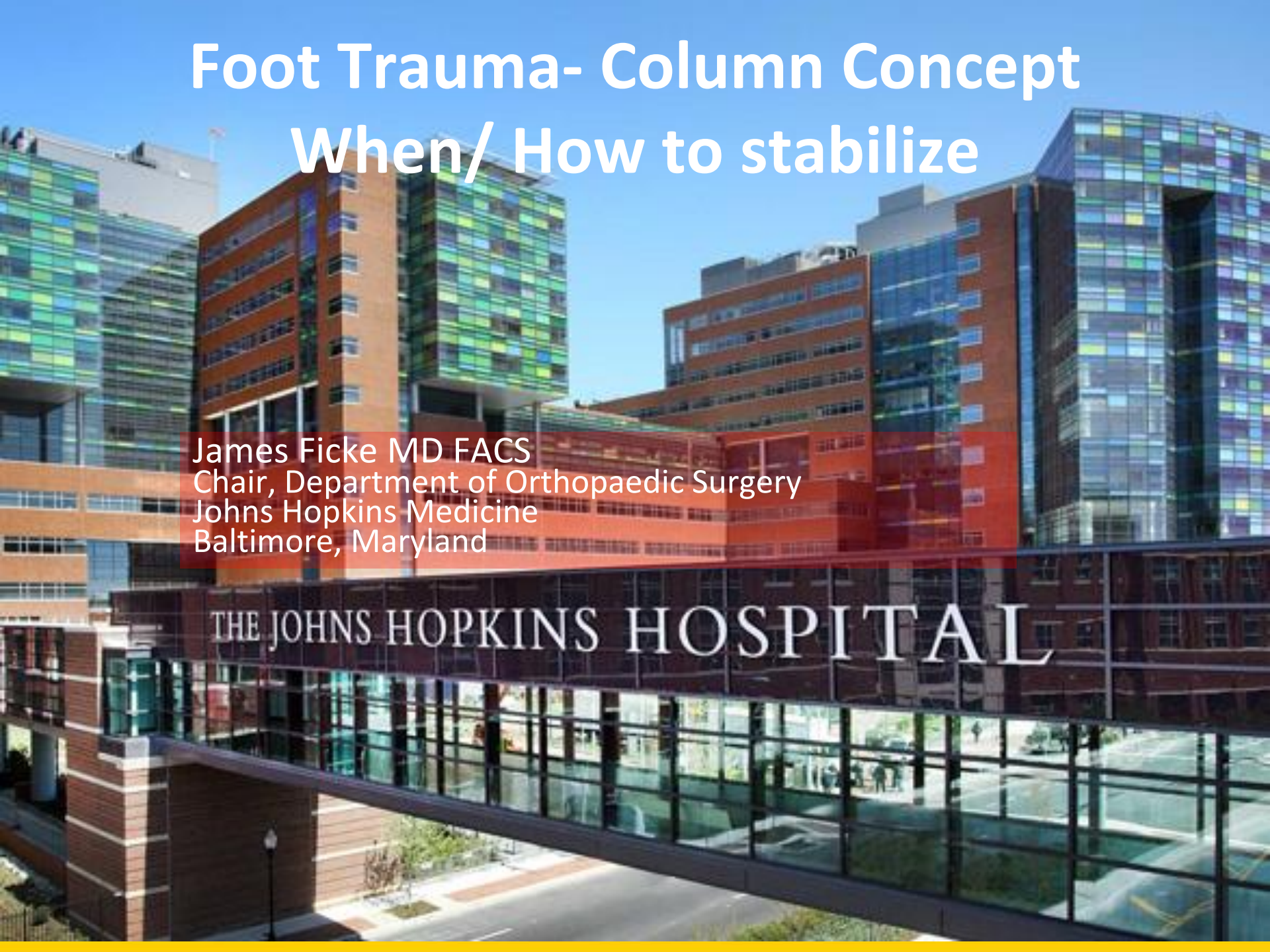
Foot Trauma- Column Concept When/ How to stabilize



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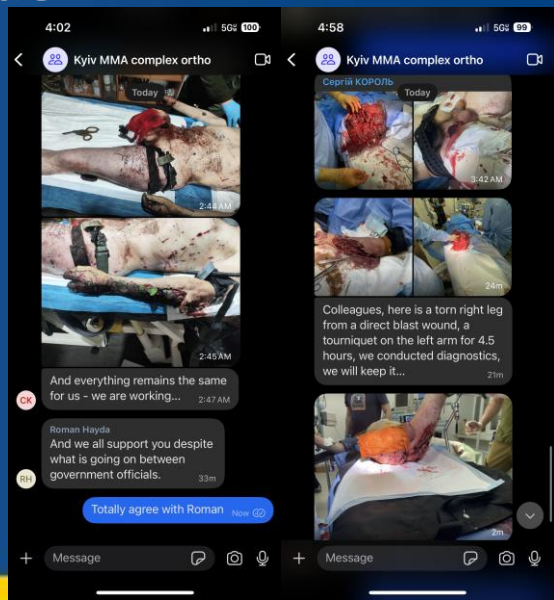
Conflict of Interest Disclosure

James R. Ficke

JOHNS HOPKINS MEDICINE

- I have no financial conflicts with this presentation
- Disclosures:
  - *Research Funding: NIH; U.S. Dept of Defense*
    - Balmoral; Stryker- Transdermal COMPRESS
    - DT MedTech- Prospective Trial H3 Total Ankle
  - *Board of Directors, ABOS; Team Red White Blue*
  - *Board of Trustees, OREF*

I STILL use Signal APP:



ORTHOPAEDIC SURGERY

Principles

- Anatomic Considerations
- Early Recognition “snakes”
- Techniques, Tips, Tricks
- Sequelae, Outcomes

ORTHOPAEDIC SURGERY

Midfoot Anatomy

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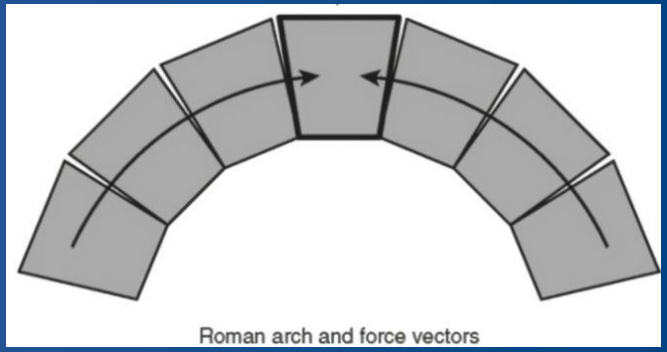
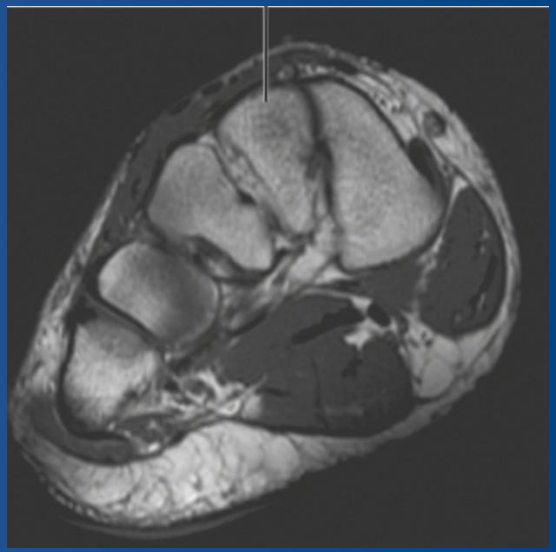
ORTHOPAEDIC SURGERY

- Medial column
- Intermediate column
- Lateral column





Dynamic Function

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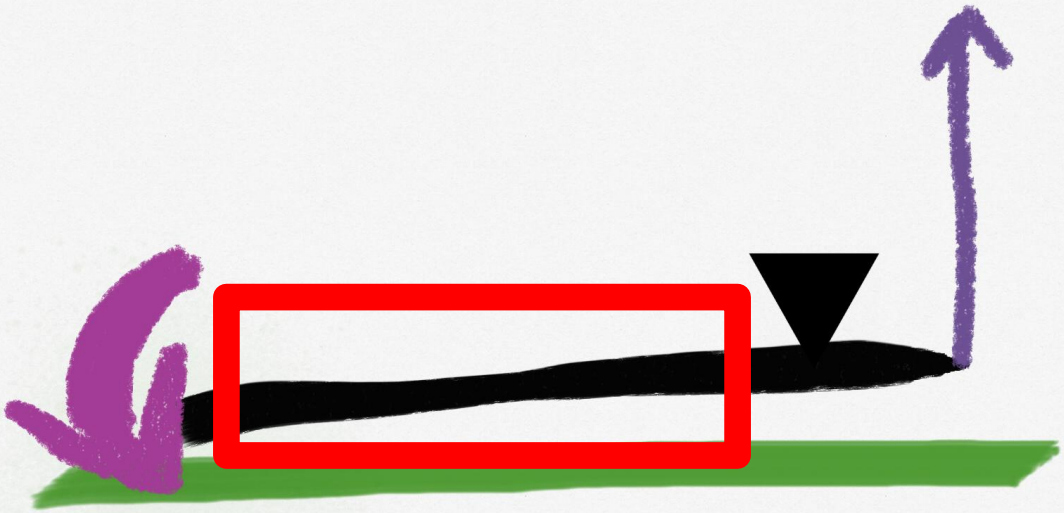
ORTHOPAEDIC SURGERY

- Heel Strike- flexible
  - *Absorb energy*
  - *Accept weight*
- Push off- Rigid
  - *Power lever*
  - *Impart energy*

Varghese et al JPOSNA; 4(2) 2022

Strengthen Lever Arm



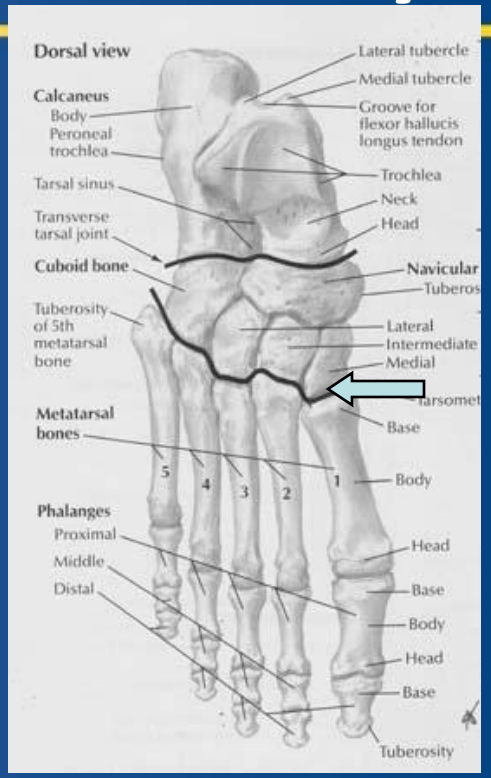
The cuneiforms are essential for converting **force** into **torque**

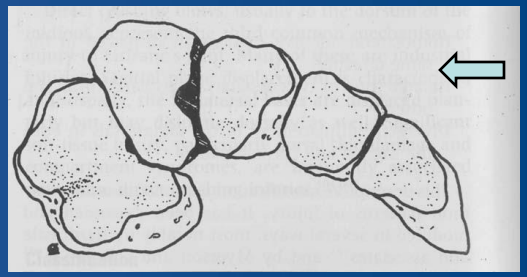
Kamron Hamid 2022

ORTHOPAEDIC SURGERY

Midfoot- Bony Anatomy

- TMT articulation (*Lisfranc)*
- Intrinsic stability
  - *roman arch- dorsal surface wider*
- 2nd MT
  - *keystone of arch, mortise configuration*
  - *No significant dislocation can occur unless 2nd MT is disrupted*





ORTHOPAEDIC SURGERY

Extreme Forces

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ORTHOPAEDIC SURGERY

Column Injuries -Treatment

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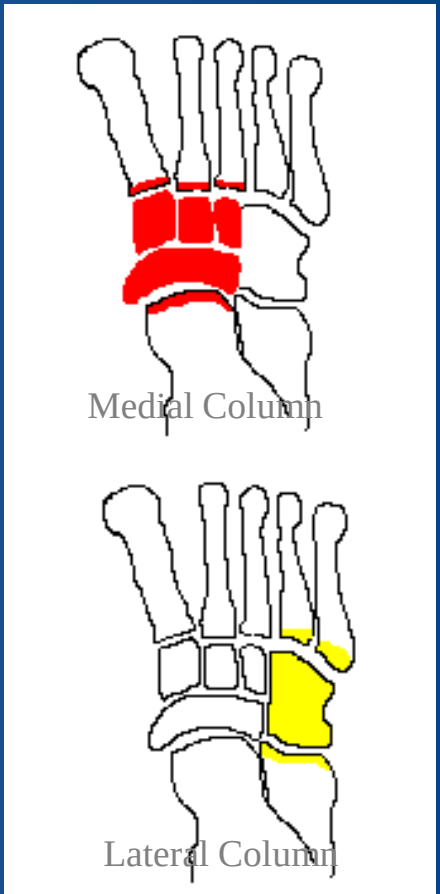
- Apply Principles of anatomic reduction and rigid fixation
- Medial and lateral column should be stable and balanced
- Avoid operating through Markedly Swollen tissue (usually 7+ days for tissue swelling to settle)



ORTHOPAEDIC SURGERY

Early Recognition

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ORTHOPAEDIC SURGERY

- Instability
- Open injury
- Vascular Injury
- Skin Compromise

Midfoot Fractures - Prognosis

JOHNS HOPKINS MEDICINE

- Guarded – often severe soft-tissue injury
- Poorer prognosis w/ T-N disrupted
- Better w/ early treatment- rigid ORIF, early motion

ORTHOPAEDIC SURGERY

Soft Tissue Considerations

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- 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*
- Skin graft

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

ORTHOPAEDIC SURGERY

Soft Tissue Considerations

JOHNS HOPKINS MEDICINE

ORTHOPAEDIC SURGERY

6 weeks postop

Medial sural artery perforator flap

Medial Column Injuries

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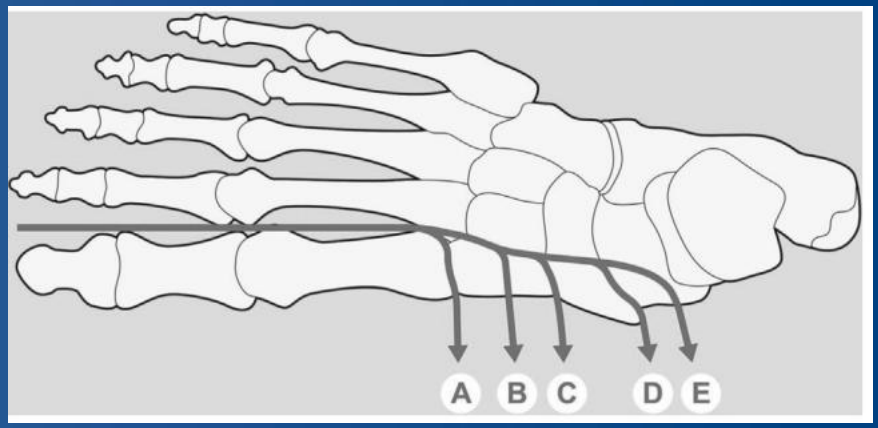
- Dissipation of energy
  - *Through Joints*
  - *Fractures*
- Key to restore length
- Stability of medial arch



ORTHOPAEDIC SURGERY

Beware Column Disruption

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ORTHOPAEDIC SURGERY

Medial Column
Navicular Fracture Types

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MEDICINE

- Avulsion Fracture
  - *Most common*
  - *Avulsed by ligament or Posterior Tibial Tendon*
- Body Fracture
  - *Higher energy – more often requires ORIF*

ORTHOPAEDIC SURGERY

Navicular Body Fracture

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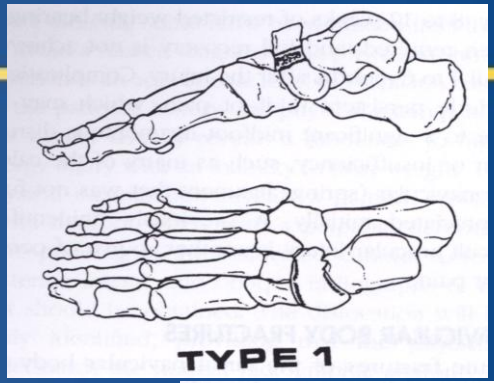
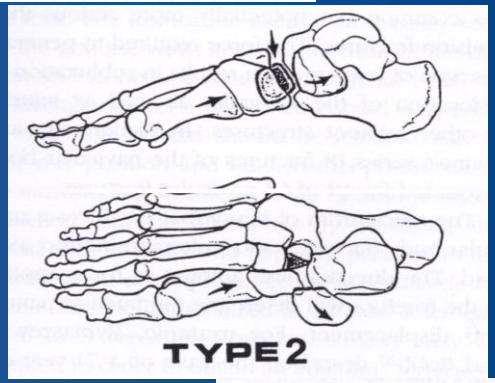
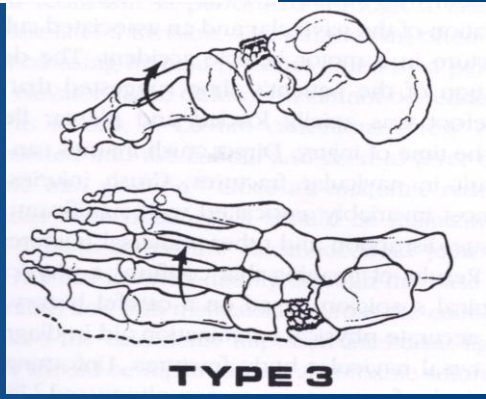
ORTHOPAEDIC SURGERY

Classification

- Type 1
  - *Transverse*
- Type 2
  - *Adduction*
  - *dorsolateral to plantarmedial Fx*
- Type 3
  - *Abduction*
  - *lateral or central comminution*







Case Example

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- 26 y.o male
- Motorcycle accident
- Adduction injury
- Midfoot swelling
- Neurovascular intact

ORTHOPAEDIC SURGERY

Body Fracture - Treatment

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- Anatomic reduction- preserve TN
- Stable fixation
- Bone graft as necessary
- Immobilize 8-12 weeks
- PTafter healing is complete
- TN arthrodesis delayed

ORTHOPAEDIC SURGERY

Navicular Body Fractures—Surgical Treatment and Radiographic Results

Roy Sanders, MD† and Rafael Serrano, MD†*

J Orthop Trauma 2020;34:S38–S44)

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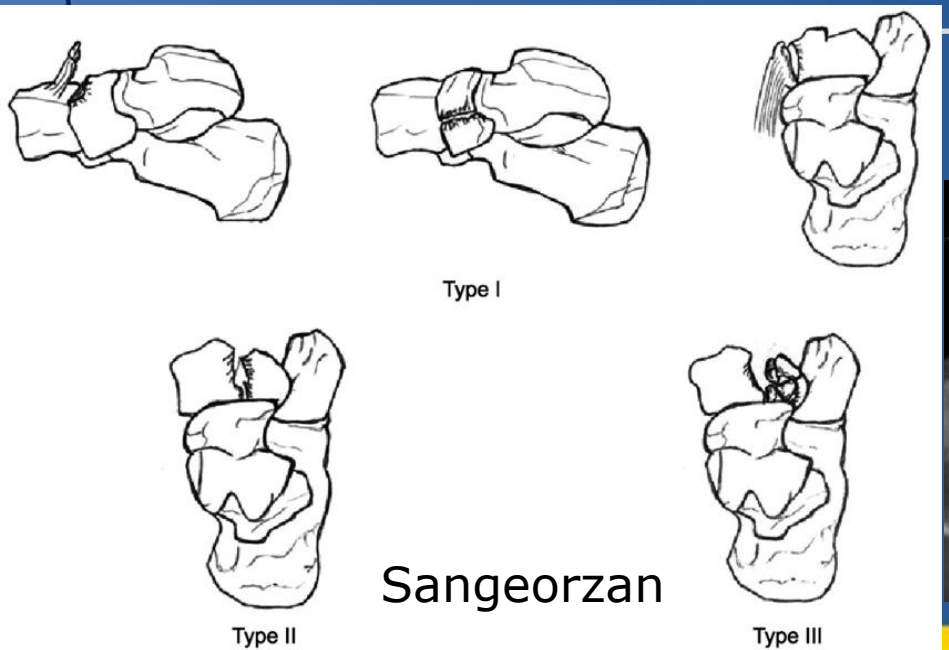
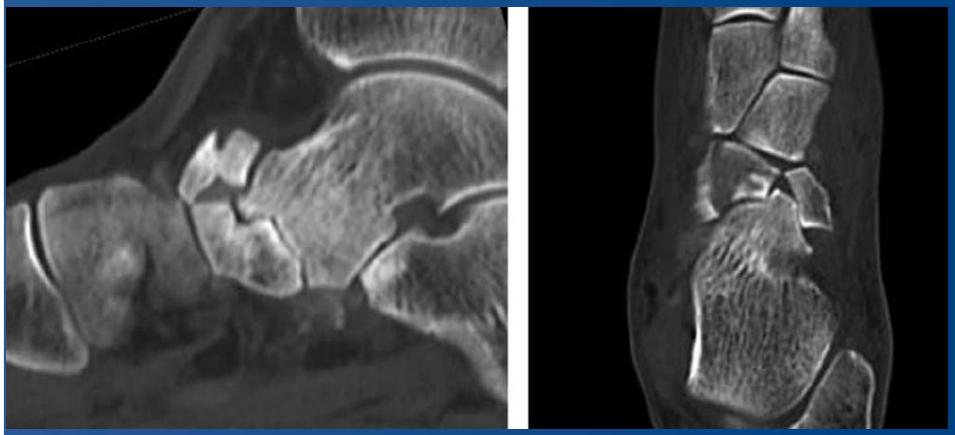
URGERY

- 126 body fractures 10 yr pd
  - *12/18 Schmidt II healed (67%)*
  - *3/21 Schmidt III healed*
  - *Uniformly Poor Prognosis*





Lisfranc Injury

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ORTHOPAEDIC SURGERY

Ligamentous Injury

Radiographs

- Often negative
- WB x-rays if possible
- <u>Check alignment</u>
  - *Medial 2nd MT – middle cuneiform*
  - *Medial 4th MT – cuboid*
  - *Dorsal MT base – Dorsal tarsal bone (lateral)*

Restoring anatomy
medial / intermediate column

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- 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

ORTHOPAEDIC SURGERY

Restoring anatomy
medial / intermediate column

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ORTHOPAEDIC SURGERY

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ORTHOPAEDIC SURGERY

Outcome Studies

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ORTHOPAEDIC SURGERY

Ly et al JBJS2006

- Compared primary arthrodesis with ORIF in pure ligamentous injuries. 20-ORIF/ 21-arthrodesis
- F/U 42.5 mos.
- Arthrodesis group reached 92% pre-injury activity level
- ORIF group 65% pre-injury level.

Rammelt et al JBJS 2008

- Comparative Study 22 primary ORIF with 22 delayed arthrodesis F/U mean 22 months
- AOFAS scores in the group fixed primarily vs delayed fusion (AOFAS mean 81 versus 72; p = 0.031

ORTHOPAEDIC SURGERY

Does Open Reduction and Internal Fixation versus Primary Arthrodesis Improve Patient Outcomes for Lisfranc Trauma? A Systematic Review and Meta-analysis

Nicholas Smith MD, MSc, Craig Stone MD, MSc, FRCSC,
Andrew Furey MD, MSc, FRCSC

Clin Orthop Relat Res (2016) 474:1445–1452

- *Outcomes Appear similar*
- *High performance Athletes/ younger patients RTP*
  - Fixation preferred

Article

AMERICAN ORTHOPAEDIC FOOT & ANKLE SOCIETY

Open Reduction Internal Fixation vs Primary Arthrodesis for Displaced Lisfranc Injuries: A Multicenter Randomized Controlled Trial

Foot & Ankle International®
2024, Vol. 45(6) 612–620

DOI: 10.1177/10711007241232667
journals.sagepub.com/home/fai

Ville Ponkilainen, MD, PhD[1], Heikki Mäenpää, MD, PhD[2], Heikki-Jussi Laine, MD, PhD[3], Nikke Partio, MD, PhD[2], Olli Väistö, MD, PhD[4], Janne Jousmäki, MD[5], Ville M. Mattila, MD, PhD[2,6,7], and Heidi Haapasalo, MD, PhD[3]

Key Points

- Recognize injury patterns
- Assess entire medial column stability
- CT scan essential- timing
- Achieve alignment and length
- Spanning fixation preferred
- Consider arthrodesis (not always!)

Lateral Column
Cuboid fracture/TMT dislocation

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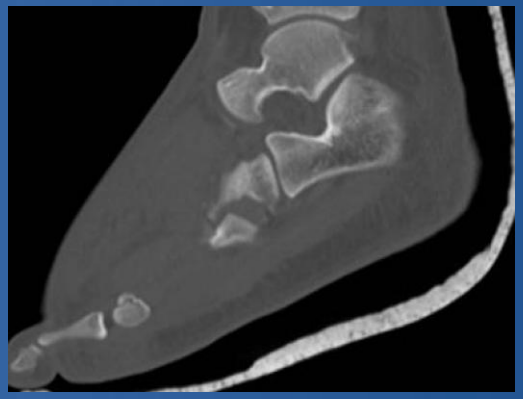
- 25M, s/p 2 story fall
- Closed injury



ORTHOPAEDIC SURGERY

Cuboid fracture/TMT dislocation

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MEDICINE

ORTHOPAEDIC SURGERY

Cuboid fracture/TMT dislocation (6 months after surgery)

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ORTHOPAEDIC SURGERY

Summary

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ORTHOPAEDIC SURGERY

- Often delayed recognition in Polytrauma
- ALWAYS prioritize & respect soft tissues
- Medial Column- Stability (fusion may be ok)
  - Talus, Navicular, Cuneiforms, Lisfranc
  - Rigid Fixation, Bridge Plating, Arthrodesis
- Lateral Column- Mobility (Length/ alignment)
  - *Calcaneus, Cuboid, 4,5 Metatarsals*
  - *Pinning, bridge plating- early removal, Ex Fix*


Thank you!