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 #ASMDC



# Subtalar Dislocations

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**Main Line Health**

Well ahead.™

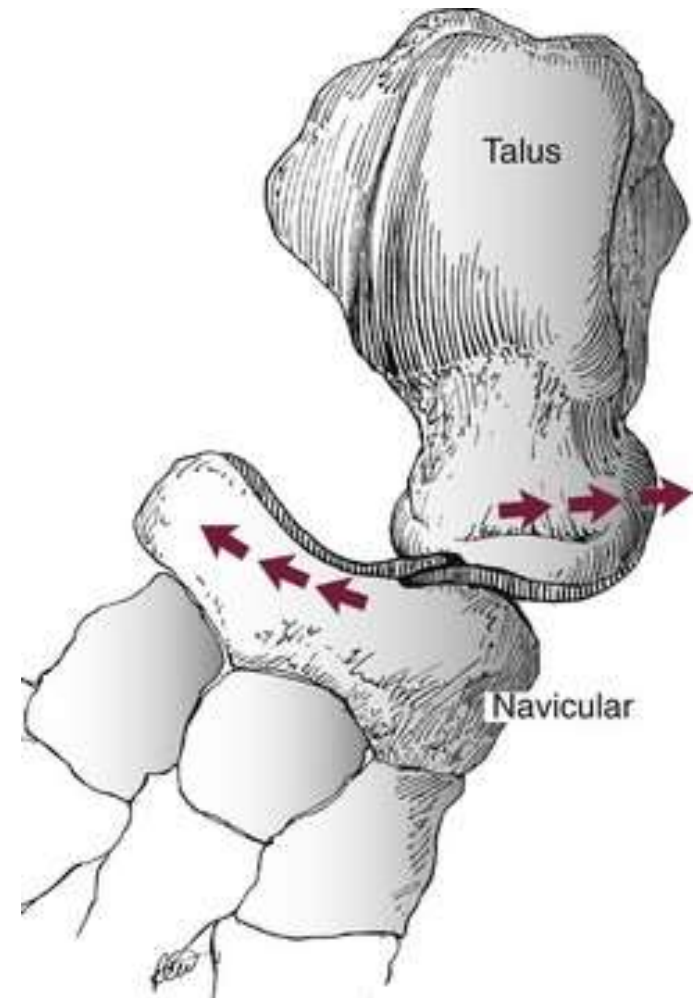


# Disclosures

- I have no disclosures.
- There are industry pictures/names used in this presentation, taken for representation purposes without bias.

# Roadmap

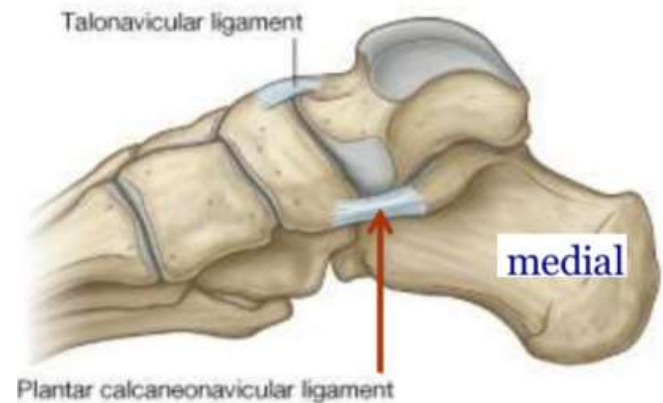
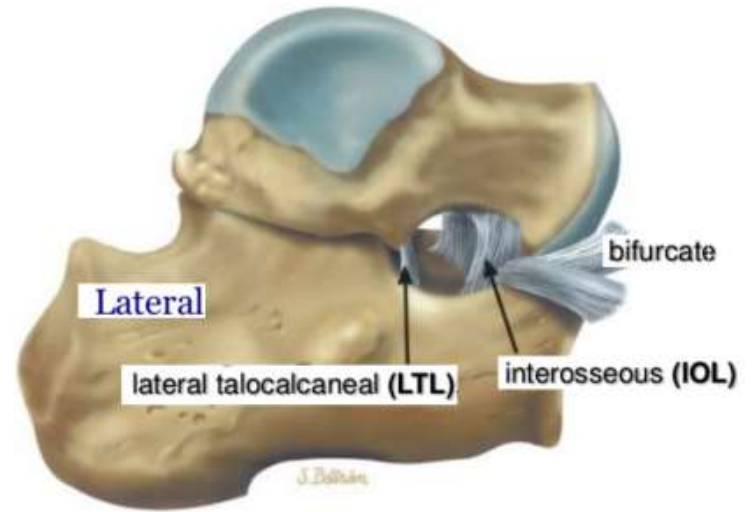
- Background
- Classification
  - Medial, Lateral, etc
- Evaluation
- Treatment
- Complications
- ~~Case Examples~~
- Review



**BACKGROUND**

# Subtalar Dislocation

- Dislocation of the articulations of the talus:
  - Talocalcaneal joint
  - Talonavicular joint
  - +/- Talo-crural joint
    - Ankle disruption can occur, but with ankle osseous fracture, the injury is classified “differently”
    - Total talar dislocation different entity
- STJ dislocation = No “fracture”
  - Bony avulsion across STJ typically present due to ligamentous attachments



# Other Info...



- $\approx$  1-2% of all dislocations
  - 15% of all peri-talar injuries
  - High Energy: MVA (50%), FFH (20-30%), Sport (14%)
- 20-25% Open
  - Lateral > Medial
- 3<sup>rd</sup> decade; Male > Female (6-10x)
- Up to 45% associated fracture rate (M vs. L)
  - Associated Injuries: OCD, Ankle Fx\*, 5MT base fx, Navicular/Cuboid fx

**CLASSIFICATION**

**CLASSIFICATION**

# Broca Classification (1853)

- 1811 – Dufaurest and Judcy (1<sup>st</sup> description)
- Dislocations can be in 4 main directions (1853, Broca)
  - *Medial*
  - *Lateral*
  - *Anterior* (added 1855, Malgaigne and Henke)
  - *Posterior*
- Do NOT confuse with Lauge-Hansen/Weber ankle fractures
  - STJ dislocations have NO “fracture(s)”; talus “IN” mortise
- MISC
  - Deltoid ligament frequently ruptures
  - CC ligaments usually remain intact → rupture = Peritalar d/l



**CLASSIFICATION**

	<b>Medial</b>	<b>Lateral</b>
<b>Incidence</b>	~85%	~ 15%
<b>Foot Position</b>	<ul style="list-style-type: none"><li>• Foot/Calc = <b>MEDIAL</b>, to talus; “Clubfoot”</li></ul>	<ul style="list-style-type: none"><li>• Foot/Calc = <b>LATERAL</b>, to talus; “Acquired FF”</li><li>• Toes PFX’d</li></ul>
<b>Talar Head (Prom.)</b>	<ul style="list-style-type: none"><li>• Dorso-<b>LATERAL</b></li></ul>	<ul style="list-style-type: none"><li>• <b>MEDIAL</b></li></ul>
<b>MOI</b>	<ul style="list-style-type: none"><li>• Forceful <b>INV</b> of PFX’d foot</li></ul>	<ul style="list-style-type: none"><li>• Forceful <b>EV</b> of PFX’d foot</li></ul>
<b>XR / CT</b>	<ul style="list-style-type: none"><li>• Foot (nav)/Calc <b>MEDIAL</b></li><li>• Talar head <b>SUPERIOR</b> to navicular</li></ul>	<ul style="list-style-type: none"><li>• Foot (nav)/Calc <b>LATERAL</b></li><li>• Talar head <b>COLLINEAR/OVERLAP</b> med to navicular</li></ul>
<b>Concomitant Injuries</b>	<ul style="list-style-type: none"><li>• TNJ d/l</li><li>• Fx = talar head, post process; navicular</li></ul>	<ul style="list-style-type: none"><li>• TNJ d/l</li><li>• Fx = cuboid, ant calc process; LTP; talus OCD; fibula</li></ul>

# Broca Classification

CLASSIFICATION

## Medial

## Lateral



# Broca – Other

## Anterior (≈ 1%)

- MOI = traction, hyper-dfx
  - I/O lig tear → posterior facet slides beyond tuber
- Highly unstable → lateral d/l
- XR
  - Talar Post Facet **on** Calc Tuber
  - “Elongated” foot



## Posterior ≈ 2.5%

- MOI = Plantar hyper-flexion
  - I/O lig tear → talus dorsal to navicular
- Highly unstable → medial d/l
- XR
  - Talus dorsal to navicular
  - Post Talus **in** post STJ facet
  - “Shortened foot” on AP



# EVALUATION

# Physical Exam



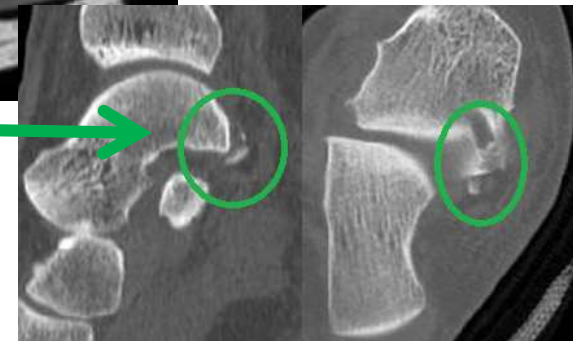
- Gross deformity
  - Define: M (vs) L
- Closed (vs) Open
- Ankle/hindfoot pain, swelling
- Limited ROM
- Blisters, Pressure, Necrosis
  - Med d/l = LM, DL talar head
  - Lat d/l = MM, med talar head
- NV Status (pre/post)
- 88% concomitant injuries f/a





# Imaging

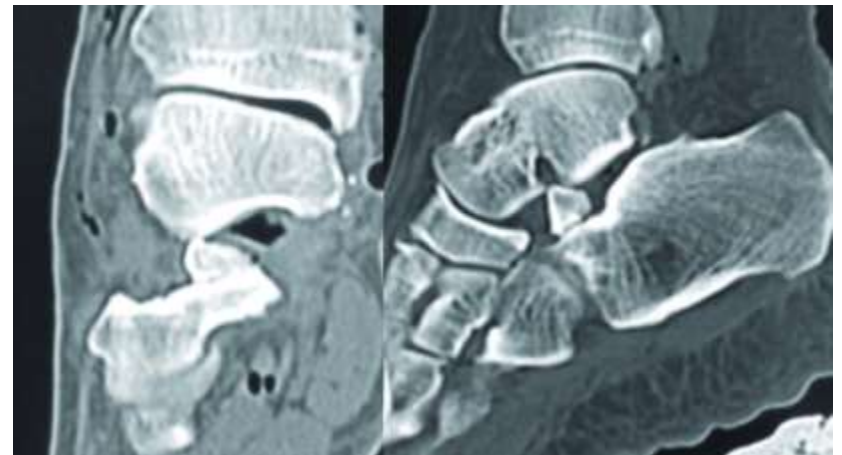
- XRs (Foot and Ankle)
  - AP = talar head/navicular
  - **MED** d/l= talar head **superior** to navicular
  - **LAT** d/l = talar head **colinear/inferior** to navicular
- CT (up to 60% fxs^)
  - Post-reduction evaluation
  - Associated injuries
    - STJ debris / fragments
  - “Invaluable tool” where in 44% cases, altered treatment course\*



**TREATMENT**

# Reduction

- Prompt reduction under anesthesia
  - Prevent skin necrosis and NV compromise
  - CR delay may require OR
- Closed vs Open
  - One attempt/session at Closed
  - Trans to operative Open





# Non-Operative

- Closed Reduction (60-70% successful)

- Position

- (1) Knee flexion / Ankle PFX
- (2) Distraction, Inc Deformity...then, Reverse Hindfoot...
  - Medial/“Supinated” = Invert, then Eversion/Pronation
  - Lateral/“Pronated” = Evert, then Inversion/Supination
  - Pressure on Talar head, foot in PFX

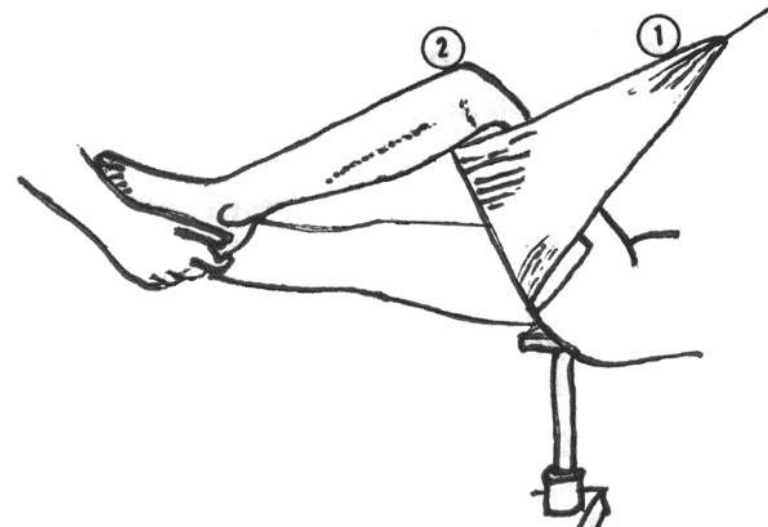
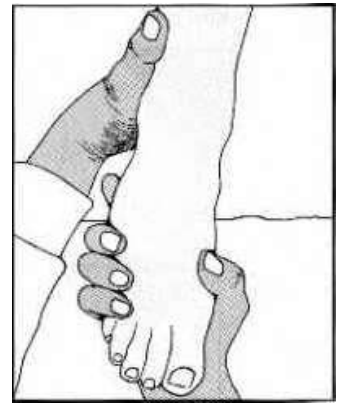
- Assess stability post-reduction (stress)

- Splint (in direction of reduction)

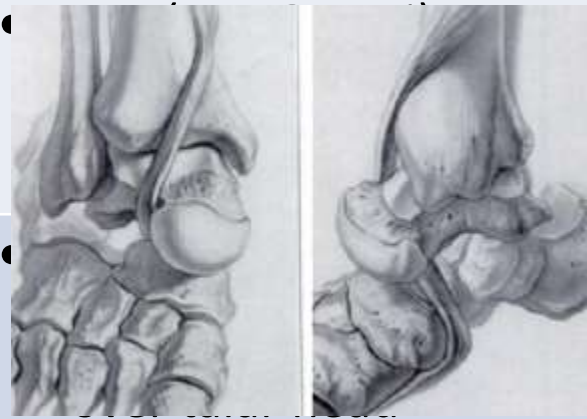
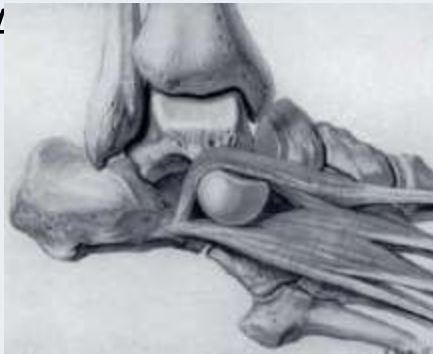
- NBW x4-6 wks → Progress
  - Medial = 4 weeks
  - Lateral = 6 weeks

- Post-Op CT

- 30% require open reduction



	Medial	Lateral
<b>Surgical (OR)</b>	~10%	~20%
<b>Blocked Reduction</b>	<ul style="list-style-type: none"> <li>• TN</li> <li>• Pe</li> <li>• Im</li> </ul>	<ul style="list-style-type: none"> <li>•</li> </ul>
<b>Incision</b>	<ul style="list-style-type: none"> <li>• An</li> <li>• ov</li> <li>• Manipulate, release</li> <li>• int</li> </ul>	<ul style="list-style-type: none"> <li>• Manipulate, release interposed tissue (PTT)</li> </ul>
<b>Post-Op</b>	<ul style="list-style-type: none"> <li>• Re</li> <li>• NV</li> <li>• /</li> </ul>	<ul style="list-style-type: none"> <li>• More unstable → trans-art pin (TN/STJ)</li> <li>• NWB 4-<u>6</u> wks → begin A/P-ROM, WB</li> <li>• CFL reconstruction (?)</li> <li>• LTP fxs = small frag ORIF (2.0-2.7mm)</li> </ul>



\*Rammelt S. FAC/Na, 2015. 26043242  
 Leitner B. JBJSam 1954. 13152139

# Pinning Techniques

- KW v Steinmann Pins
- Joints
  - TNJ, STJ; CCJ?
- Removal 4 wks

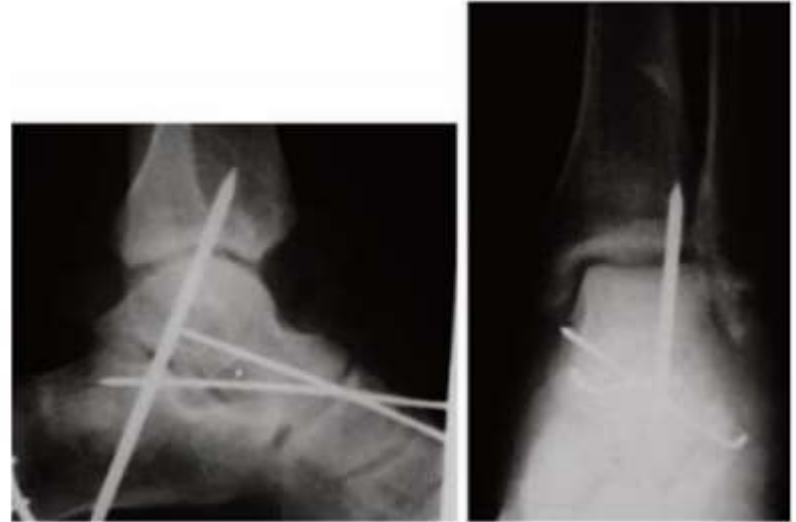


Figure 8. A 33 year-old with unstable isolated medial TCN dislocation who underwent percutaneous pinning with steiman pins.



# Post-Reduction CT

- Purpose:
  - Assess reduction
  - Evaluation for:
    - Fractures (LTP, Sust tali, post process, etc)
    - Bony blocks
    - OCDs
- Go back 2° for ORIF of necessary fxs



# Open Injuries

- ≈ 25%
- Lateral >> Medial
- More likely 2° fractures
  - Calcaneus, fibula, midfoot
- Lavage → Reduction → Lavage
  - 1° Close vs VAC, DPC
- ExFix Stabilization (tib/met)
  - 4-6 wks
- RT OR 3-5d for Lavage and Closure



# Post-Operation Protocols



- In stable injuries:\*
  - Medial >> Lateral
  - 3-5d = A-ROM Ankle (P.T.)
  - 3-4 wks = PWB CAM; A/P-ROM Ankle, foot strengthening exercises
  - 5 wk = → FWB CAM
  - 6-7 wks = WBAT ASO
    - DFX/PFX w ltd INV/EV
- In unstable injuries:
  - Lateral >> Medial
  - If joints pinned, remove at 3-4 wks
  - NWB 4-6 wks → begin A/P-ROM, WB

\*\*Imaging at 6-8 wks s/p injury = XR, CT, MRI = Eval for AVN\*\*

# Prognosis



- Purely ligamentous: medial = lateral
- Energy?
  - Low E = up to 100% excellent functional outcome
  - High E = up to 15% “”””
- Hoexum and Heetveld et al.
  - N = 329; functional results
    - Good = 52%, Fair = 25%, Poor 23%

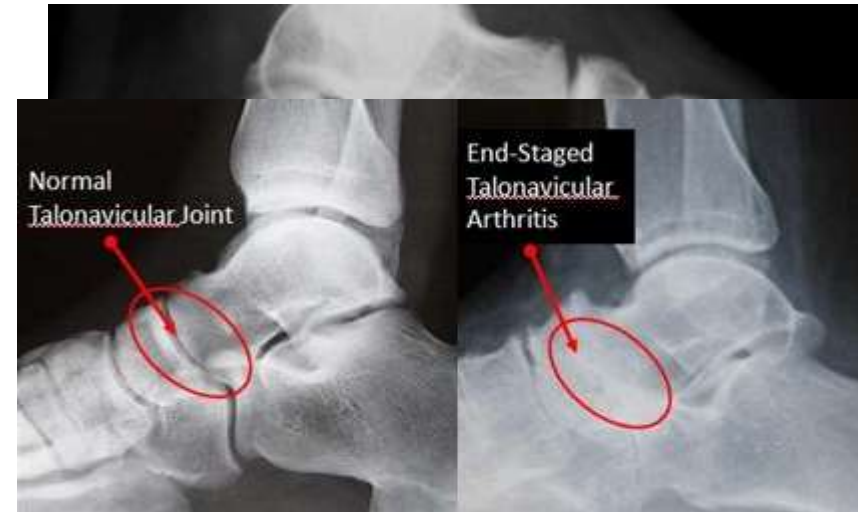


# COMPLICATIONS



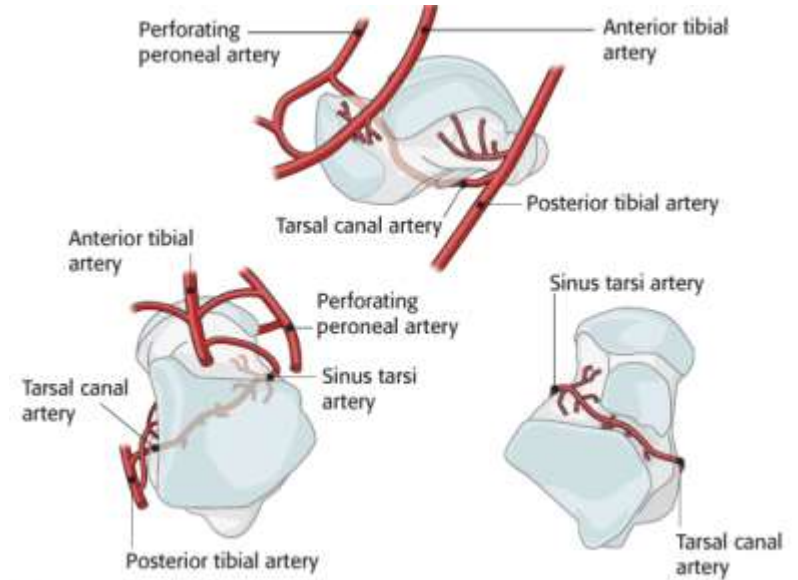
# Complications

- Overall 20% rate
- Post-traumatic Arthritis (40-89%^)
  - Mostly to STJ
  - Long term studies = up to 90% STJ / 72% Midfoot radiographic PTA; 15-60% symptomatic PTA\*
  - OCDs 80-100%
  - Long term prognosis worse w/ Lateral



# Complications

- AVN
  - Case reported
    - 0-10% closed / up to 50% open
  - Pending talar fx level
  - W/ mortise intact, maintained blood supply
  - Tx = grafting, talectomy, fusion



# Complications

- Infection
  - Skin necrosis
  - 30% rate with open injuries
    - Total extrusion → semi-perm ABX/PMMA spacer (?)
- Ligamentous Instability
- Sinus Tarsi Pain
- MISC: Nerve injury (Tib N w lat); CRPS; DVT/PE, Chronic pain; tendon lacerations (PT w lat)





# **CASE EXAMPLES**

# A.R. – 48m



- HPI = s/p MVA
  - L-Knee pain and foot pain
- PMH = neg
- Ø T/A/D
- PE (Lat d/I)
  - No gross deformity
  - Mild med talar head prominent
  - Ø NV Compromise
  - Pain @ hindfoot, knee



A.R. – 48m



# A.R. – 48m

- MRI (4/26/17)
  - Talar subchondral impaction/fx posterior dome
  - Tear = ATFL (FT), CFL (FT), PTFL (G2), Deltoid (PT); TNL (FT), I/O and Cervical (FT)
  - Synd = AITFL/PITFL (G1-2) w mild widening
  - MISC = fibular avulsion fx;
  - Intact = Tendons
- MRI (9/26/17)
  - Talar dome BME resolution
  - New BME Lat Post Facet
  - Chronic Tear = ATFL, CFL, Spring
  - Tendinosis = PB/L
  - Sinus Tarsi = edema/STS
  - Intact = PTFL, Deltoid, Synd, LisF; PT/FDL/FHL

# L.L. – 33F



- HPI = s/p MVA
  - L-Arm pain
  - R-Ankle pain
- PMH = neg
- Ø T/A/D





# L.L. – 33F

- Phys Exam

- Ortho = mild gross foot deformity, talar head medial prominent; toes PFSx; gross A-ROM intact
- Neuro = grossly intact to light touch
- Vasc = DP/PT palpable and doplerable
- Derm = mild visual medial deformity, no pressure skin changes



# L.L. – 33F

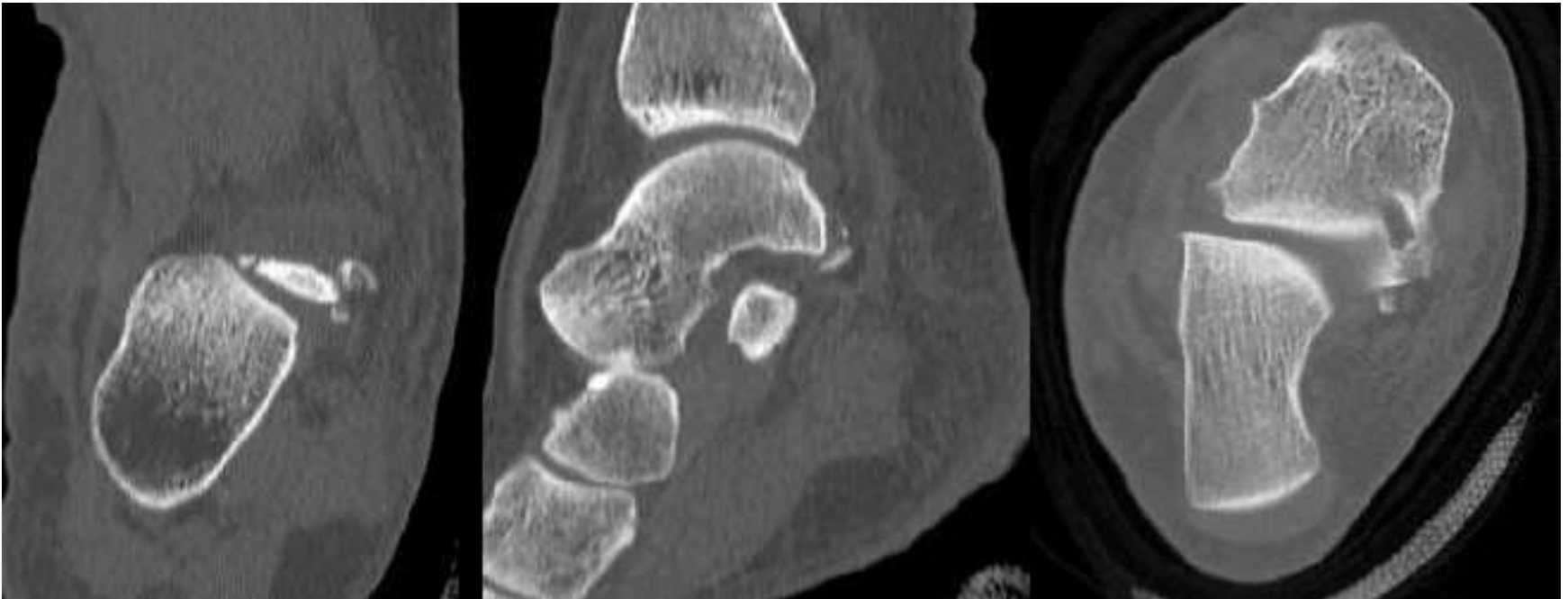
- Plan:
  - Operative CR
    - Successful OR closed reduction
  - Jones/Posterior Splint
  - Monitor NV and d/c
  - NWB 4 wks, w/ progression through therapy



# L.L. – 33F



- CT
  - Small avulsion fractures of post-med/lat talus
  - Talar head impaction fracture

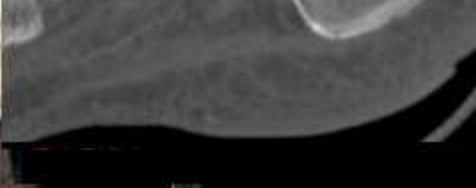


# J.C. – 52M



- HPI = s/p insidious onset of LEFT foot pain and deformity
- PMH = DM w neuropathy;
- PSxH = R-5<sup>th</sup> toe amp
- Ø T/A/D
- PE (LLE)
  - Neuro = diminished
  - Vasc = intact
  - Derm = submet 2 ulcer to SQ; heel ulcer to SQ
  - Ortho = medial bulge hindfoot w local erythema/edema/calor



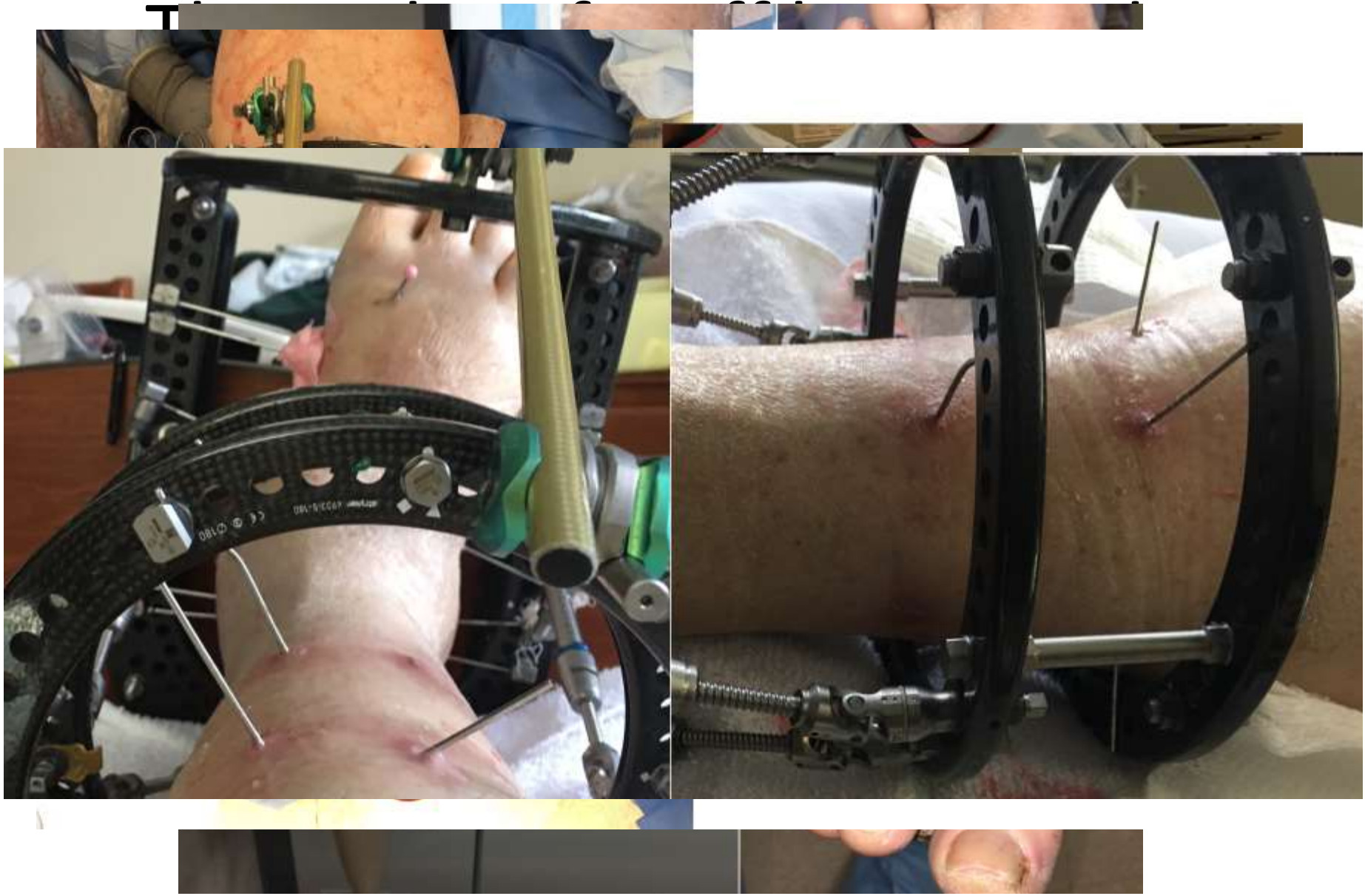


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J A







R  
RG



R  
RG



100 mm





**REVIEW**

# In Review



- Medial >>>> Lateral >>> Anterior/Posterior
- Full P/E eval w films (XR foot/ankle)
  - Medial much more obvious than Lateral, visually
- Reduction
  - Closed = knee flex, ankle pfx, distract and reverse mechanism/dislocation type
  - Open = sweep away blocking structures
    - Pinning more common in Lateral > Medial
  - CT invaluable / a MUST post reduction
- High rate of STJ & TNJ DJD, both XR and symptomatically
- Prognosis:
  - Lateral worse than Medial (Lateral ↑er E)
  - I/A fracture = worse prognosis



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ANY  
QUESTIONS

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# Thank you

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**#surgicalblitz**  
**#subtalar**  
**#fracture**  
**#trauma**

## Question?

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