Deformity and TAR: Is There a Limit?

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Disclosure

- Consultant
  - Wright Medical
  - Integra
  - Kinos
  - Paragon 28
- Disclaimer: Off label use: all total ankle replacements in this talk have been put in without cement

Talk outline

- ***Surgical Tips and Pearls***
- ***Cases***

Introduction

- There is no consensus regarding total ankle replacement (TAR) in case of arthritis associated with coronal plane deformities.
- Historically, coronal deformities greater than 10° were a contraindication

Tips and Pearls

- Evaluate lower extremity for any deformities
  - Angulation of tibial plafond in any direction in relationship to axis of tibia > 10 degrees may require corrective osteotomy before ankle arthroplasty

Two stage this!!!

Tips and pearls – two stage

- Co-existing foot deformities
  - Subtle pes cavus, or subtle pes valgus can be left alone
  - Significant cavus feet, or significant flat feet need prior correction to prevent abnormal loading of prosthesis

Tips and pearls

- Co-existing arthritis
  - Subtalar and chopart joint arthritis
    - **Selective lidocaine injections helps localize source of pain**
    - **triple arthrodesis: 2 stage**
    - **TN and CC arthrodesis: 2 stage**
    - **Isolated TN arthrodesis: 1 stage**

Tips and pearls

- Lateral ankle ligament laxity
  - Test for with anterior drawer and talar tilt
  - Brostrom: **1 stage**
  - Allograft tendon reconstruction: **2 stage**

Tips and pearls

- Equinus contracture
  - If silfverskiold test positive, then gastrocnemius contracture must be considered
  - Gastrocsoleus recession or percutaneous Achilles tenotomy often performed: 1 stage

Varus deformity

Tibial erosion, intra-articular

(Bone deformity)

No tibial erosion, extra-articular

(Ligamentous)

Valgus deformity

Tibial erosion, intra-articular

(Bone deformity)

No tibial erosion, extra-articular

(Ligamentous)

Total ankle replacement in ankle arthritis with varus talar deformity. Pathophysiology, evaluation, management

Foot Ankle Clin. 2012 Mar;17(1):127-39

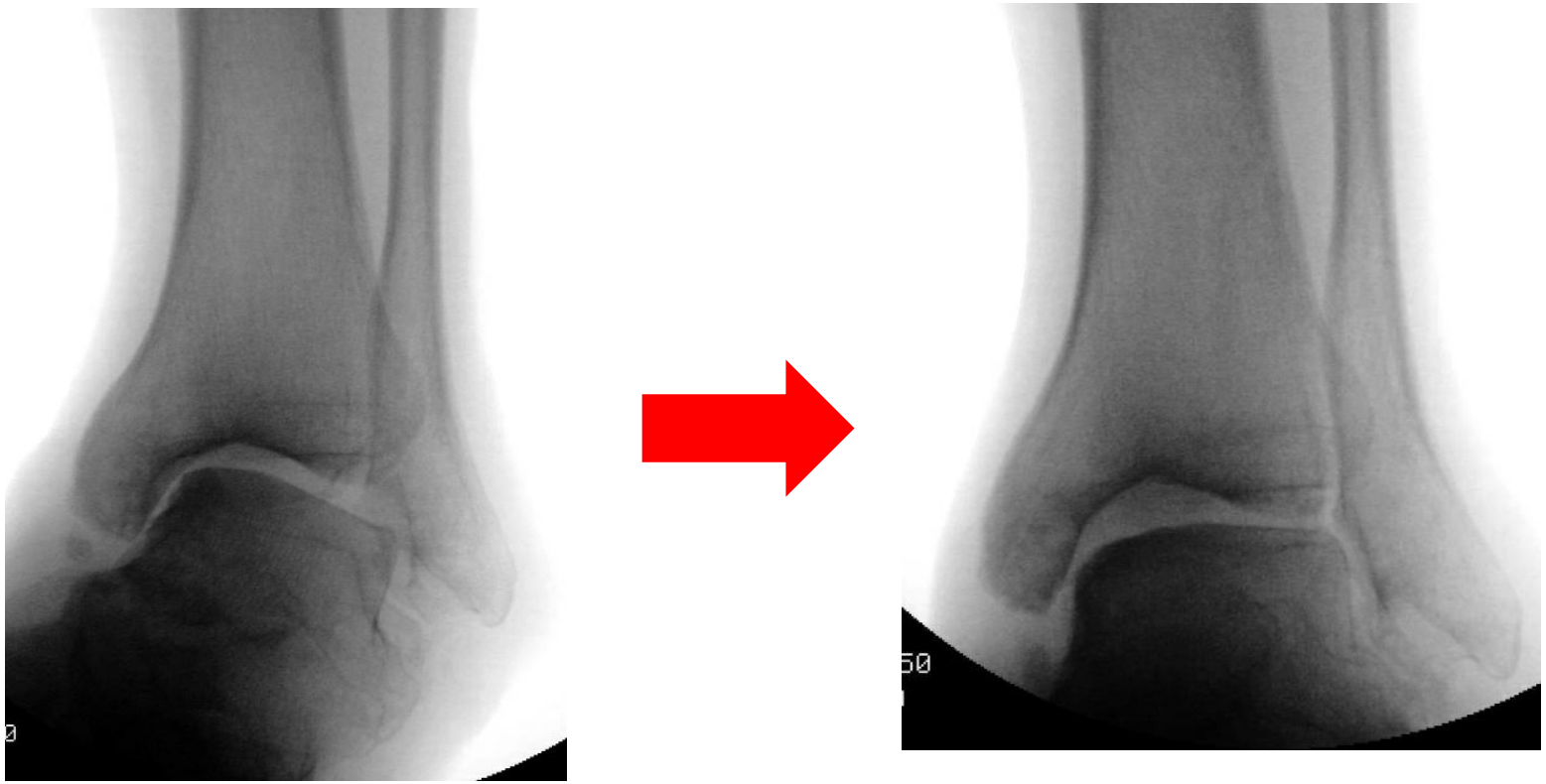
Keys to successful deformity correction

obtaining a congruent ankle with sufficient ROM

- not all ankles are correctable
- one may need to bail to a fusion if necessary

Stress XR

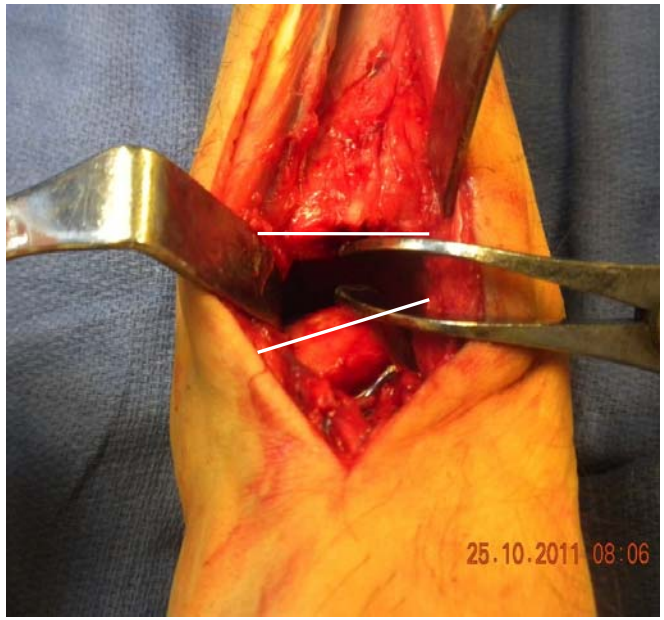
How mobile is the joint ?

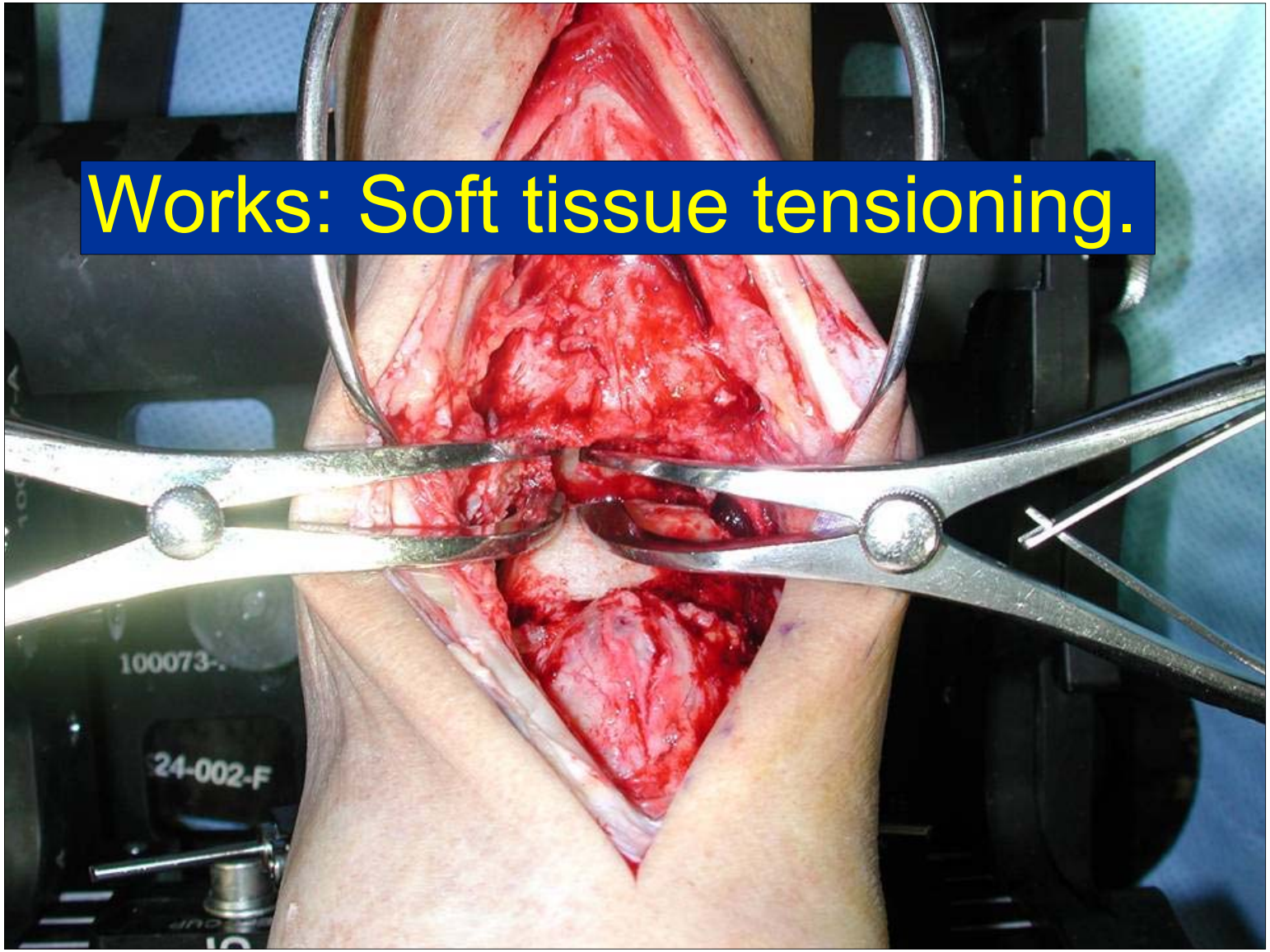


If you can balance the ankle you can proceed with replacement

If you cannot balance the ankle

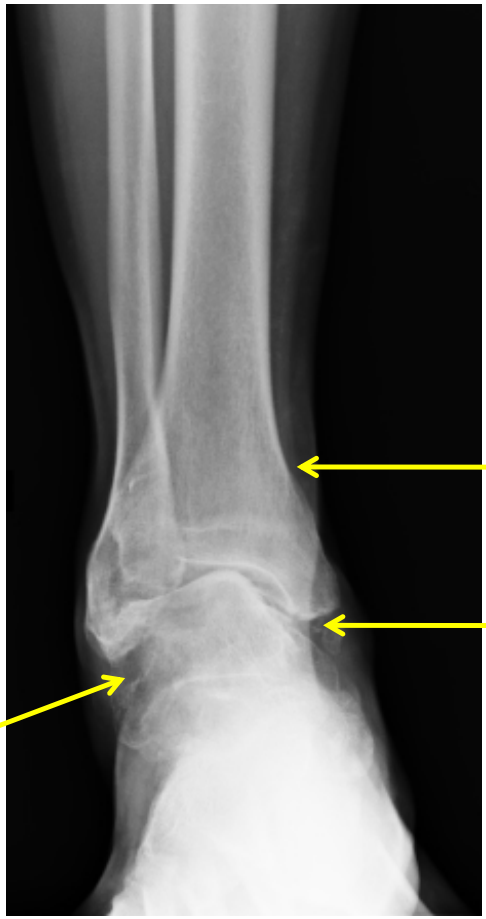
you cannot proceed with replacement




Works: Soft tissue tensioning.

Soft tissue management

- ***The varus talar tilt***
- ***Make certain that peroneals function***
- ***Be ready with***
  - ***Deltoid peel***
  - ***Lateral ligament repair or reconstruction***
  - ***Medial malleolar osteotomy***

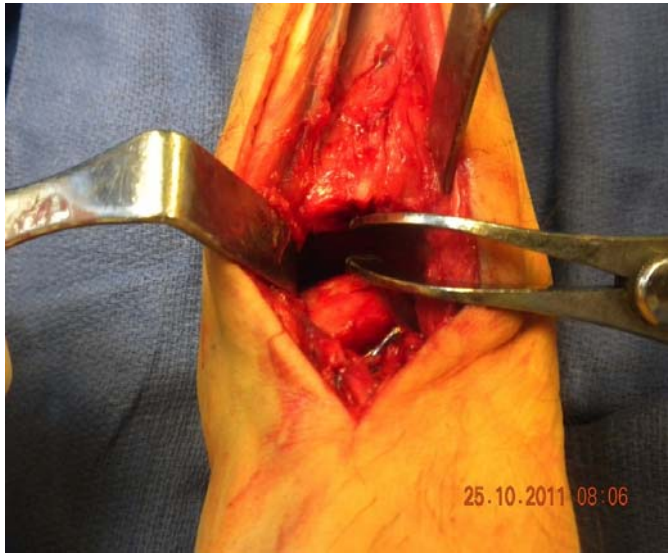

Lengthen medial malleolus
Release the deltoid
Remove bone
lateral gutter

No stress on joint

Prior to debridement

Eversion stress on joint

Following debridement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RIGH
W/WEIGHT
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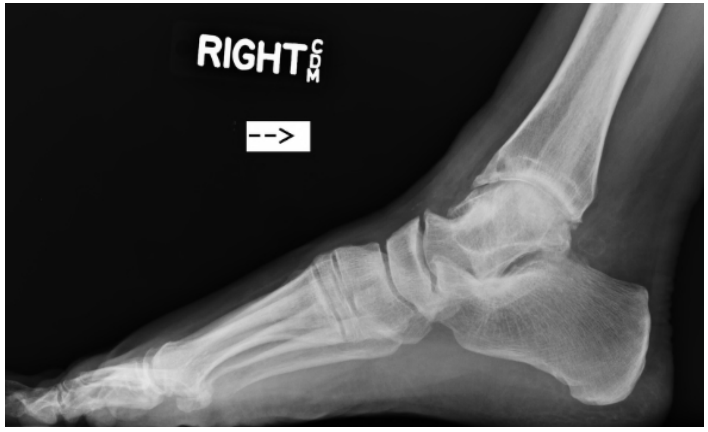
RIGHT
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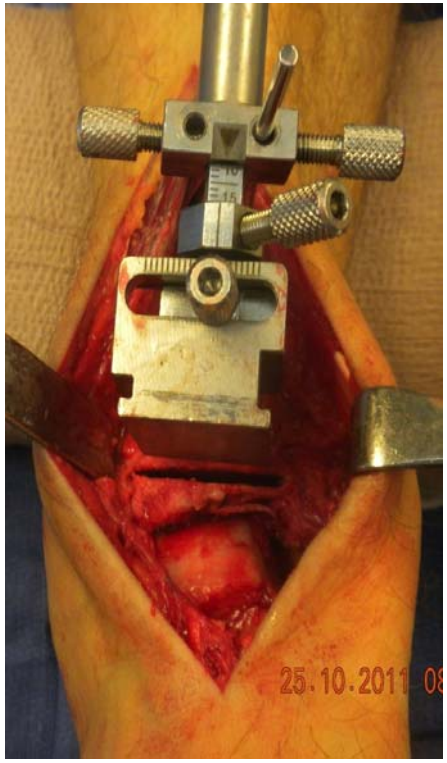
MDC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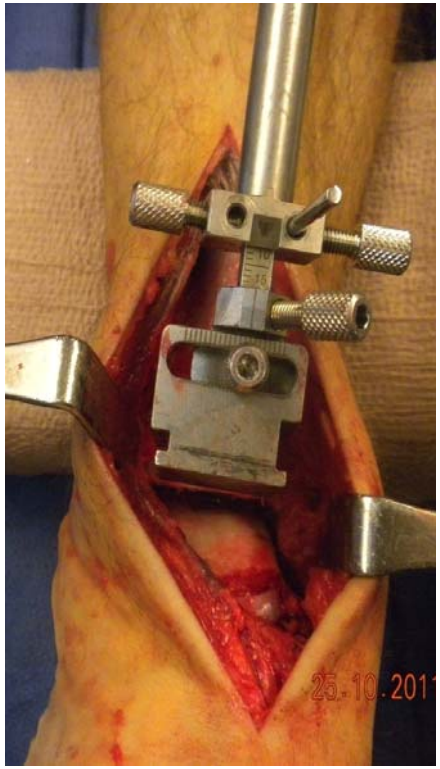
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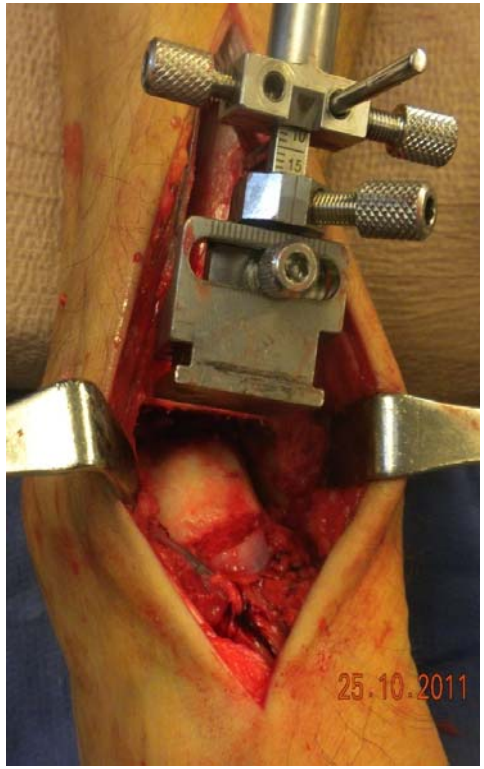
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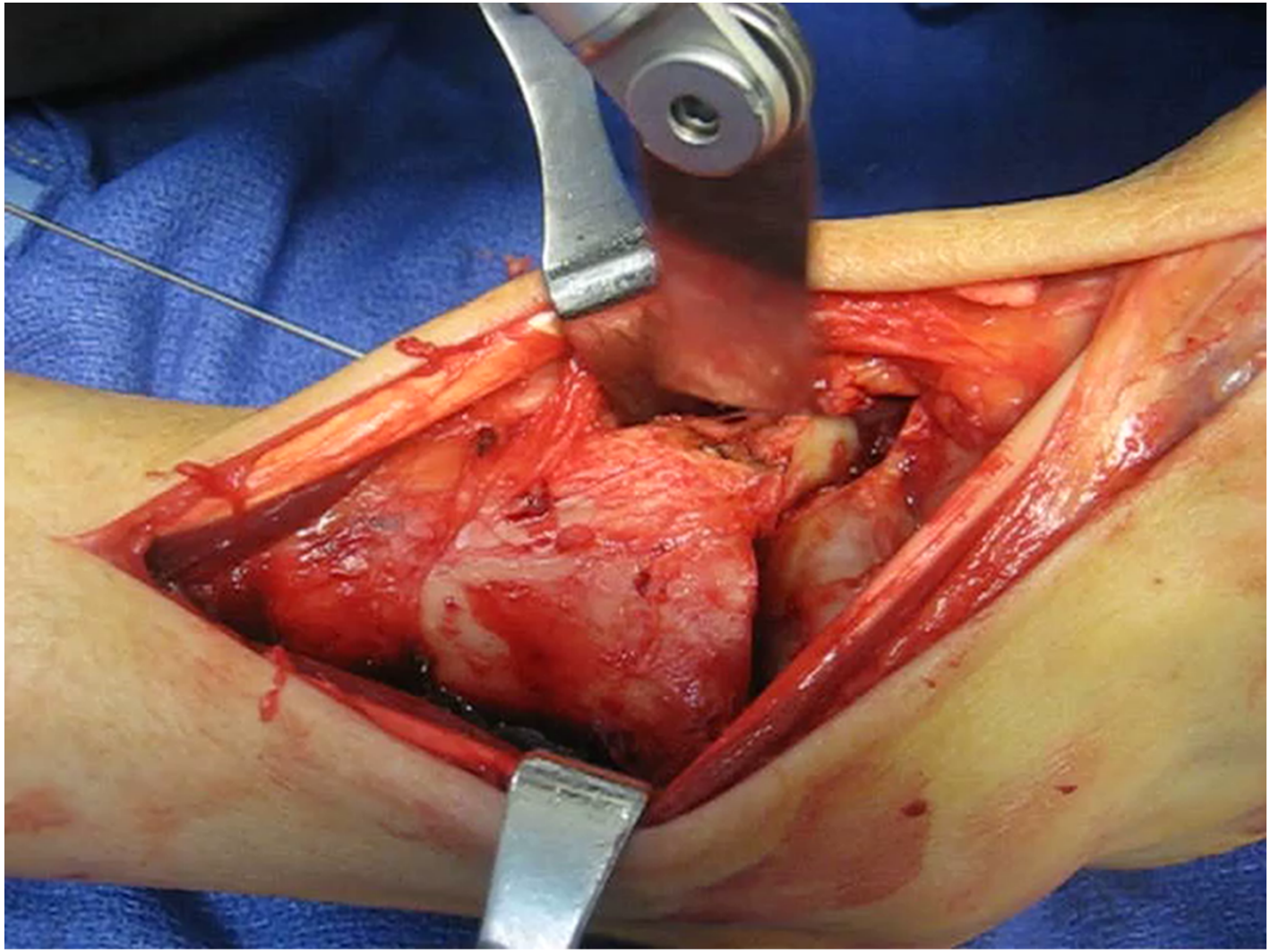
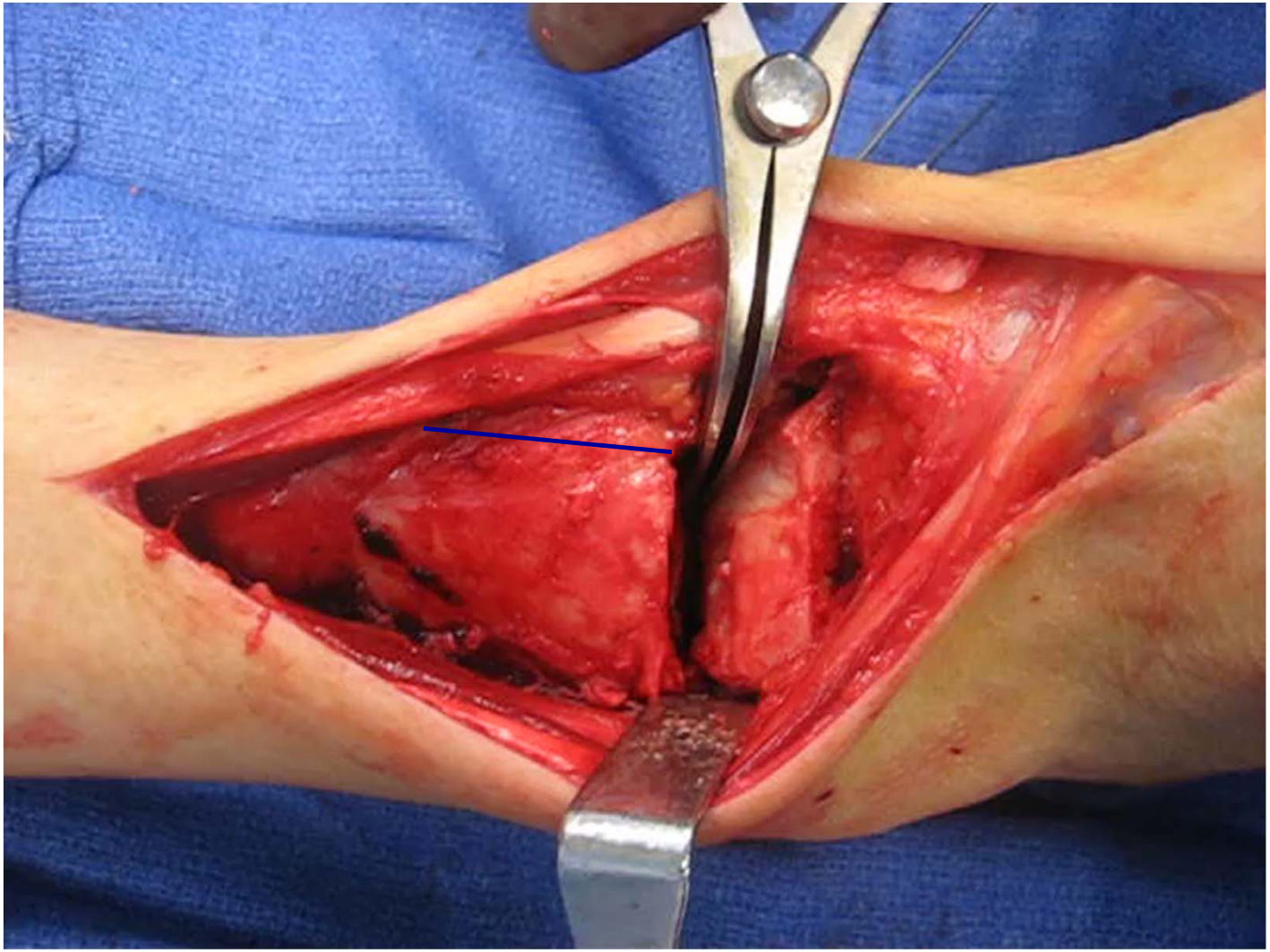
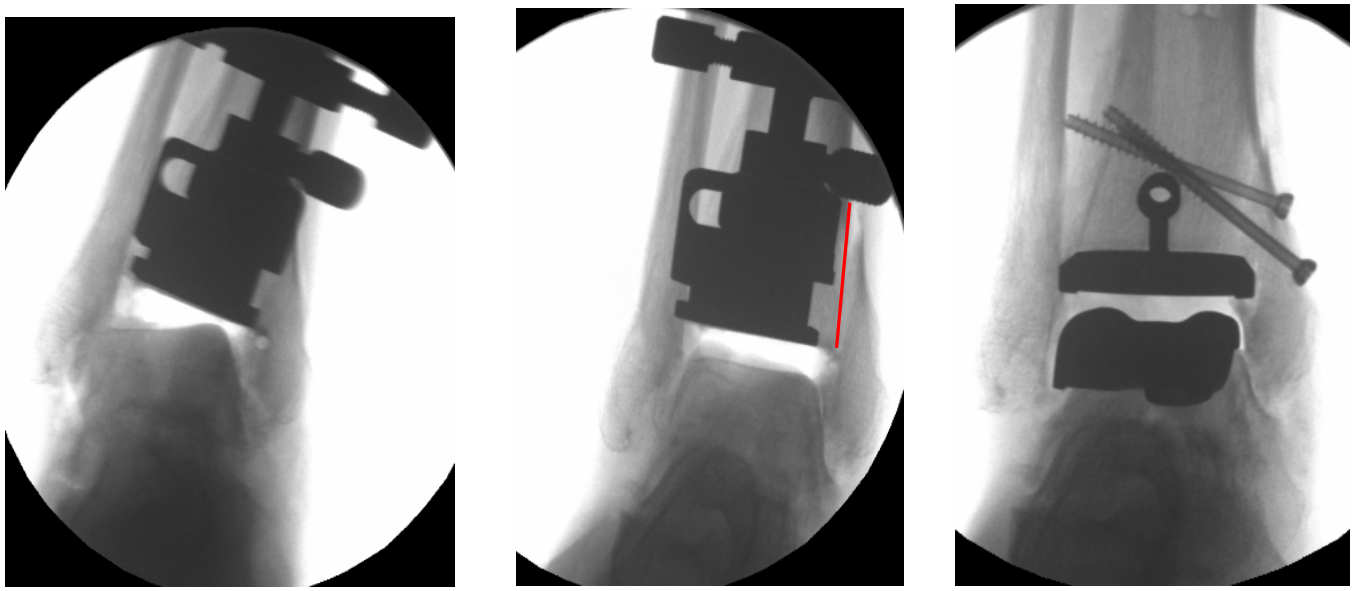






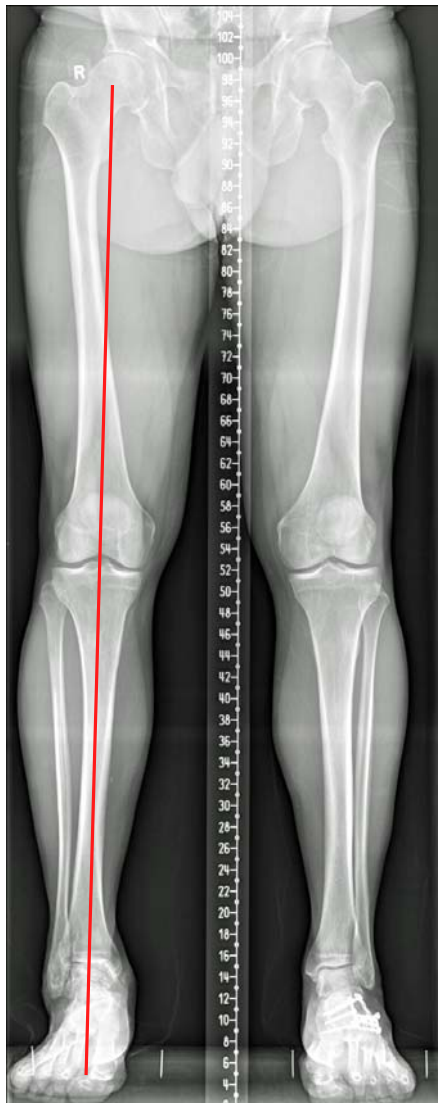
Additional procedures that may be needed to balance the foot and ankle

Ankle ligament reconstruction

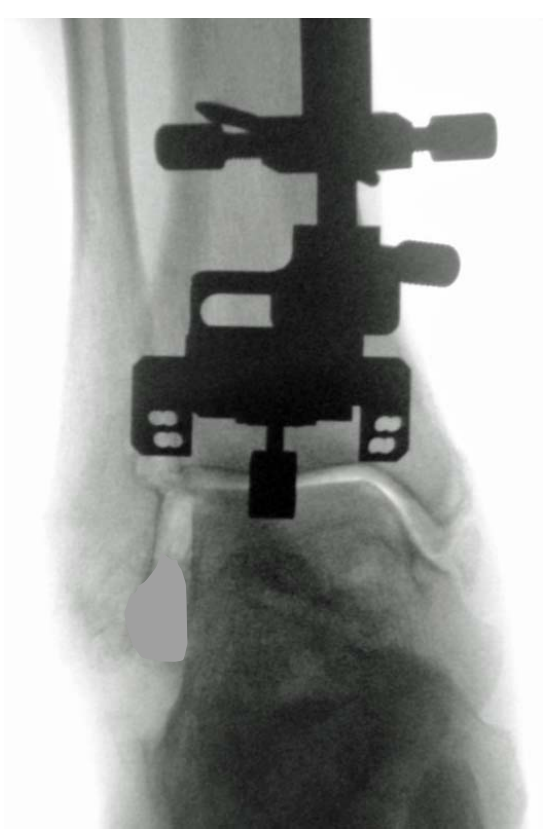
- Calcaneus osteotomy
- 1st metatarsal osteotomy
- 1st TMT arthrodesis

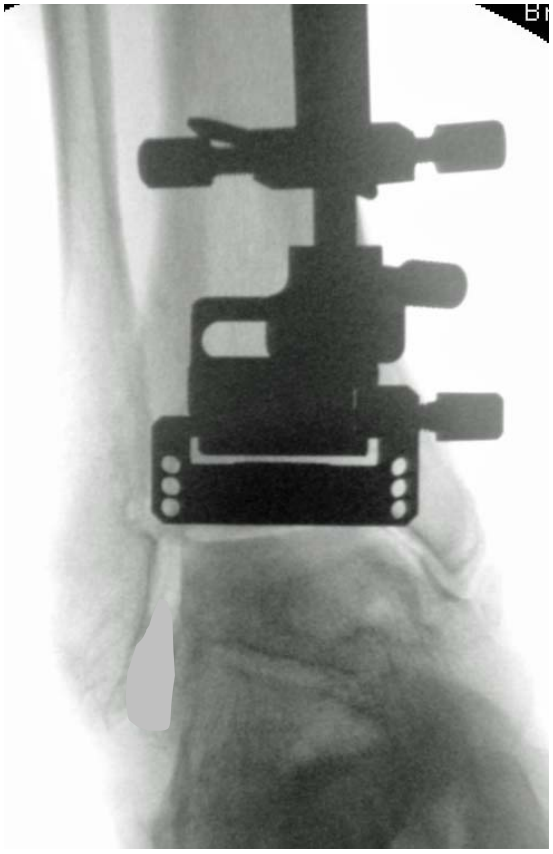
Mild varus, ligaments stable

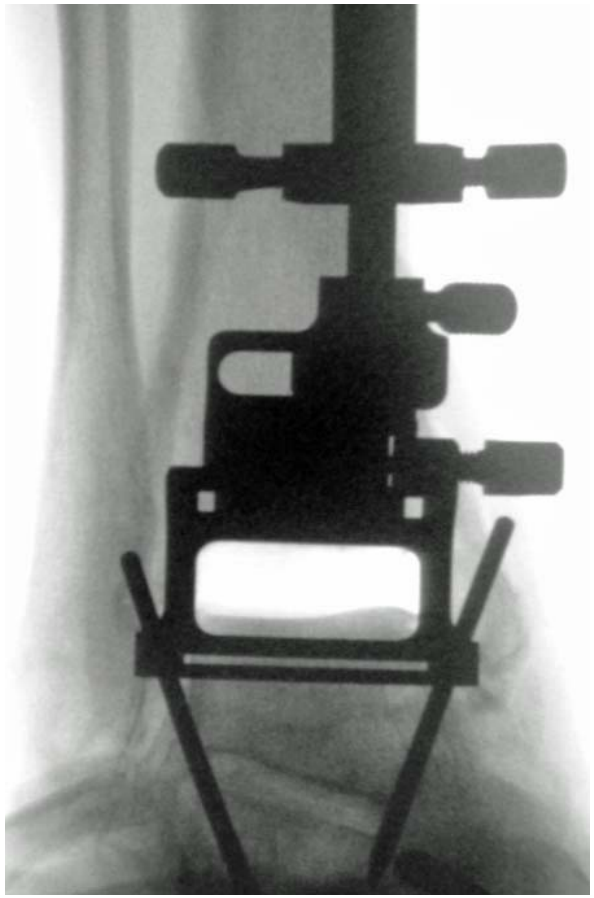
Limb aligned well




Brage
Right
3
MAG





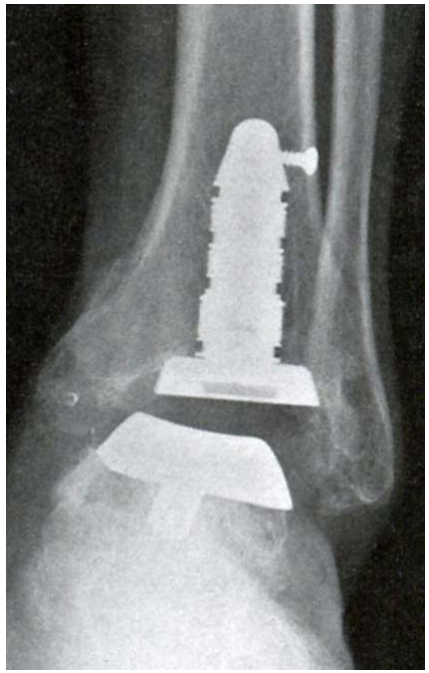


6 months

ROM

Another case

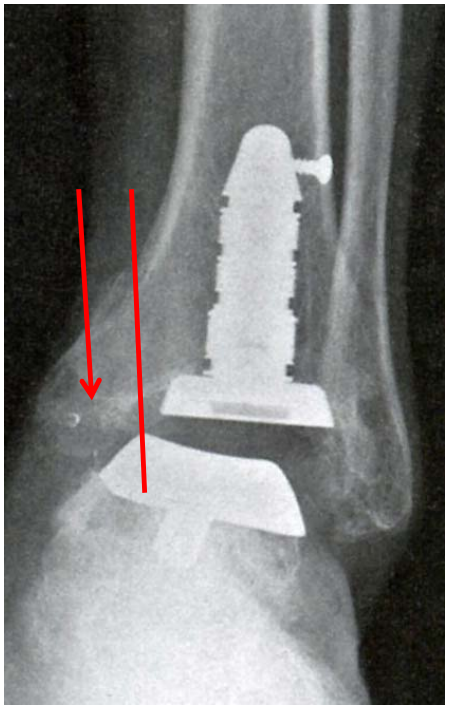
Another case



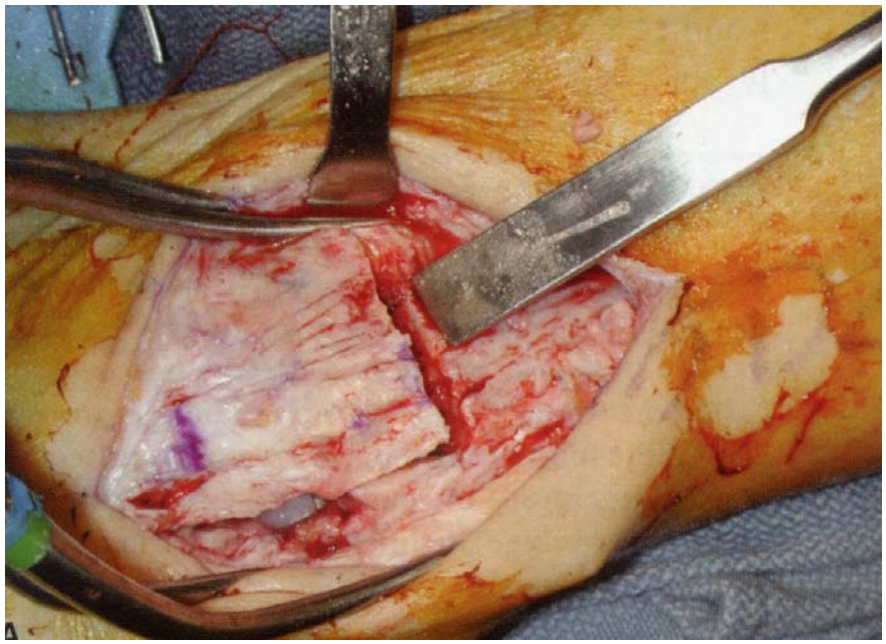
6 months

The plan

- Medial malleolar osteotomy
- Lateral ankle ligament repair

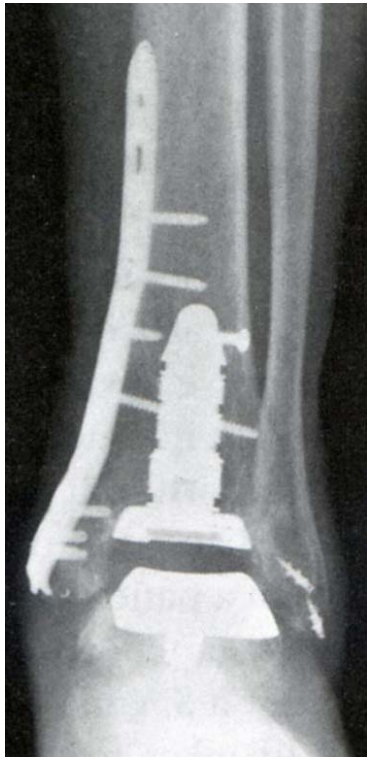


Osteotomy exposure



Result

- At one year



Case

- 65 year old male
- Severe, daily ankle pain
- Ankle gives out
- s/p ankle ligament repair
- s/p midfusion

Case

Surgical planning

- Two stage procedure
- Re-do lateral ankle ligament reconstruction
- Re-do midfoot fusion
- Then TAR

Peroneal tendons at surgery

Tendons repaired

2 months later

2 months later

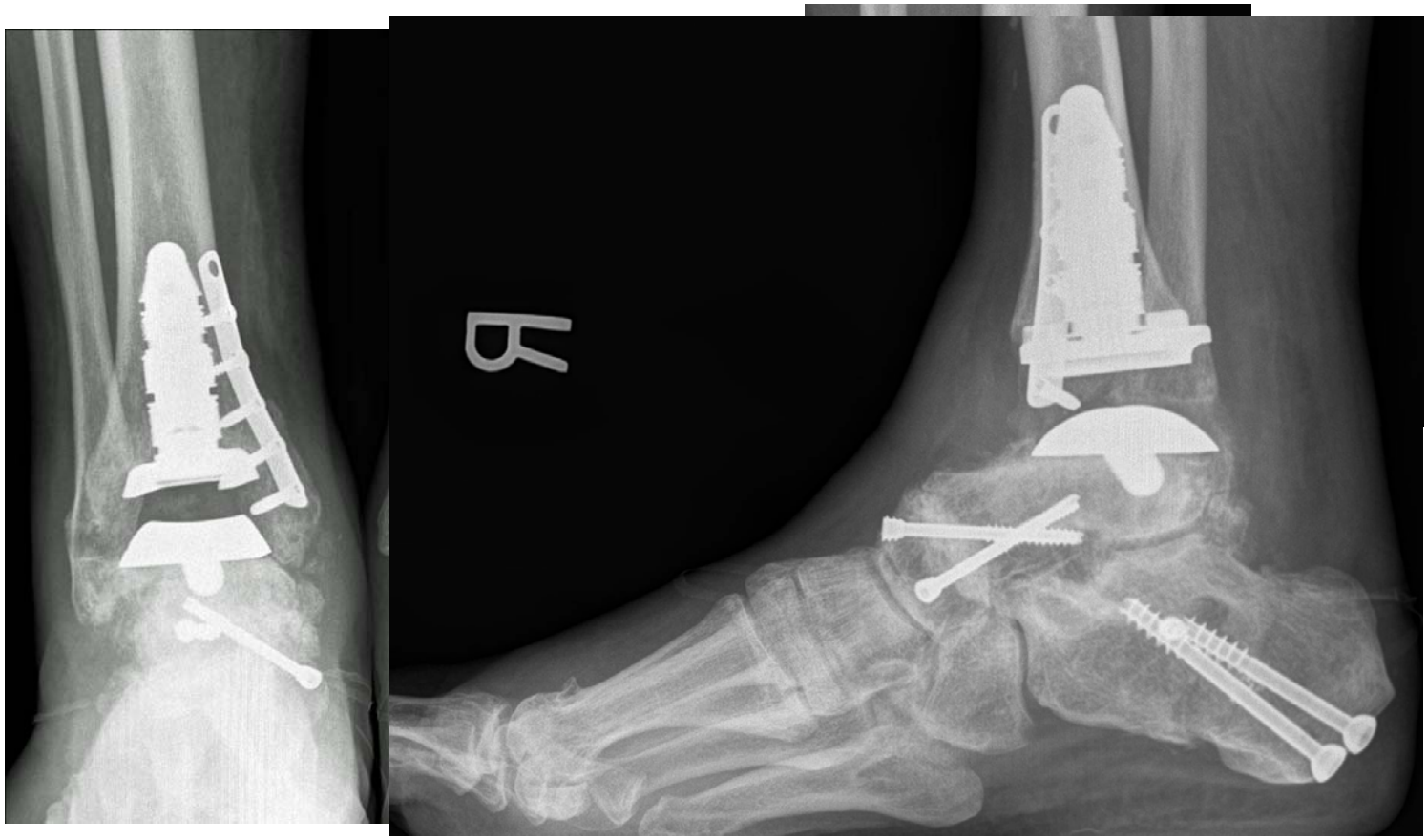
Still in pain: second operation

3 months later….

Third operation

- Repair medial malleolus fracture
- Transfer posterior tibial tendon to lateral heel
- Lateralizing calcaneal ostetotomy

10 months out



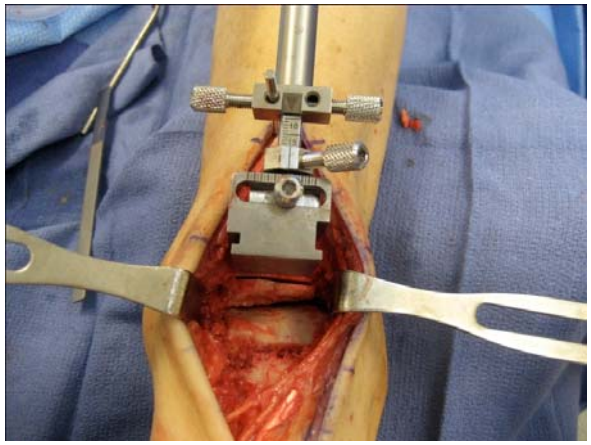
Preoperative planning

- *The valgus ankle*
- *Be ready to:*
  - *Lengthen fibula*
  - *Osteotomize tibia*
  - *Correct flat foot*
  - *Lengthen or transfer peroneals*

Not all valgus deformity of the ankle is associated with a rupture of the deltoid.

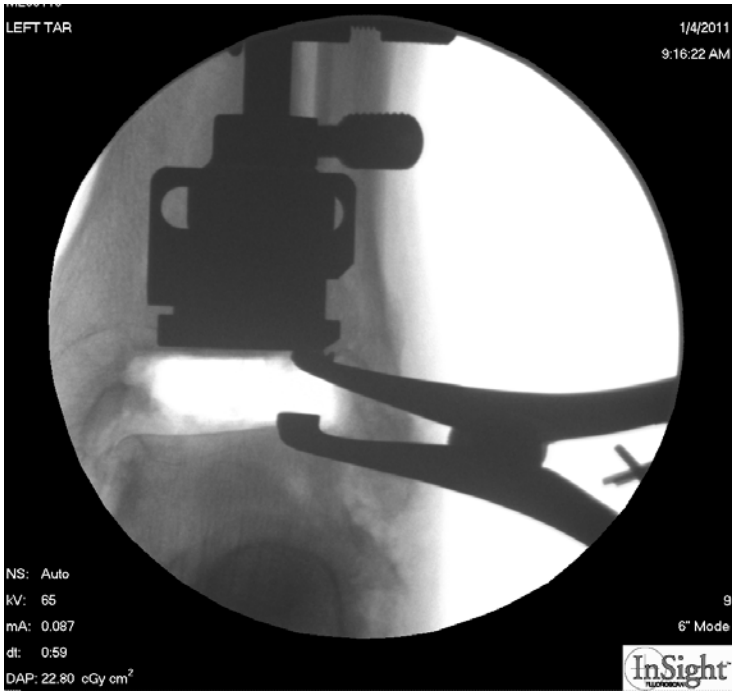
correct balance prior to any bone cuts

- soft tissue balance with lateral release if necessary
- larger poly as needed
- deltoid reconstruction is often not necessary

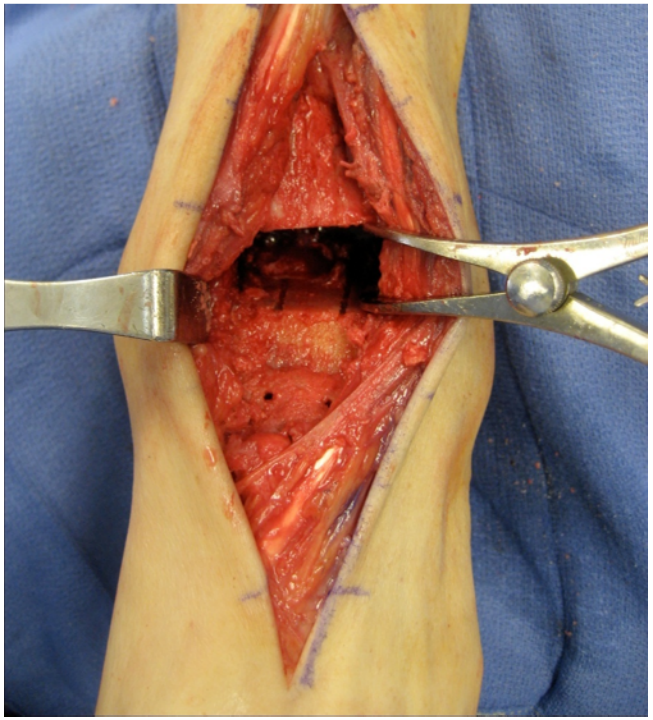



Foot&Ankle Institute
1/4/2011
9:09:00 AM
NS: Auto
kV: 65
mA: 0.087
dt: 0:31
DAP: 12.91 cGy cm2
6
6" Mode
InSight

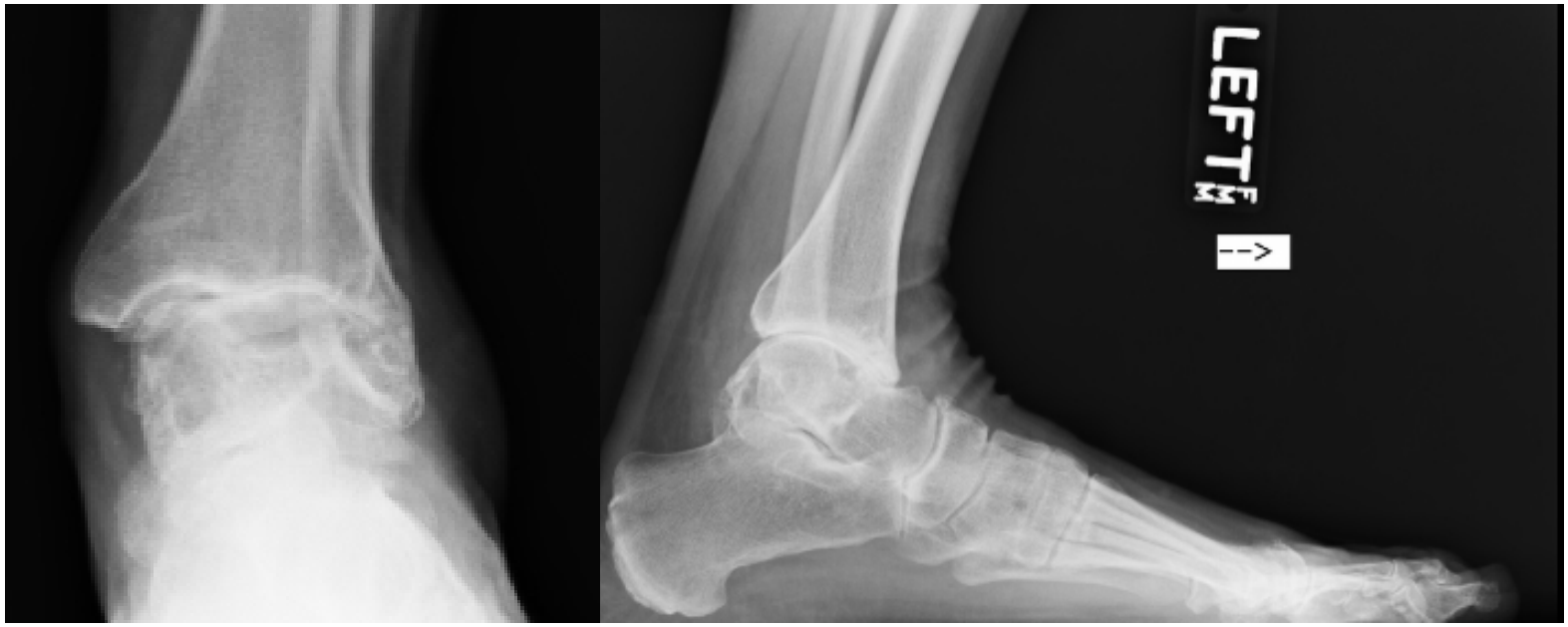
Balance not perfect



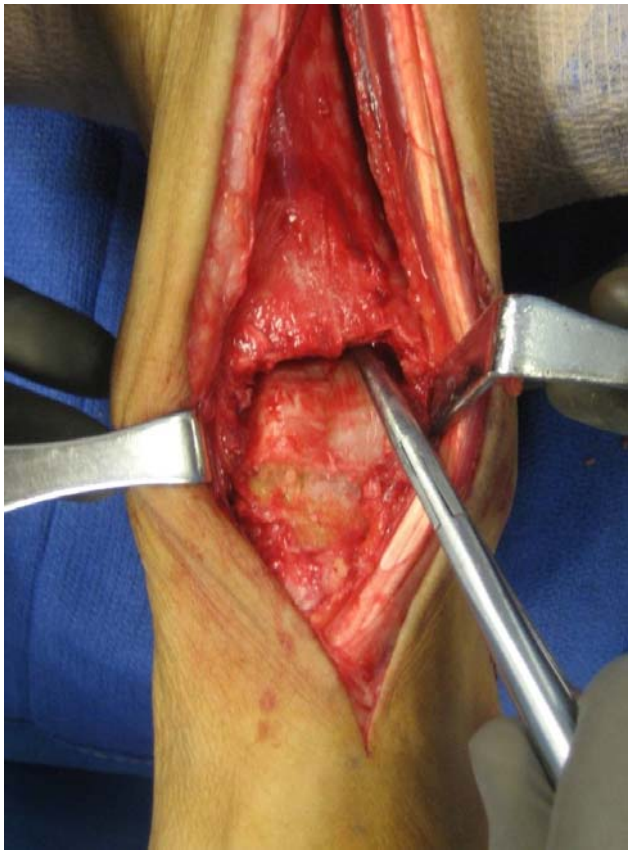
Lateral ligaments released



Be careful of the XR.
Use stress evaluation intra-operatively



Lateral ankle laxity was present in this ankle
This is the result of erosion of the calcaneofibular ligament



Additional procedures

Calcaneus osteotomy

Peroneus brevis to longus transfer

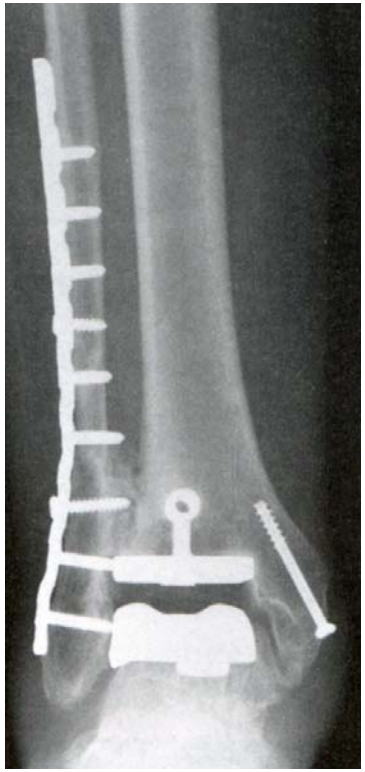
Subtalar arthrodesis

Plantarflex arthrodesis 1st TMT

A case: mild valgus

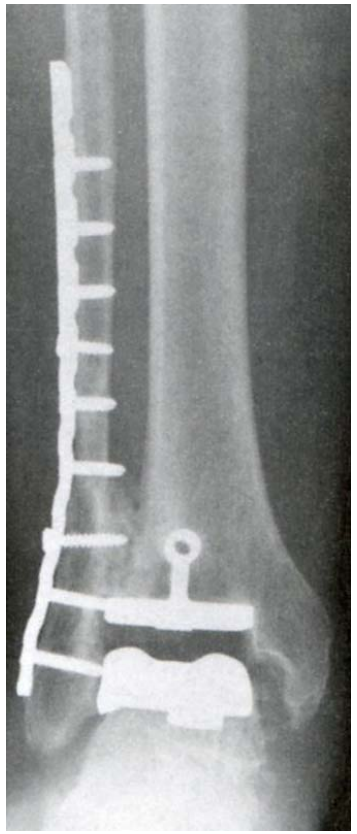
- Post traumatic OA
- Daily pain
- Likely AVN of anterolateral tibial plafond

mild valgus corrected



3 years

- Medial gutter debridement



Another case

60 year old male

Years of pain

Nonsmoker

His foot

Planning

- **Discussed**
- Ankle fusion with or with flat foot repair
- Ankle replacement with flat foot repair
- Gastroc recession
- Post tib tendon repair

- Wanted to think about it
- He returns one year later

One year later his foot is worse

Finally has surgery…

Double calcaneal osteotomy

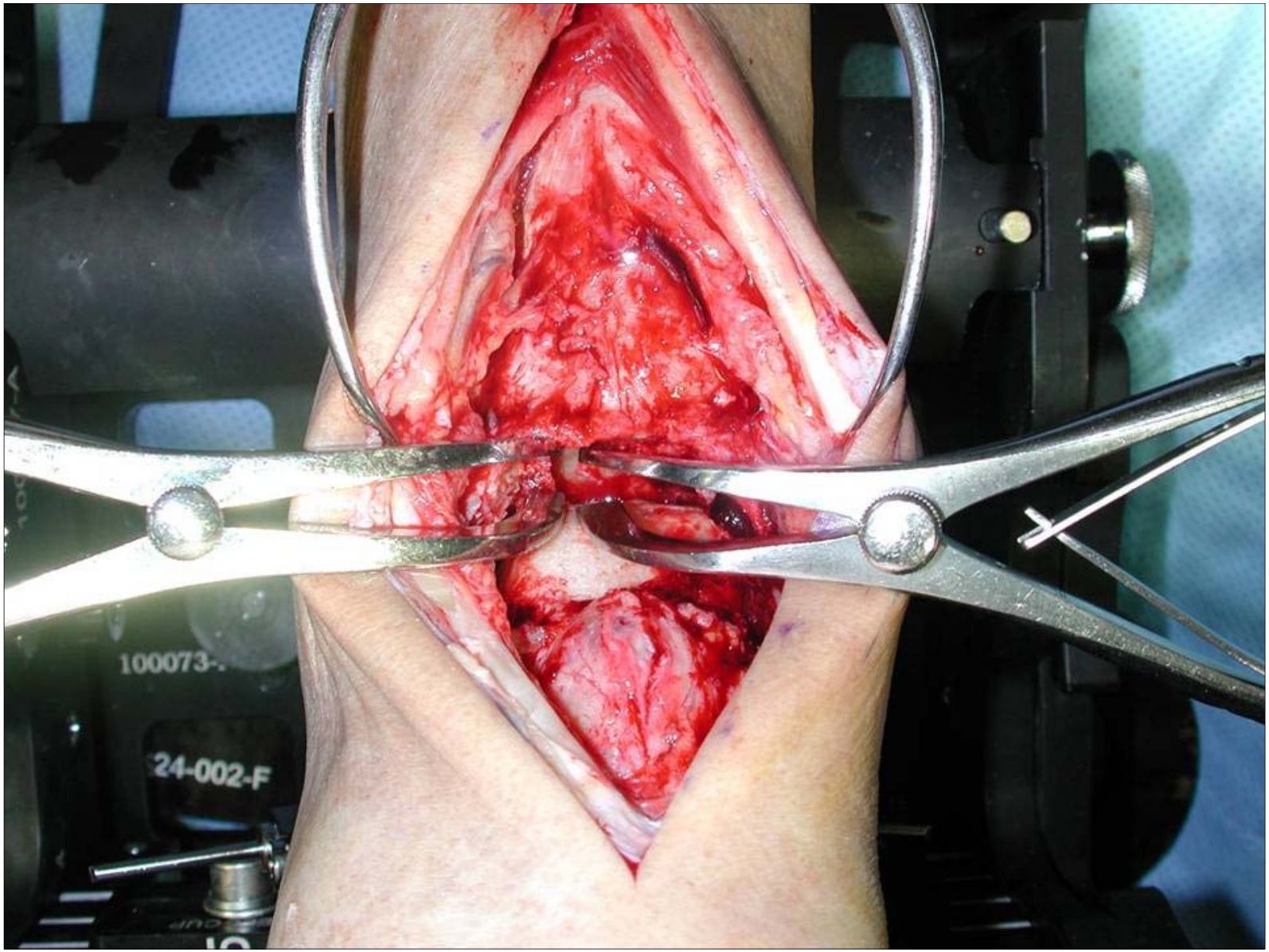
1st TMT arthrodesis

Ankle stress views

Neutral

Valgus stress

Varus stress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Final intra-op films

Range of motion

Patient disappears
for 6 years
No contact
None

Dorsiflexion **Plantar flexion**

6 years post op

6 years post op

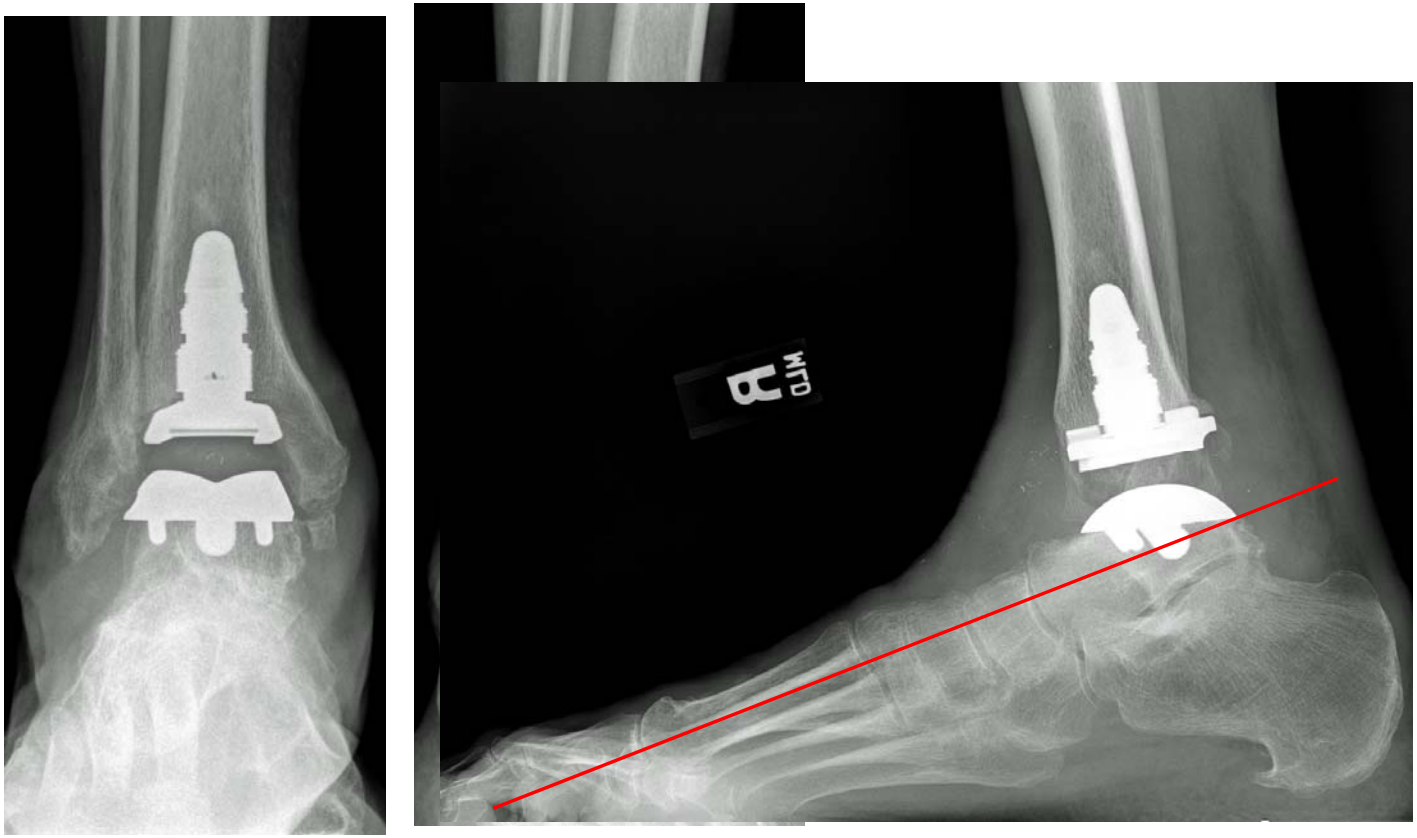
Valgus tibial erosion case

Tips

Valgus stress

Pinned in corrected position

Ankle at 1 year



Motion at 1 year

Custom Metallic Talus after Failed Total Ankle Replacement

Total Talus Prosthesis

- First developed in 1970's for treatment of talar body AVN
  - These did not include metallic talar neck or head
  - Relied on poor fixation to native talar neck/head
- Used in TAR in conjunction with tibial bearing surface
- Cobalt-chrome with customizable size, ingrowth and load bearing surfaces

Total Talus Prosthesis

INDICATIONS

- Subsidence of the talar component with substantial bone loss
- Metallosis or osteolysis
- Clinical judgement based on radiographs and CT

CONTRAINDICATIONS

- Active or chronic infection
- Poor soft tissue
- Vascular pathology
- Poorly controlled diabetes mellitus
- Obesity
- Immunosuppression
- Prior subtalar arthrodesis

Custom implants

A. Custom talus viewed from anterior aspect.

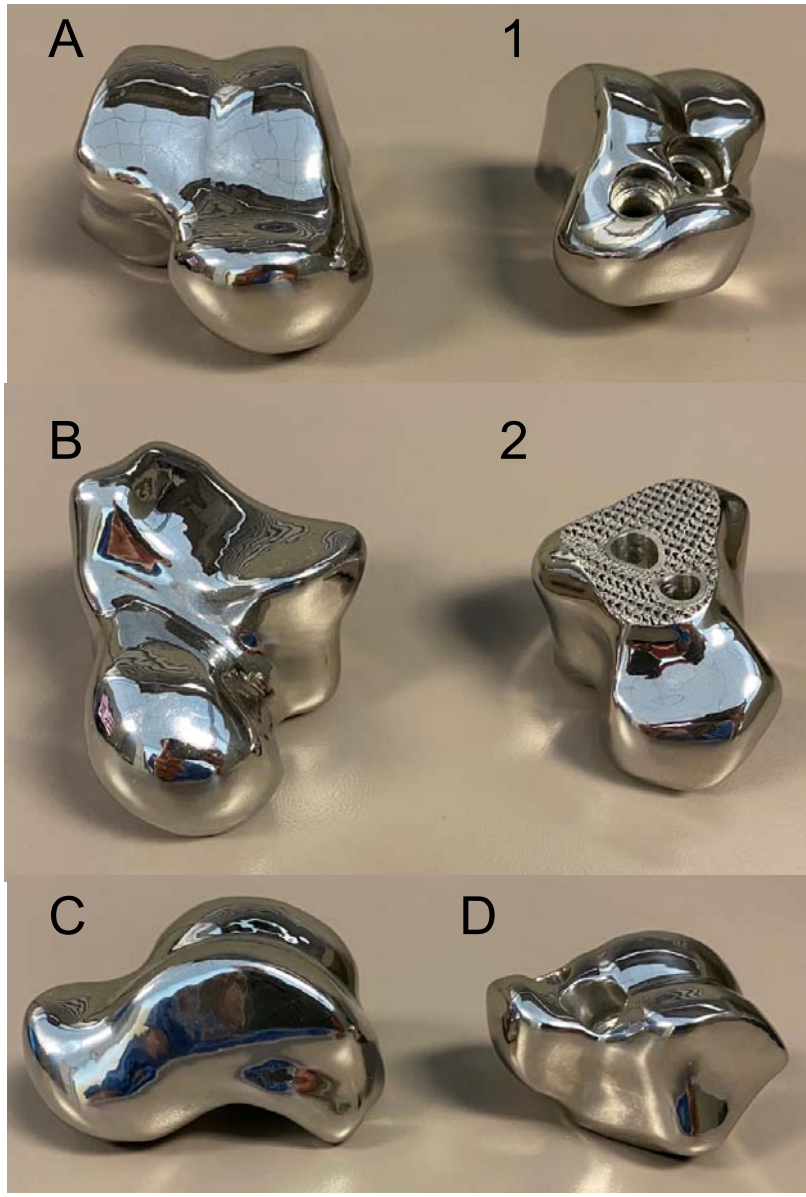
1. Right implant has pilot holes for ST arthrodesis screws

B. Custom talus viewed from inferior aspect

2. Right implant has pilot holes and inferior ingrowth surface

C. Custom talus viewed from medial aspect

D. Right implant viewed from lateral aspect

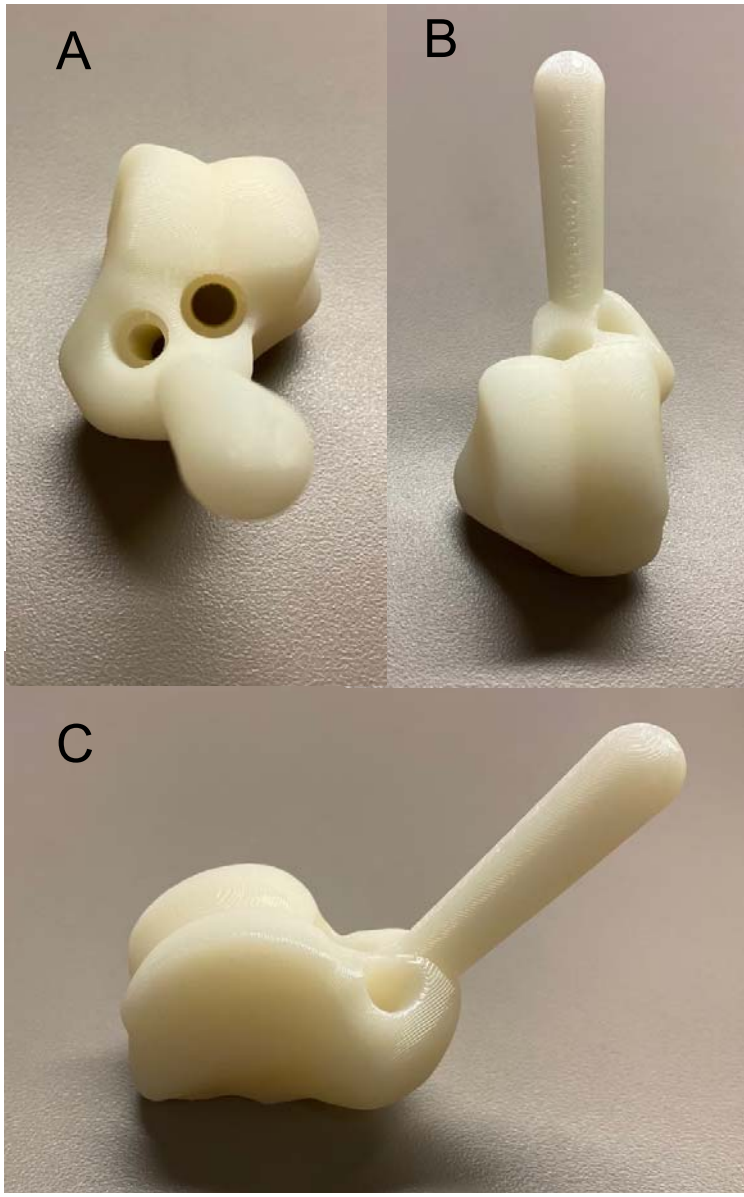


Pre-op planning

- Weight bearing radiographs
- Weight bearing CT of both ankles to evaluate the native talus
- Custom talus is made in 2 heights (native height and 1-1.5mm less)
  - Provides opportunity for an improved fit
- Tibial tray must be sized pre-operatively to allow proper articulation with talus
  - Surgeon’s choice for implant
- Talus can be made to incorporate subtalar arthrodesis
  - 1 or 2 pilot holes and an inferior ingrowth surface

Talar trials

- Trials are manufactured in 2 sizes as are custom implants
- Trials have anterior handle for ease of insertion/removal
- Pilot holes for ST arthrodesis if applicable
- Radiolucent



A.Anterior superior view
B.Posterior superior view
C.Medial view

Operative technique

- Standard supine position with ipsilateral hip bump
- Anterior approach with distal extension to expose TN joint
- Resection of prior implants, then complete excision of talus
  - Osteotomize the talar body/head to ease excision
  - Take care to preserve navicular cartilage and subtalar cartilage if not performing arthrodesis
- Fluoroscopy to confirm complete excision
- Posterior capsular debridement

Operative technique

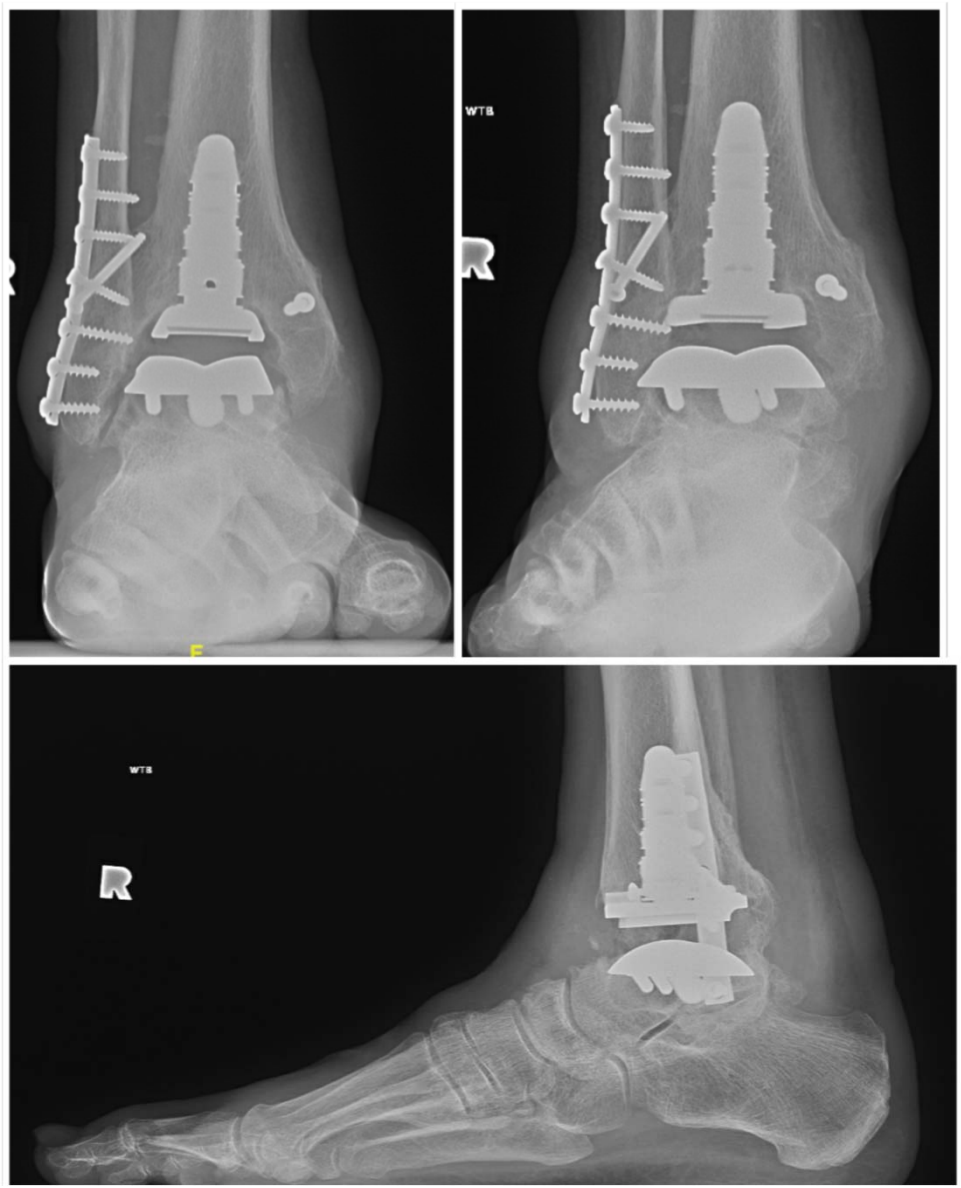
- Tibia instrumented with surgeon's choice of TAR implant
  - Crucial to maintain/obtain correct axial rotation
- Tibial trial can be used in coordination with talar trial to check stability and alignment
- Talar trial is produced with a T-handle for easier placement/extraction
- Definitive tibia inserted and talar prosthesis follows
  - Care must be taken to protect navicular cartilage
  - Subtalar arthrodesis if indicated
- Radiographs of ankle and foot to ensure alignment

Post-op course

- Splint immobilization weeks 0-2
- Gentle active ROM weeks 2-6
- Progressive weight bearing weeks 6-12
- WBAT in a shoe at 12 weeks
- Radiographs at 6w, 12w, 6 mo, 12 mo, then annually

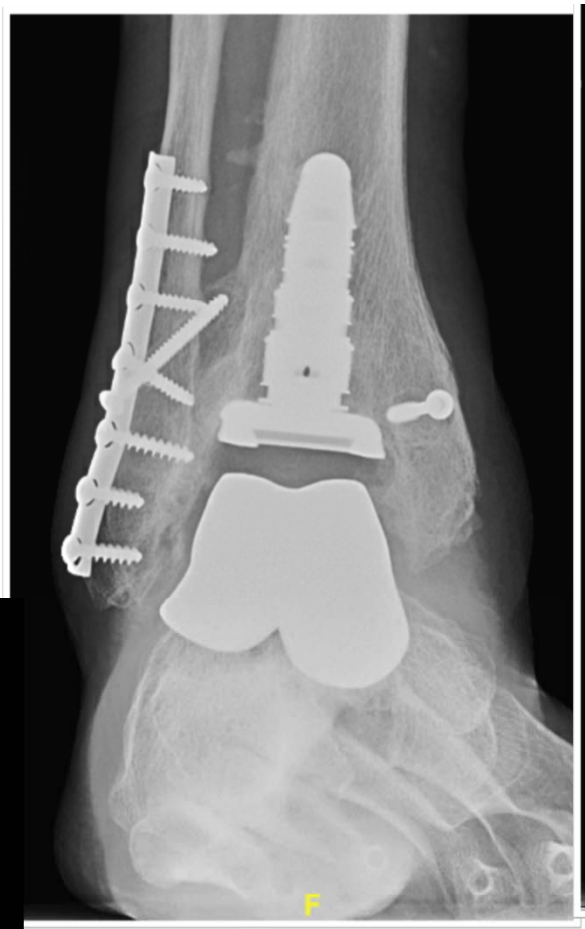
Case 1

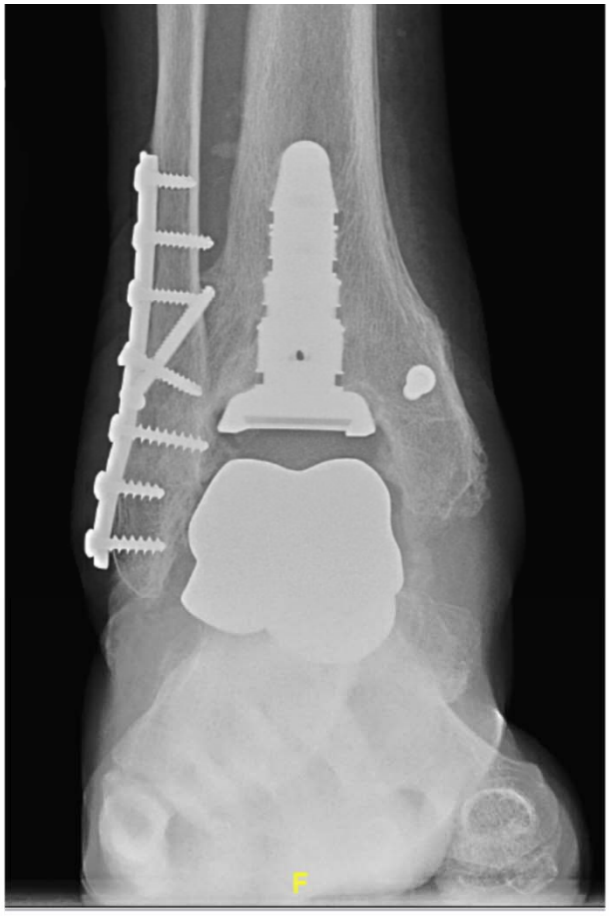
- Patient A is 5 years s/p TAR with significant osteolysis and talar bone loss
- Coronal alignment maintained



Case 1

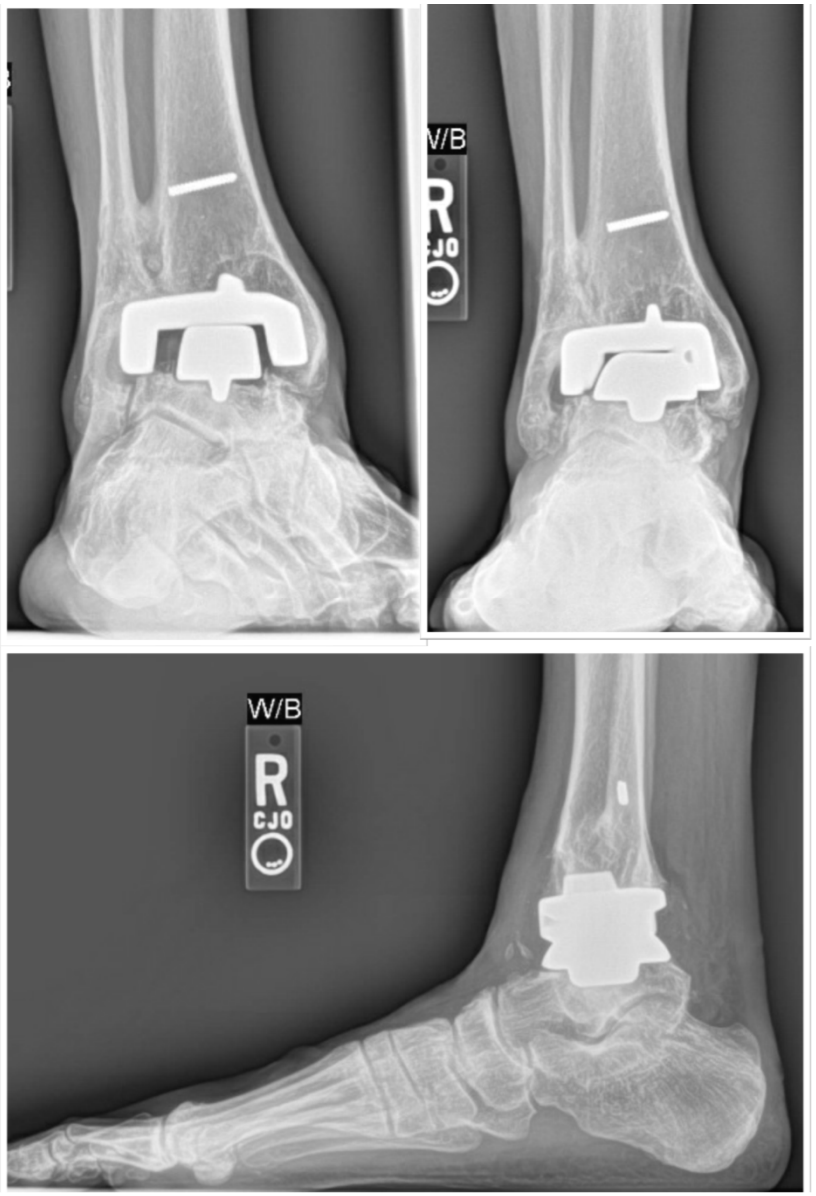
- 6 months s/p revision TAR with custom metal talus





Case 2

- Patient B s/p TAR in 1999 with poly-exchange in 2002, now 18 years s/p index procedure.

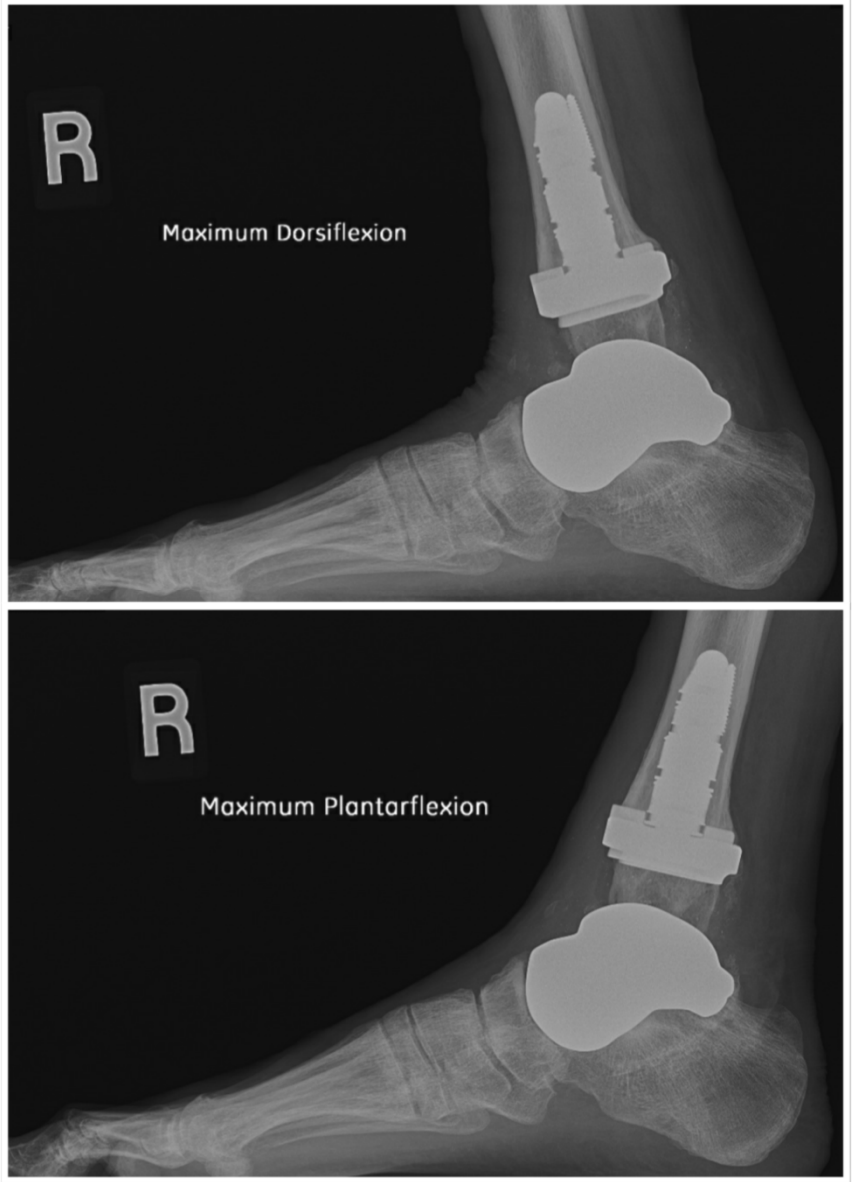


Case 2

- Patient B 9 months s/p revision TAR with custom metal talus

Case 2

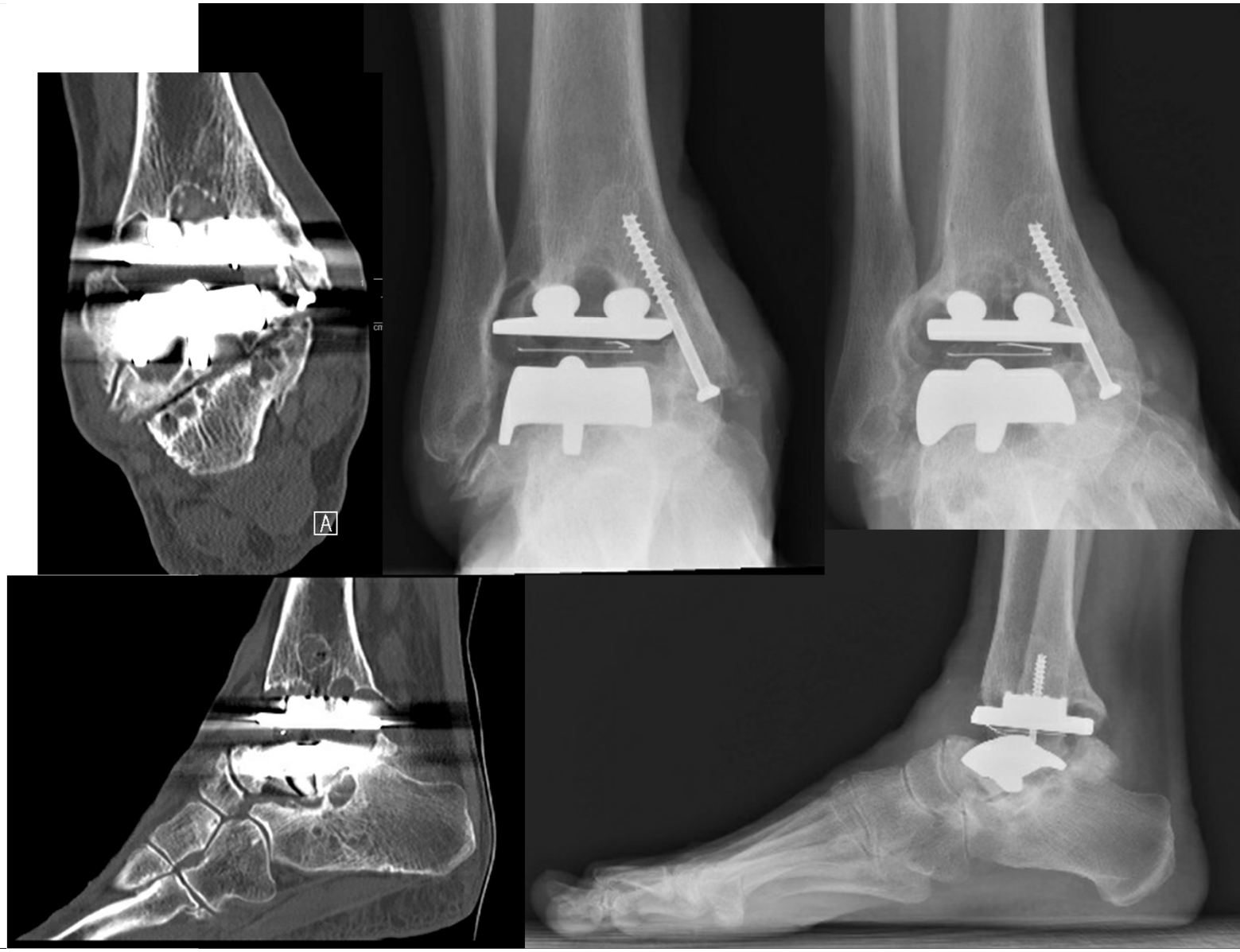
- Patient B 9 months s/p revision TAR with custom metal prosthesis in maximum motion radiographs
- 25 degrees arc of motion at tibiotalar interface



Case 3

- 69 yo F with failed STAR TAA and ankle pain
  - CT shows talar collapse with adjacent subtalar arthritis

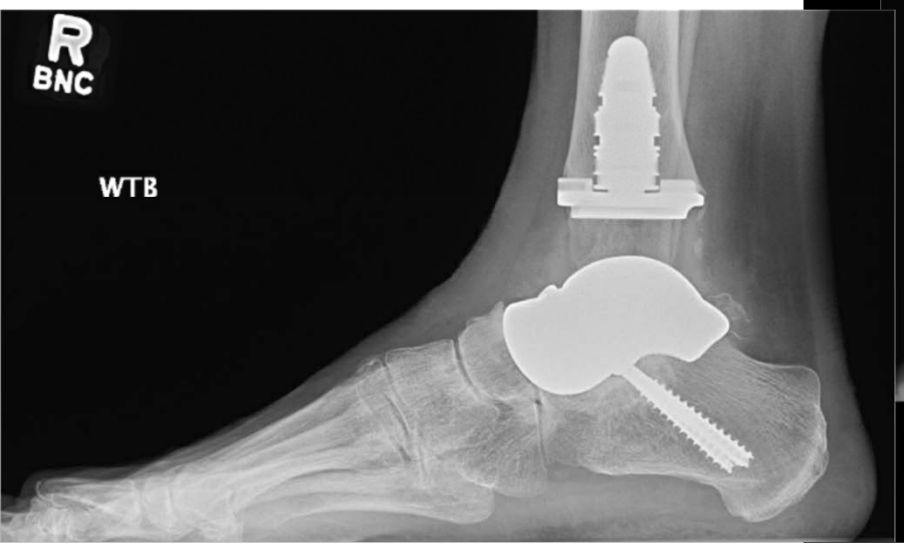
RIGHT

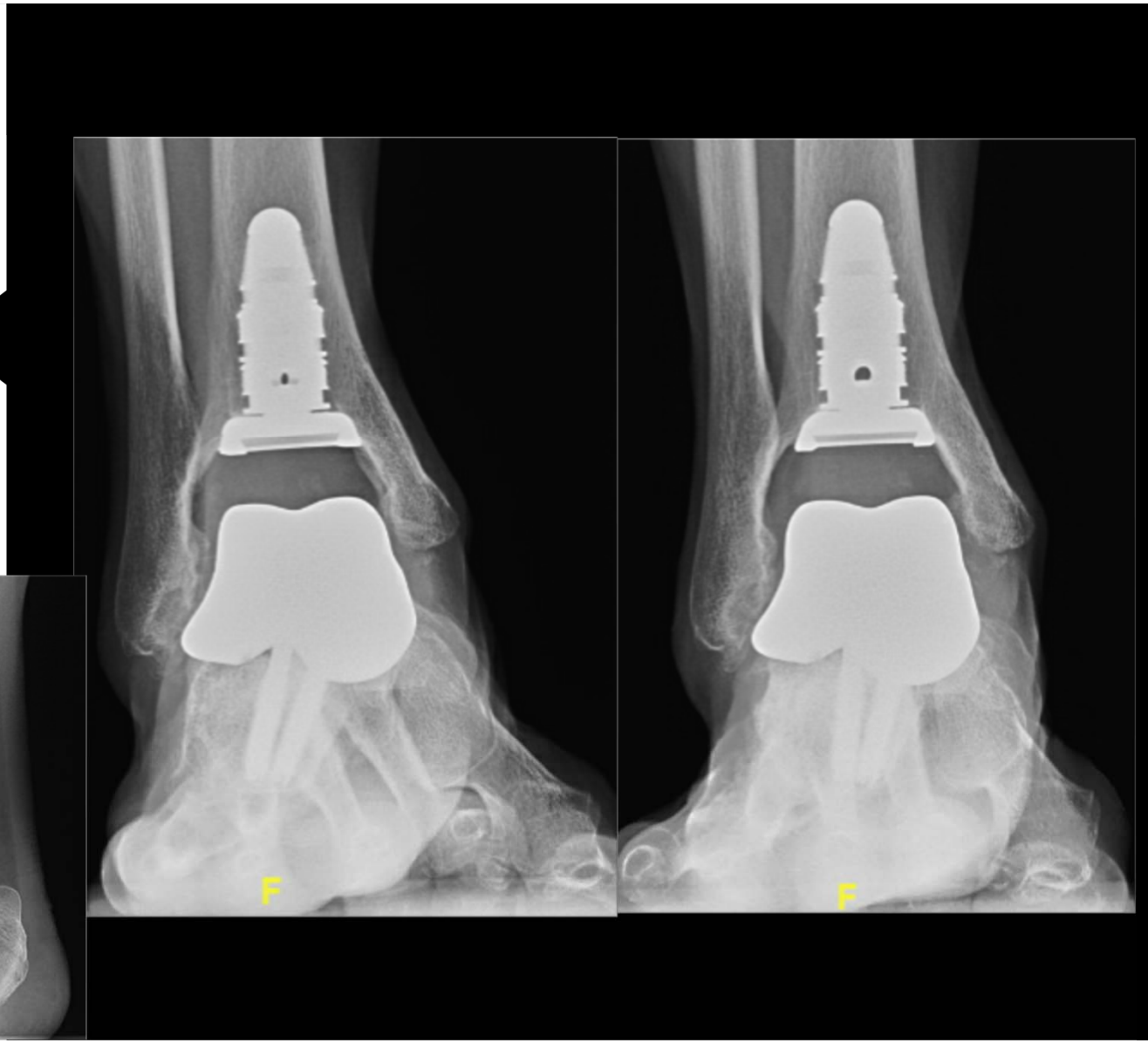


Case 3

- 18 months s/p revision TAA with custom metal talus and ST arthrodesis

RIGHT





Case 3

- 18 months s/p revision TAA with custom metal talus and ST arthrodesis

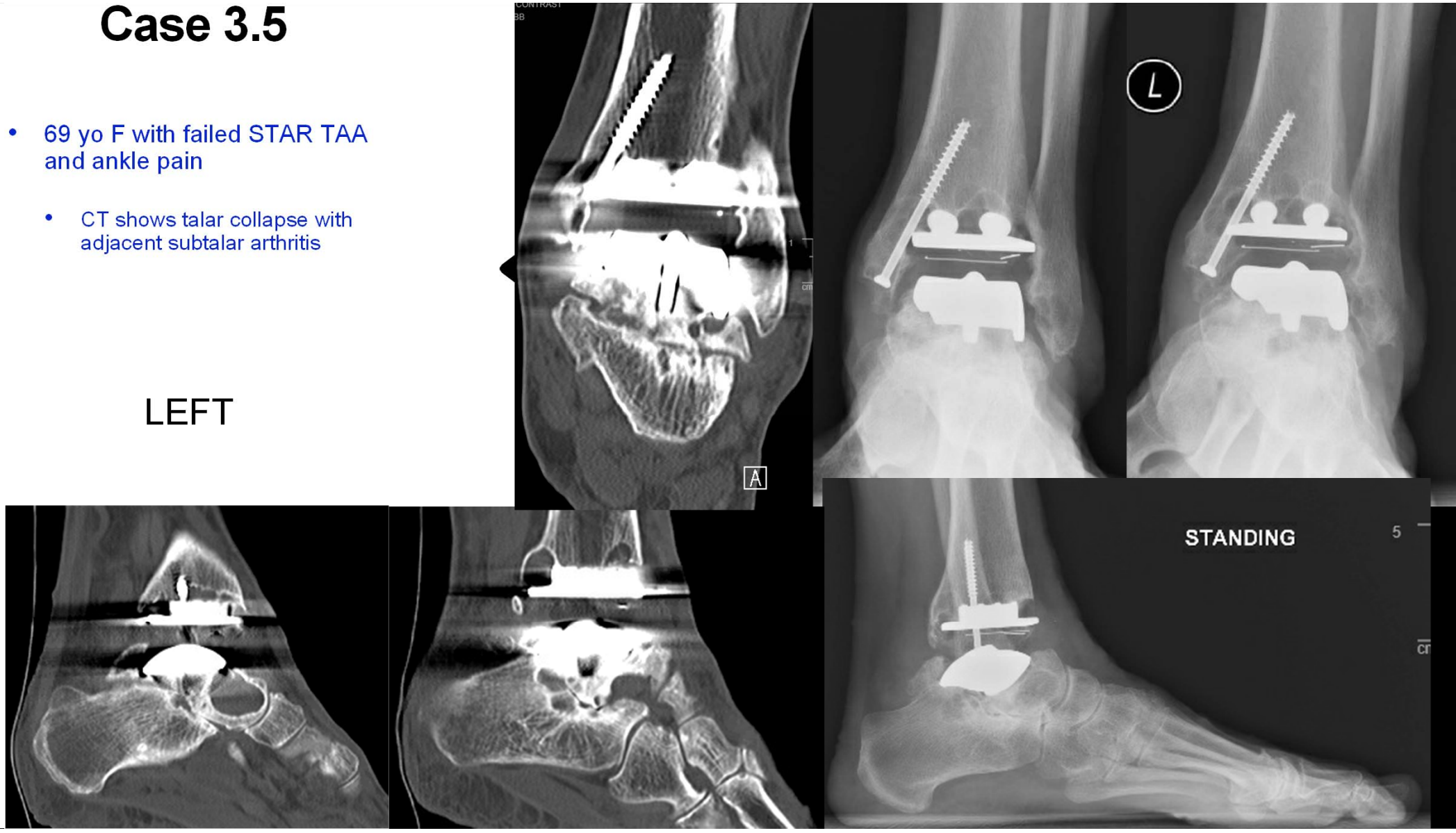
RIGHT

45 degree arc of motion in tibiotalar joint

Case 3.5

- 69 yo F with failed STAR TAA and ankle pain
  - CT shows talar collapse with adjacent subtalar arthritis

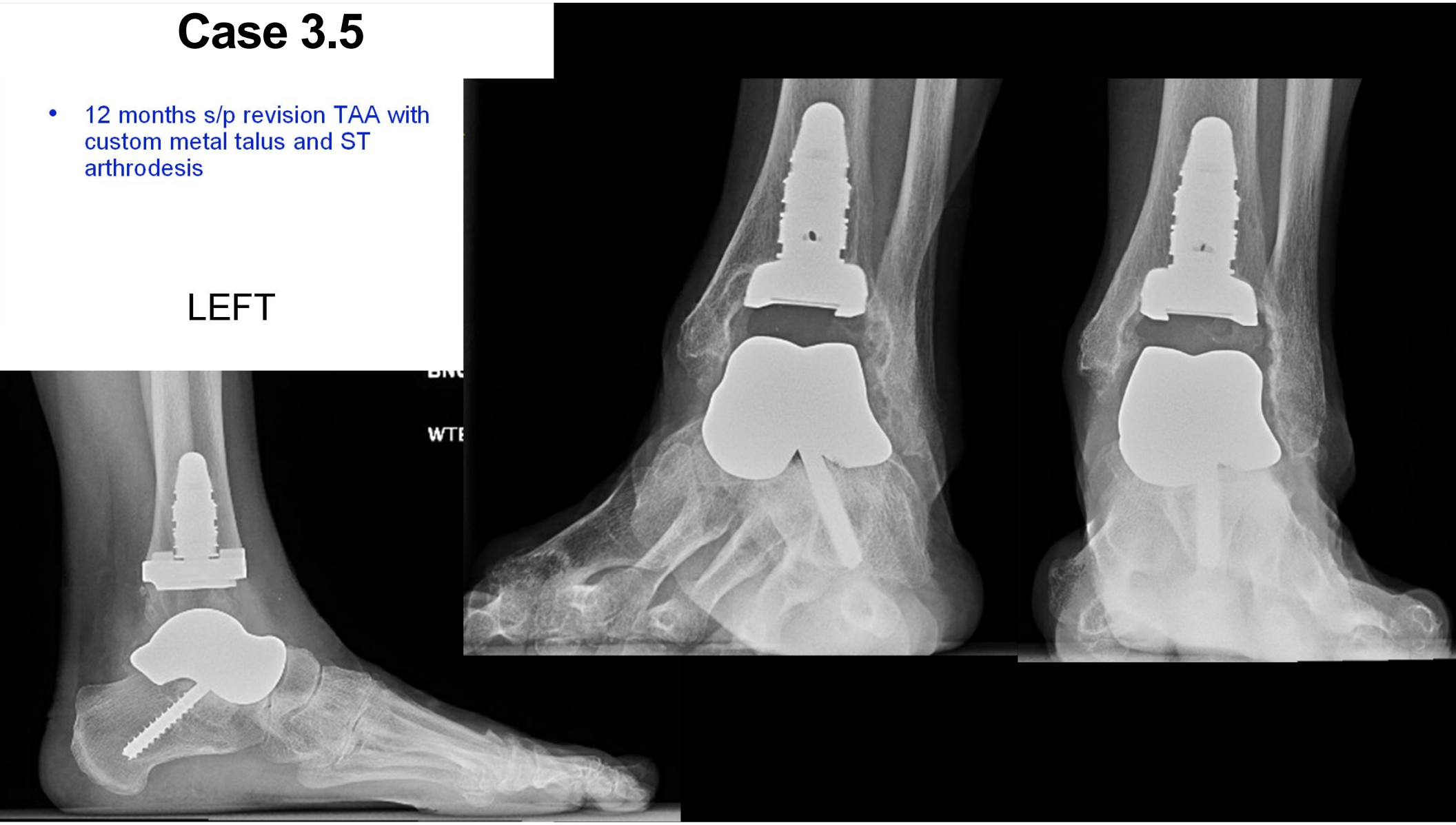
LEFT



Case 3.5

- 12 months s/p revision TAA with custom metal talus and ST arthrodesis

LEFT



Case 3.5

- 12 months s/p revision TAA with custom metal talus and ST arthrodesis

LEFT

51 deg arc ROM in tibiotalar joint

Thank you

Case for discussion

- 52 year old fisherman
- Worker's comp
- Foot caught in a grate on his boat
- 5/10 pain, AFO dependent
- Continues to work but is challenging

Introduction

- Walks in varus even with AFO
- PTT contracted
- No peroneal muscle power
- Ankle tender to palpation

discuss

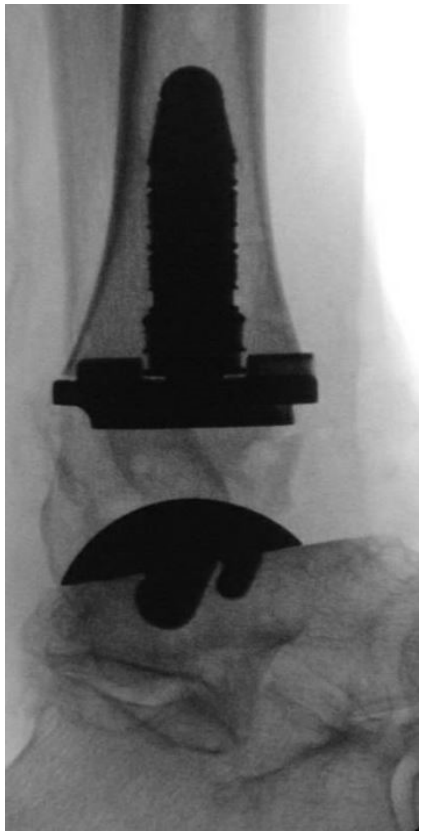
1st surgery

- FHL tendon transfer to lateral foot (no peroneal tendons present)
- PTT lengthening
- Gastroc recession
- Calcaneal osteotomy
- InBone 2 total ankle

Calcaneal slide

InBone 2 final OR images

Motion obtained intra-op



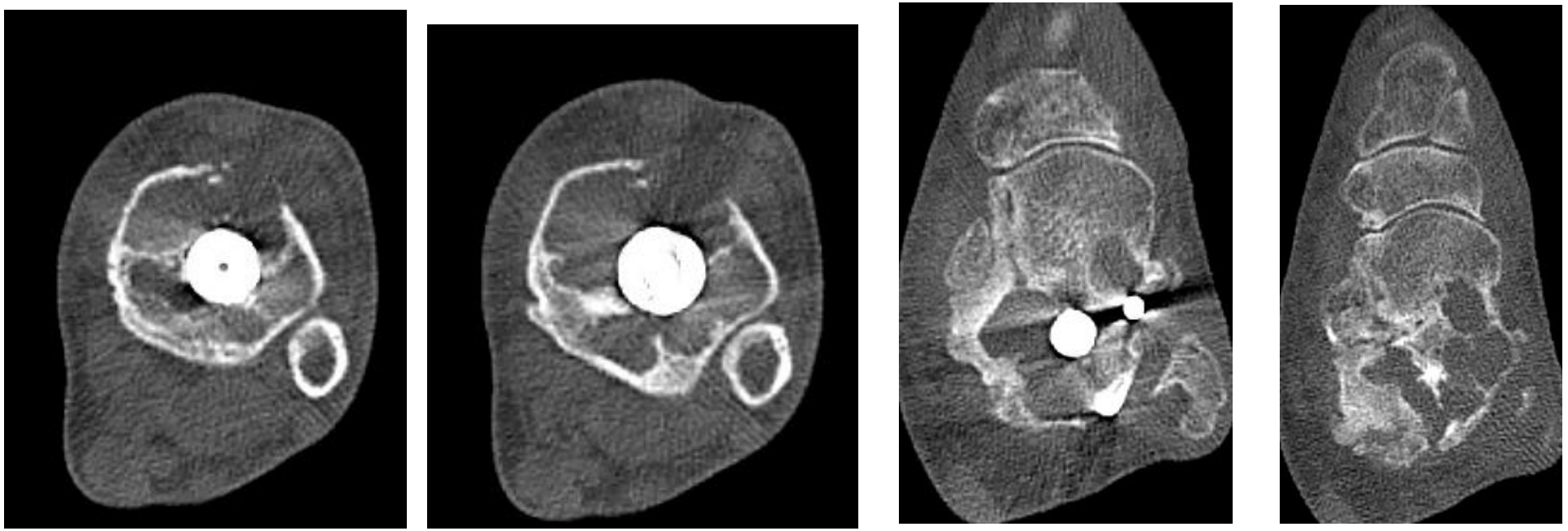
1 year later

Patient disappears for 4 years

5 years later…pain, deformity

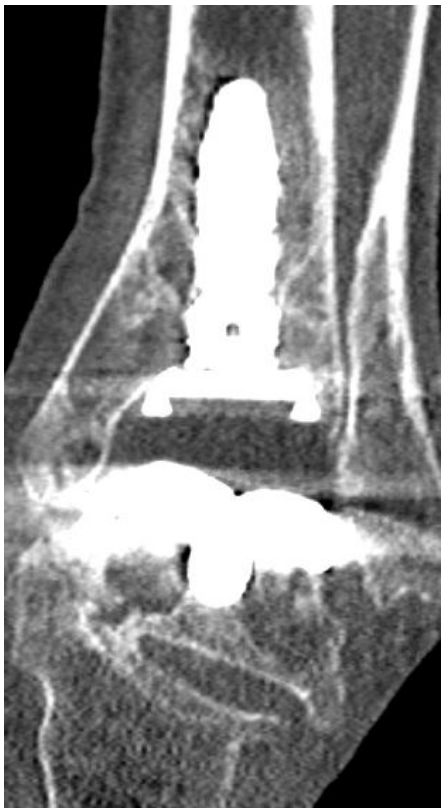
Pre-op
now

Ct scans….

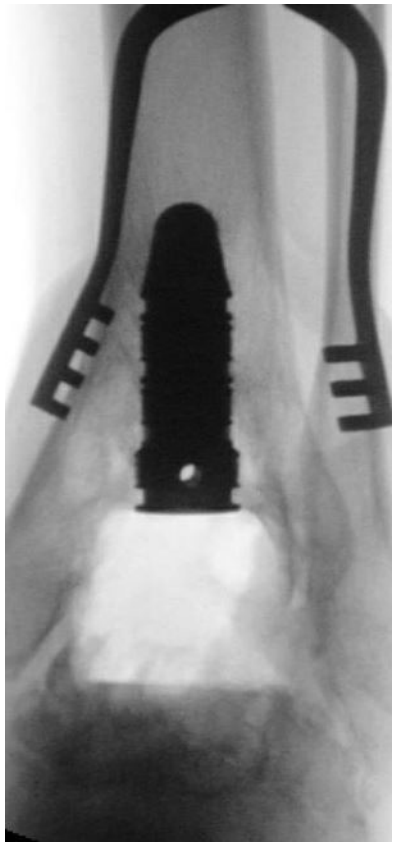


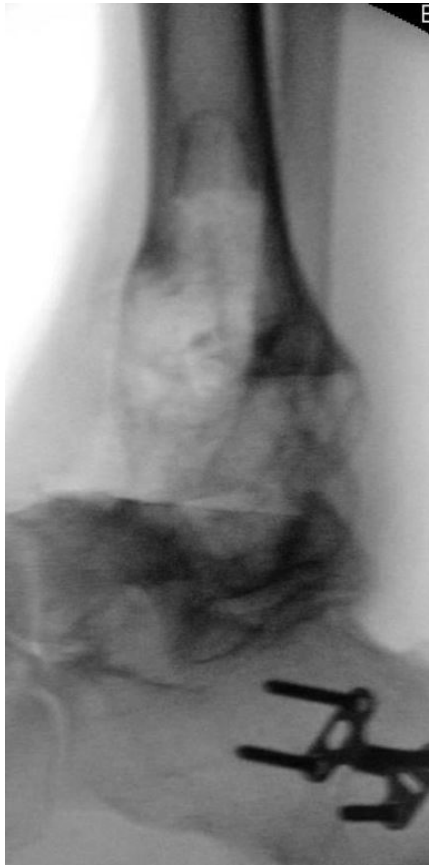
Ct scans…

discuss



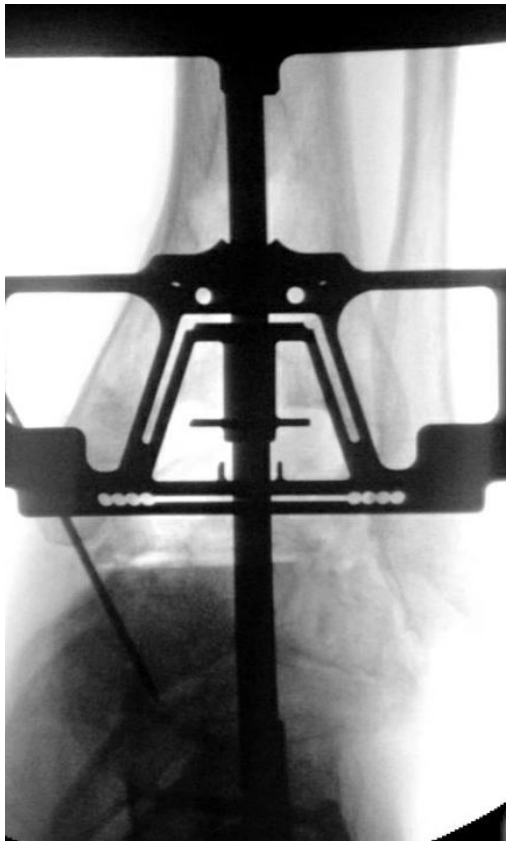
Revision to Invision

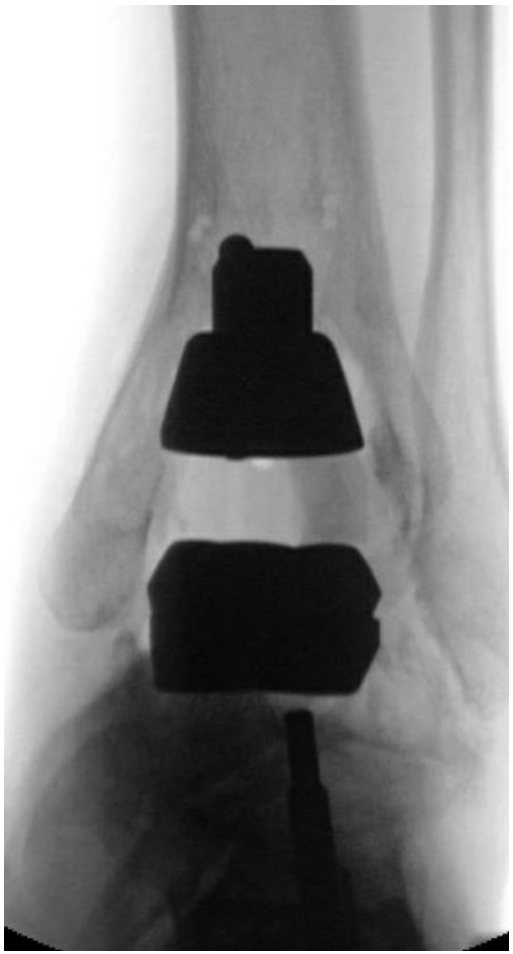


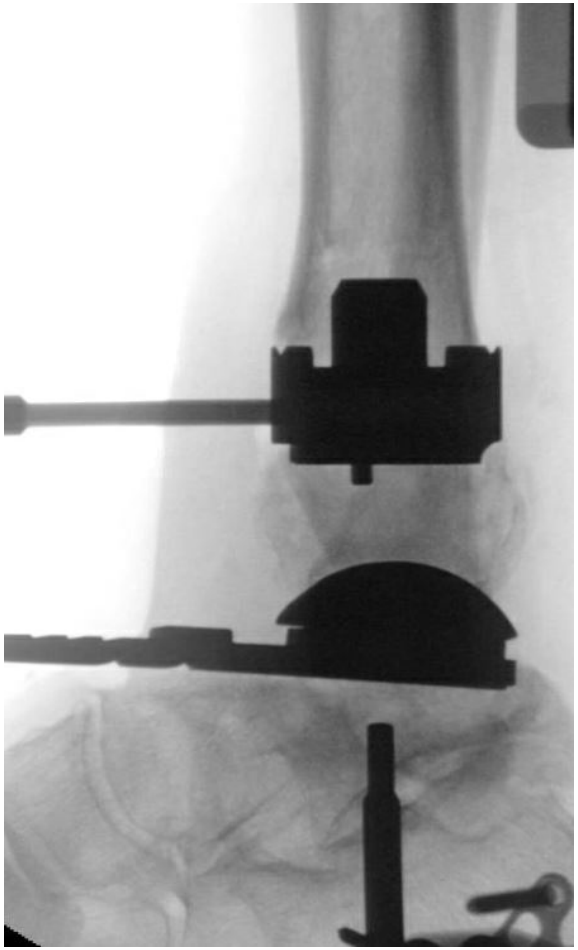



Checking the residual talus

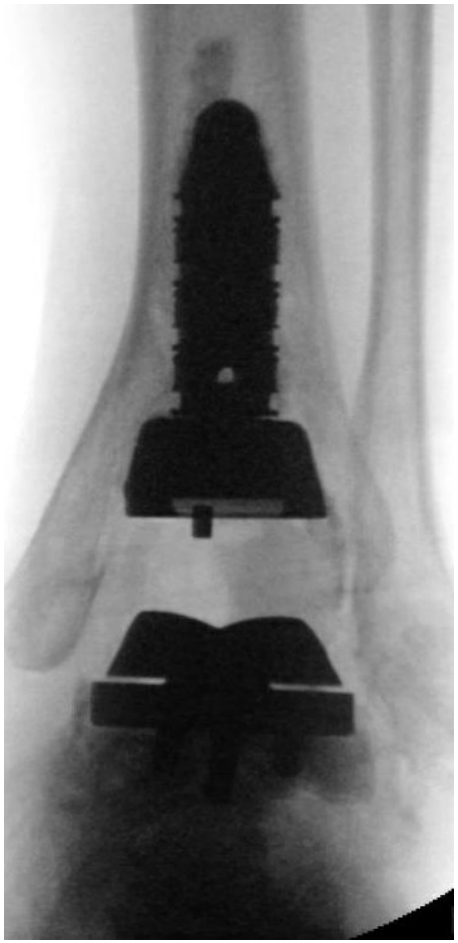
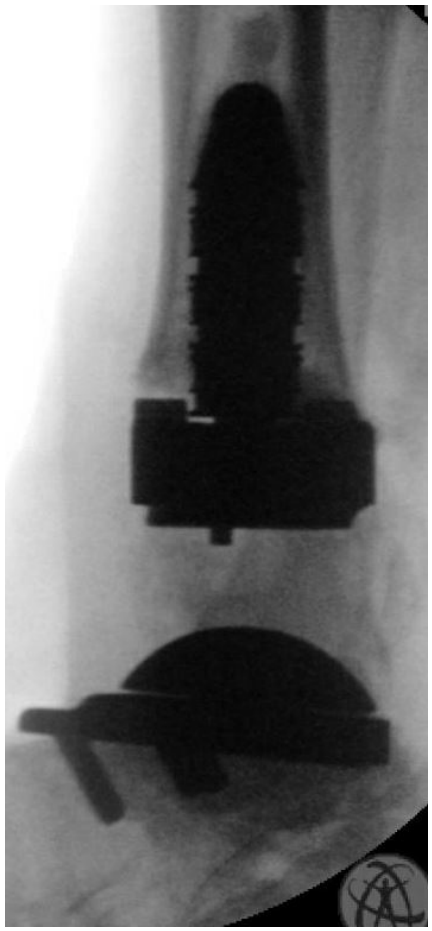
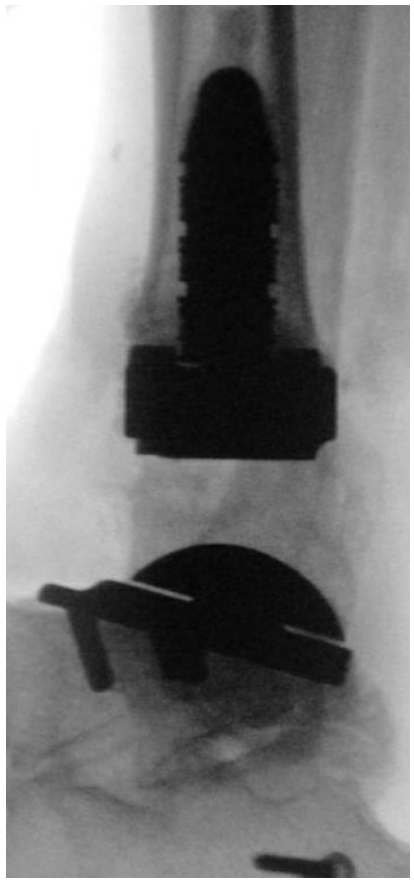
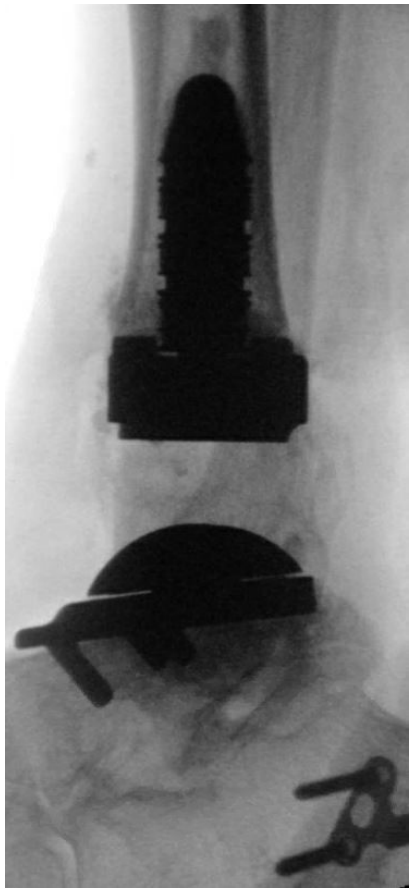
Tibial cut







Final OR images

3 months post-op

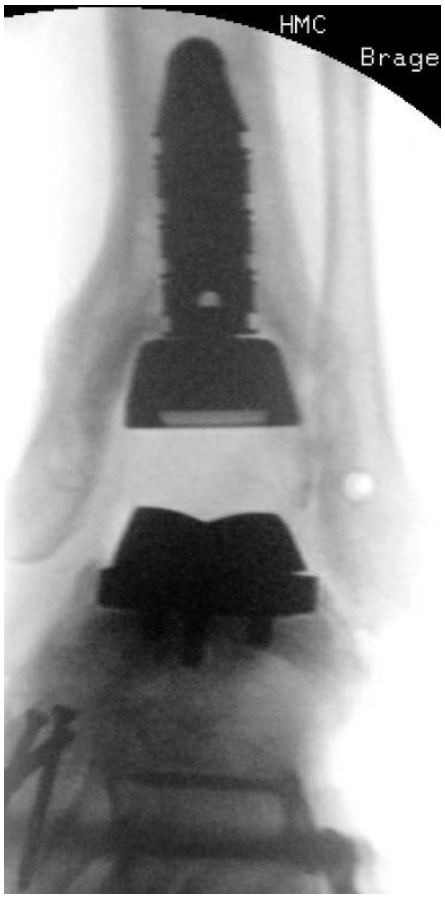
9 months post-op

discuss

3rd surgery

Lateral ankle ligament

Reconstruction with allograft tendon

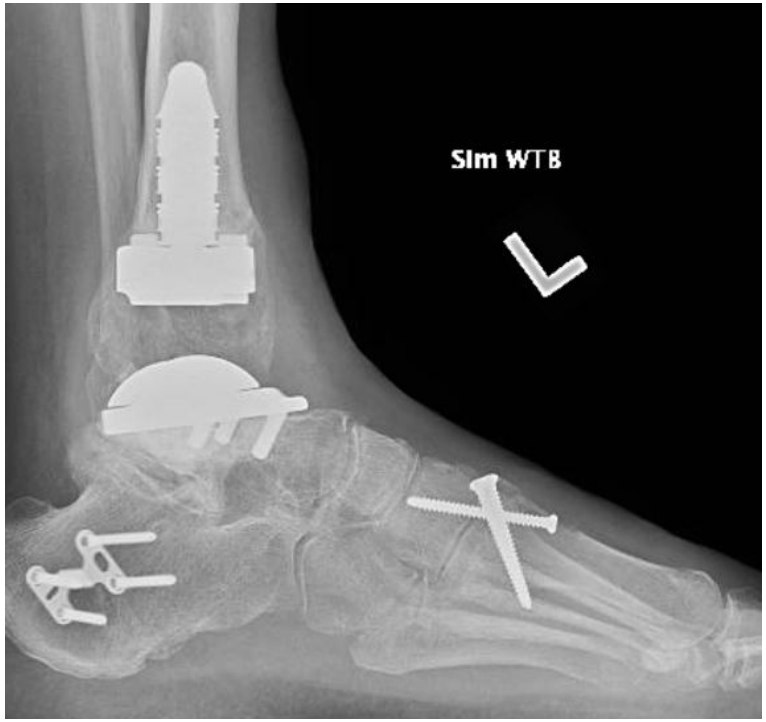


Stress
Stress after

3rd surgery

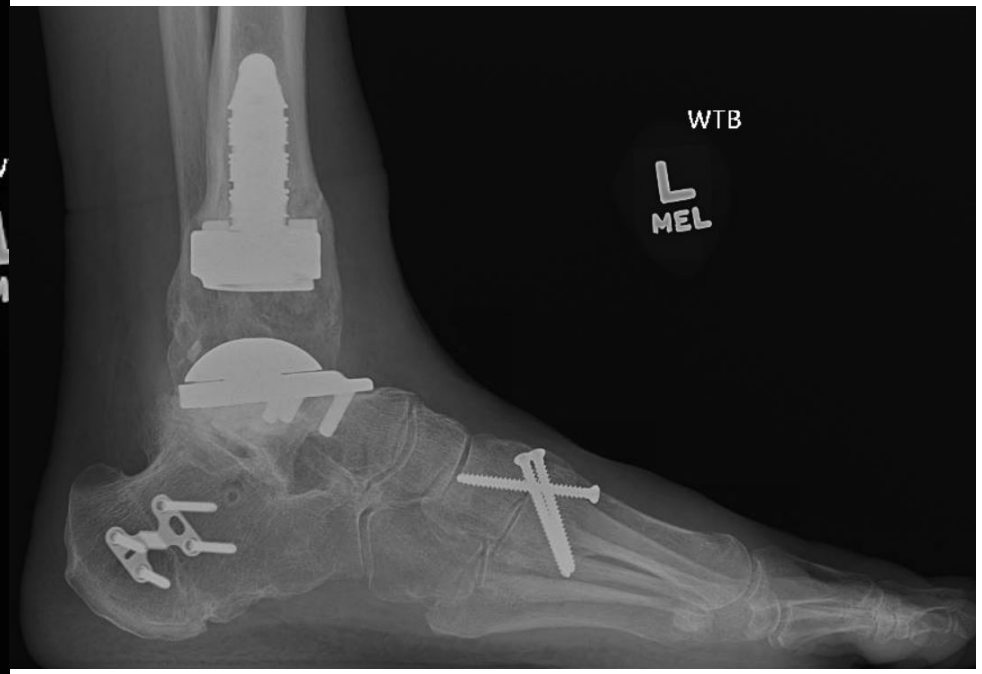
- Dorsiflexing 1st TMT arthrodesis
- Revision PTT lengthening and medial foot capsular release
- Transfer tibialis anterior to the lateral foot

3 months later….

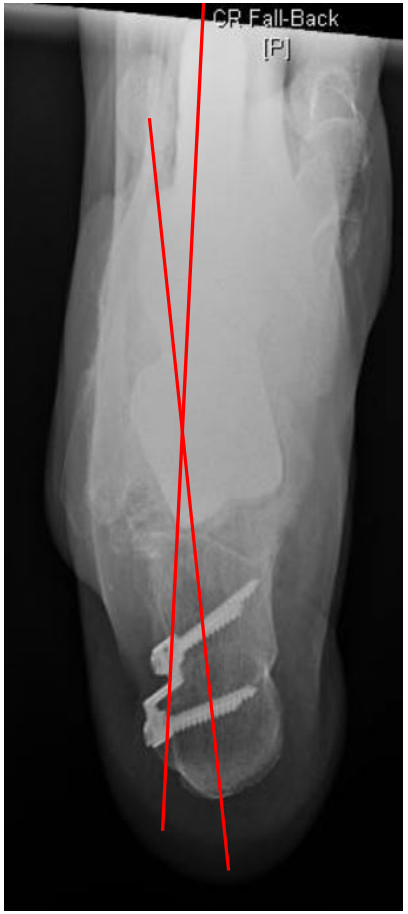


Motion at 3 months, post 3rd surgery

8 months later…..he hates it



8 months later….

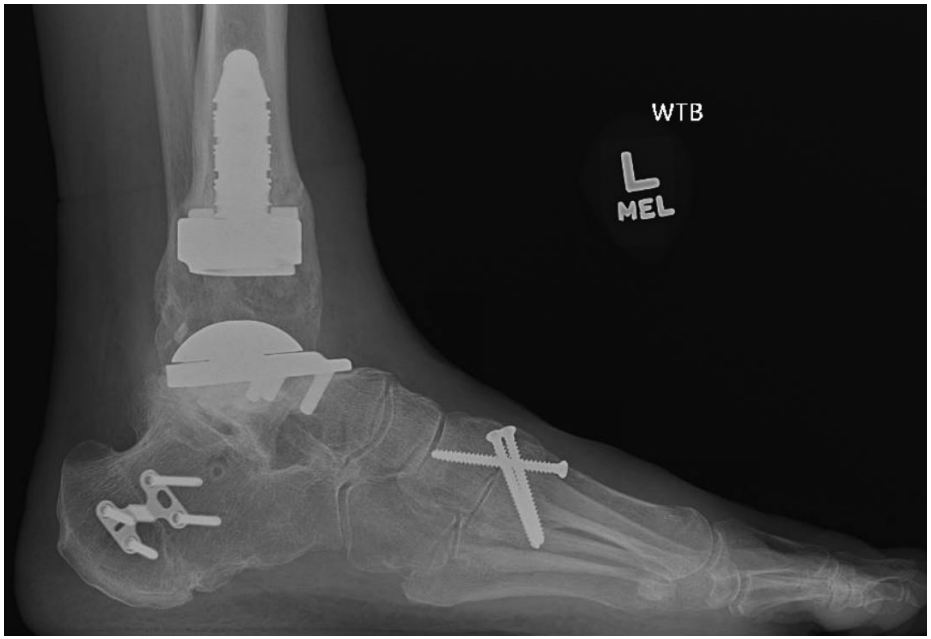


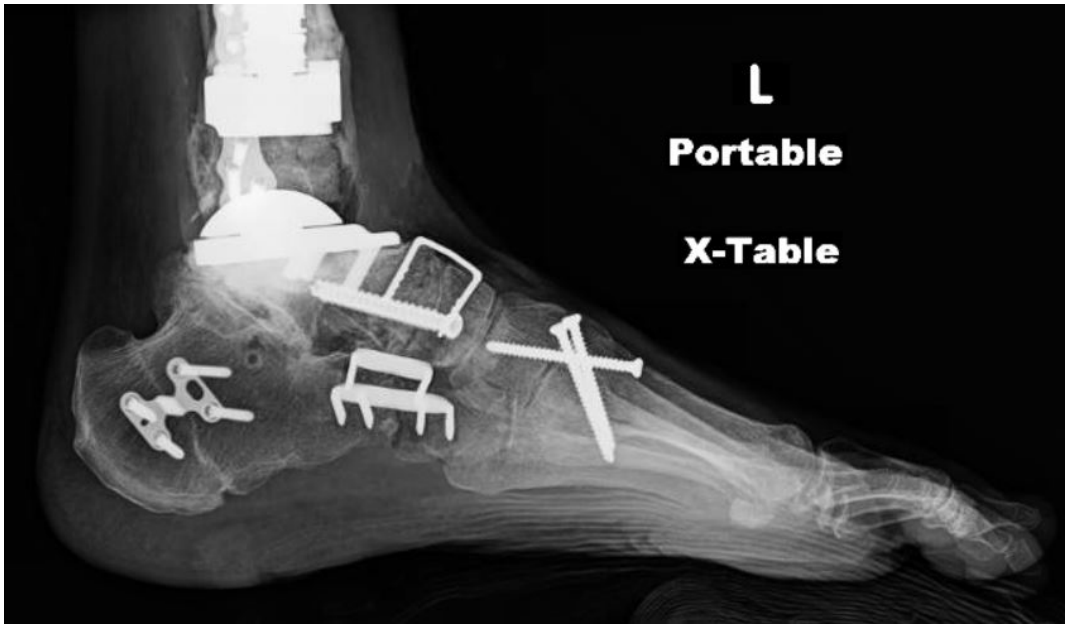
Most recent surgery……

Fibular shortening osteotomy

Corrective midfoot fusion

Corrective midfoot fusion





6 weeks post, NWB films due to Covid 19

To be continued????