

Innovations in Hindfoot Surgery

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NE Thames London Pott Rotation

Fellowships:

Foot and Ankle:

Stanmore – Dishan Singh, Nick Cullen

Toronto – Tim Daniels

Baltimore – Mark Myerson

Trauma:

Seattle – Sigvard 'Ted' Hansen

Liverpool – Durai Nayagam, Badri Narayan



Agenda

Pes planus

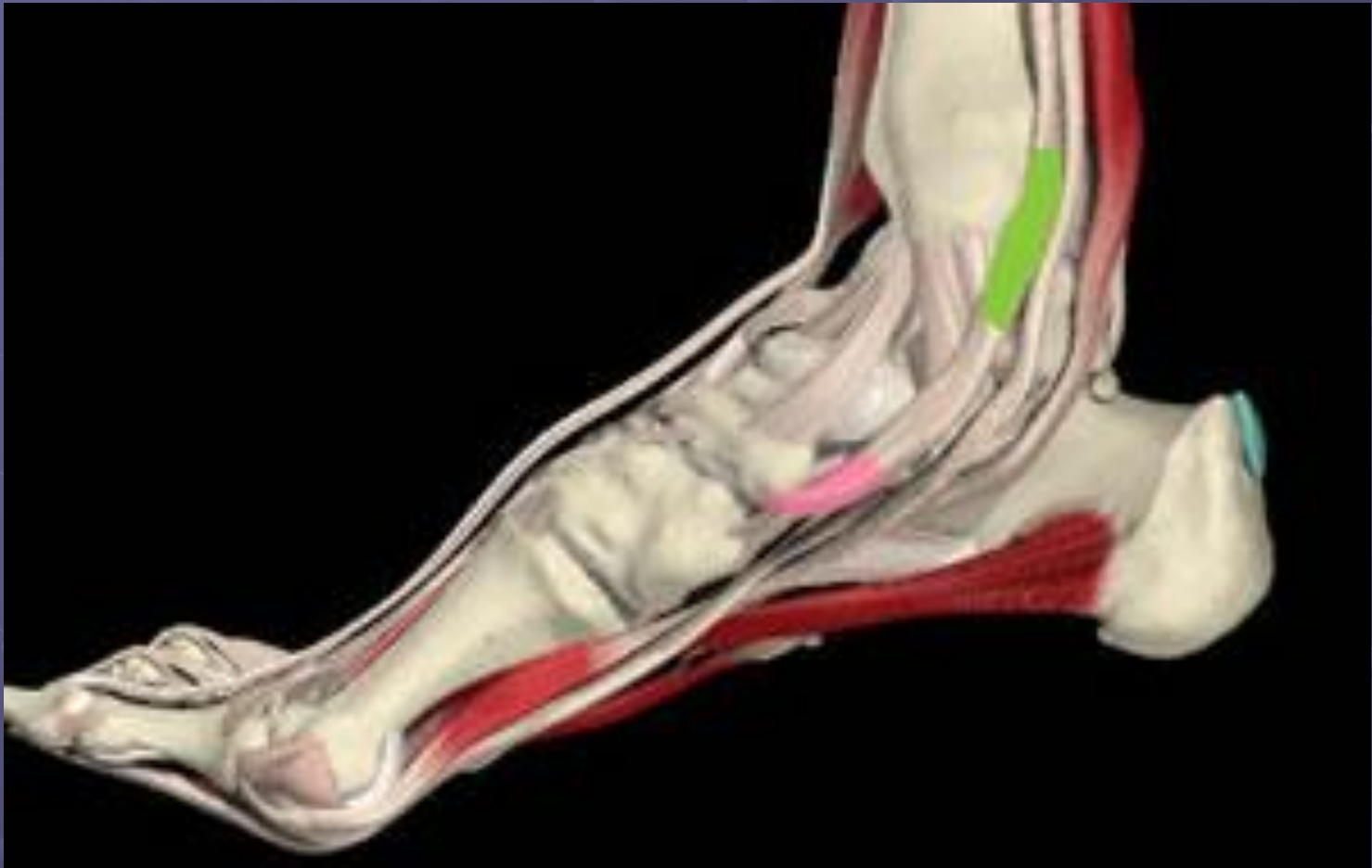
Pes cavus

Calcaneal fractures

Peroneal tendon disorders

Pes Planus (flatfoot deformity)

TIBIALIS POSTERIOR DYSFUNCTION



Tibialis Posterior Tendon

Normal function

- Supports longitudinal medial arch of foot
- Powerful inverter of hindfoot

1CM EXCURSION

Typical Patient

Middle aged female

Referred as medially based Ankle pain

Gradual deterioration

Often trauma accelerates the process

The 'Sag' is inevitable

Understand the continuum

It develops over time

Hindfoot Valgus

Forefoot abduction

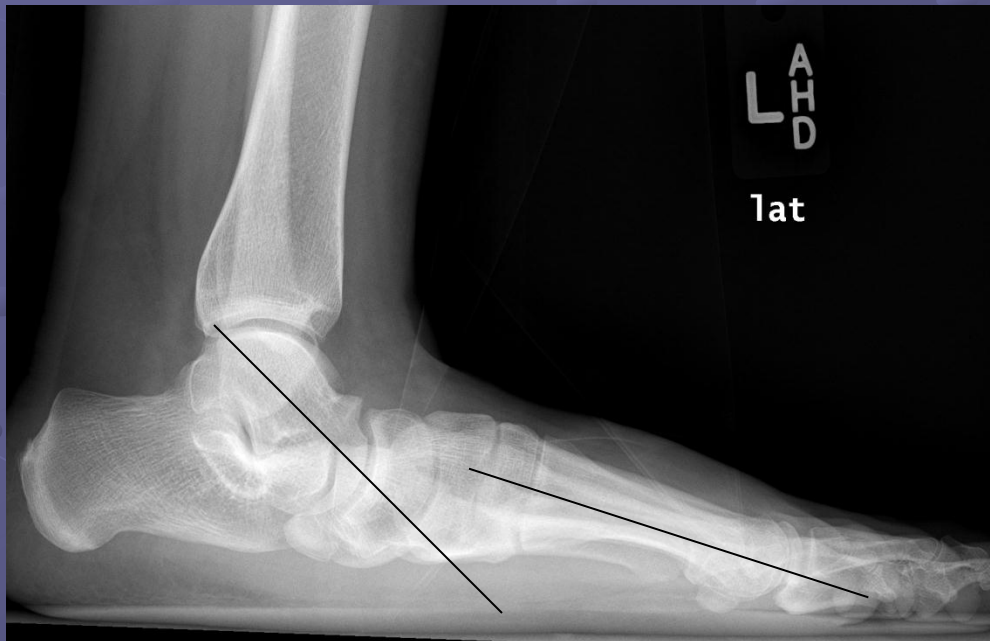




Johnson and Strom

- Stage 1: Tendon inflammed, no deformity
- Stage 2: Tendon no longer functioning
Foot deformity flexible
- Stage 3: Tendon no longer functioning
Foot deformity not correctable
- Stage 4: Any stage + ankle involvement

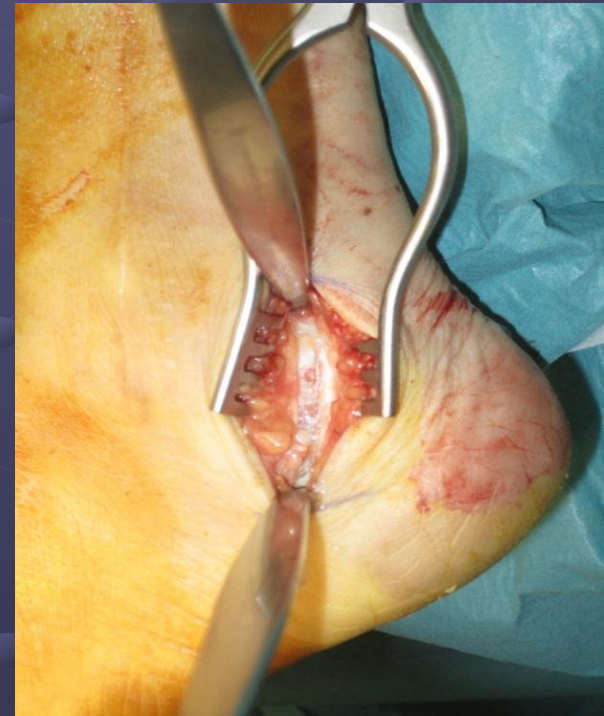
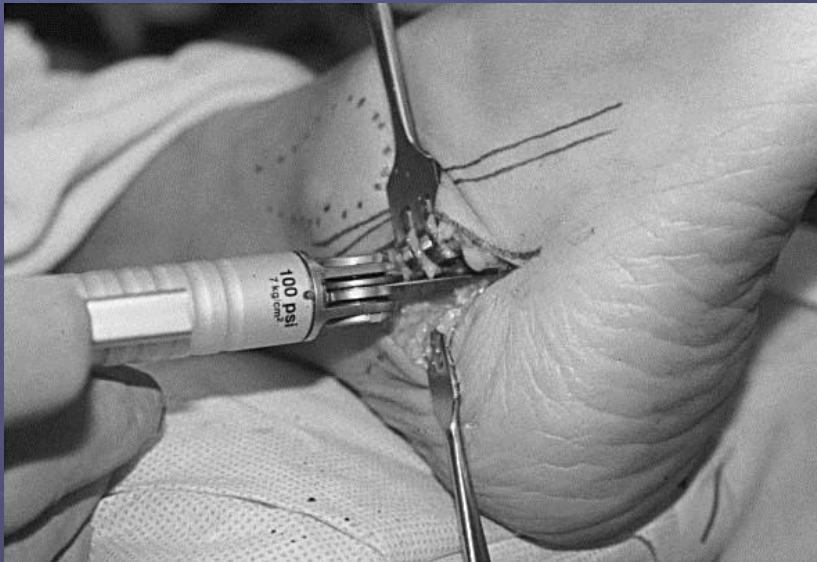
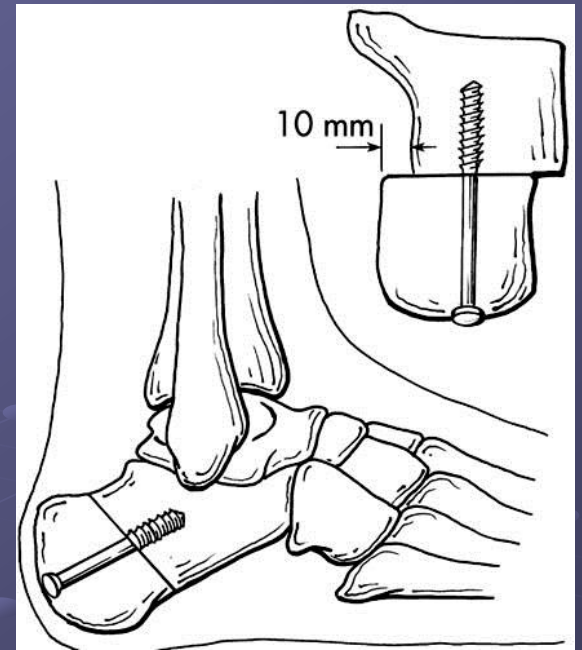
Radiographic parameters



Calcaneal osteotomy

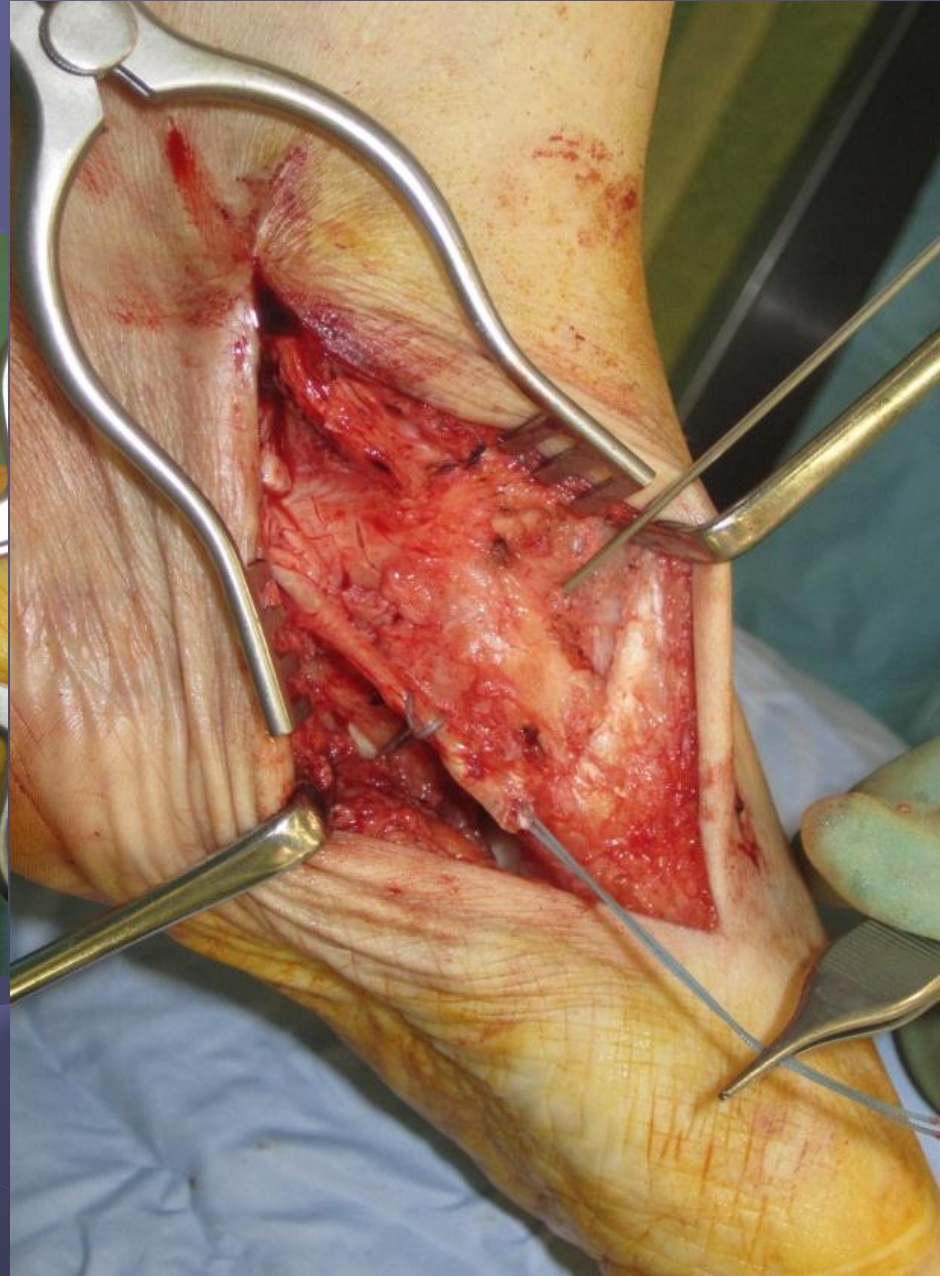
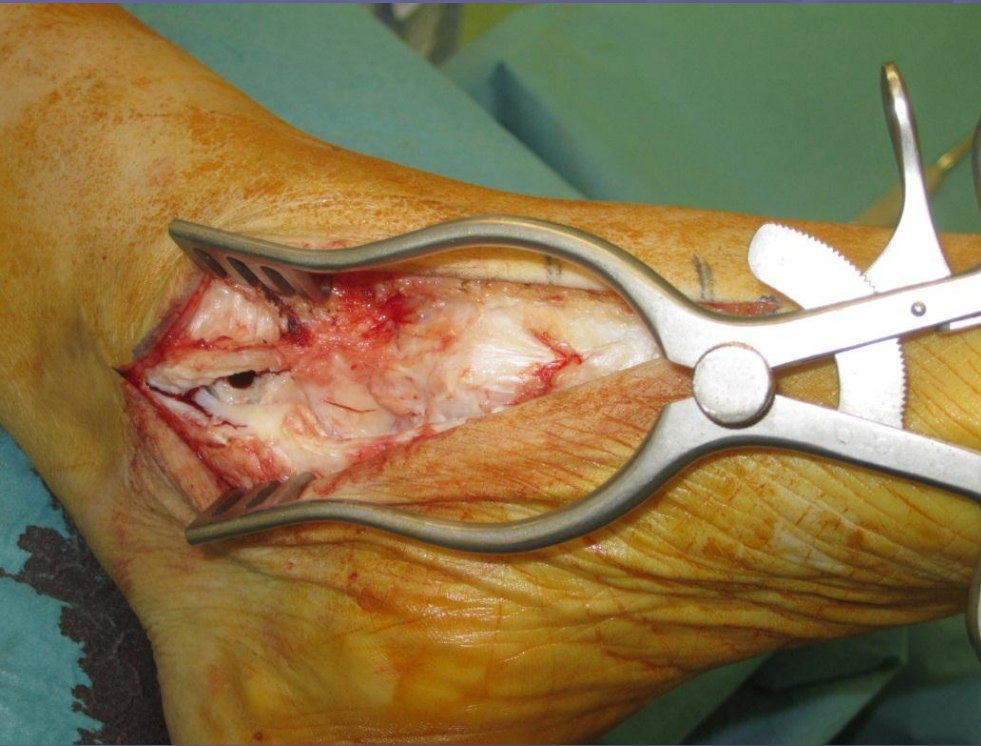
Restores pull of achilles tendon

Reduces tension on medial side

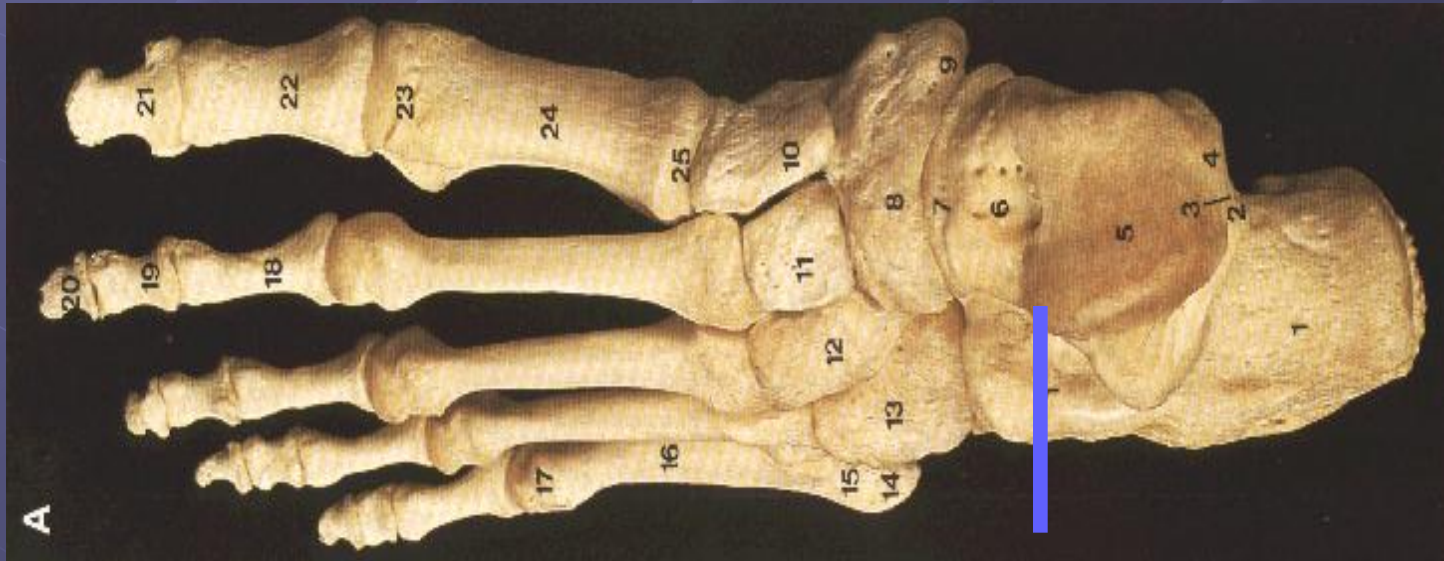
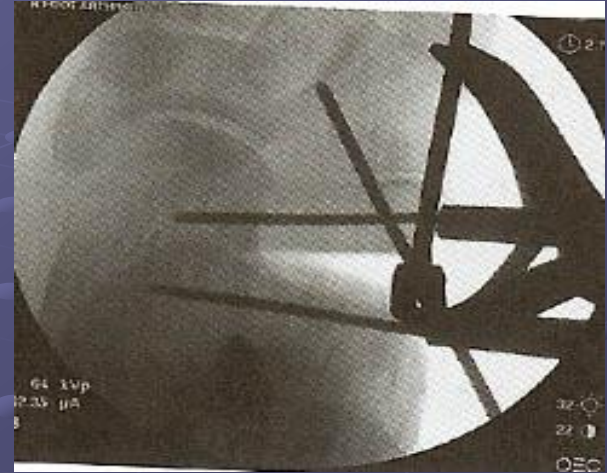
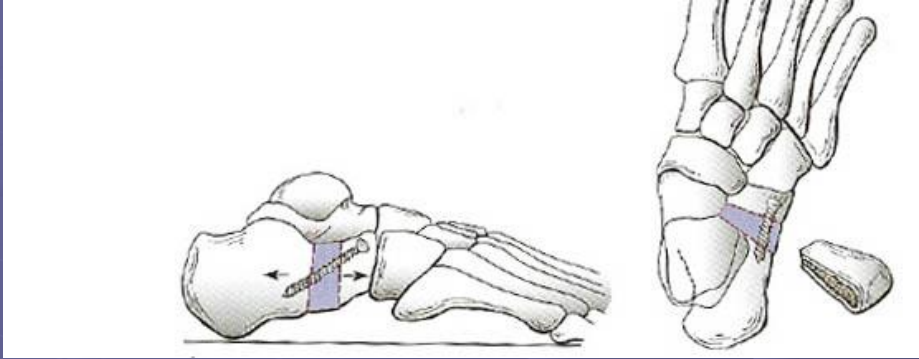




FDL Transfer



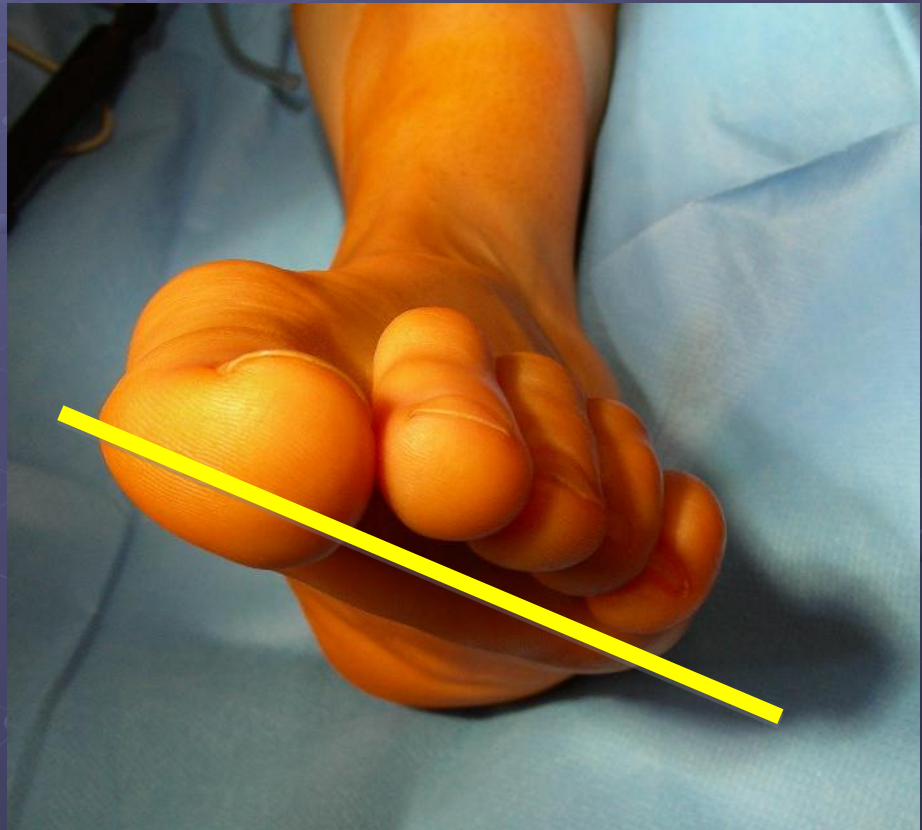
Lateral Column Lengthening



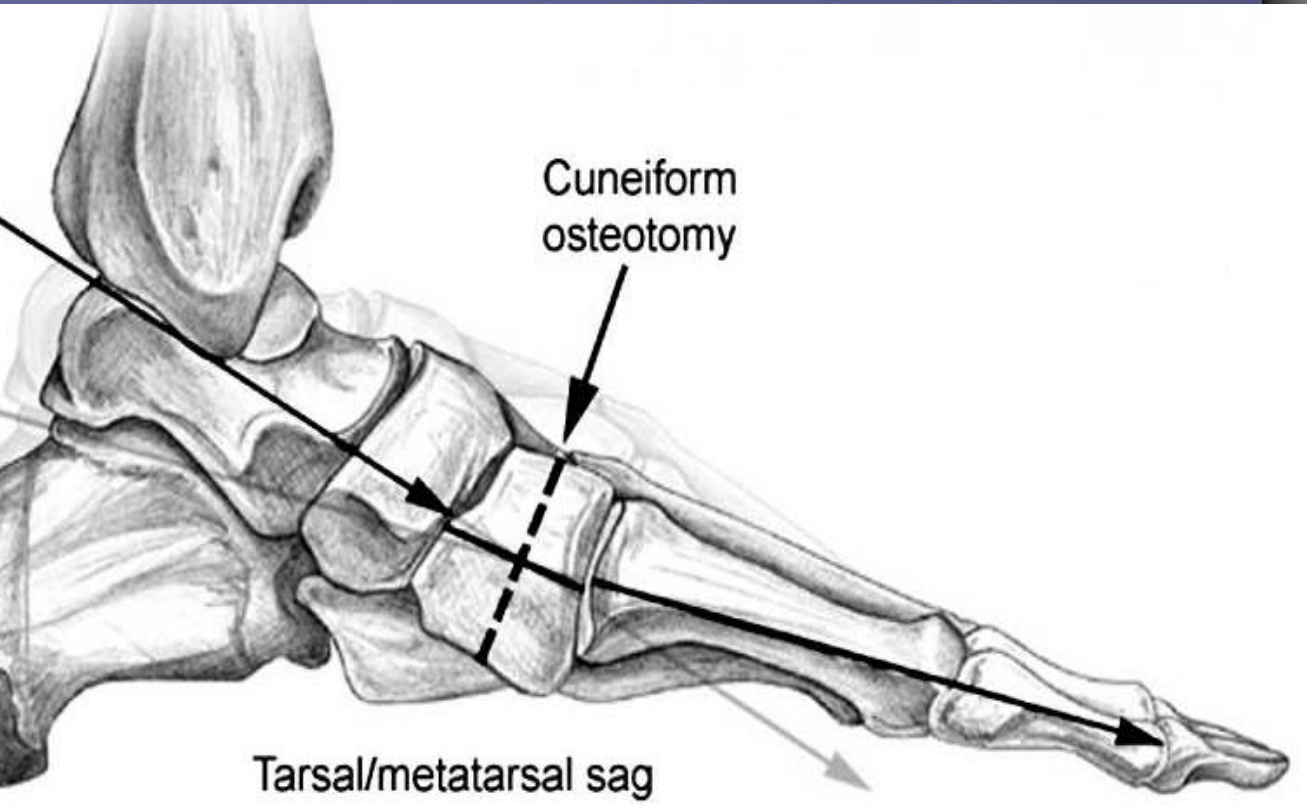


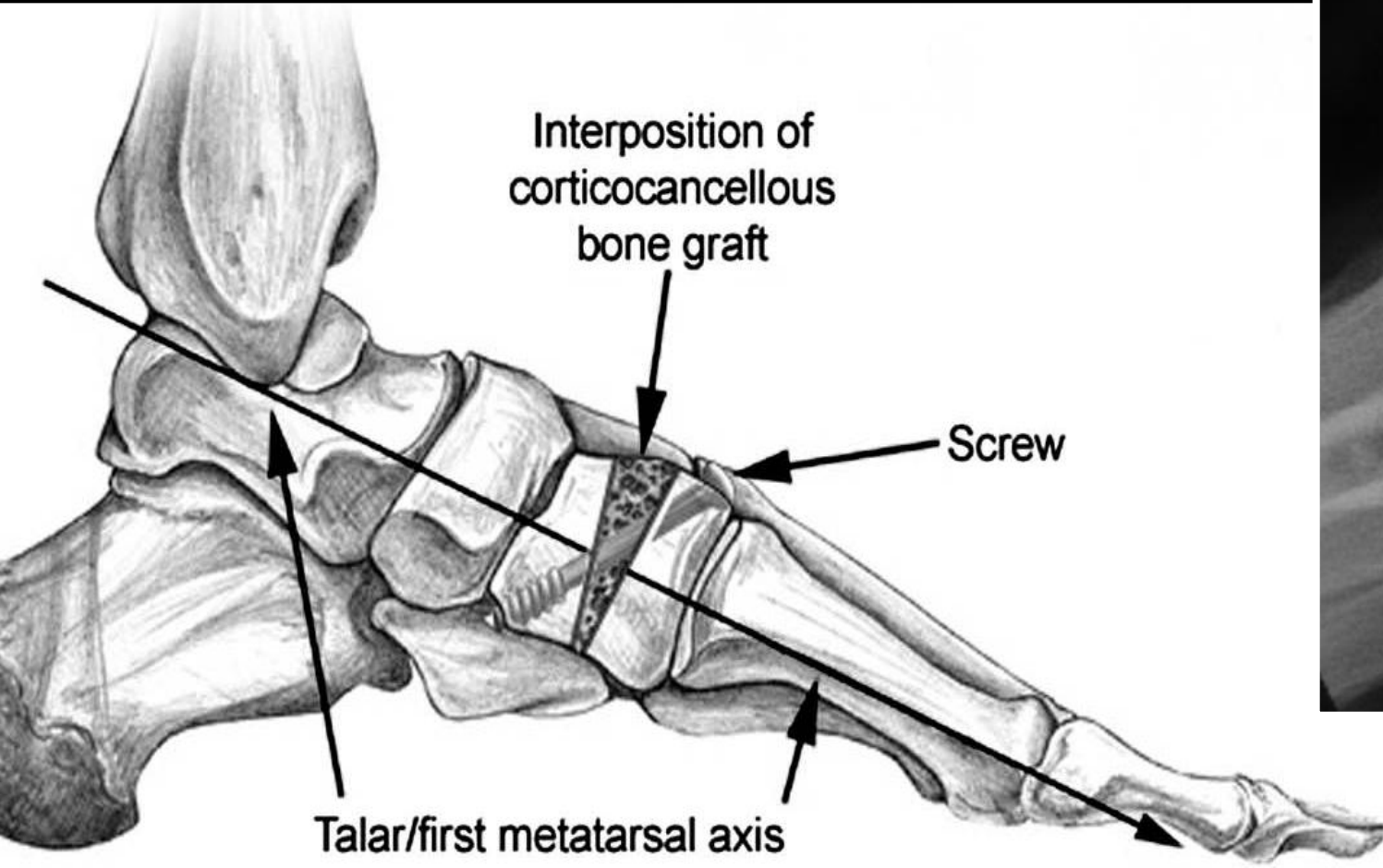
Cotton Procedure

Medial Cuneiform
Opening wedge
Osteotomy



Technique



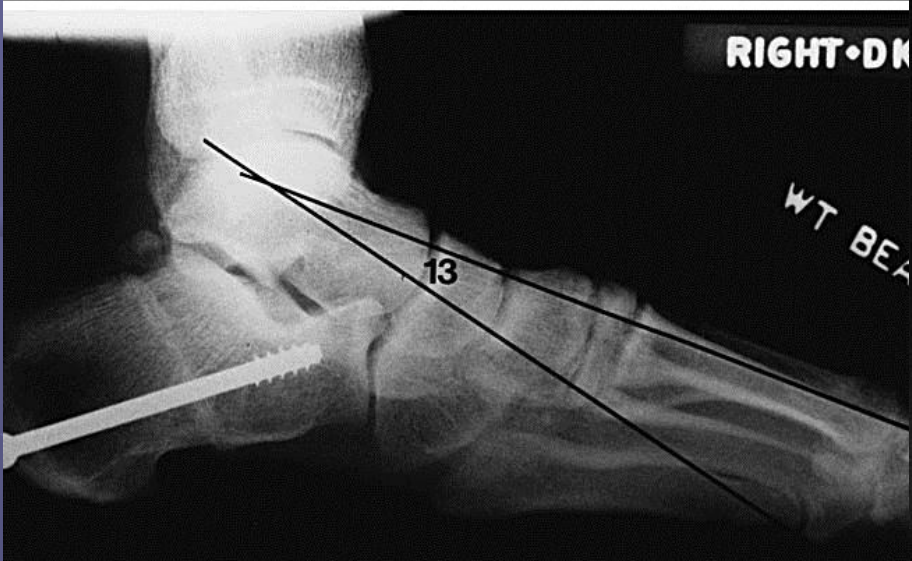
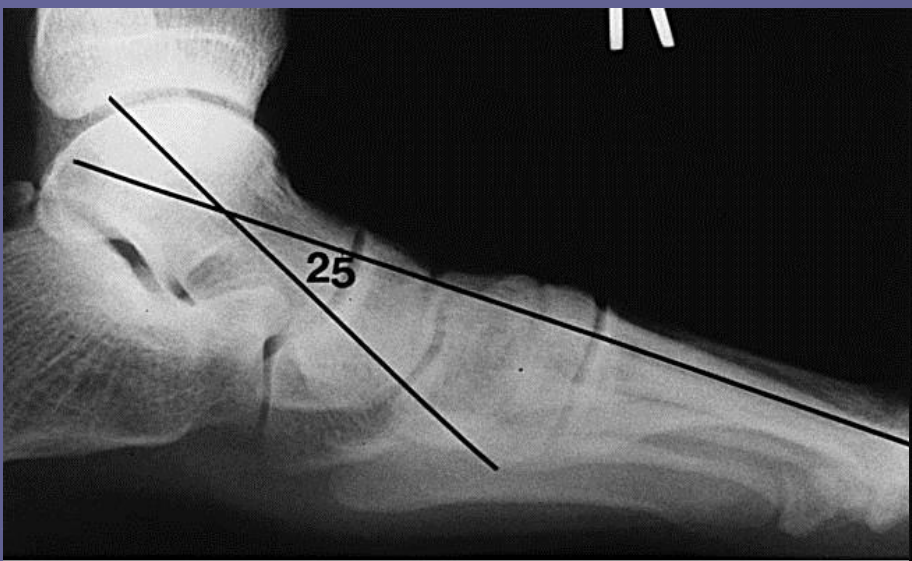


Tight Gastroc - Universal

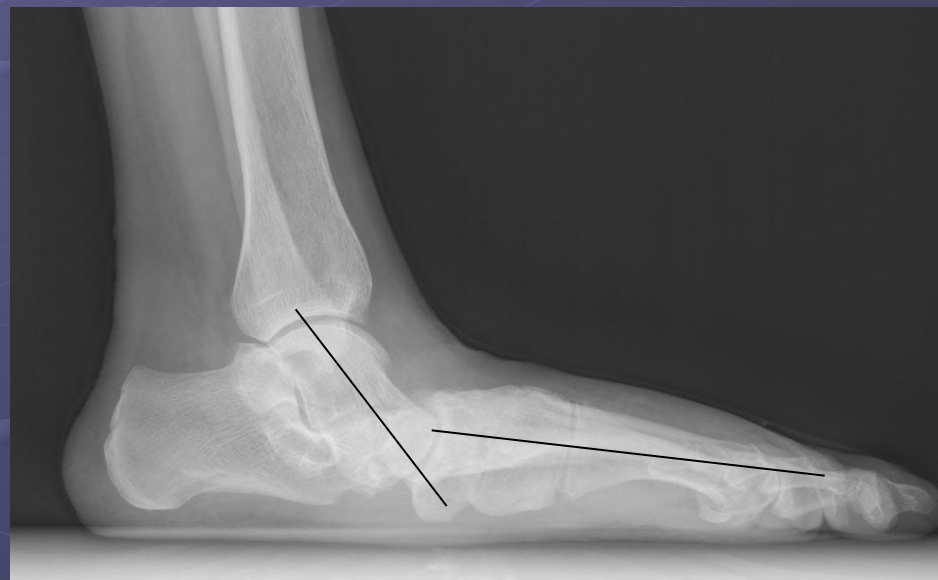


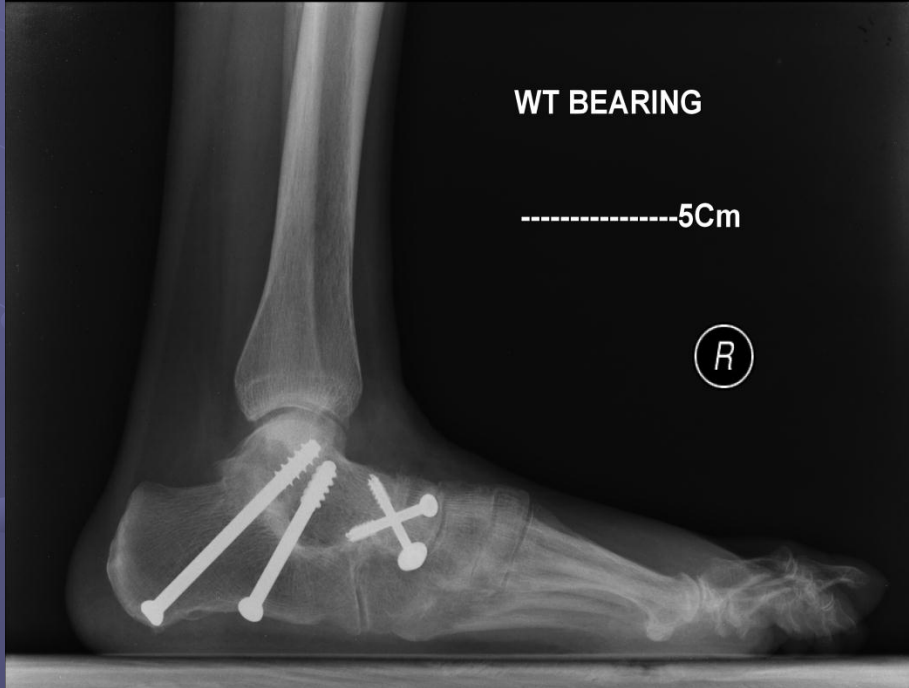






Severe flatfoot case





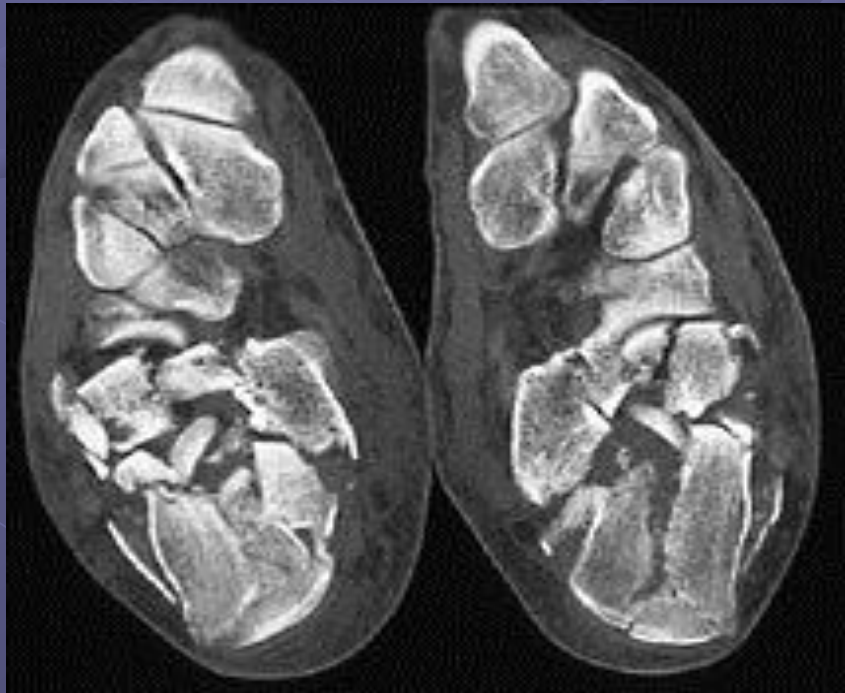
Arthroeresis

- Screw sits between calcaneus and talus
- Used by podiatric surgeons USA
- Minimally invasive surgery - NO
- NICE guidance
- Never an isolated procedure



Calcaneal Fractures

Minimally Invasive Surgery



C



Historical Perspective

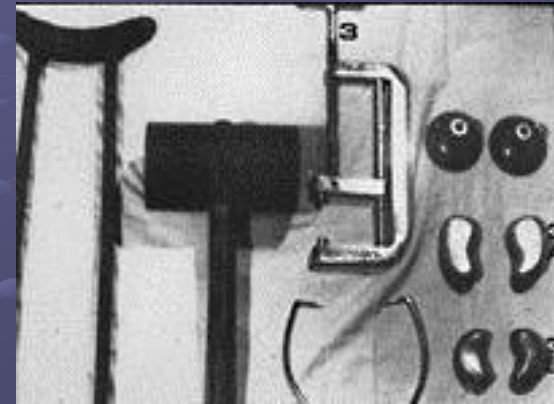
“ it is not possible to classify the fracture of a nut subjected to stresses in a nutcracker ”

**"ORDINARILY THE MAN WHO
BREAKS HIS HEEL BONE IS
DONE SO FAR AS HIS
INDUSTRIAL FUTURE IS
CONCERNED."**

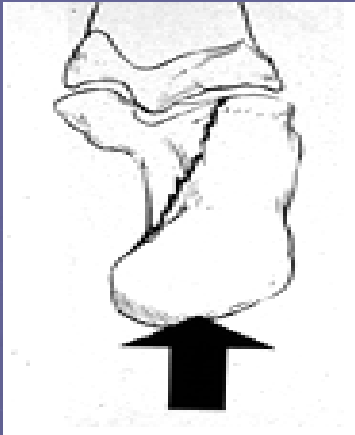
COTTON (1908)

The early experience

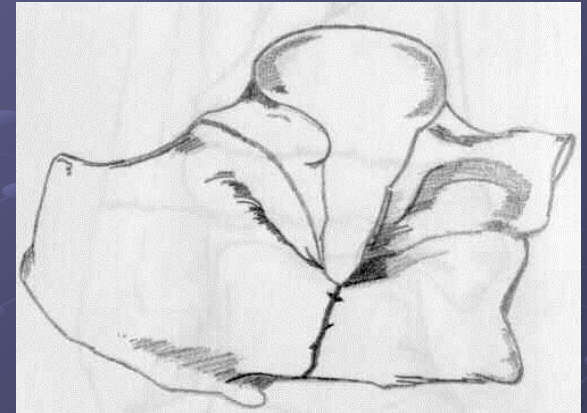
- ¢ Cotton and Wilson 1908 – closed treatment. 'Sandbag and Mallet technique'
- ¢ French 1920s – Internal fixation
- ¢ Westhues 1934 – percutaneous pin



Pathomechanics



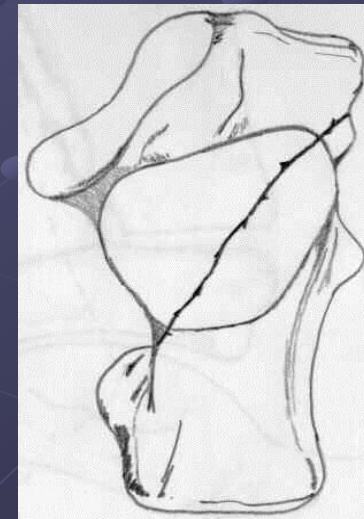
Palmer 1948, Essex-Lopresti 1952,
Souer and Remy 1975, Carr 1989



Diverging axes of calcaneus and
talus

- ¢ Subtalar joint forced into EVERSION,
lateral process talus driven into calcaneus

Primary and secondary fracture
lines

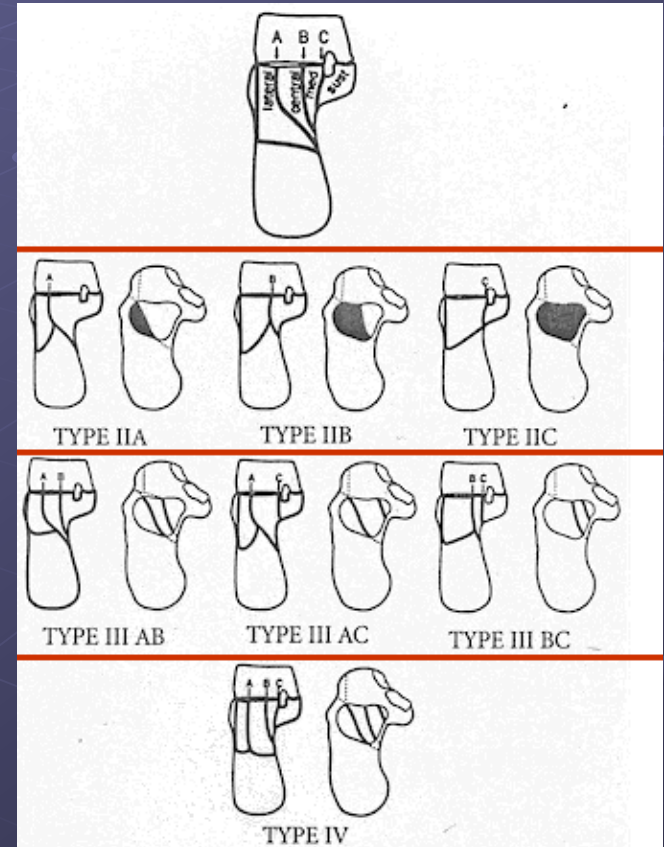
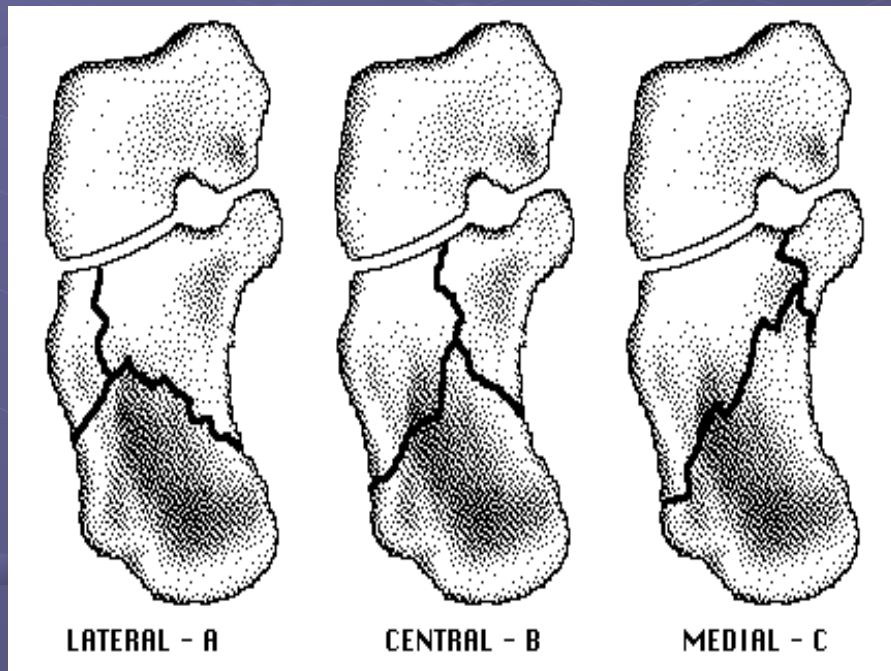


Fracture Components

- ¢ A - Sustentacular 'Constant' Fragment
- ¢ B - Lateral joint / superolateral
- ¢ D - Anterior main
- ¢ E - Anterolateral (Lateral wall of anterior process)
- ¢ F - Posterior main fragment - tuberosity



Sander's Classification



Considerations

Age?

Co-morbidities – diabetes,
PVD, RA, Obesity,
immunodeficiency

Smoking?

Delay to Surgery > 2
weeks

Fracture classification

Advanced osteoporosis

Open fracture

Other injuries

Soft tissues

Goals of treatment

- ¢ Pain free plantigrade foot
- ¢ Ability to wear shoes with comfort
- ¢ Promote near-normal gait
- ¢ Reduced risk of late subtalar fusion / symptomatic malunion

Can non-operative management meet these targets??

Can surgery with acceptable complication rate??

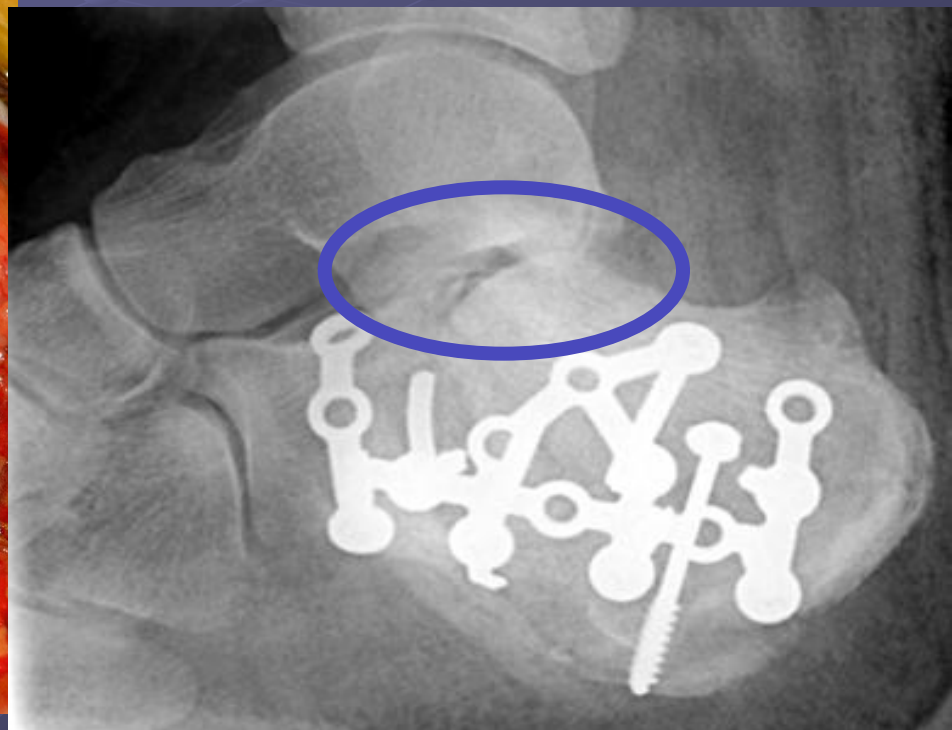
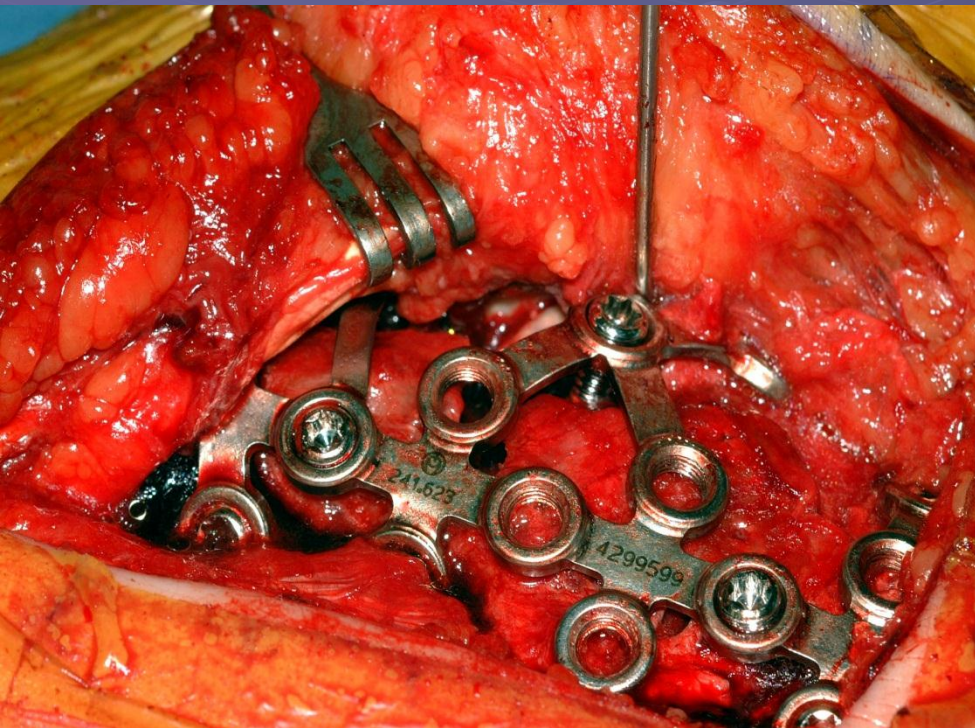
We need to fix all displaced fractures?
Sander's, Zwipp, Hansen, Thermann

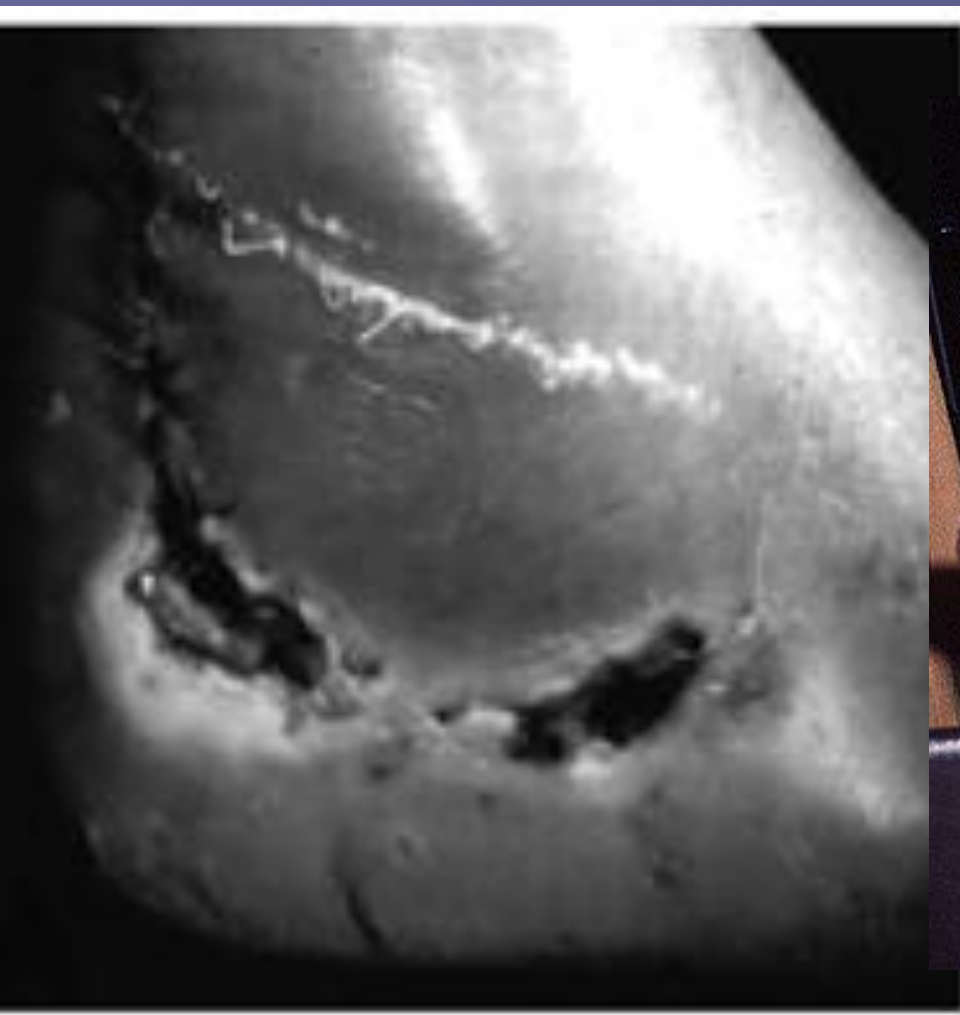
UK Heel trial...no difference BOA 2012?

Randomised evidence?

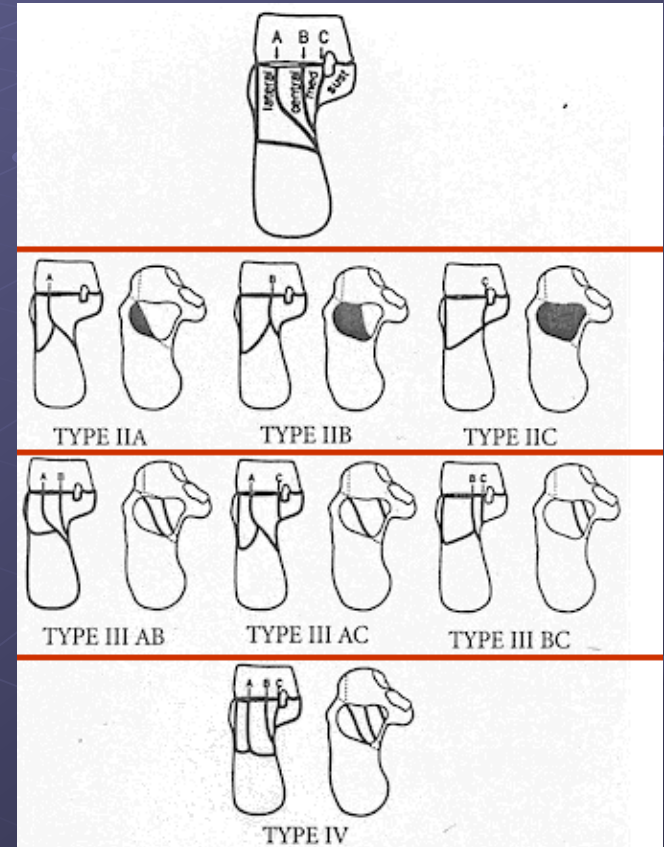
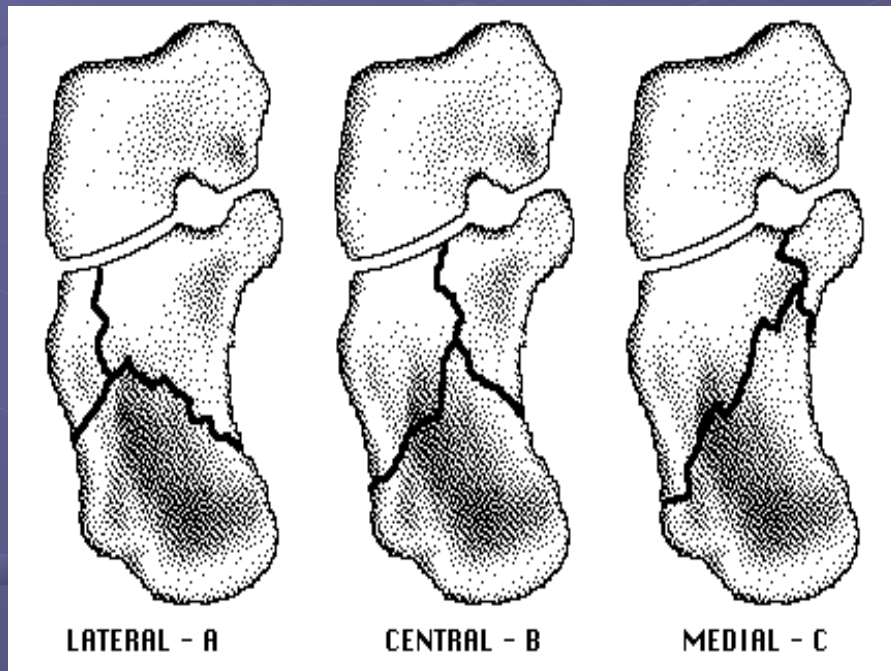
Extended lateral approach







Sander's Classification





Courtesy: Bruce Sangeorzan, Seattle

6/10/2009

20:40:32

#0002

RDY
SNAP

EDG 1



10/2009

20:41:

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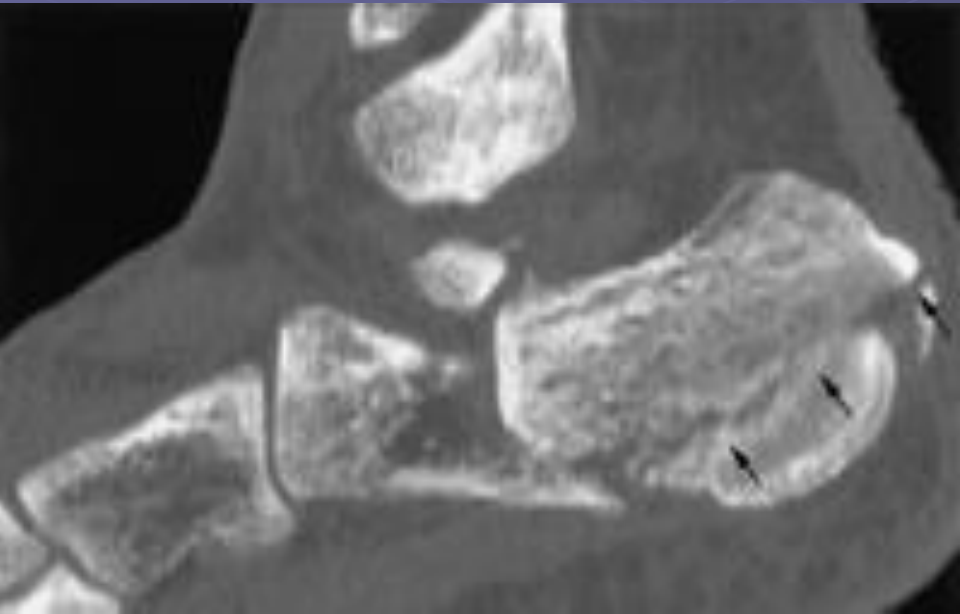
DY
AP

EDG

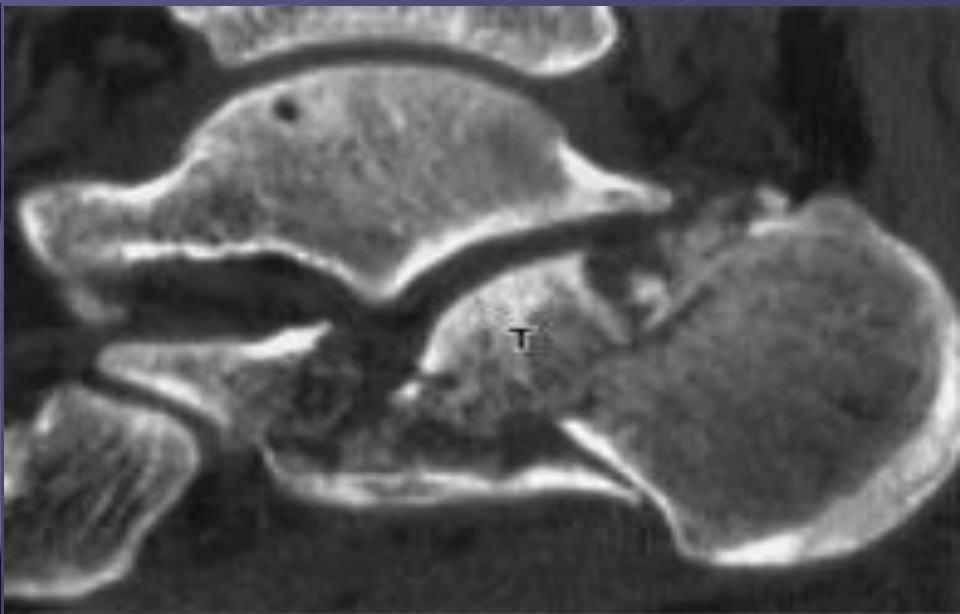


RDY
SNAP

Peter Essex-Lopresti 1952

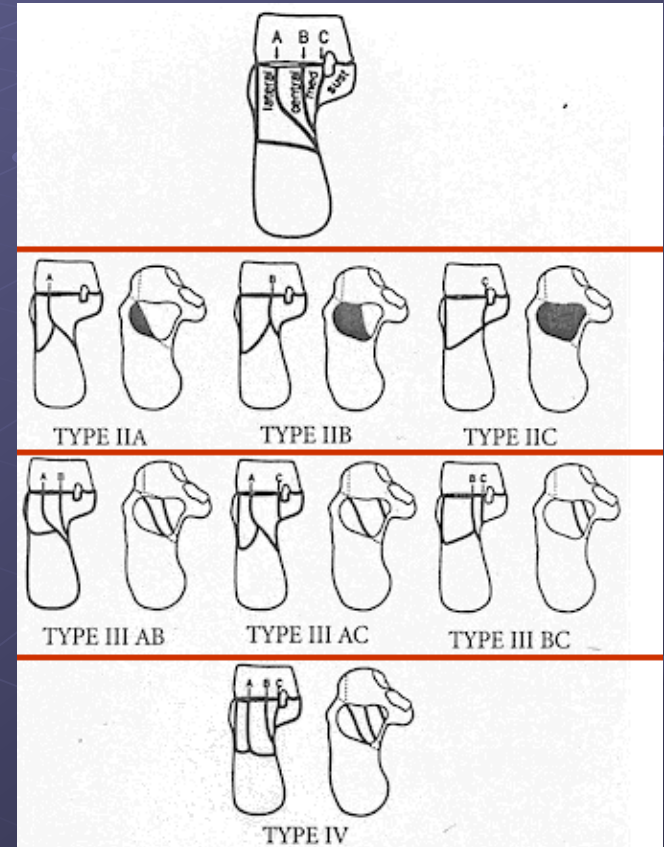
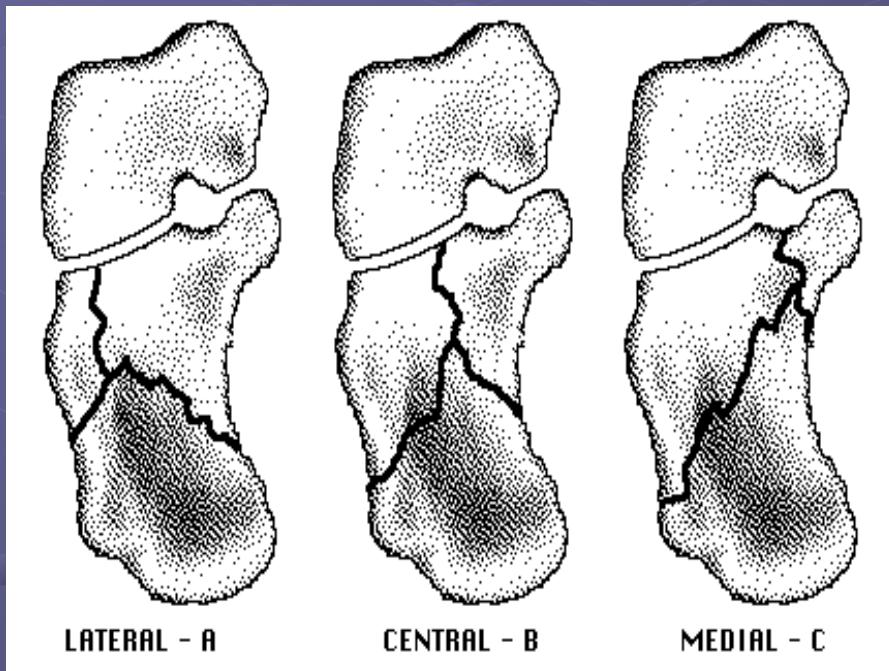


tongue



joint depression

Sander's Classification





071

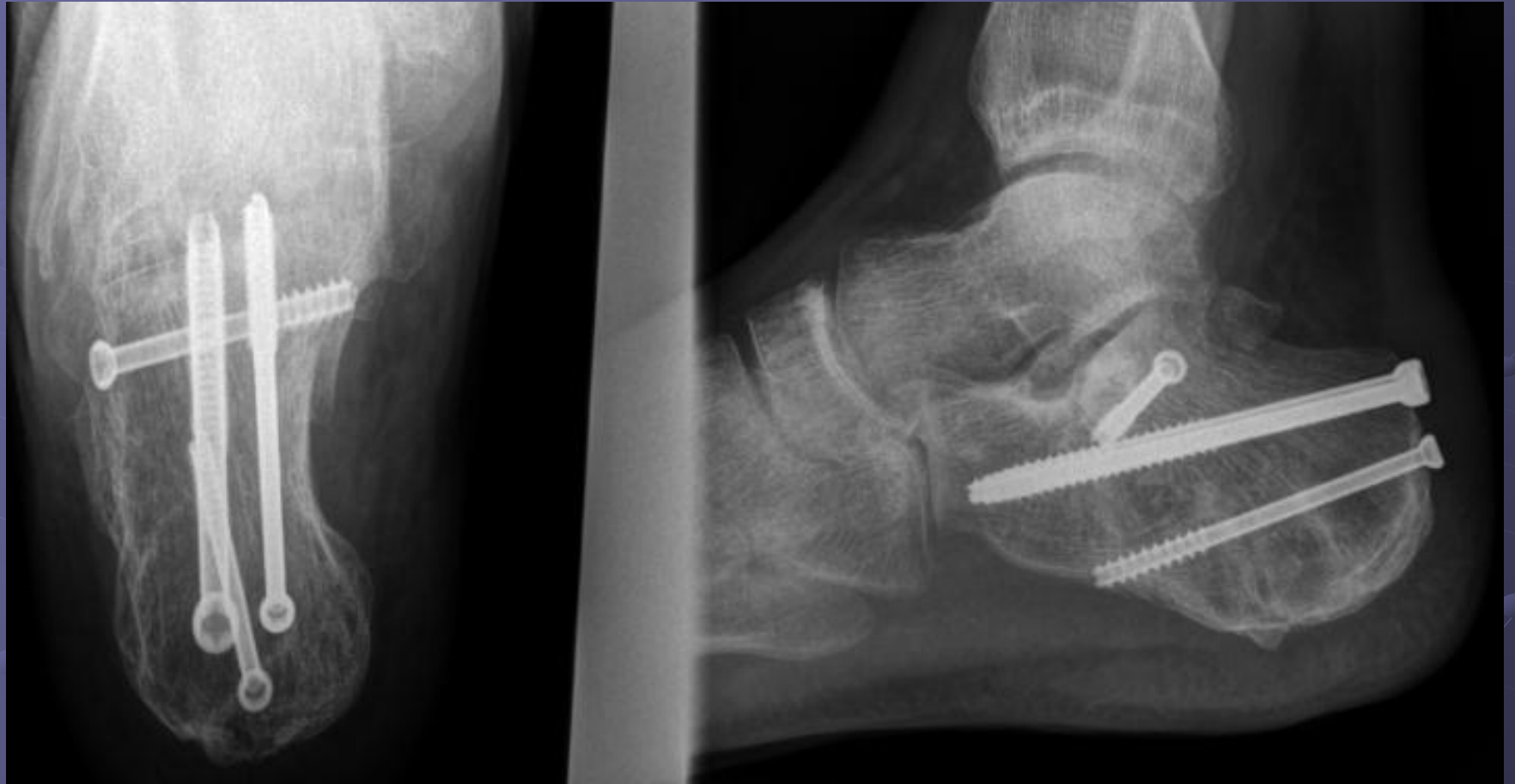
09

ASTHORE



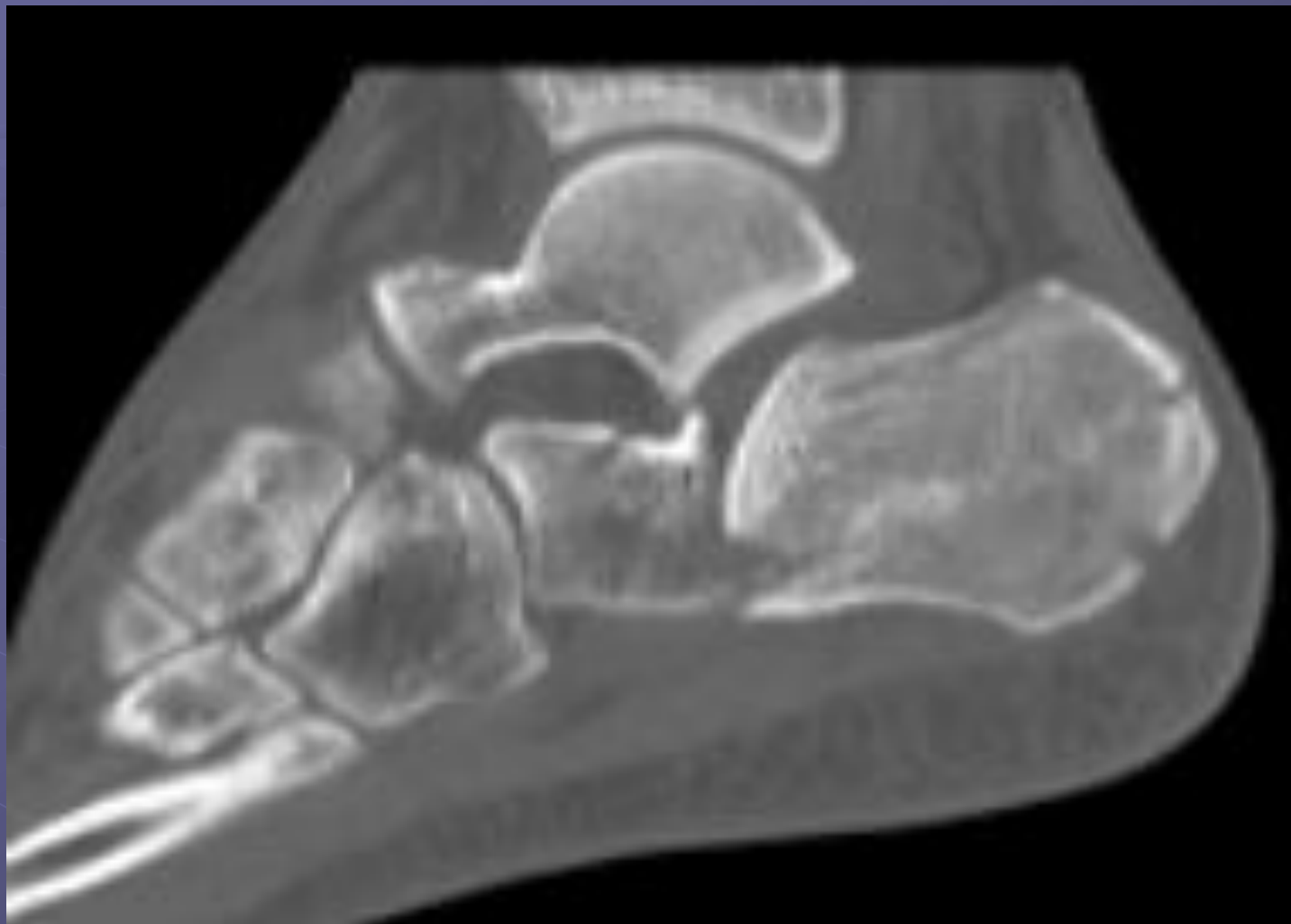












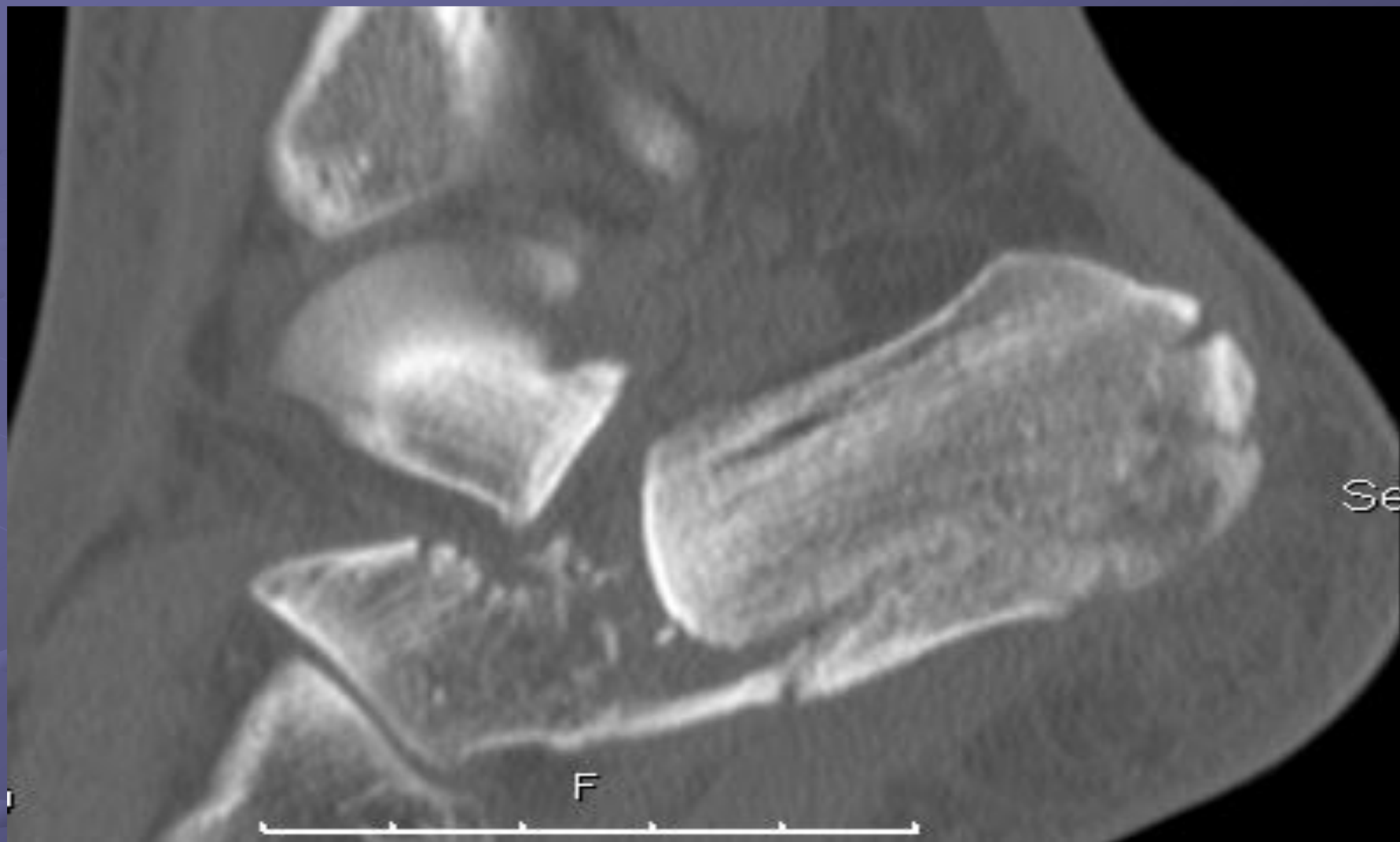


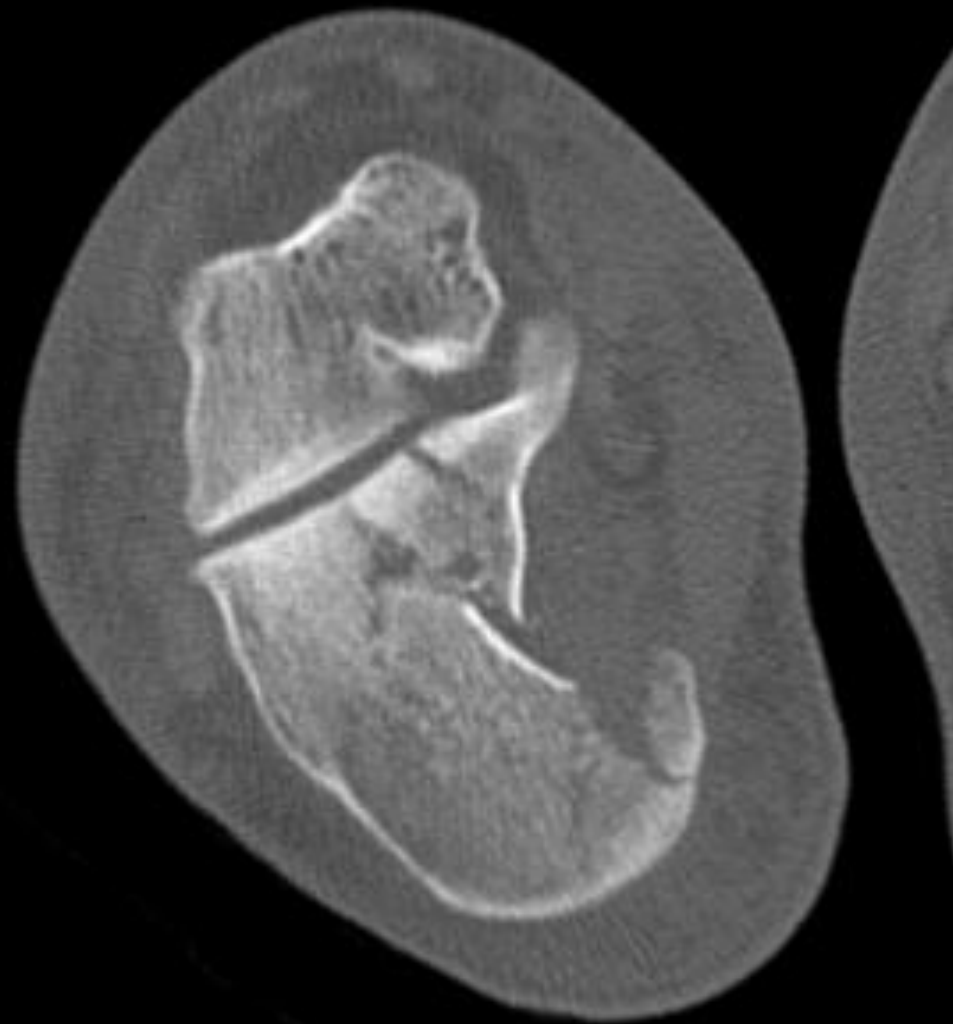
R HBL

Weight Bearing

























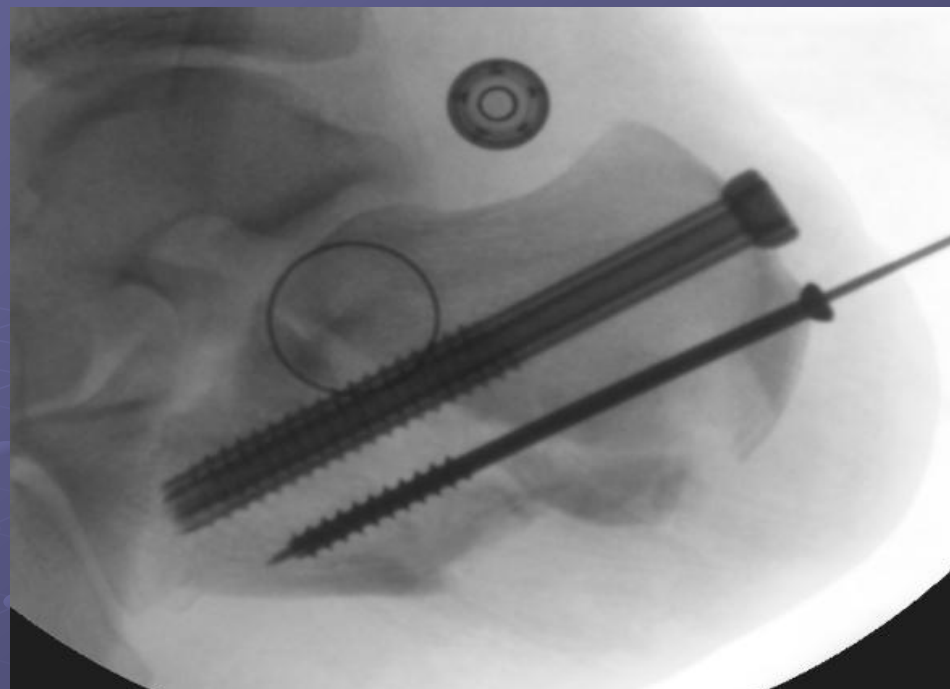


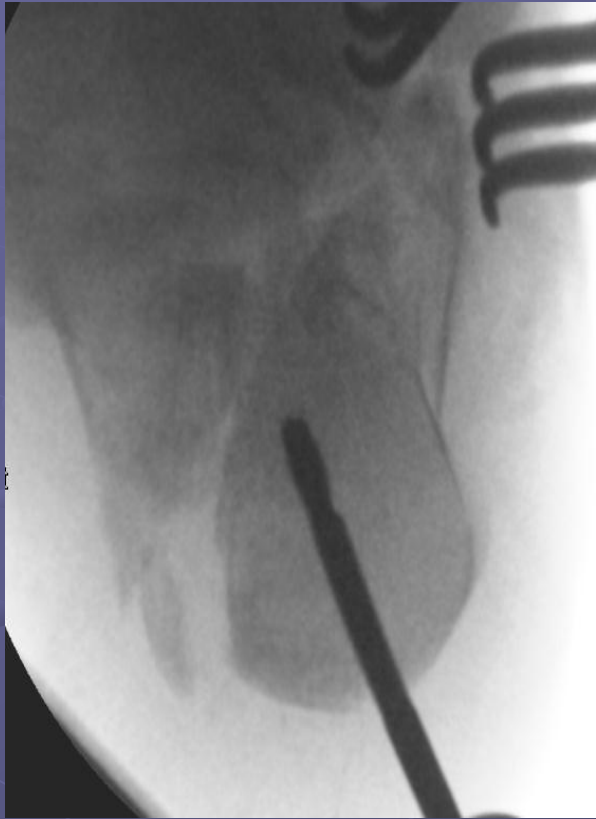














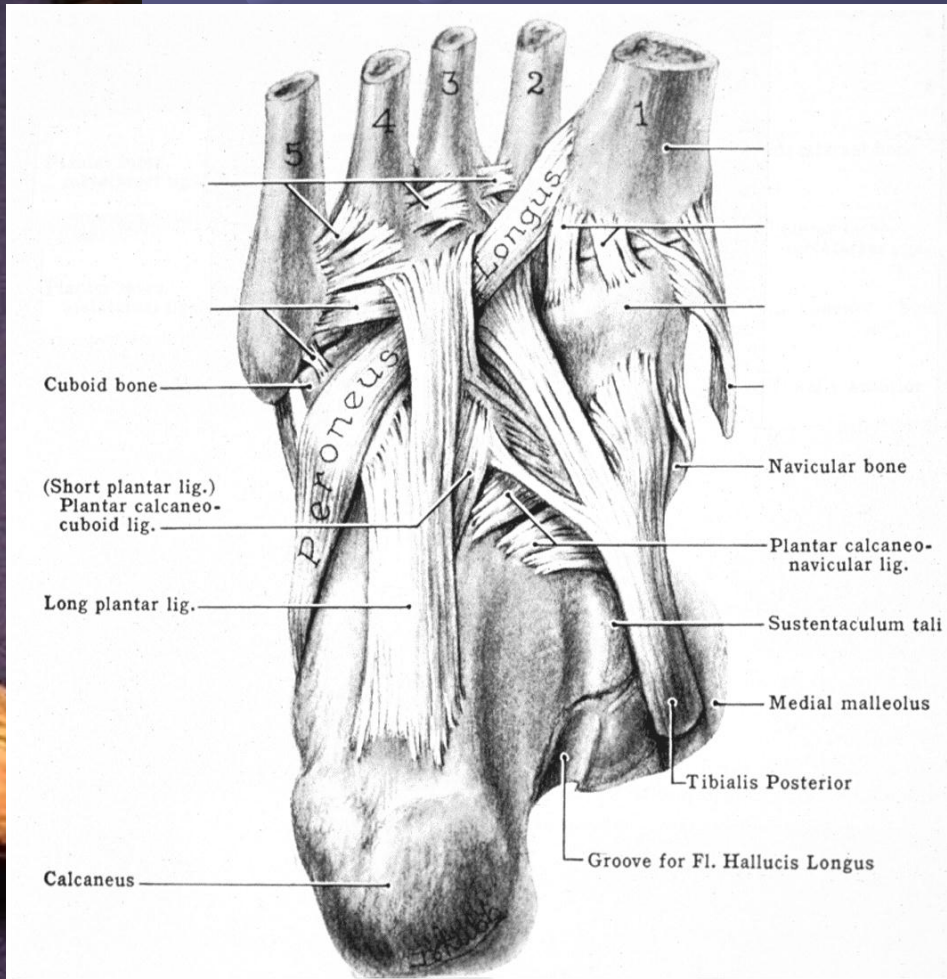
Looking ahead

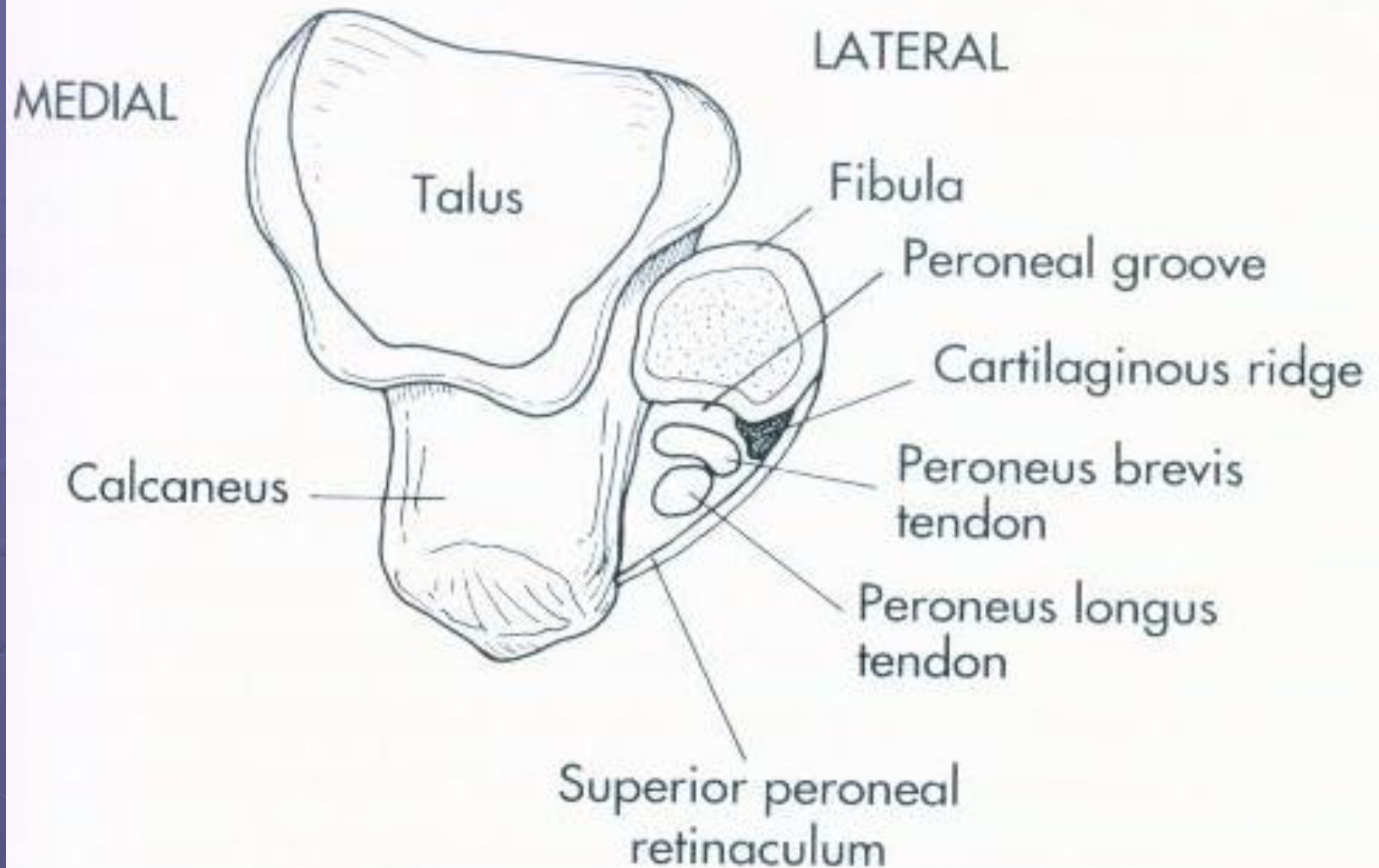
Reduction using subtalar arthroscopic control....



Peroneal tendon disorders

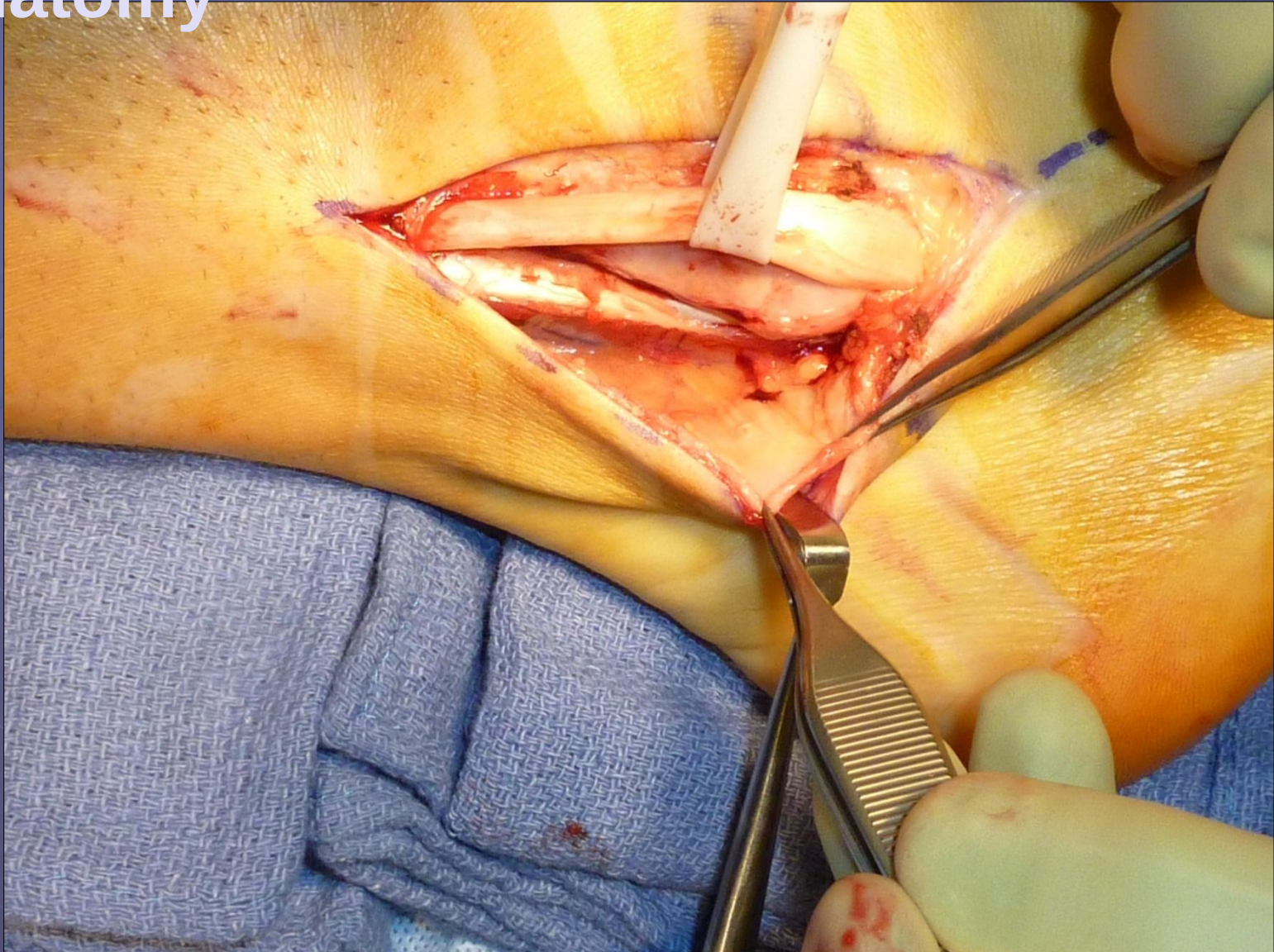
Peroneus brevis and Peroneus longus



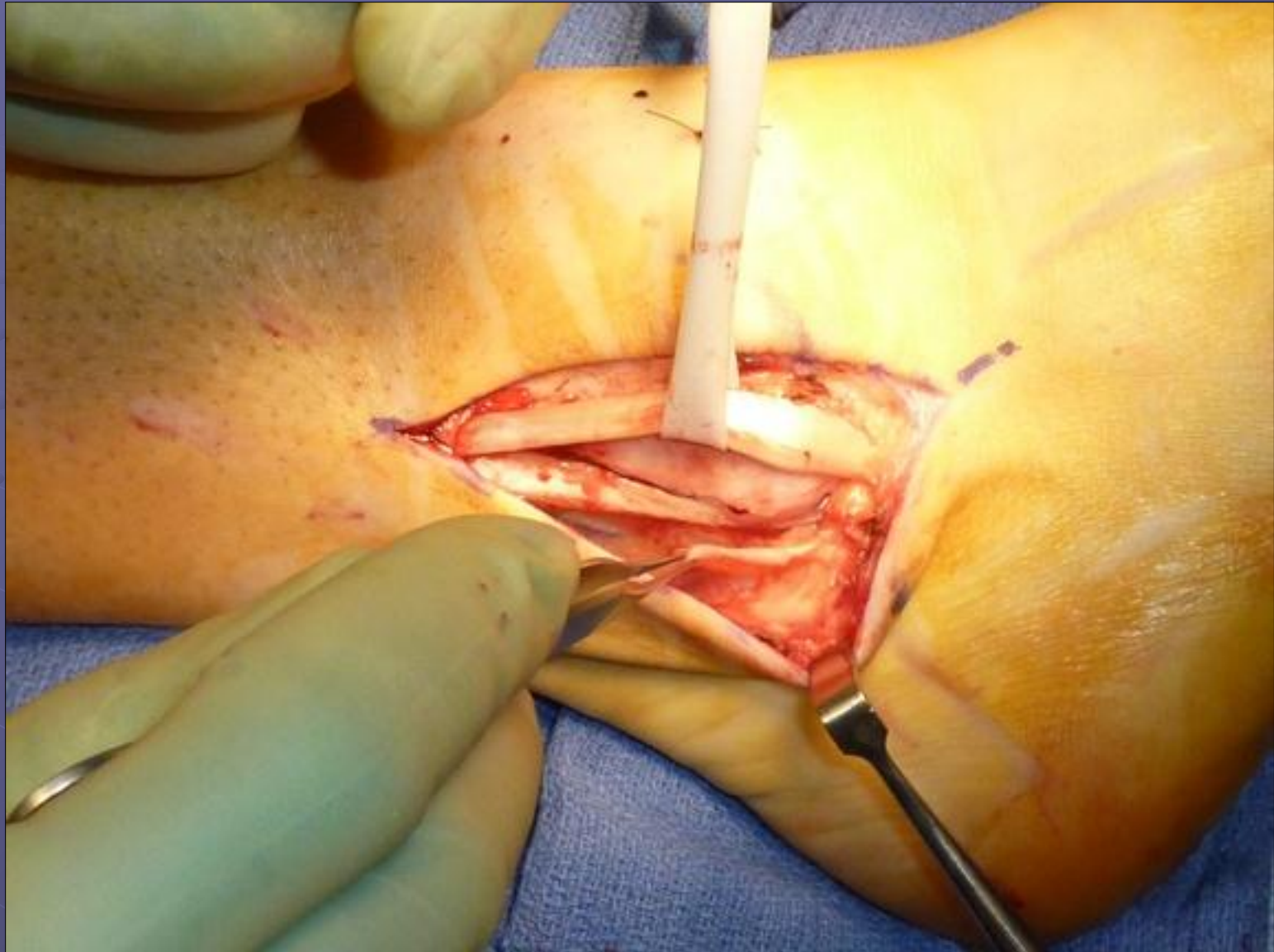


Retromalleolar course & ridge

Functional Anatomy



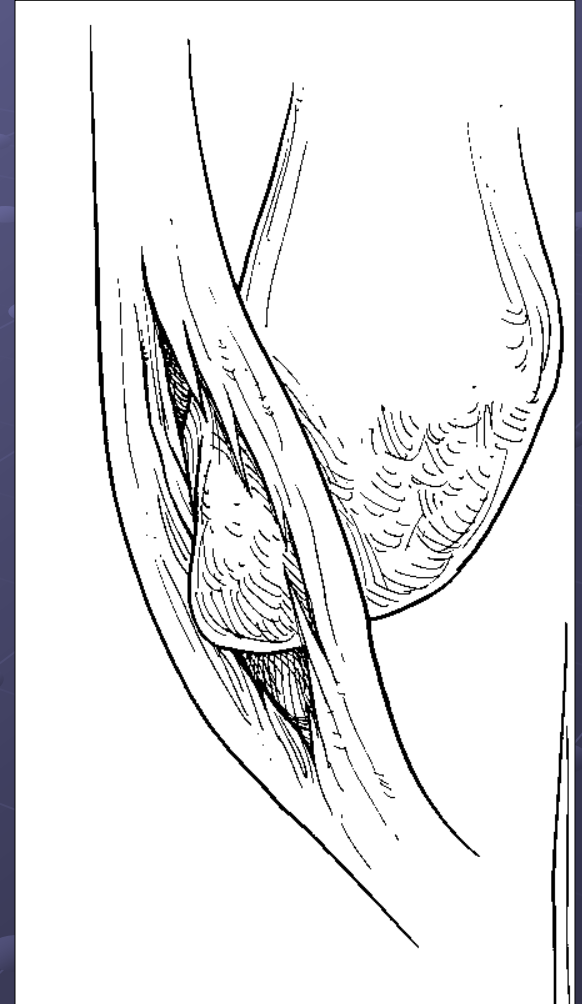
Functional Anatomy



Pathology

- Tenosynovitis
- Tears
- Subluxation

All usually due to trauma



Clinical features

- History trauma – dorsiflexion / inversion
- Retrofibular pain
- Swelling
- Snapping – subluxation / tear
- Ankle instability



Physical Examination





Longitudinal split tear



Surgical Repair – tubularisation v excision

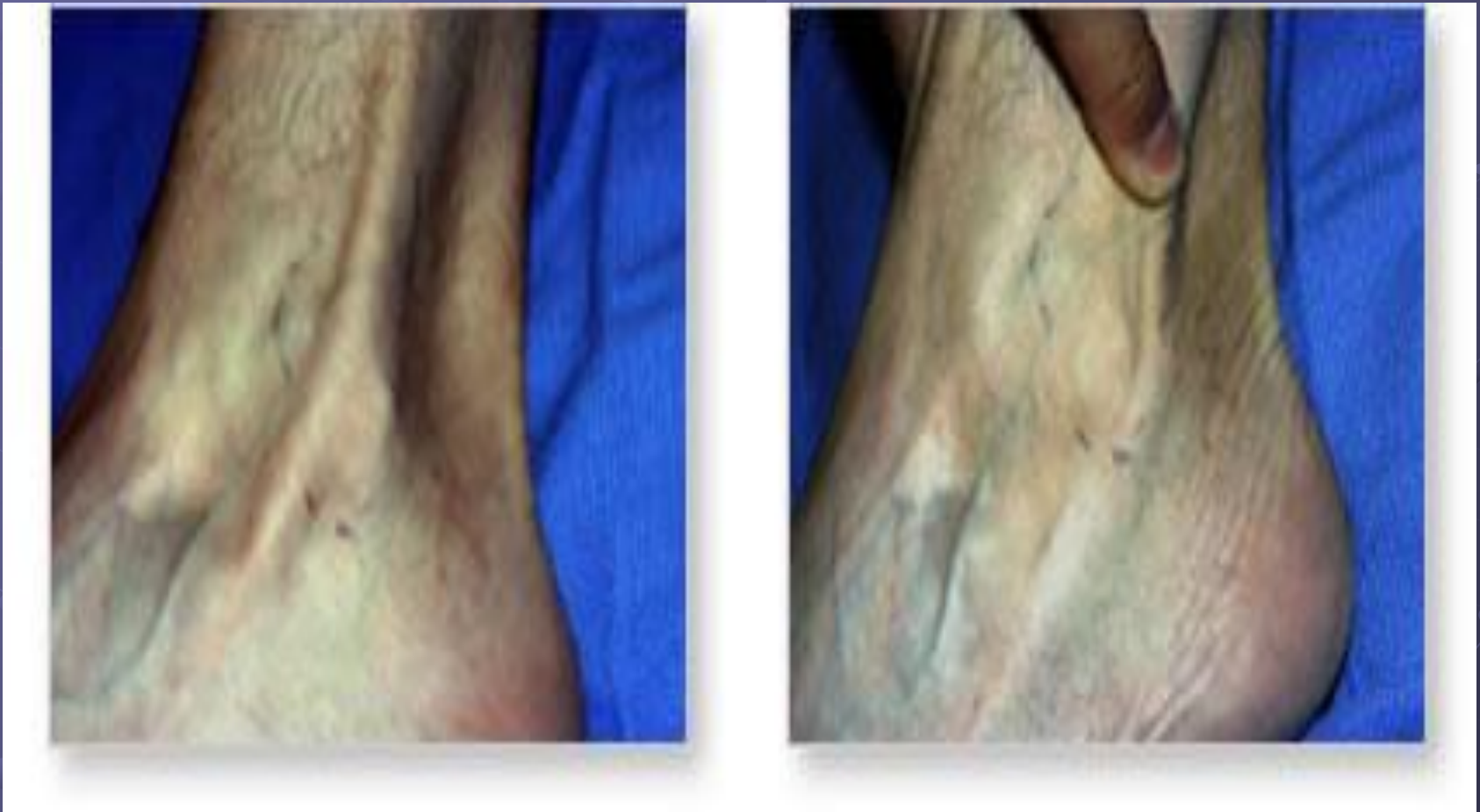


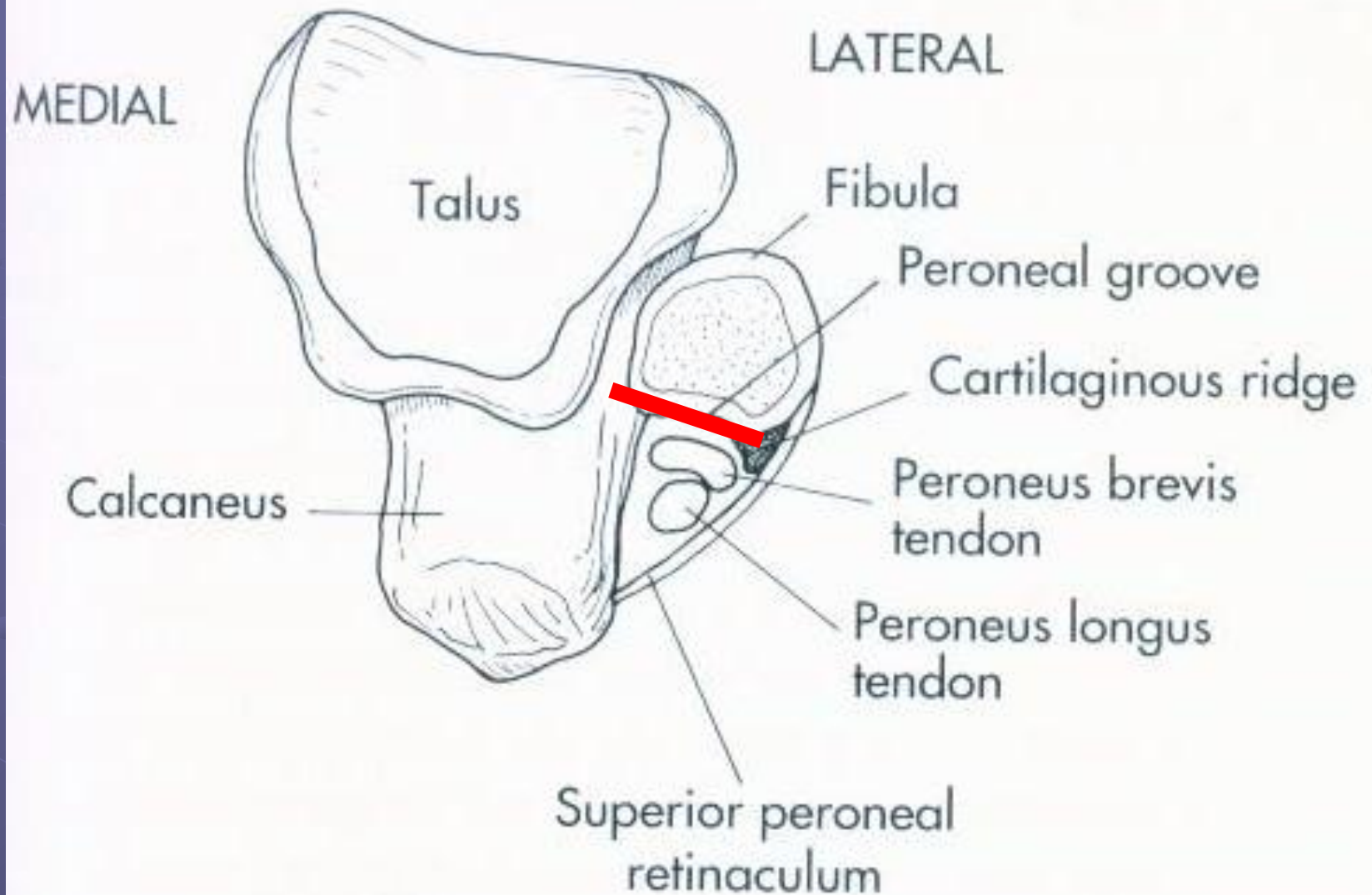


Peroneal Instability . . .



Subluxation





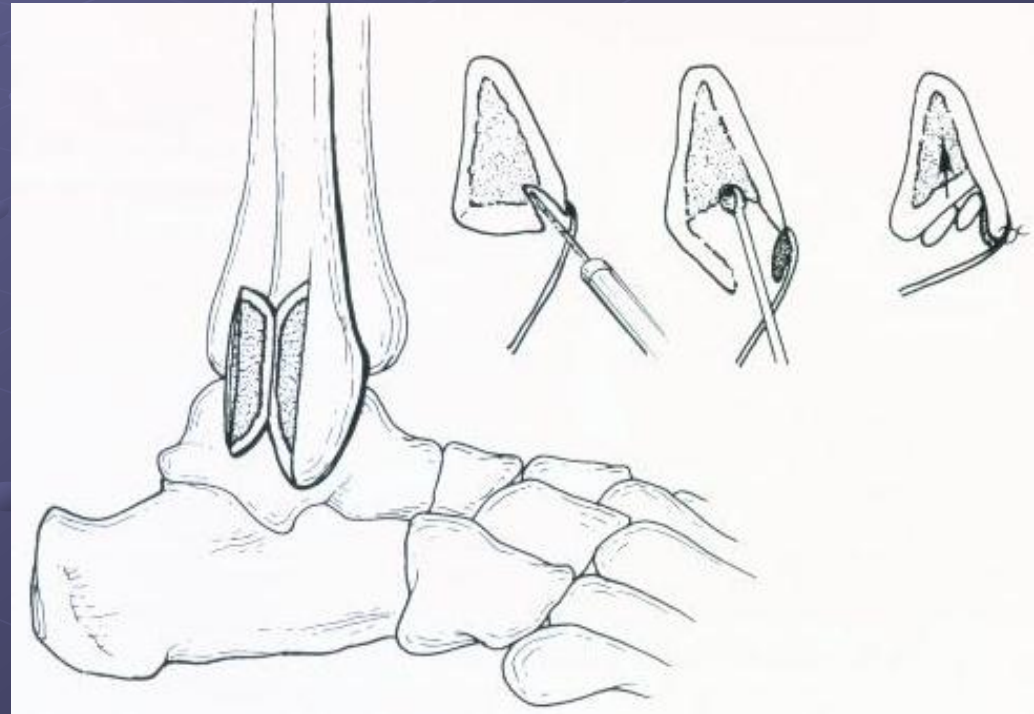
SHALLOW GROOVE - CONGENITAL

Low Peroneus Brevis Muscle Belly



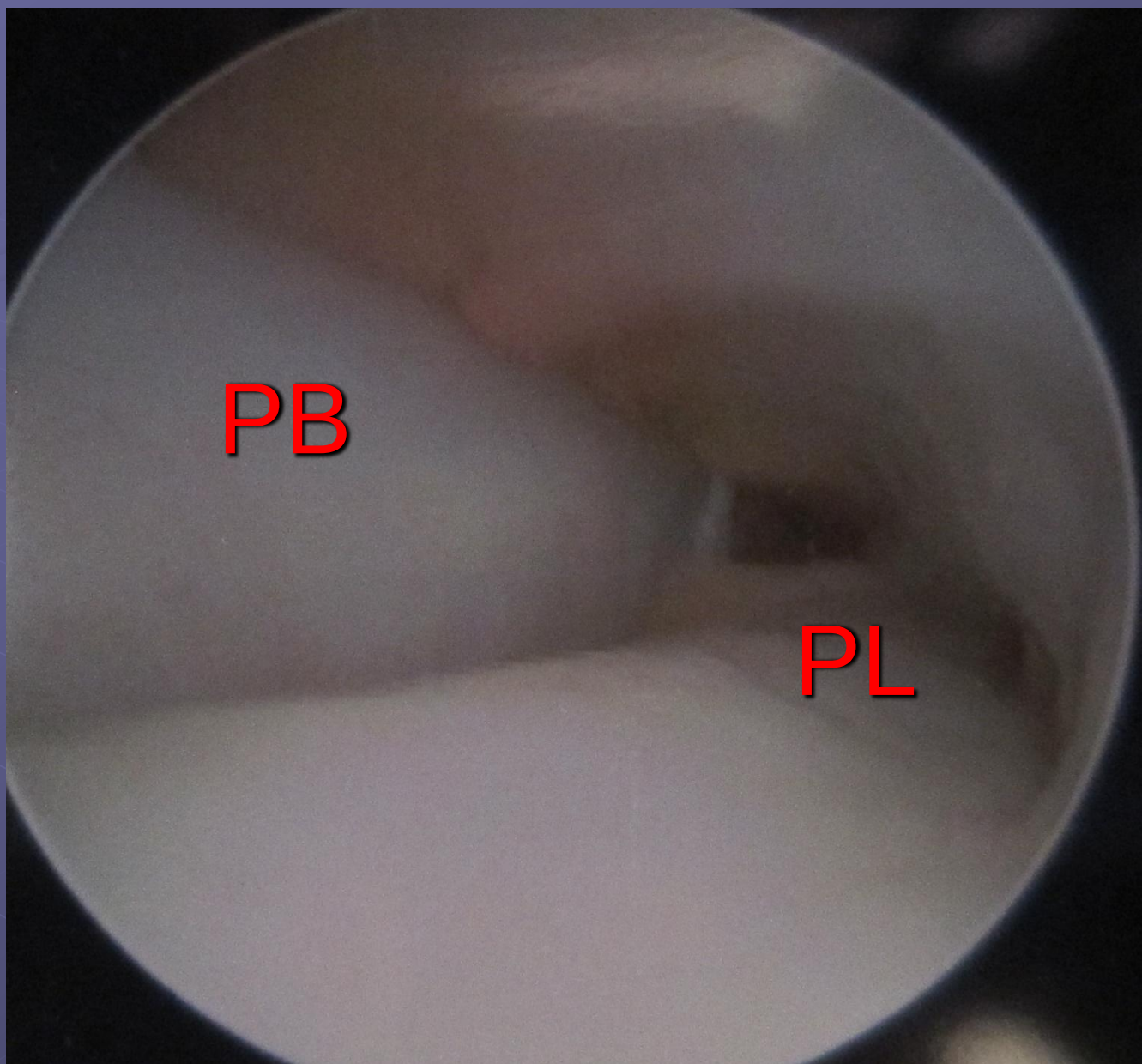
Groove-deepening procedures

- Incision over posterior border of fibula
- Tendon sheath and SPR divided
- Groove deepened
- SPR reefed



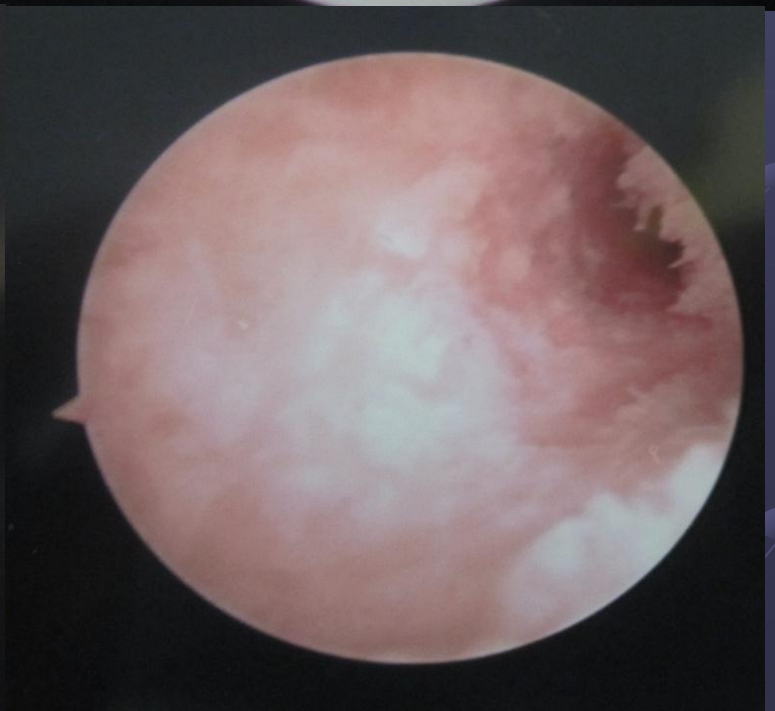
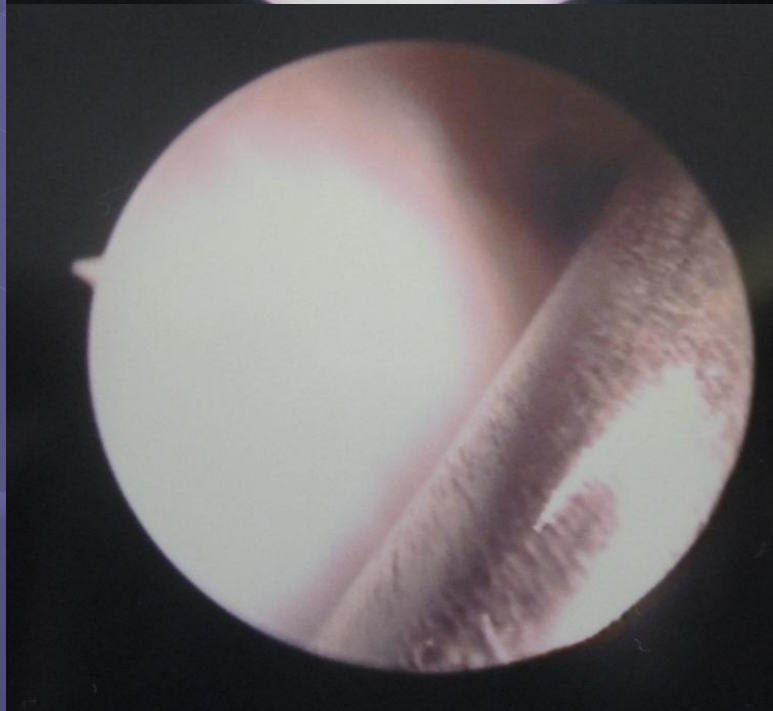
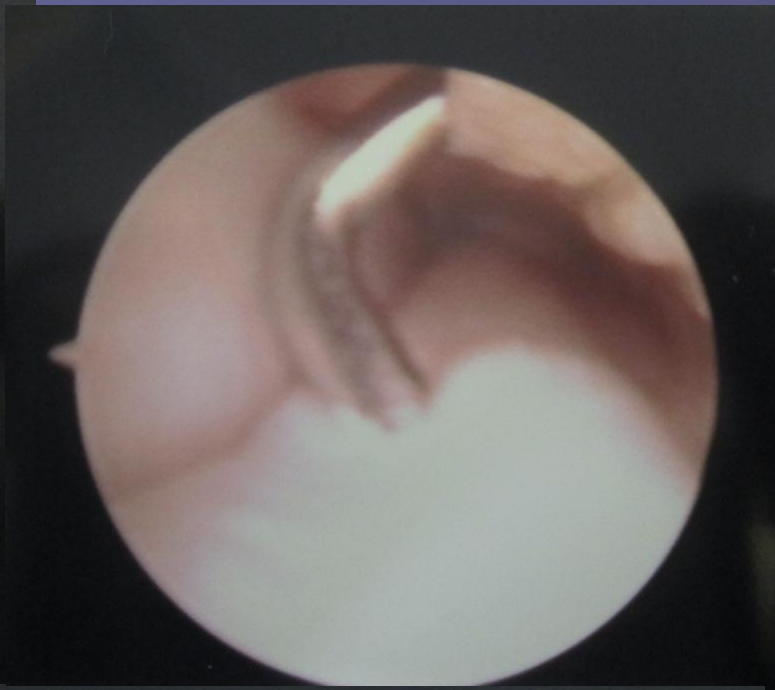
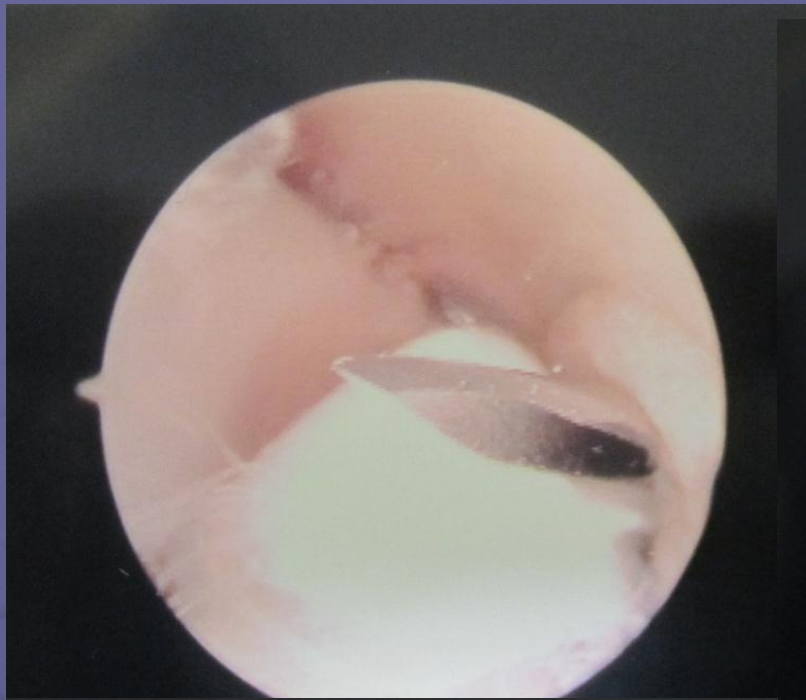


Peroneal tendoscopy



Low Brevis . . .





Disadvantages

- Cannot repair tear
 - Convert to open
 - BUT can direct incision
- Cannot reef SPR – Important?
- Niek Van Dijk

Rehabilitation

- Open procedure – POP 6 weeks, 2 weeks non-weight bearing, Aircast boot at 6 weeks, avoid active eversion for 3/12.
- Endoscopic groove deepening – aircast boot for 6 weeks for mobilisation, early ROM, avoid active eversion for 6 weeks.

Pes Cavus

High arched foot

 No CORRECTION with WB

 Fixed plantar flexion forefoot

 Deformity

 forefoot

 midfoot

 hindfoot



Classification

- PURE CAVUS
 - No hindfoot deformity
 - Midfoot
- CAVOVARUS (anterior)
 - Hindfoot varus
- CALCANEO-CAVUS (posterior)
 - Compensatory forefoot equinus



AETIOLOGY

❖ IDENTIFIABLE – 80% CASES

- ❖ Neuromuscular disease
- ❖ Residual club foot
- ❖ Sequelae of compartment syndrome
- ❖ Burns
- ❖ Hindfoot malunion
- ❖ Rarely tarsal coalition

❖ 20% - IDIOPATHIC AND NON-PROGRESSIVE

NEUROMUSCULAR DISEASE

⌘ MUSCULAR DYSTROPHY

MUSCLE



⌘ CHARCOT-MARIE-TOOTH (HSMN)

PERIPHERAL



⌘ SPINAL DYSRAPHISM

⌘ POLYNEURITIS

⌘ INTRASPINAL / CORD TUMOURS

⌘ POLIOMYELITIS

ANTERIOR HORN

⌘ SYRINGOMYELIA



⌘ FRIEDREICH ATAXIA

CENTRAL

⌘ CEREBRAL PLASY

⌘ CVA



CHARCOT-MARIE TOOTH / HSMN

☯ MANN 1992

AGONIST vs ANTAGONIST

TIBIALIS ANTERIOR
PERONEUS BREVIS

INTRINSIC CONTRACTURE

EXTENSORS RECRUITED

➡ CLAW TOES

TIBIALIS POSTERIOR / PERONEUS LONGUS

FOREFOOT
ADDUCTION

PLANTAR FLEXION FIRST RAY
FOREFOOT ADDUCTION

History and Examination

- Determine AETIOLOGY – Joint effort
- Determine functional disability
 - Pain
 - Ulcers – plantar / toes
 - Instability
 - Shoe wear / AFO
- Neurological

Idiopathic cavus foot (ICF)

Symmetrical involvement

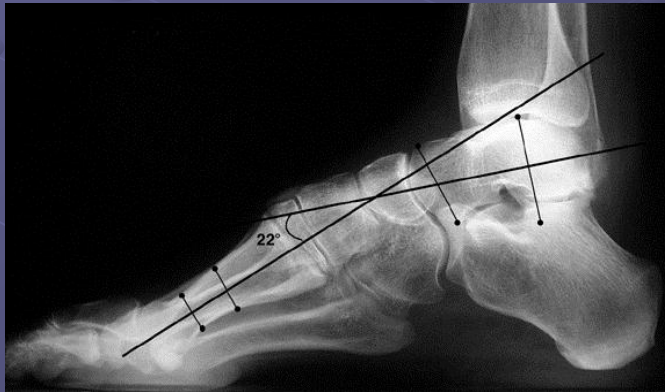
Hindfoot stiffness

Lateral column stress fractures

Ankle instability

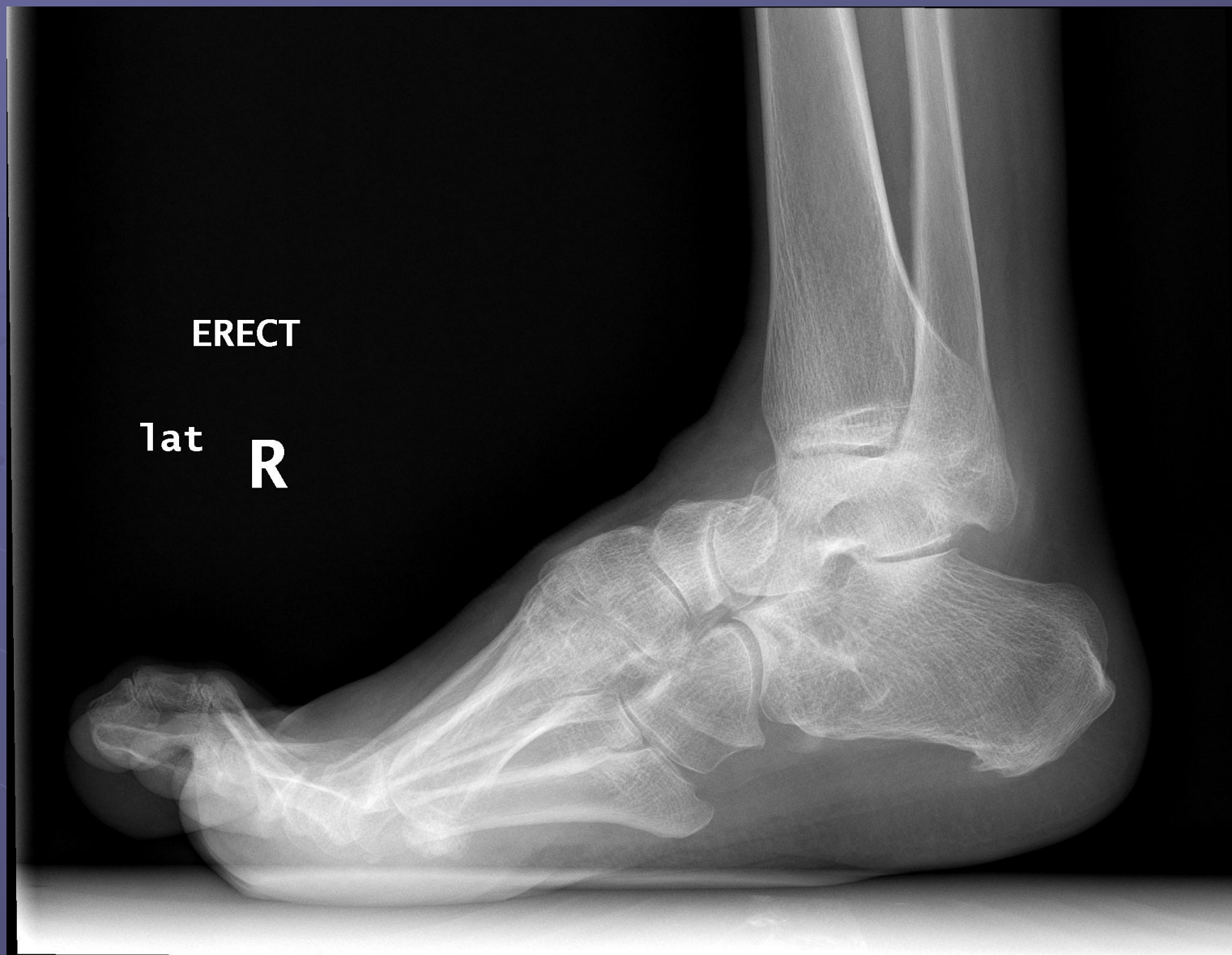
Metatarsalgia

Plantar ulceration

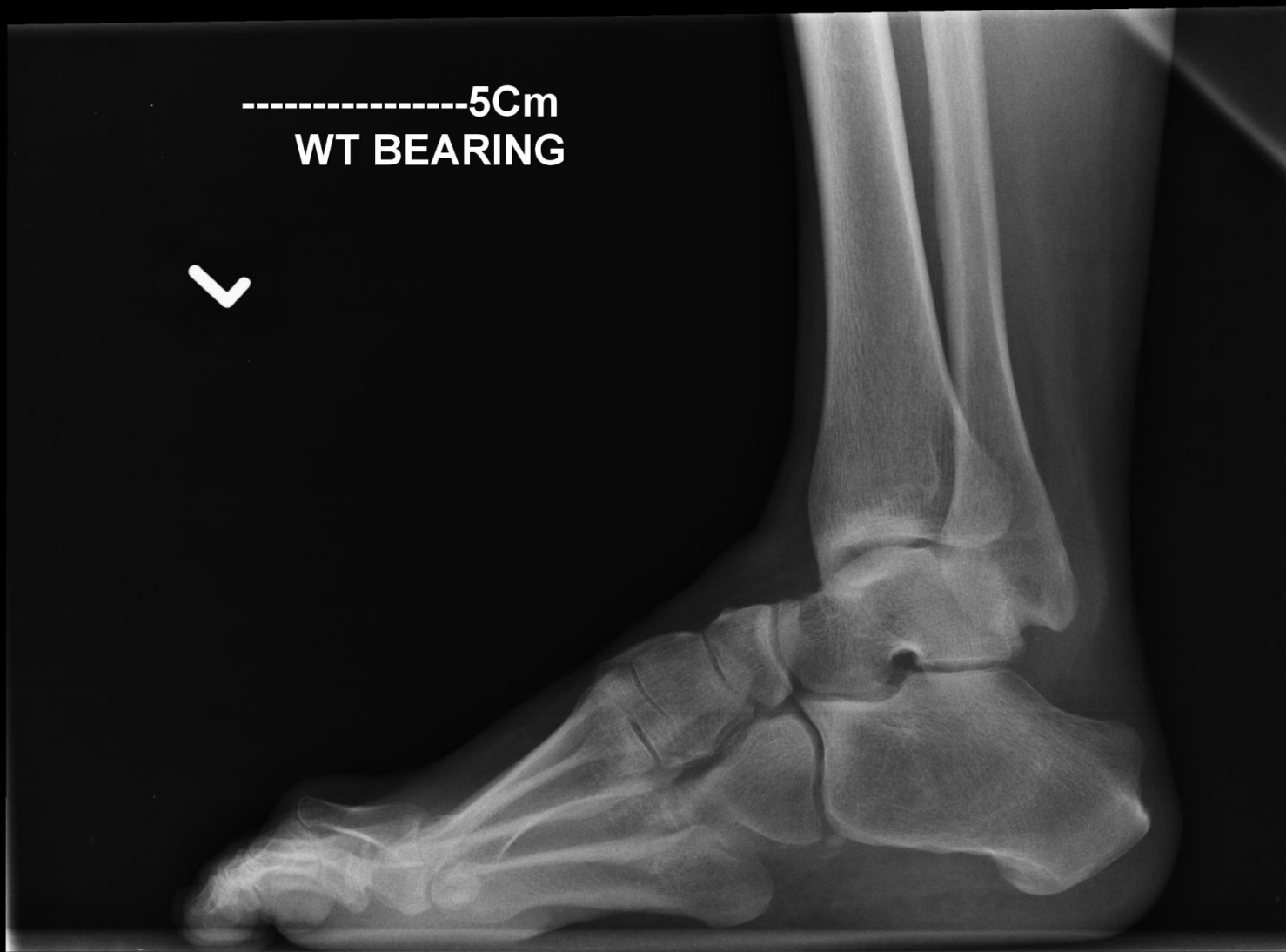


HSMN





-----5Cm
WT BEARING



POLIO

HINDFOOT DEFOMITY

SECONDARY FOREFOOT EQUINUS

WEAK GASTROSOLEUS COMPLEX

SIGNIFICANT CALCANEAL PITCH ANGLE





Deformity Analysis

Is the HINDFOOT deformity flexible? – Coleman Block Test

Neurological exam

Ankle instability

Pressure areas

Radiographic measurements:

- Meary's line

- Calcaneal pitch

- Degeneration?

- Hindfoot views



Hindfoot Views

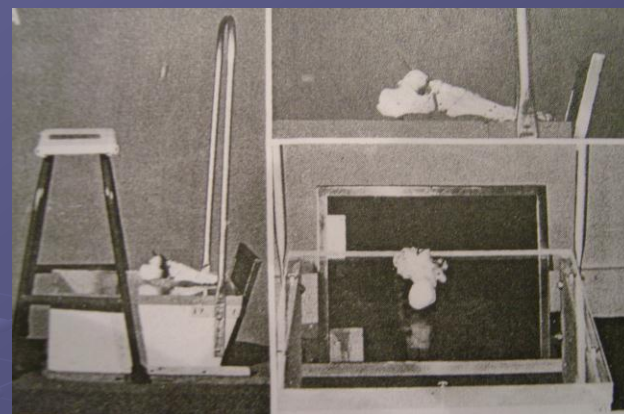
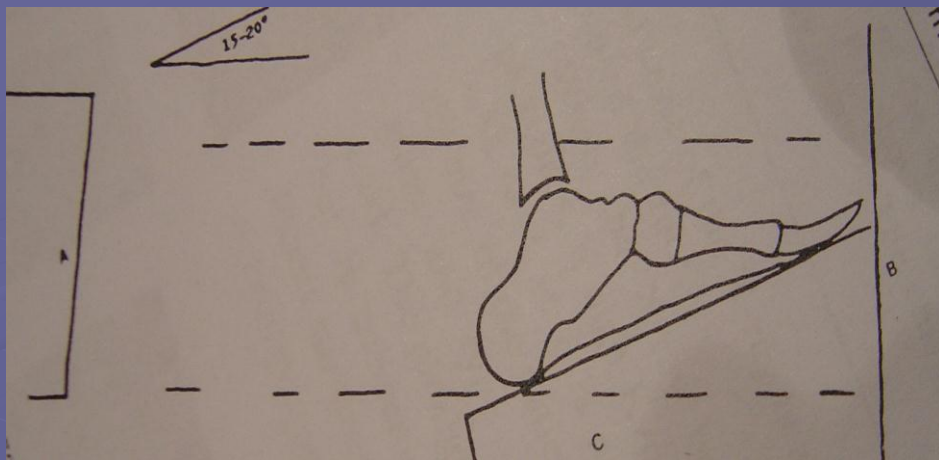
Alignment views

Cobey 1976

Saltzman modification 1996

Johnson modification 1999





Conservative Options

Aggressive achilles stretching

Small lateral heel post to induce inversion and redistribute load

REDUCE medial arch height and recess for 1st met head

AFO / Custom shoes





Surgical management

Individualised – NO RECIPE

Aetiology

Progressive / Non-progressive

Soft-tissue rebalancing

Joint-preserving techniques preferable

Plantigrade, pain-free, shoeable foot

Principles with HSMN

Flexible / partially correctable

Plantar fascia release

Dorsiflexion 1st ray osteotomy

Lateral displacement calcaneal osteotomy

Peroneus longus to brevis tenodesis

Tibialis posterior tendon transfer



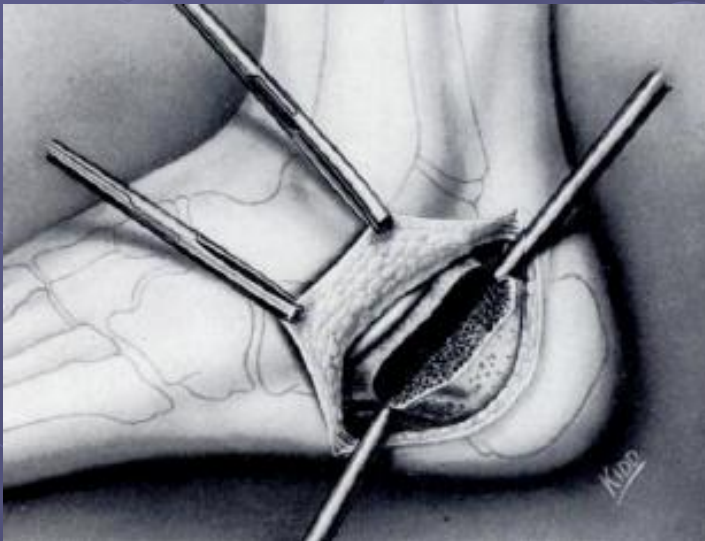
Dwyer calcaneal osteotomy

JBJS 1959

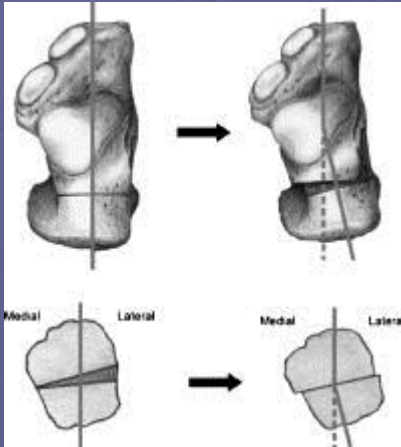
For correction of hindfoot varus

Medial cortex should remain intact

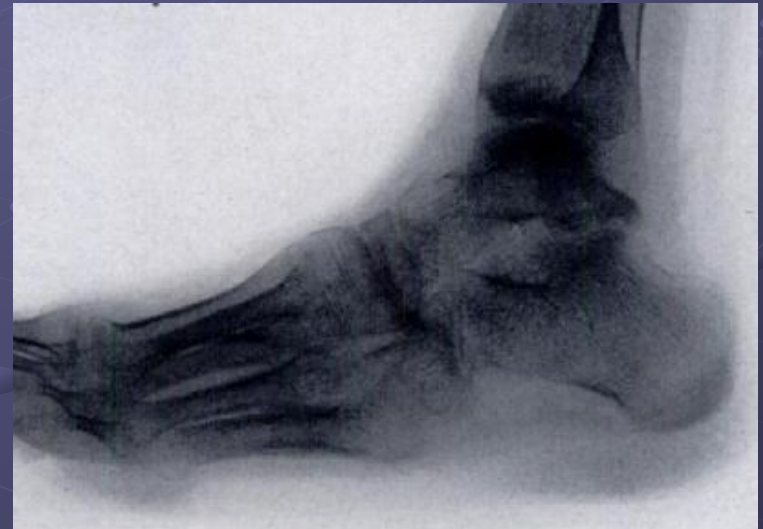
Moves heel laterally into neutral/ mild valgus alignment



Hintermann Z osteotomy



Cole Osteotomy



Cole Osteotomy



Triple arthrodesis

Subtalar, Talonavicular, Calcaneocuboid

Rigid deformity

Recurrent deformity

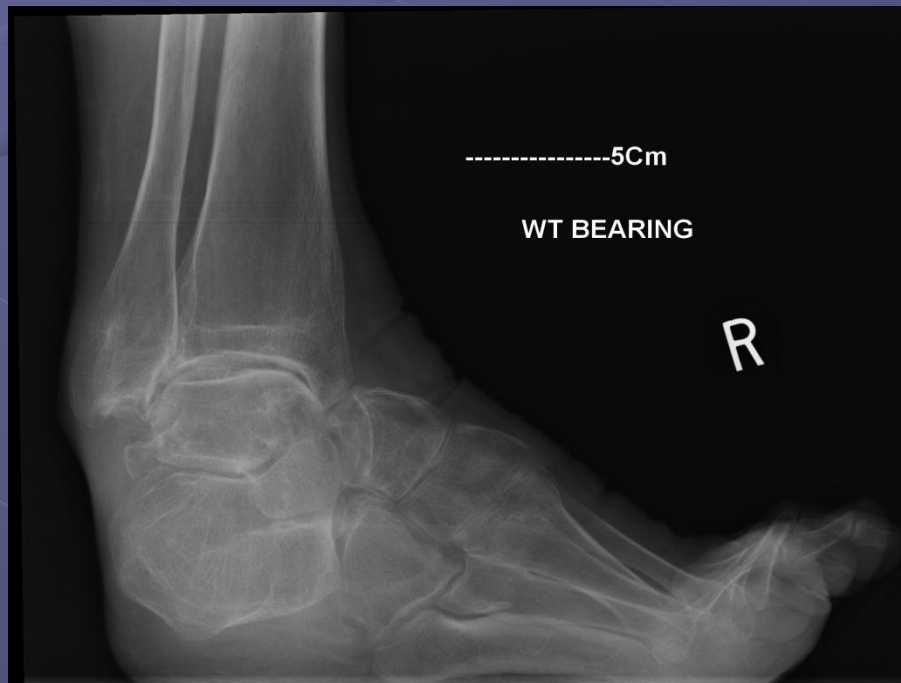
Extended wedge resections

Technically challenging

Lambrinudi

Hoke

Siffert



Complications

- High risk cases
- Wound healing problems
- Infection
- Non-union
- Recurrent deformity
- PLASTIC surgical colleagues









Equinovarus deformity

- Post compartment syndrome
- Unknown neurological conditions
- Post stroke

Principles

- Patient goals – walkers, wheelchair
- Vascular status
- Flexible or rigid deformity
- Fusion versus osteotomy
- Tendon release versus transfer













