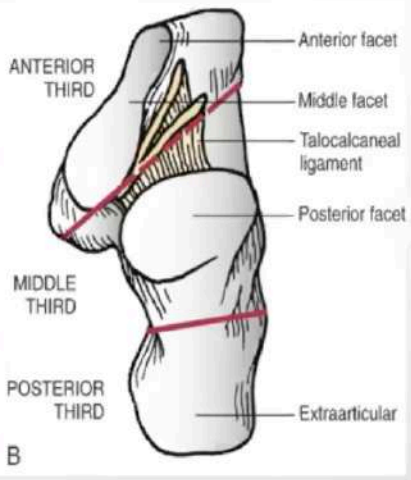
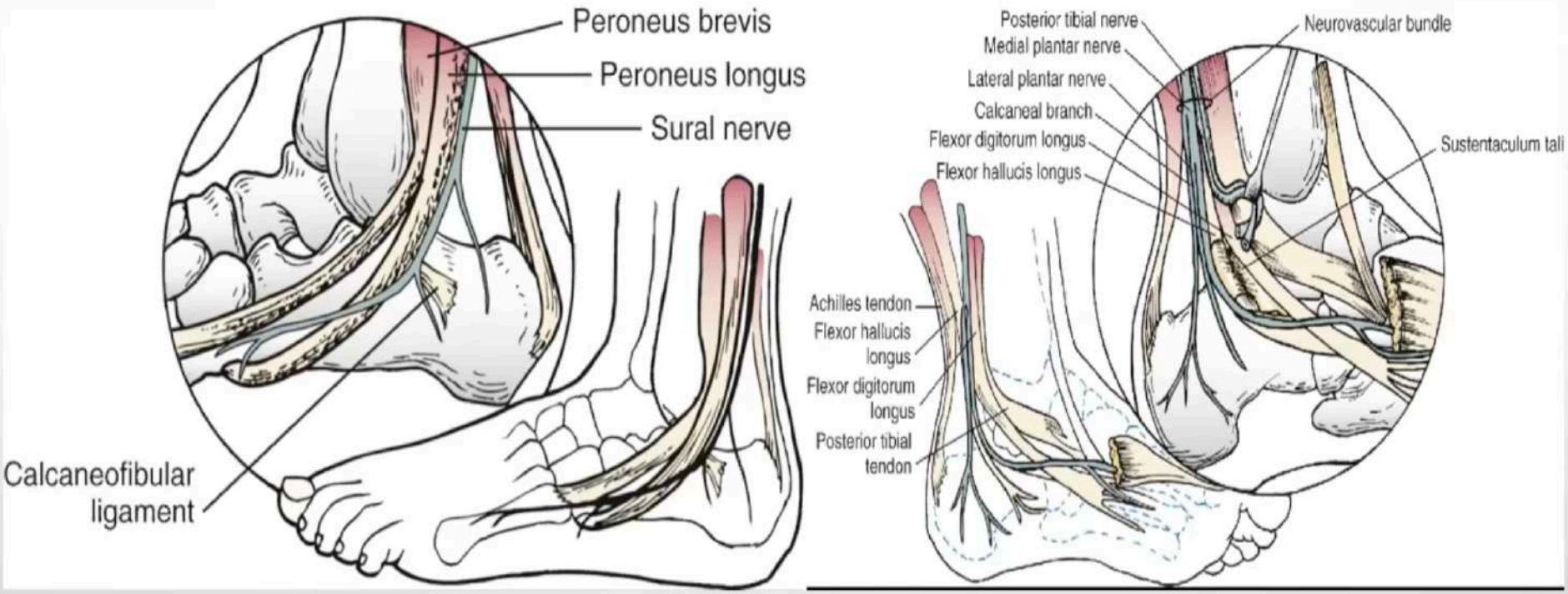
INTRODUCTION

- MOST COMMON TARSAL BONE FRACTURES .
- 2% OF ALL FRACTURES.
- 60- 75% ARE DISPLACED INTRAARTICULAR FRACTURES.
- 10% HAVE ASSOCIATED SPINE FRACTURES, 26% HAVE OTHER EXTREMITY INJURIES.
- 90% OCCUR IN YOUNG ADULTS.

ANATOMY

- 6 DISTINCT SURFACES
- SUPERIOR SURFACE-
  . EXTRAARTICULAR BODY, CALCANEAL TUBEROSITY
  . 3 ARTICULAR FACETS- ANTERIOR, MEDIAL AND POSTERIOR (LARGEST)
- ANTERIOR SURFACE- SADDLE SHAPE (CONVEX TRANSVERSELY, CONCAVE VERTICALLY)
  . FORMS CC JOINT
- LATERAL SURFACE- PERONEAL TUBERCLE, GROOVE
- MEDIAL SURFACE- STRONGER, SUSTENTACULAM TALI
- INFERIOR SURFACE- LONG AND TRIANGULAR (CALCANEUM TUBEROSITY)
- HEEL PAD- SPECIALIZED AND CONDENSED COLLECTION OF ADIPOSE TISSUE, CONDENSED BY FIBROUS SEPTA.

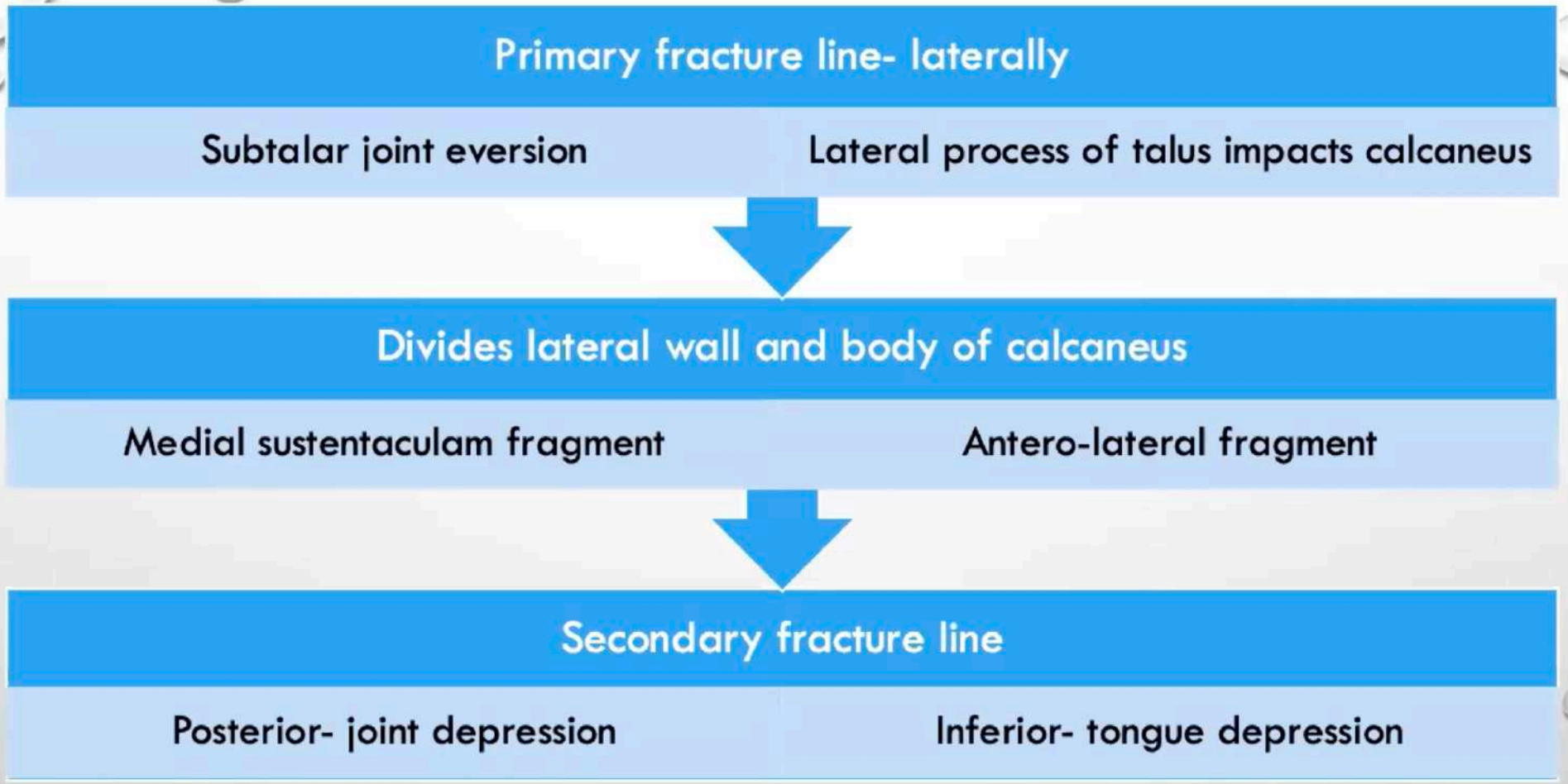


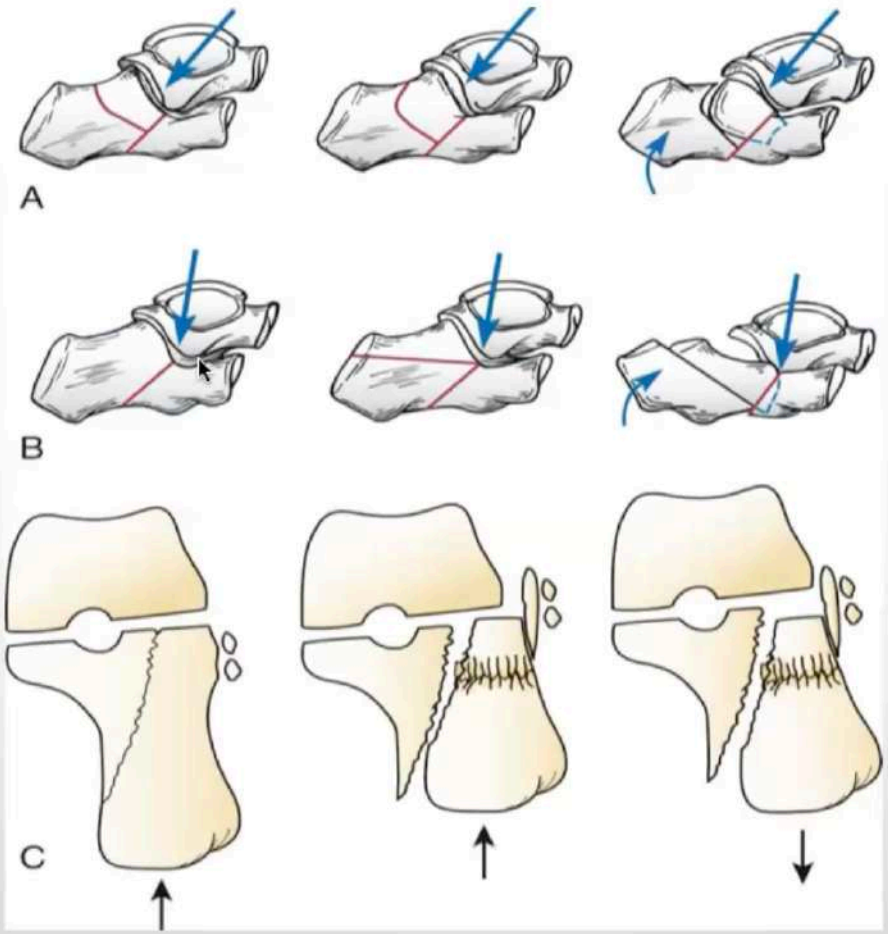


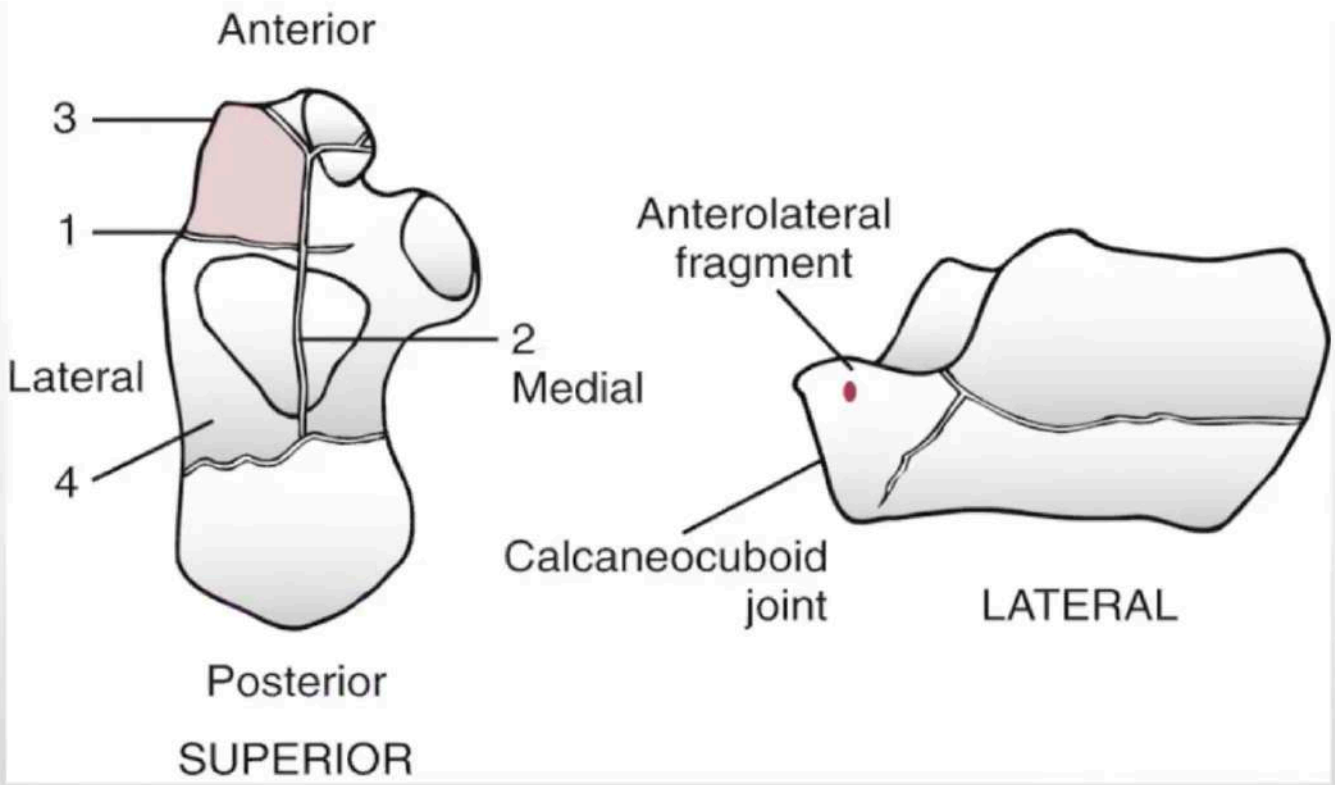
MECHANISM OF INJURY

- HIGH ENERGY TRAUMA- FALL FROM HEIGHT, RTA
- FRACTURE PATTERN- POSITION OF FOOT, EXTENT OF FORCE AT IMPACT, BONE QUALITY.
- ESSEX-LOPRESTI CLASSIFICATION-

    . PRIMARY FRACTURE LINE- LATERALLY







CLINICAL EVALUATION OF THE PATIENT

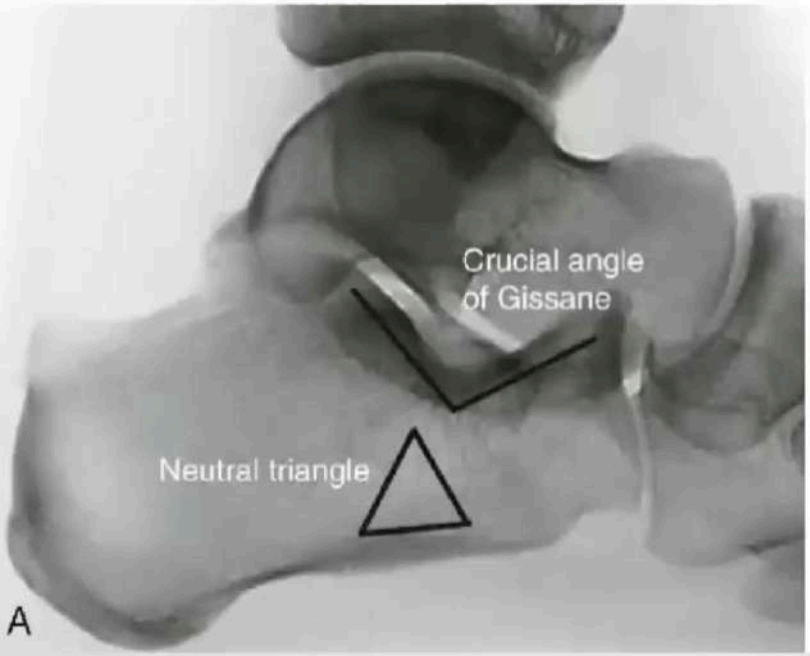
- SOFT TISSUE INJURY- SEVERE DISRUPTION, OPEN INJURY, SWELLING
- COMPARTMENT SYNDROME – 4 MAIN COMPARTMENTS
  - . MEDIAL
  - . LATERAL
  - . CENTRAL (SUPERFICIAL & DEEP)
  - . INTEROSSEOUS
- SKIN BLISTERS
- OPEN FRACTURES
- ASSOCIATED INJURIES

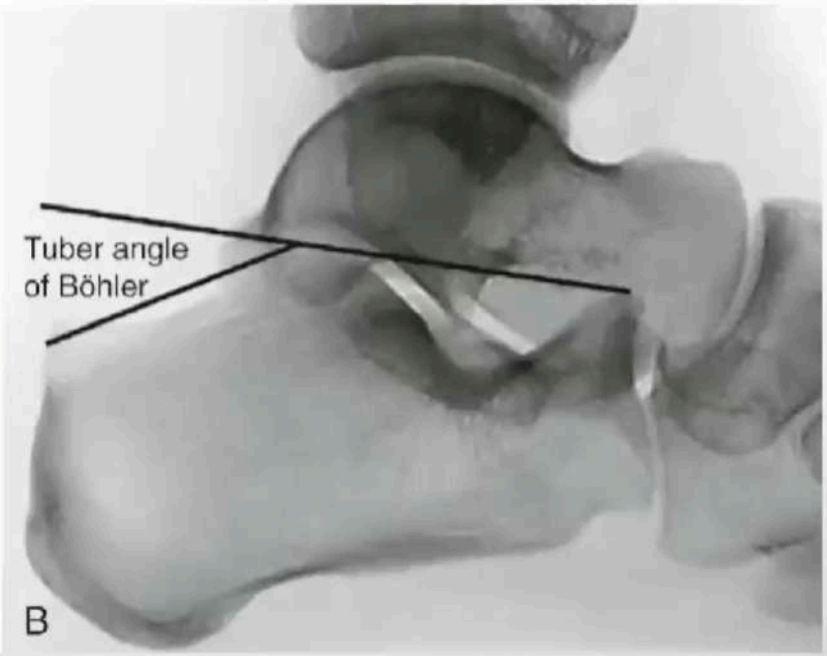
RADIOLOGIC EVALUATION

- PLAIN RADIOGRAPHY
- COMPUTED TOMOGRAPHY

PLAIN RADIOGRAPHS

- INVOLVED FOOT & ANKLE
- LATERAL VIEW OF HINDFOOT
- AP VIEW OF FOOT
- AXIAL VIEW OF HEEL
- MORTISE VIEW OF ANKLE
- SPINE AND PELVIS





LATERAL VIEW

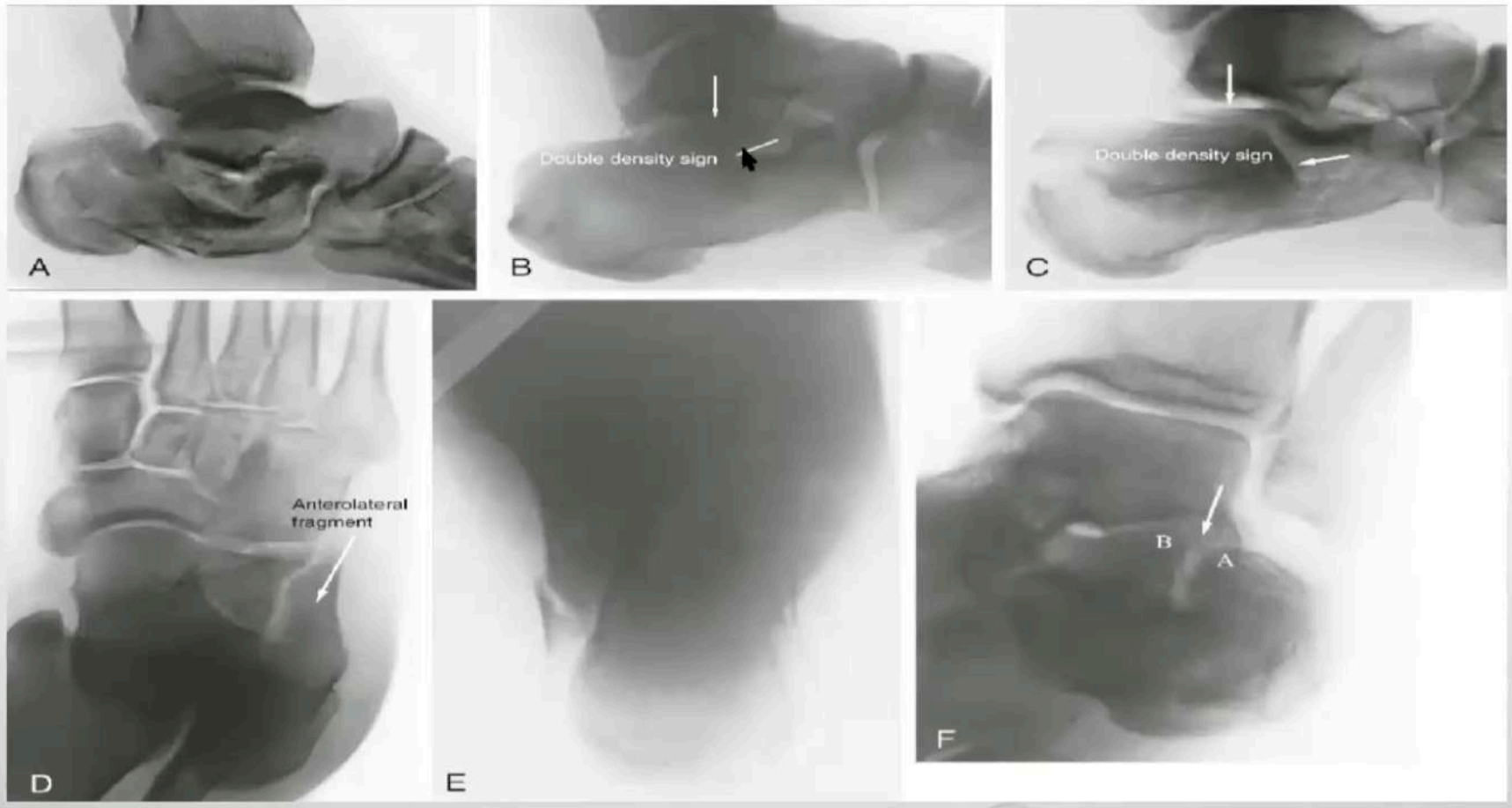
- FRACTURE, WITH INTRA-ARTICULAR EXTENSION
- TYPE OF FRACTURE- JOINT DEPRESSION, TONGUE TYPE
- LOSS OF HEIGHT
- DECREASED TUBER ANGLE OF BOHLER
- INCREASED CRUCIAL ANGLE OF GISSANE
- DOUBLE DENSITY SIGN (ONLY LATERAL PORTION OF POSTERIOR FACET)

HARRIS AXIAL VIEW

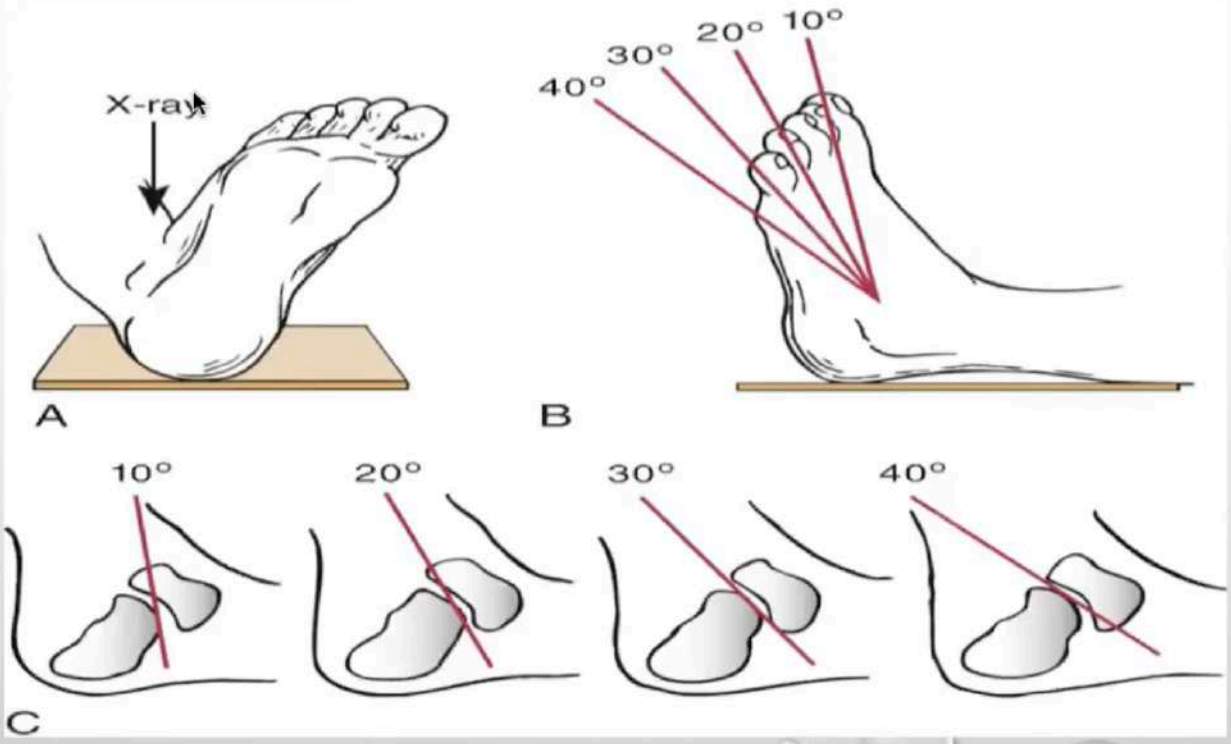
- LOSS OF CALCANEAL HEIGHT
- INCREASED WIDTH
- VARUS ANGULATION
- ARTICULAR SURFACE

AP VIEW AND MORTISE VIEW

- CC JOINT
- ANTEROLATERAL FRAGMENT
- LATERAL CALCANEAL WALL
- POSTERIOR FACET, LATERAL WALL BROADENING
- ABUTMENT OF LATERAL MALLEOLUS

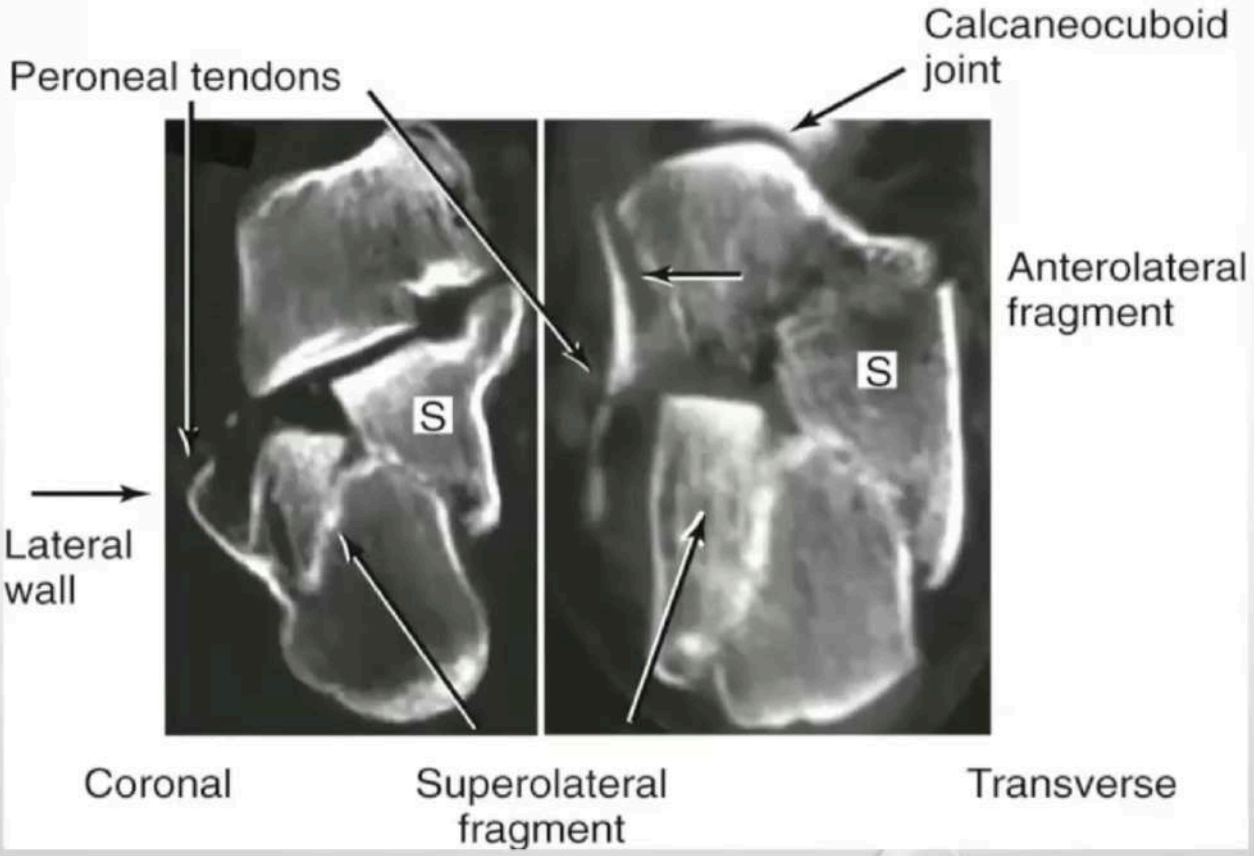


BRODEN VIEW



CT SCAN

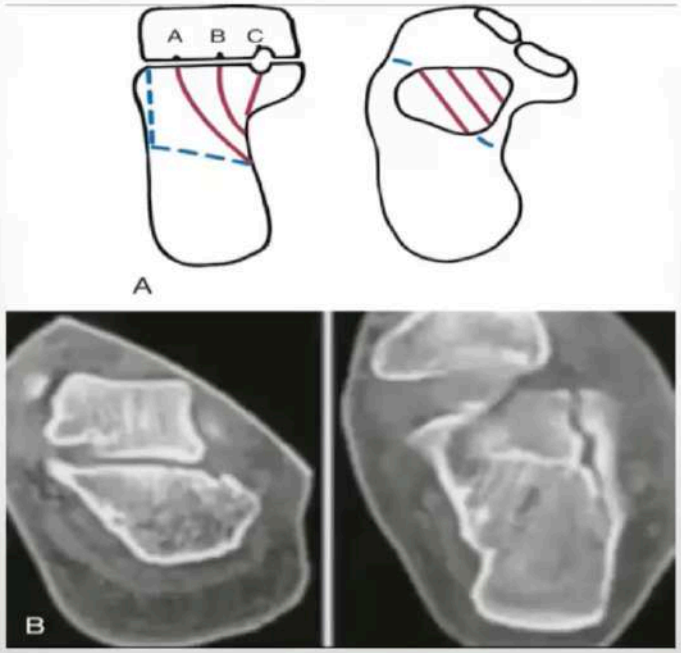
- LESS THAN 2MM INTERVAL
- **AXIAL CUTS**- FRACTURE INTO ANTERIOR PROCESS AND CC JOINT
  SUSTENTACULAM TALI, ANTEROINFERIOR MARGIN OF POST. FACET
- **SAGITTAL**- TUBEROSITY DISPLACEMENT, ANTERO-LATERAL FRAGMENT
  POSTERIOR FACET SUPERIOR DISPLACEMENT
  JOINT DEPRESSION OR TONGUE TYPE
- **30 DEGREE SEMICORONAL** – DISPLACEMENT OF POST ARTICULAR FACET
  SUST.TALI, WIDENING AND SHORTENING OF BODY
  FHL AND PERONEAL TENDONS



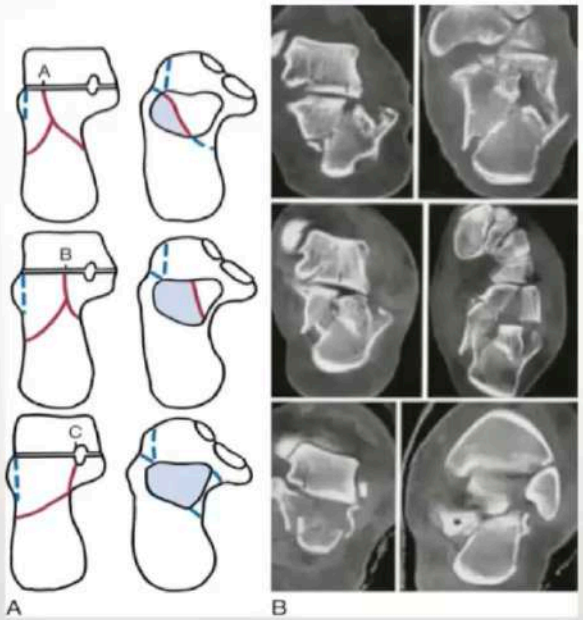
SANDER'S CLASSIFICATION

- CORONAL PLANE IMAGES
- IMAGE WITH WIDEST UNDERSURFACE OF TALUS

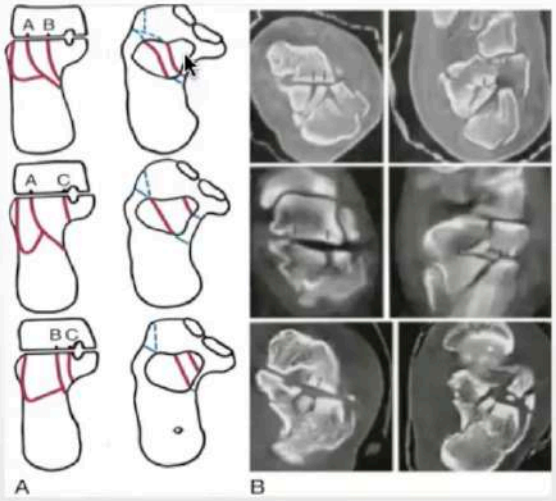
SANDER'S TYPE 1



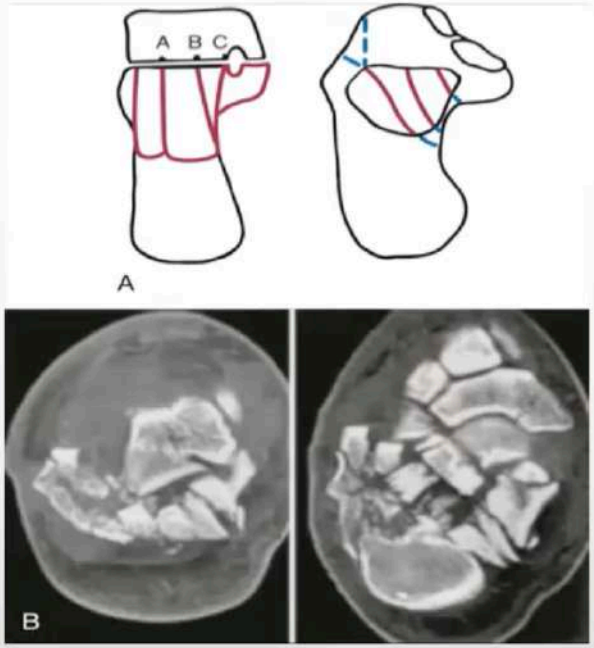
SANDER'S TYPE 2



SANDER'S TYPE 3



SANDER'S TYPE 4



NON OPERATIVE TREATMENT

- EXTRA ARTICULAR UNDISPLACED FRACTURES
- SANDERS TYPE 1 INTRA-ARTICULAR FRACTURES
- SEVERE PERIPHERAL VASCULAR DISEASE
- UNCONTROLLED OR POORLY CONTROLLED DM
- ELDERLY WITH MINIMAL AMBULATION
- VERY LARGE OPEN WOUNDS
- LIFE THREATENING INJURIES

OPERATIVE TREATMENT

- DISPLACED INTRA-ARTICULAR FRACTURES
- ANATOMICAL RESTORATION OF ALIGNMENT AND JOINT CONGRUITY

APPROACHES

- MEDIAL
- LATERAL
- COMBINED MEDIAL AND LATERAL
- EXTENSILE LATERAL APPROACH- MOST COMMON
- SINUS TARSI- MINIMAL INVASIVE
- PERCUTANEOUS FIXATION

WRINKLE SIGN

PRE-OP PLANNING

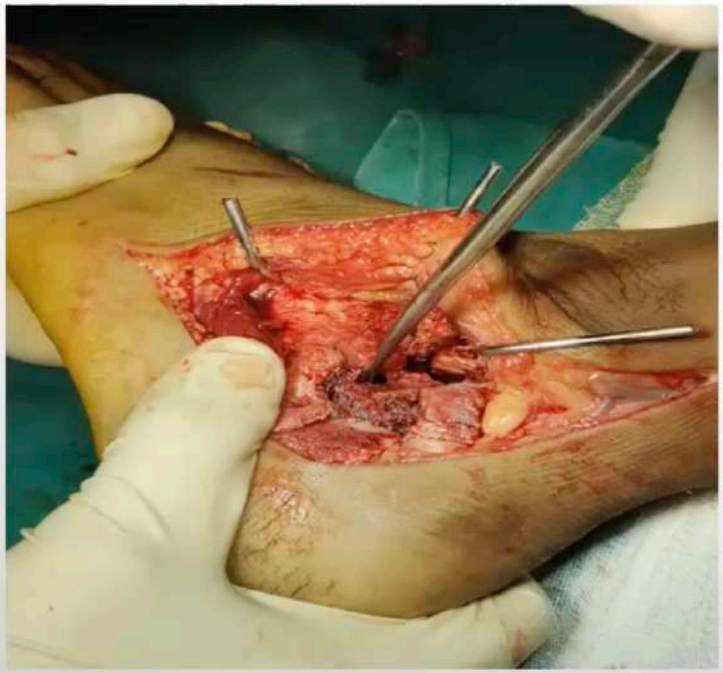
- REVIEW PLAIN RADIOGRAPH AND CT IMAGES
- PRIMARY FRACTURE LINE ON CORONAL CT AND AXIAL CT
- AXIAL CUT TO LINEATE MEDIAL TO LATERAL EXTRA-ARTICULAR SURFACE TO FIGURE OUT IF ROTATION OF MEDIAL PORTION OF POSTERIOR FACET.

CASE 1

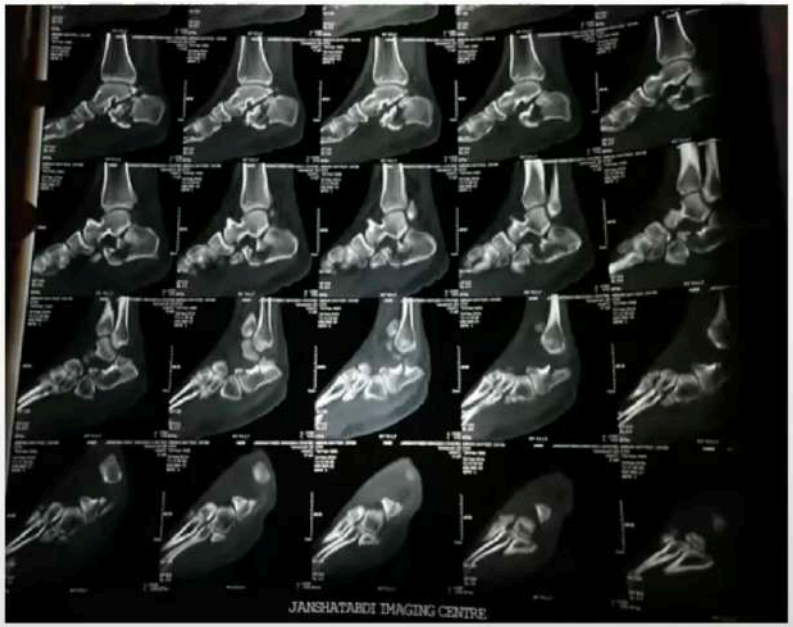
PERCUTANEOUS FIXATION

CASE 2

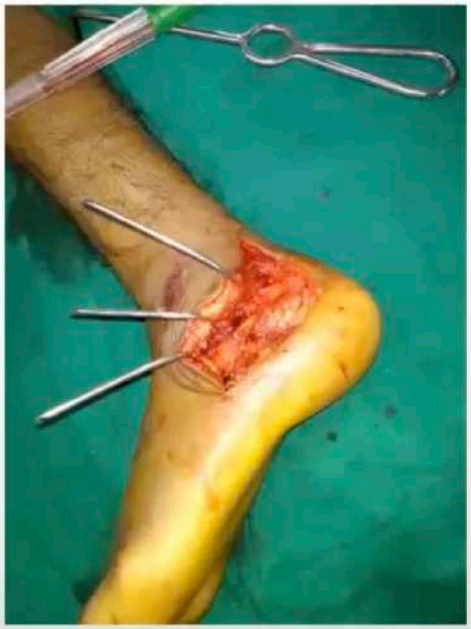
EXTENSILE LATERAL APROACH

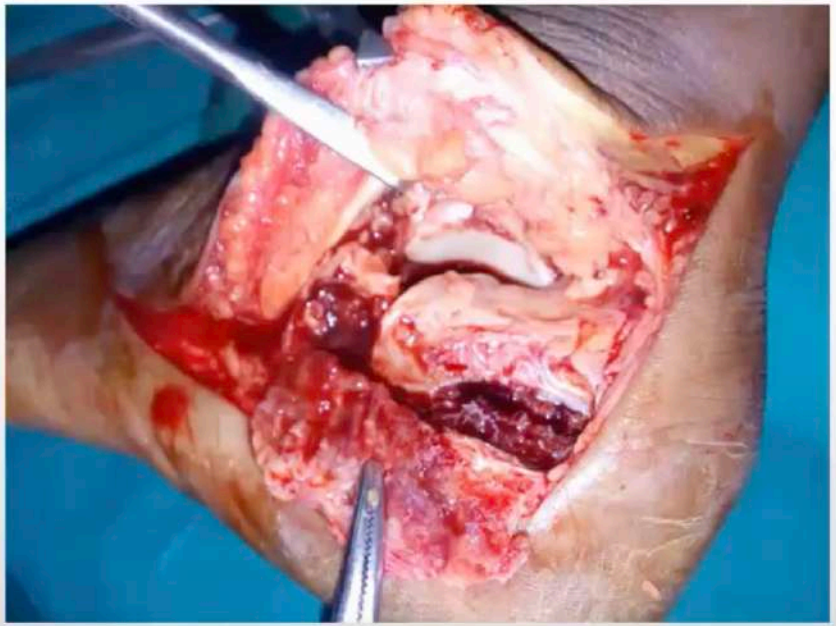


CASE 3

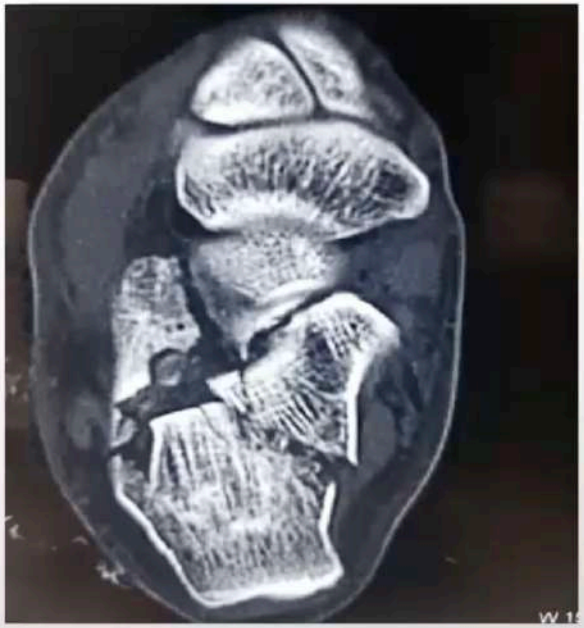


EXTENSILE LATERAL APPROACH



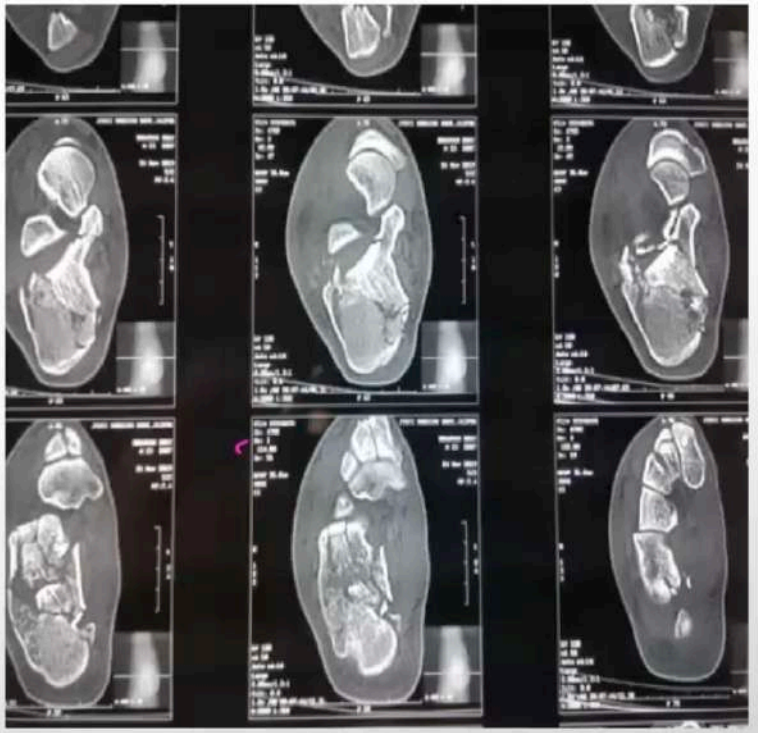


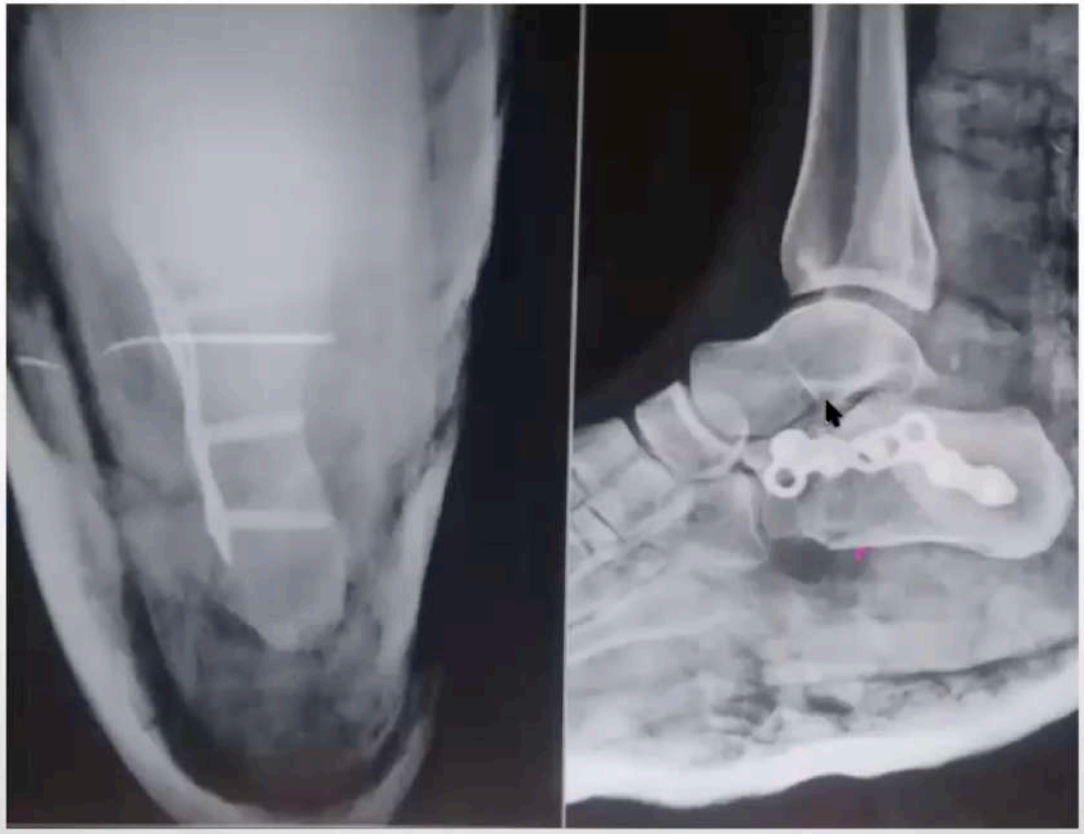
CASE 4



SINUS TARSI APPROACH

SINUS TARSI APPROACH

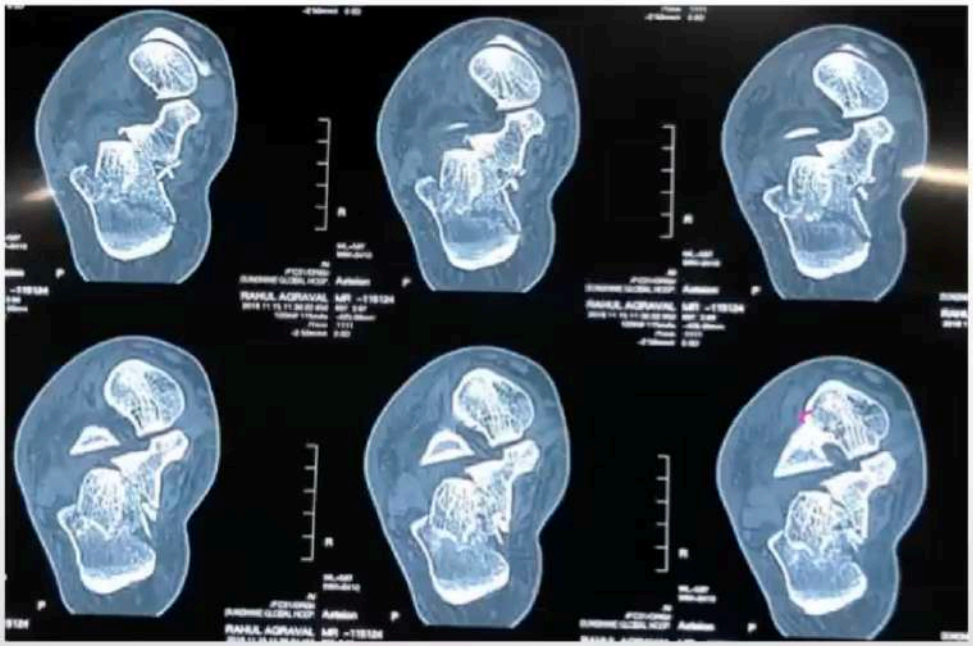




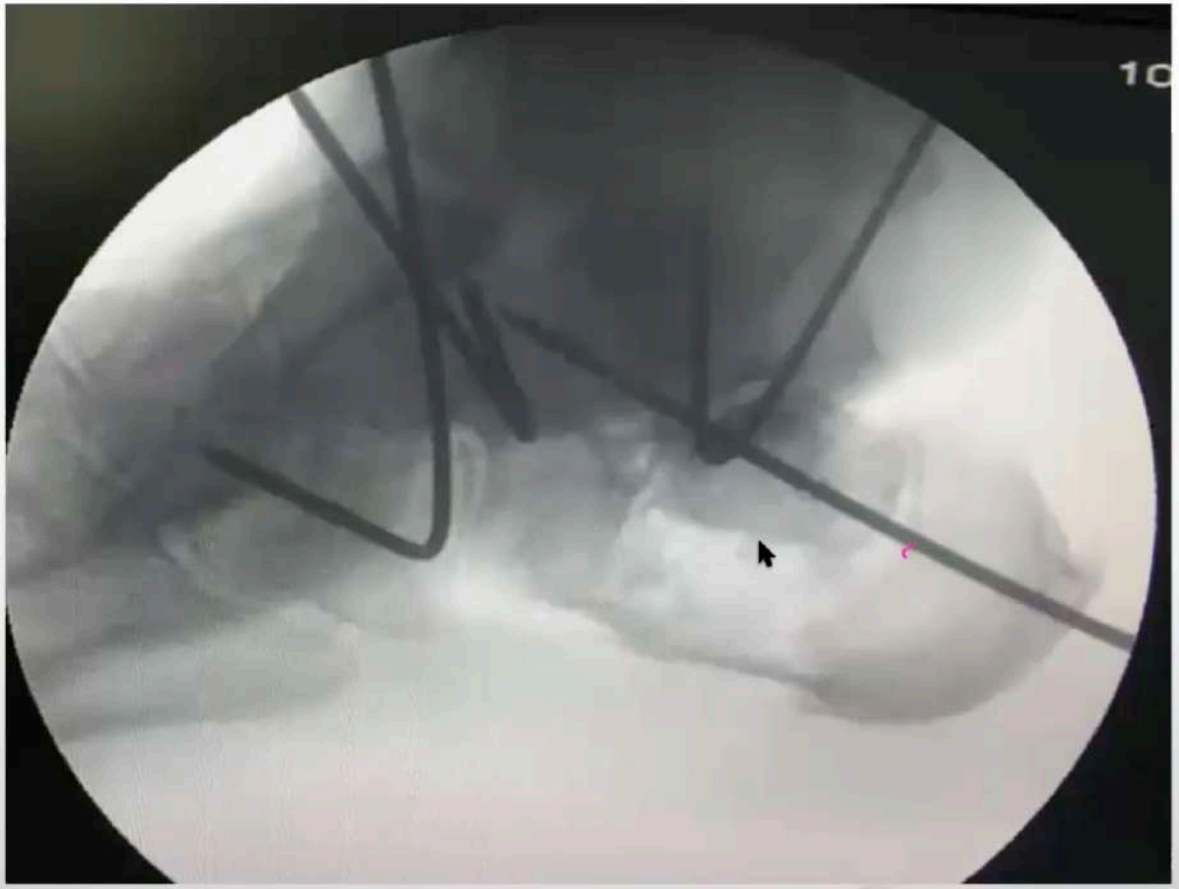
MALUNITED CALCANEUM

- RECONSTRUCTION
- SUBTALAR FUSION

24 YEARS OLD FEMALE, 6 MONTHS OLD INJURY



LATERAL WALL OSTEOTOMY

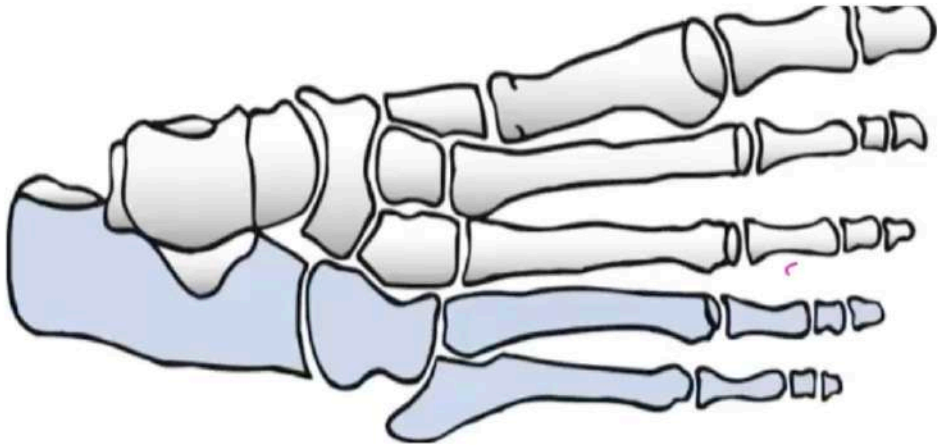


- Mid-tarsal joint injuries
- Lisfranc joint injuries
- Isolated dislocations

Mid-tarsal joint injuries

- Aka Transverse tarsal or **Chopart** joint.
- TN joint, CC joint
- Coupled motion.
- Goal : restoration of painless, stable and plantigrade foot

Functional anatomy of foot



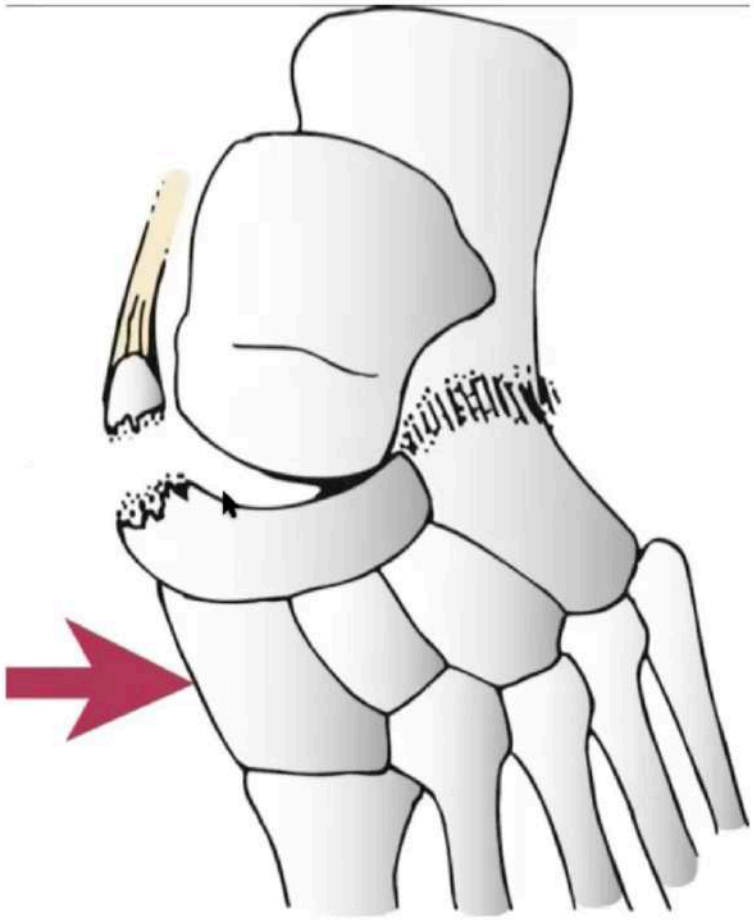
Classification- mechanism of injury

- Longitudinal stress- high energy (40%)- axial load to MT head
- Medial stress (30%)- inversion of plantar flexed foot
- Lateral stress- forceful abduction (17%)
- Plantar stress- plantar flexion force(7%)
- Crush injury – high energy open injuries

Longitudinal stress

Medial stress

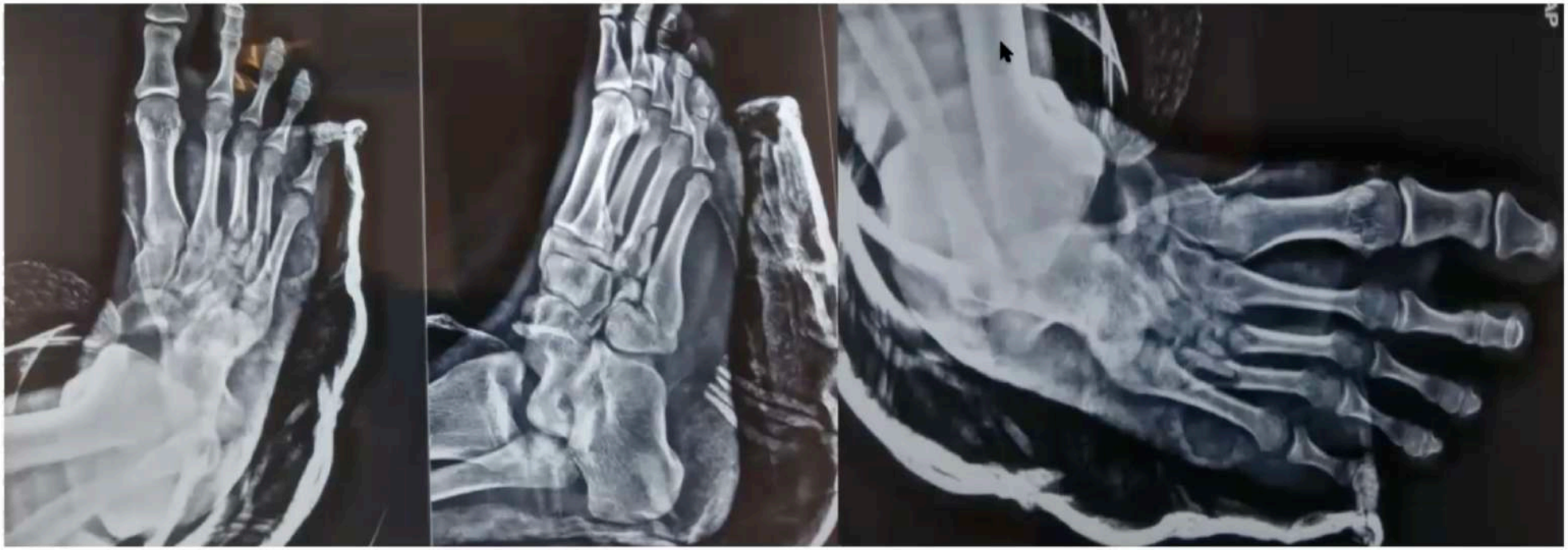
Lateral stress



Plantar stress

Clinical evaluation

Missed injuries in absence of suspicion



Pie crusting

Treatment – soft tissue and osseous

- Closed reduction and immobilization- only dislocation
- Orif
- Fusion

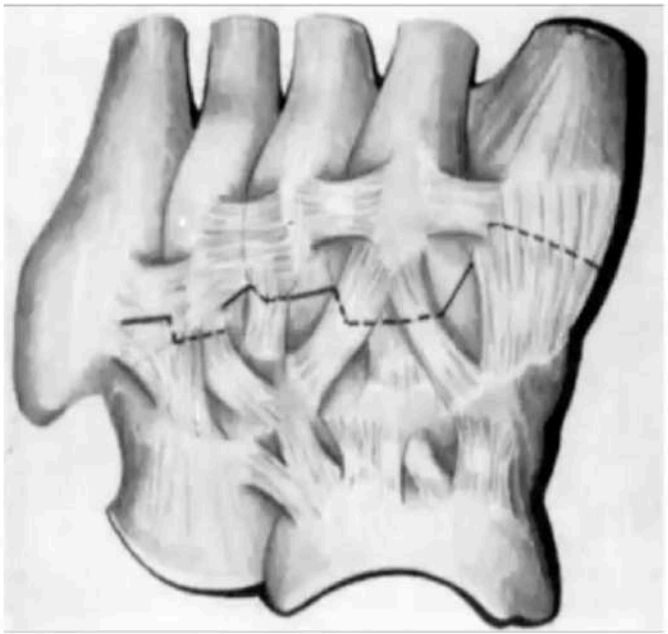
Results and Complications

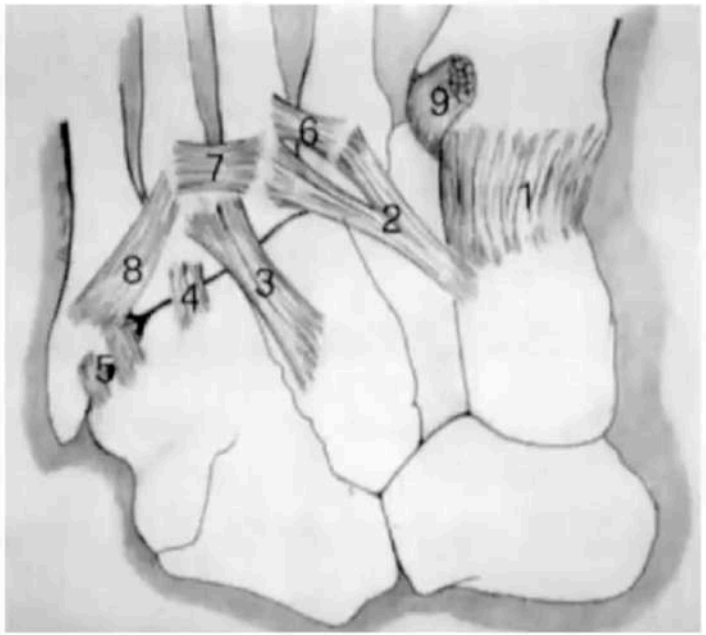
- Energy of initial injury
- Degree of comminution
- Number of joints involved
- Associated injuries
- Gait abnormality
- Loss of foot architecture
- Column malalignment
- CRPS

Lisfranc joint injuries

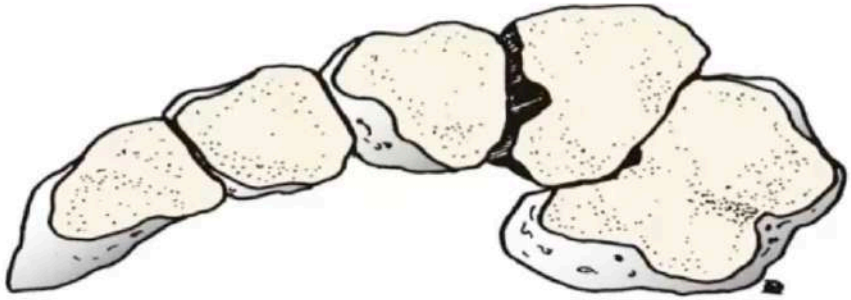
- Injuries to Tarso-metatarsal joint complex
- Wide spectrum of injury pattern
- Goal : restoration of mechanical alignment of foot, maintaining functional anatomy of foot, maintaining joint congruity

Anatomy – complex structure

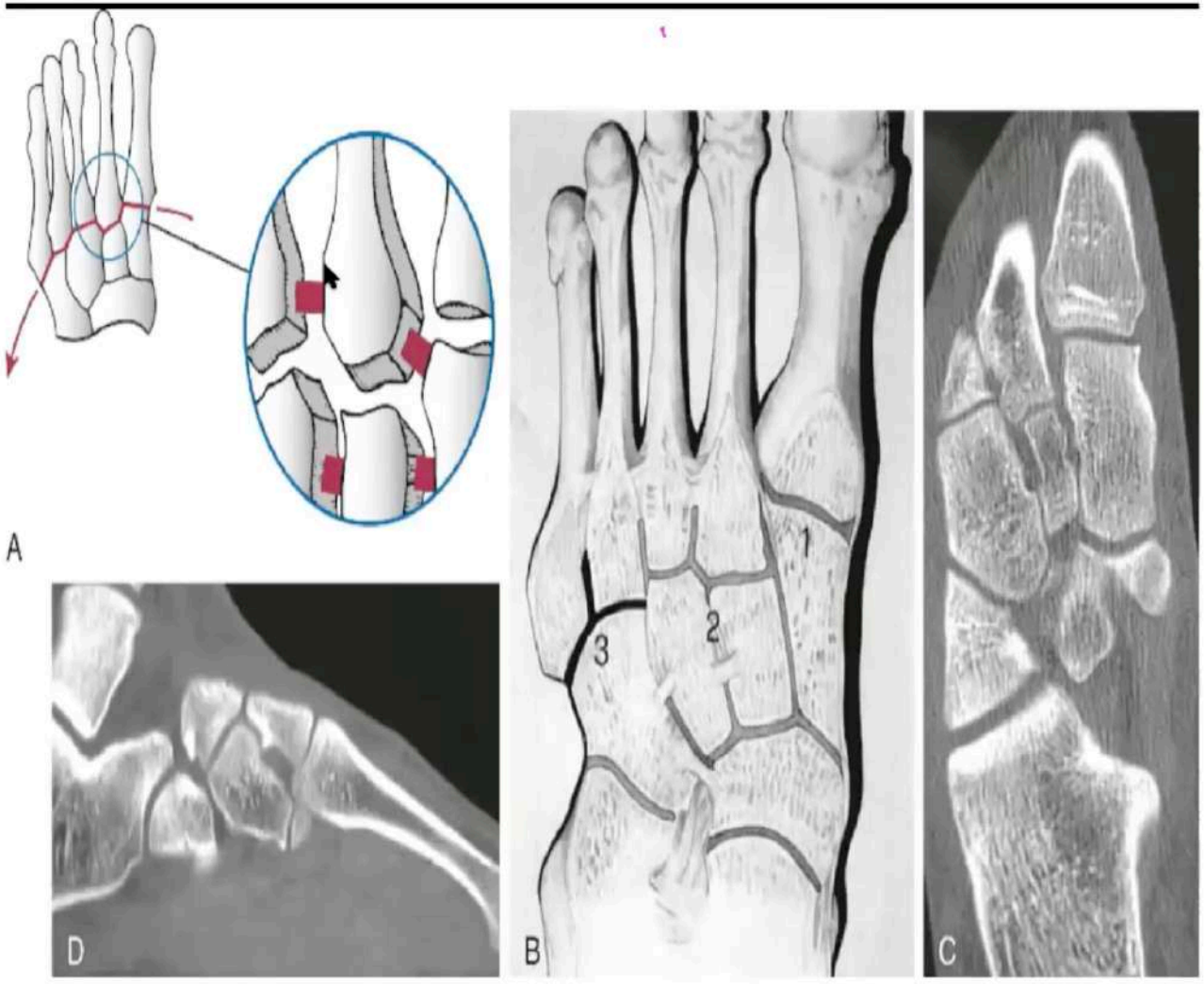




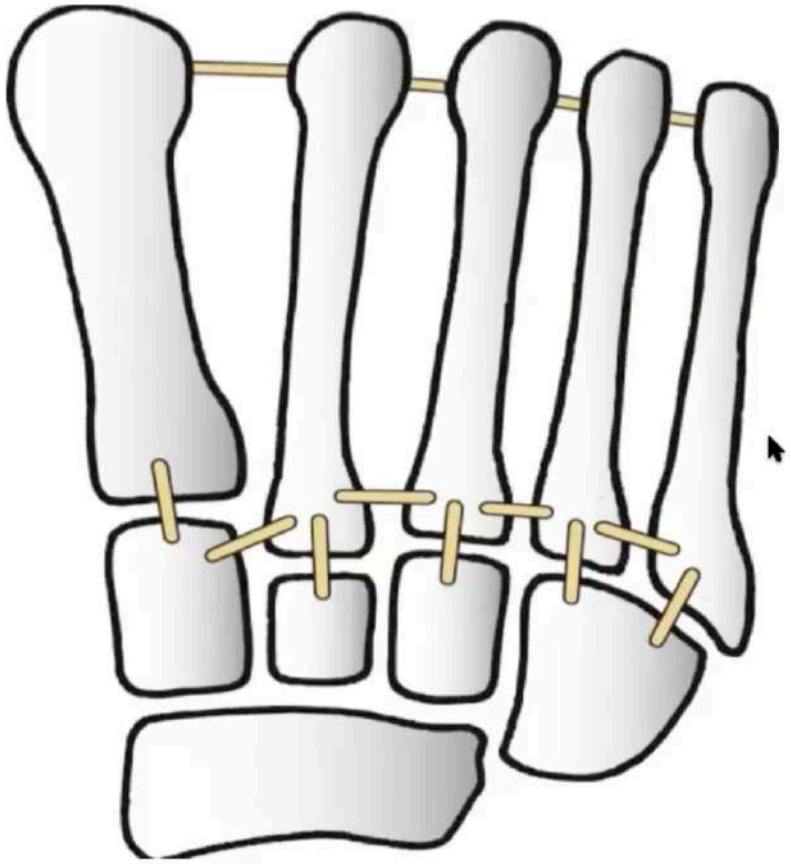
Roman arch configuration

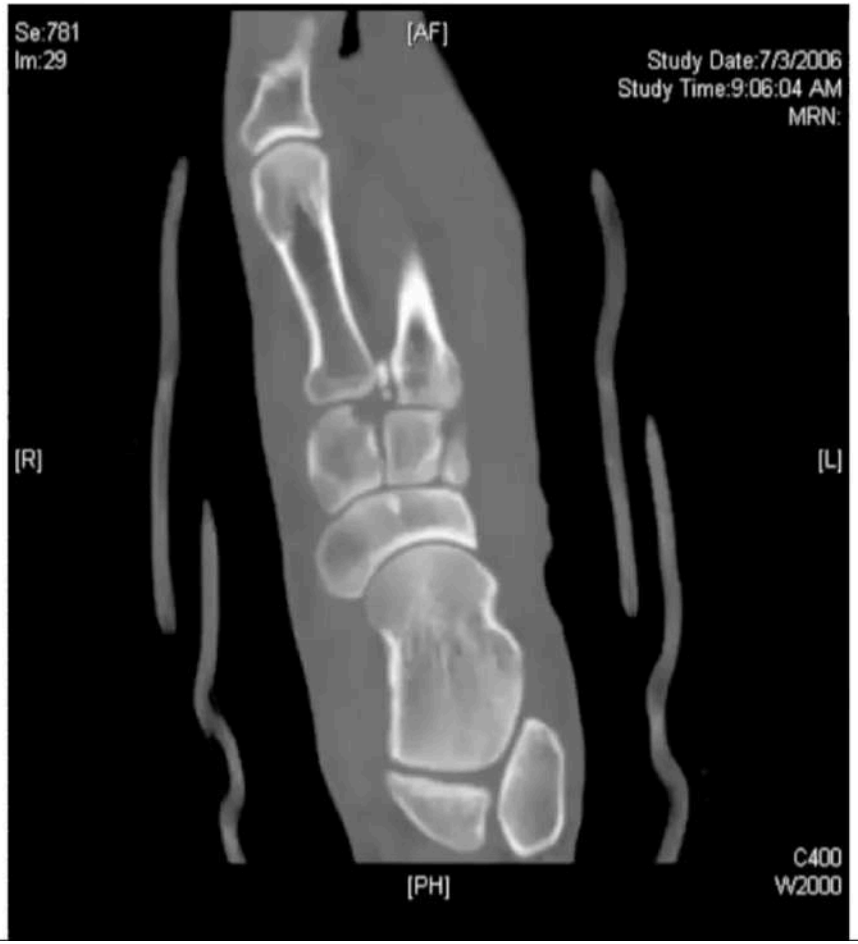


A

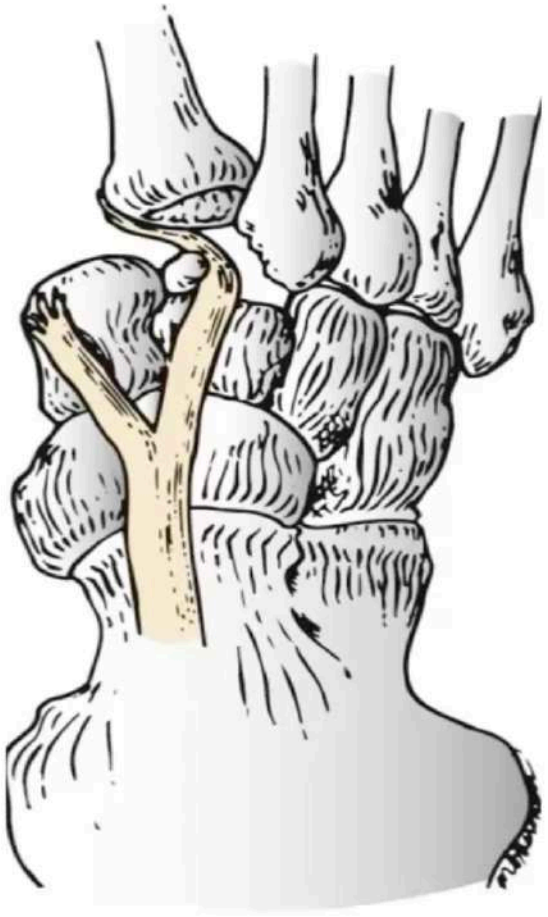


Schematic representation



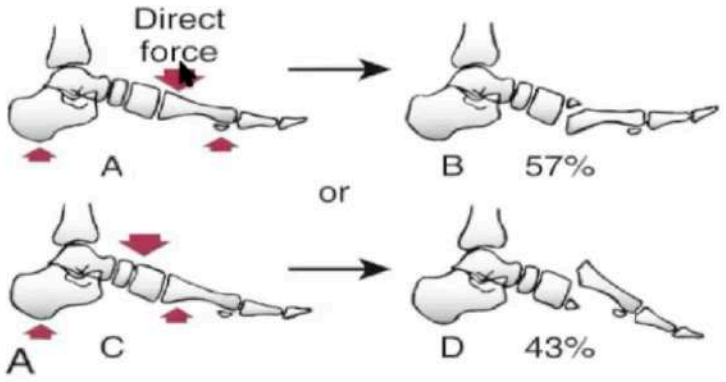


Irreducible Lisfranc dislocation

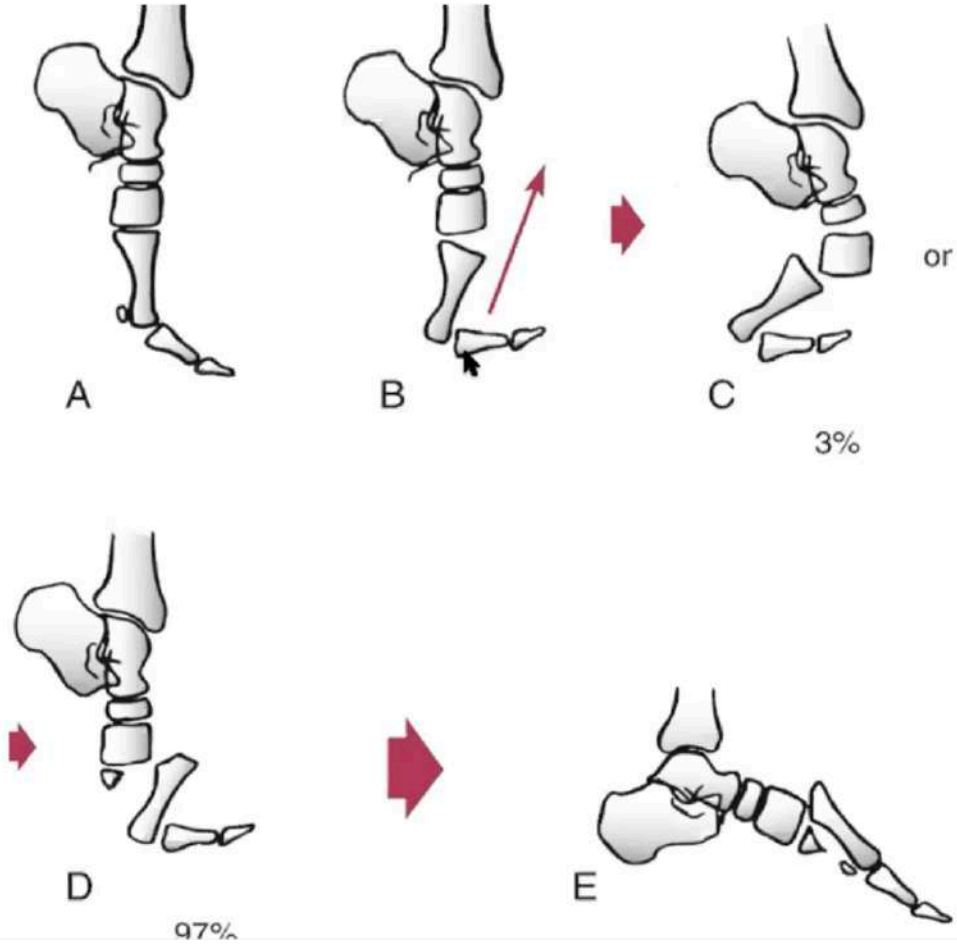


Mechanism of injury

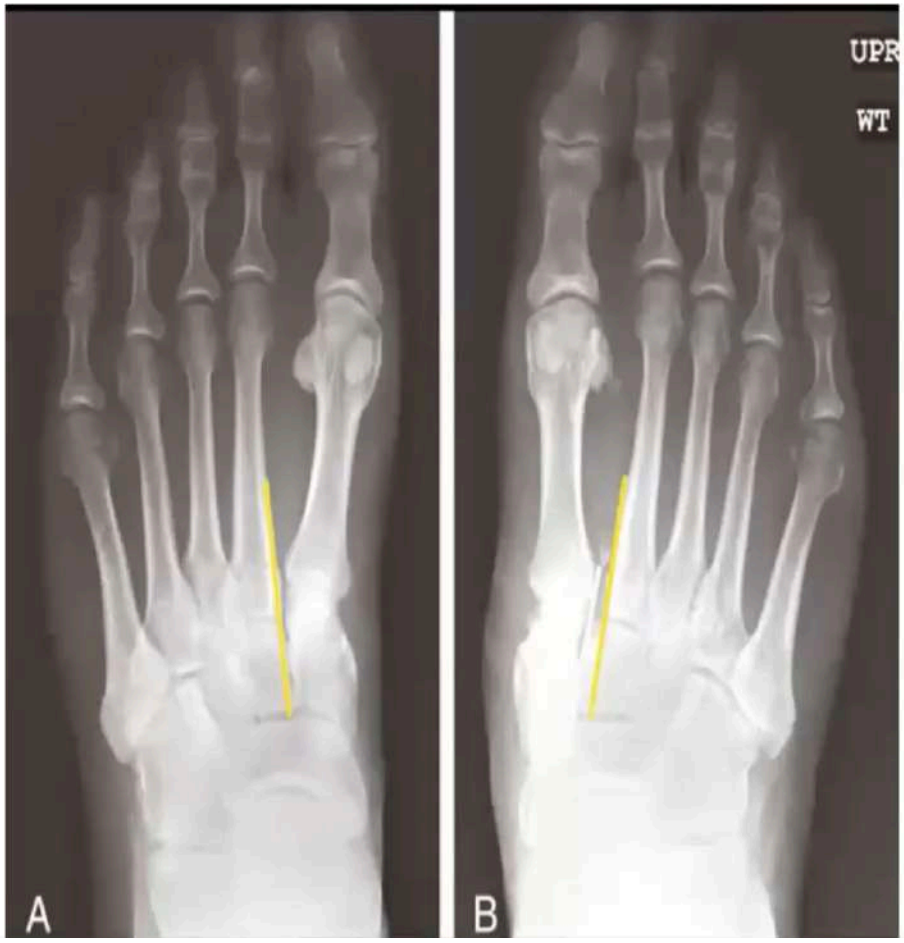
- **Direct force-** crush injuries, direct blows
- Associated with wound complications, open injuries, compartment syndrome, vascular injuries.
- **Indirect injuries**: twisting and axial loading
- **Subclinical**- neuropathic foot, repetitive injuries

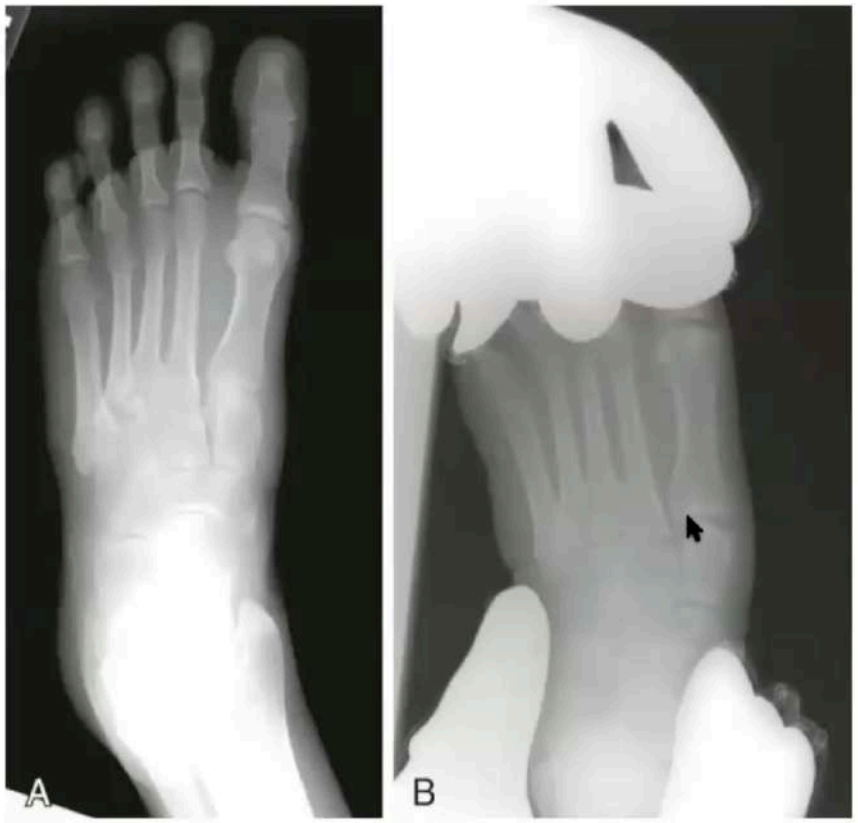


Indirect force



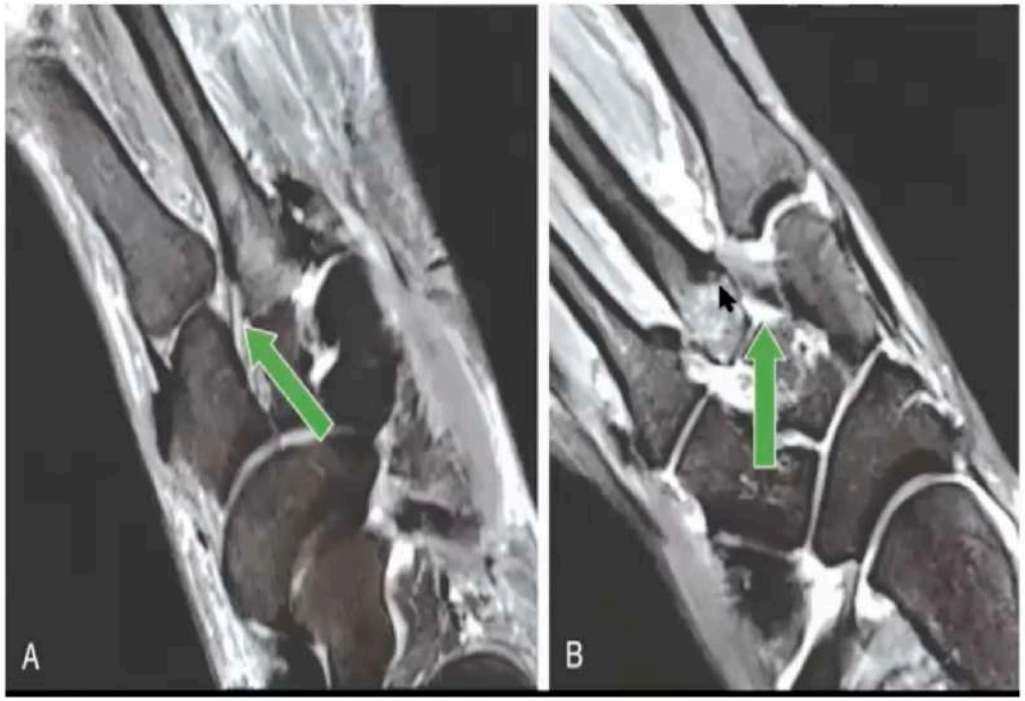
Radiography

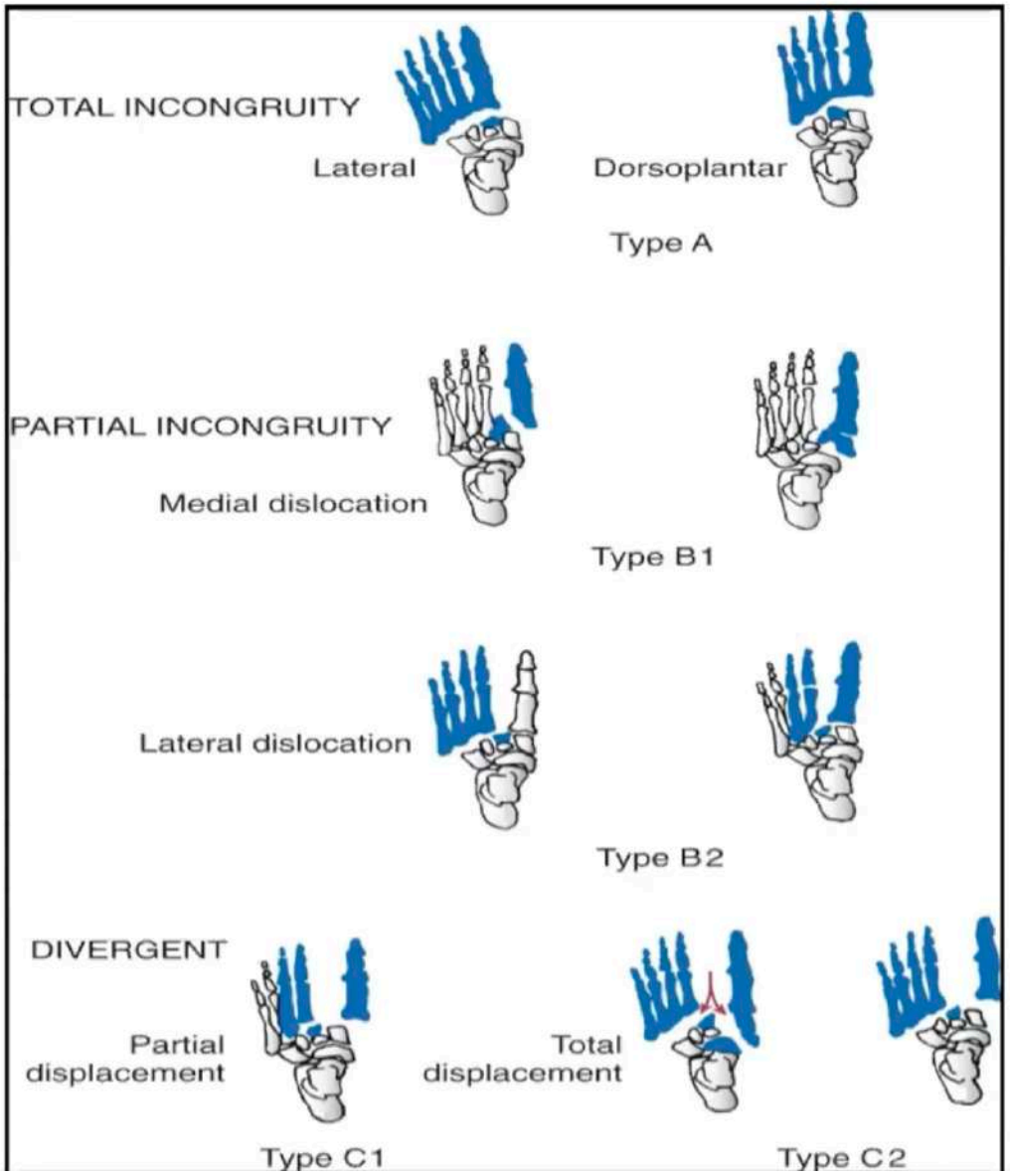




CT

MRI





Type A

Type B

Type C

Clinical evaluation

Management