MONASH University

Image Interpretation : Pelvis & Lower limbs

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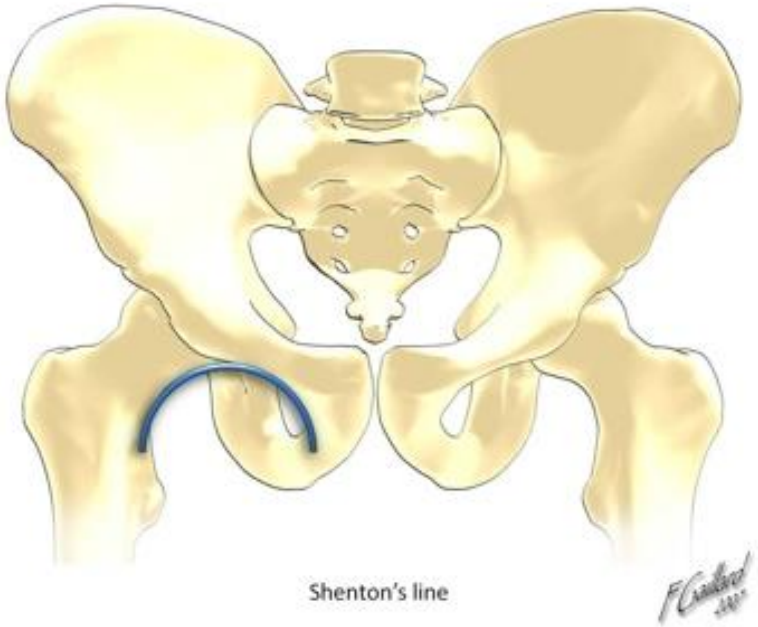
GROUP OF EIGHT AUSTRALIA

Radiographic interpretation of the pelvis

- Anatomical radiographic lines to assess for trauma.
- Shenton’s line: gentle curve of the lower border of superior pubic ramus & inferior border of femoral neck.

Shenton's Line



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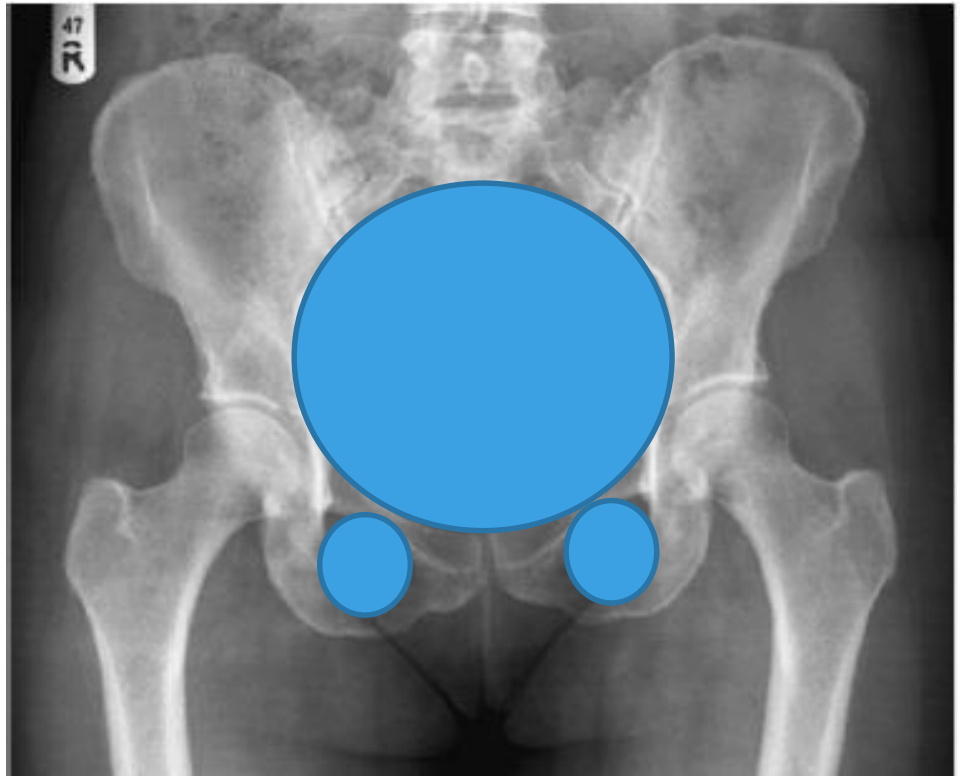
The pelvis contains 3 bony ring structures which indicates careful scrutiny to exclude additional fractures or dislocations.



ABCs Pelvic Search Strategy

- **Alignment:**
  - Examine the 3 bony rings : one fracture in a bony ring is frequently associated with another.
  - Look at Shenton's line
  - Sacro-iliac joints- compare their widths, they should be equal
  - Symphysis pubis- superior border of the pubic rami should align, the width of the joint should be approx 5mm
  - Look at acetabulum-compare sides

Bone, Cartilage, Soft tissues

- Bone- trace outline of each bone for signs of fractures
- Cartilages – are joint spaces uniform?
- Soft tissues- look for
  - calcifications, foreign bodies, avulsion fractures.
- Satisfaction of search: if you find one abnormality, search for possibility of another.

Pelvic fractures

- Pelvic fractures are relatively uncommon,
- Fractures are classified as minor (stable) isolated fractures or major (unstable) displaced fractures
- Fractures involving bony ring
  - Widened SI-joint
  - Diastasis of pubic symphysis represents fracture of main ring
  - Double pathology e.g. fracture(s) / dislocation = unstable fracture

Stable fractures

- Fractures around the “ring” which do not break into the ring
- Usually the result of moderate forces

- **Isolated sacrum fractures**
- Mechanism is usually fall onto sacrum

Unstable Pelvic fractures

- Consist of fractures to both arches.
- High risk of hemorrhage

- Classified by: **Mechanism of injury**

Lateral Compression fractures

- Most common unstable fracture
- Affected iliac wing folds inwards
- Tension in SI-joint
- Fractures of pubic rami, sacral foramina

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HIP: Range & Significance of Radiographic Appearances

Hip fractures associated with high morbidity & mortality in elderly population

- Intracapsular
- Reduce the blood supply to femoral head
- High risk of delayed union, non-union or avascular necrosis

- Extracapsular
  - Intertrochanteric
- Do not interfere with femoral head blood supply

Hip dislocations

- Traumatic: Anterior or posterior
- Slipped capital (upper) femoral epiphysis (SUFE)
  - Patients prone to AVN & degenerative arthritis

- **Complications of hip dislocations**
- SUFE
  - AVN femoral head
  - Osteoarthritis

Hip: Posterior dislocation

- Patient presents with internal rotation of knee
- 90% of cases may have acetabular posterior rim fracture
- 20% can result in avascular necrosis

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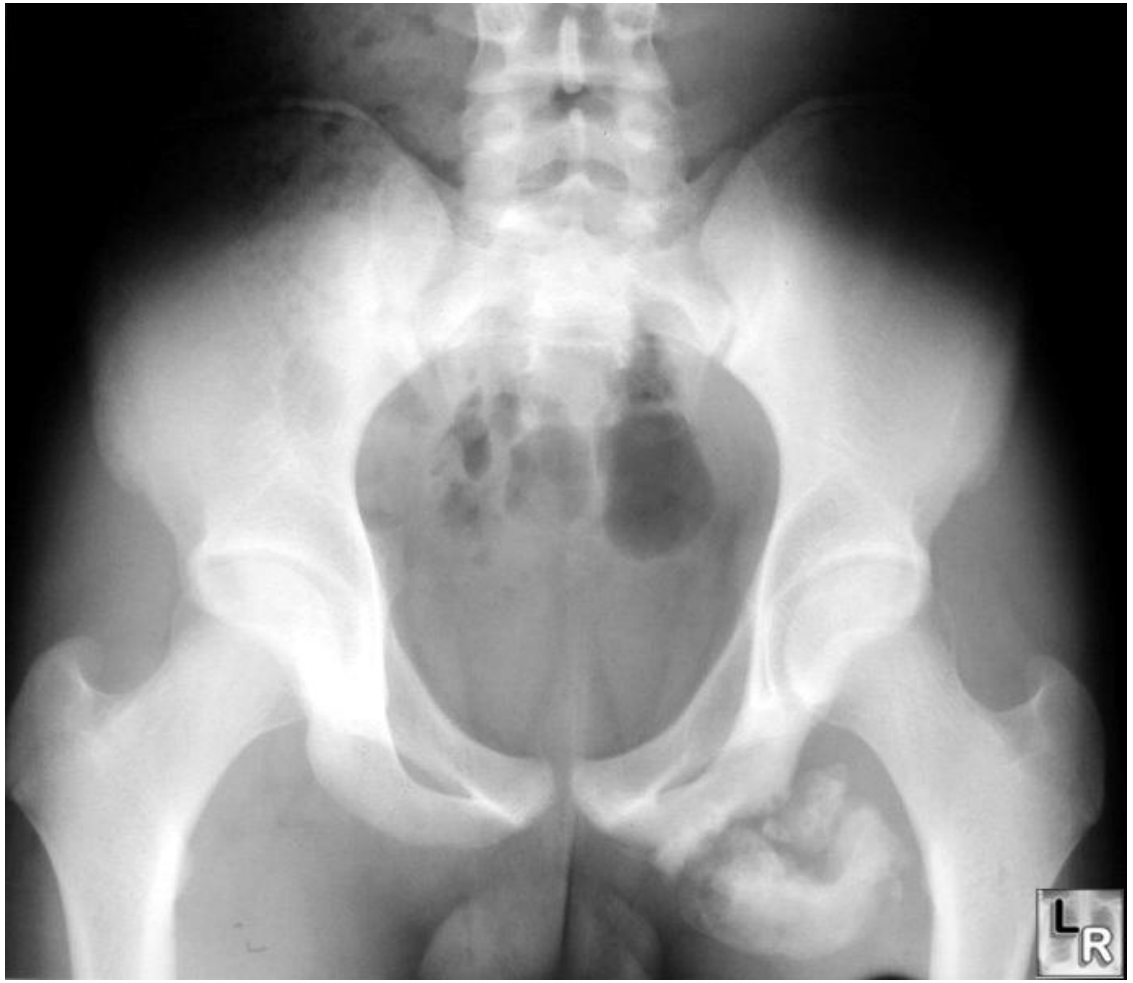
Apophyses: sites of muscle insertion



Ischial tuberosity avulsion following hamstring injury

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Fractures of Femoral Shaft

- Open or Closed
- Spiral
- Comminuted
- Supracondylar
- Pathological

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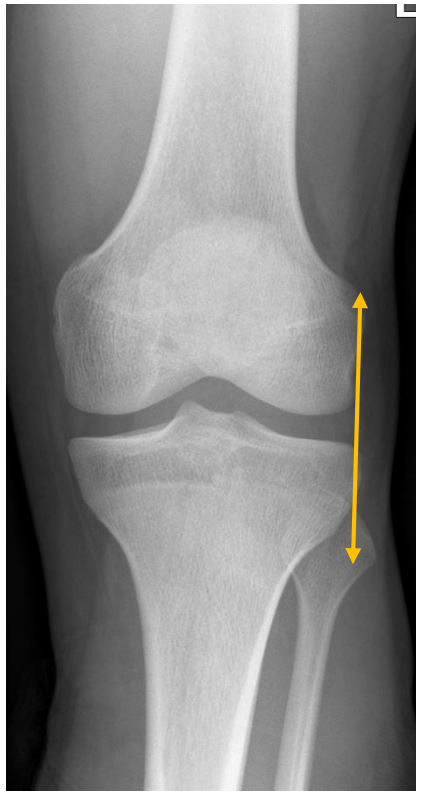
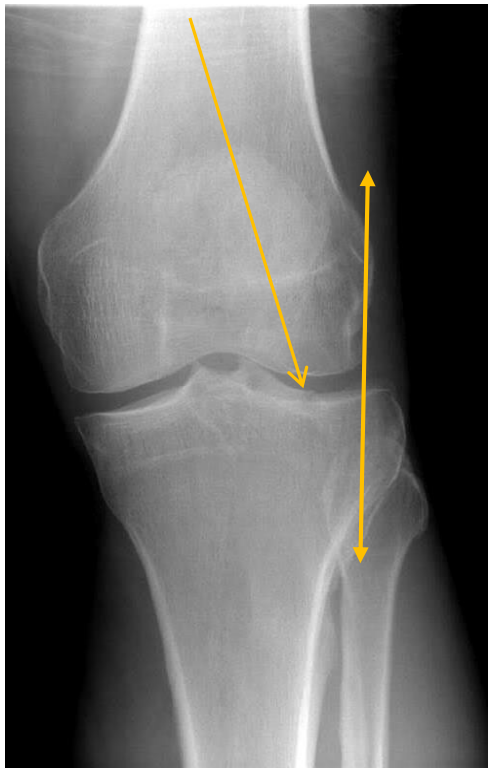
Tibial Plateau Fractures



Normal knee

Slight cortical disruption and lucent line of fracture



Lateral femoral condyle does not align to lat tibial margin

- Check condyle alignment:
  - Line drawn perpendicular to tibial plateau from lateral margin of the femur
  - Should be no more than 5mm of tibia outside of it

Normal Variant

- Bipartite or Multipartite patella common normal variants
- Distinguish from patella fracture:
  - Smooth margins
  - Uni / Bilateral
  - Most common location: supero-lateral corner of patella

Bipartite patella

Multipartite patella

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Avulsion fracture

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- Inversion injury – result of pull of the calcaneofibular ligament

Danis-Weber Classification

The Danis-Weber classification system uses the position of the level of the fibular fracture with its relationship to its height at the ankle joint.

Type A: fracture below the ankle joint

Type B: fracture at the level of the joint, with the tibiofibular ligaments usually intact

Type C: fracture above the joint level which tears the syndesmotic ligaments.


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Calcaneal injuries

- Usually associated with a fall from a height
- Associated with T12/L1 compression fractures
- Most fractures are visible on the lateral projection
- Look for cortical disruption, a sclerotic line and check Bohler's angle which should be between 30-40 degrees

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Stress fractures

- Normally affect one metatarsal, usually the second or third
- Early signs – fine incomplete fracture line with a fluffy callus formation

Missed stress fracture

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Base of the fifth metatarsal

Avulsion fracture:

- Most common fracture of this area – an inversion injury
- Occurs at the most proximal tip of the 5th metatarsal where the peroneus brevis tendon attaches

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Phalanx fractures are common

Crushed fracture

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Take home principles

- Always consider the mechanism of injury.
- Apply a search strategy.
- Know the common pelvis and lower limb fractures and dislocations.