Indication: Hip Pain

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MSK Radiology 4014

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Clinical History

- Patient is a **44 year-old male** presents to ER from an outside hospital for higher level of care after a **motor vehicle collision** of unknown speed
  - Multi-trauma, AAA dissection
- PMHx of HTN, AVR on Coumadin and seizure disorder 2/2 previous stroke on Keppra
- Vitals
  - Temp: 98.8 HR: 88 RR: 19 BP: 113/71 SpO2: 96%
- Physical Exam:
  - GCS: 15
  - Neuro: Oriented x 3 on arrival
  - MSK: no obvious deformity, active ROM
  - Extremities: No cyanosis/clubbing/edema, pulses 2+
- Labs:
  - Hgb: 12.3 g/dL
  - WBC: 34.7

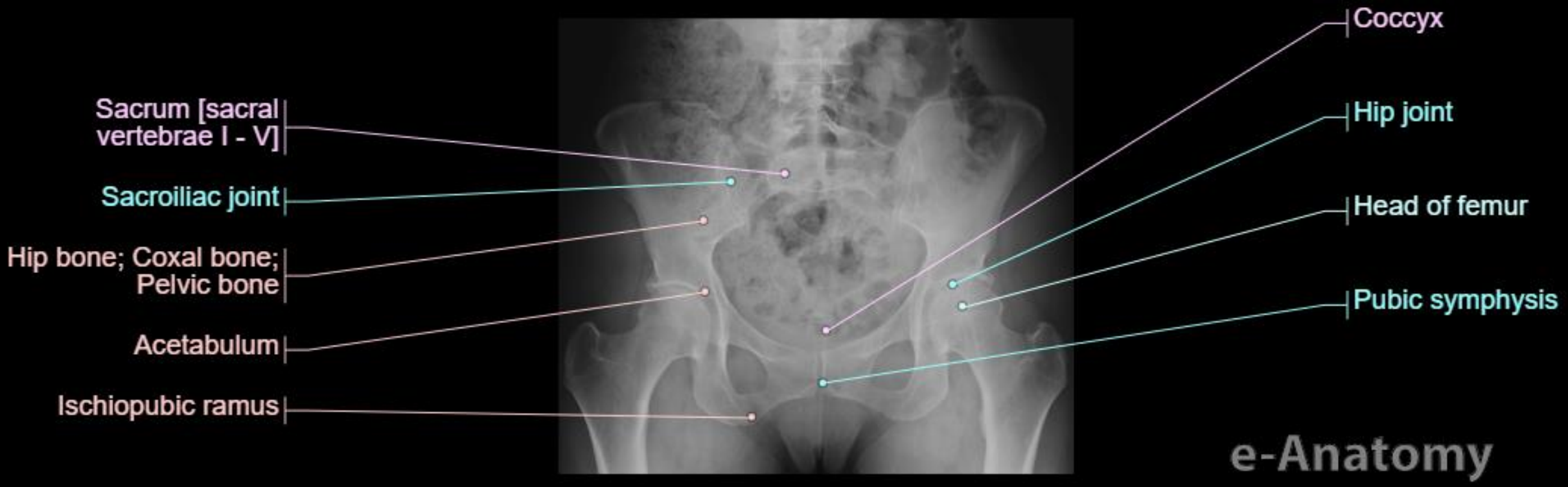
Differential Diagnosis for Hip Pain

- Bone – fracture, avascular necrosis, primary neoplasm, metastatic disease, loose bodies
- Joint – osteoarthritis, septic arthritis, inflammatory arthritis, labral tear
- Muscle, tendon– contusion, muscle strain, tendon rupture, tendonitis
- Spine, neuropathic source – lumbar disc bulging, lumbar spinal stenosis, vertebral compression fracture, sciatica, femoralacetabular impingement

Differential Diagnosis for Hip Pain After MVC

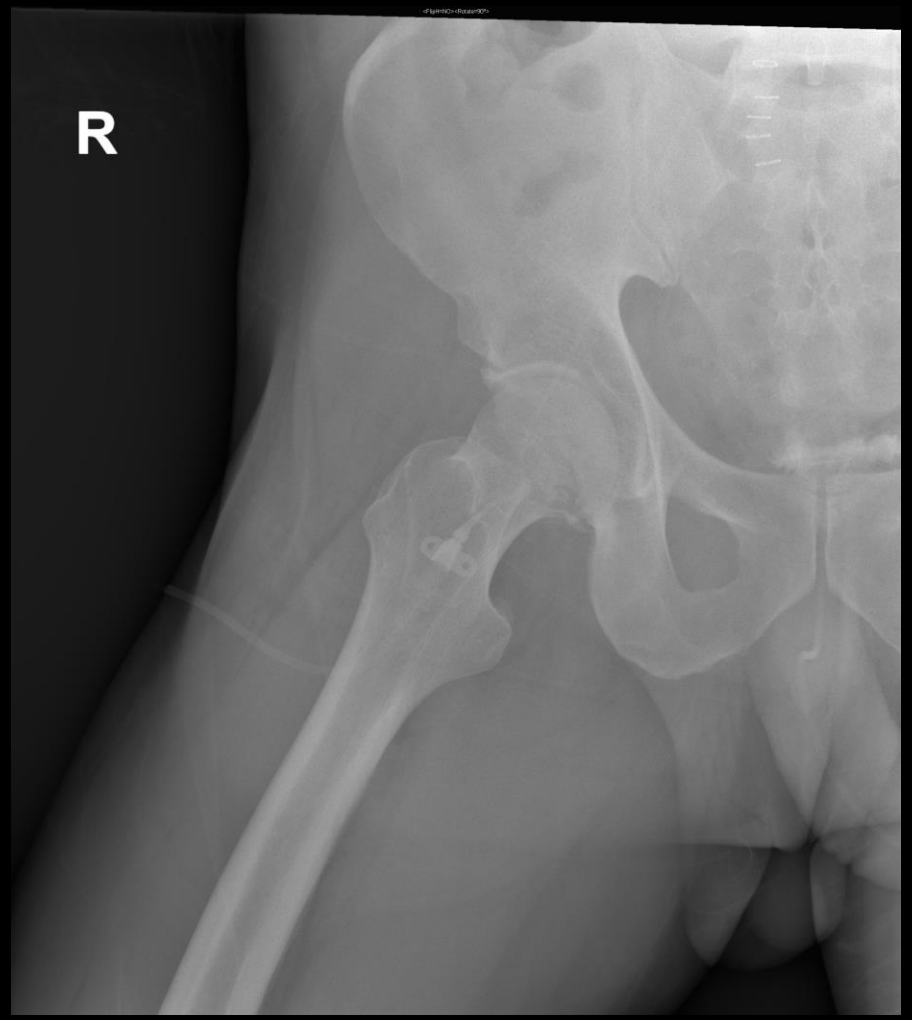
- Bone – **fracture**, avascular necrosis, primary neoplasm, metastatic disease, **loose bodies**
- Joint – osteoarthritis, septic arthritis, inflammatory arthritis, **labral tear**
- Muscle, tendon**– contusion, muscle strain, tendon rupture**, tendonitis
- Spine, neuropathic source – **lumbar disc bulging**, lumbar spinal stenosis, **vertebral compression fracture**, sciatica, **femoral acetabular impingement**

Pelvic Anatomy



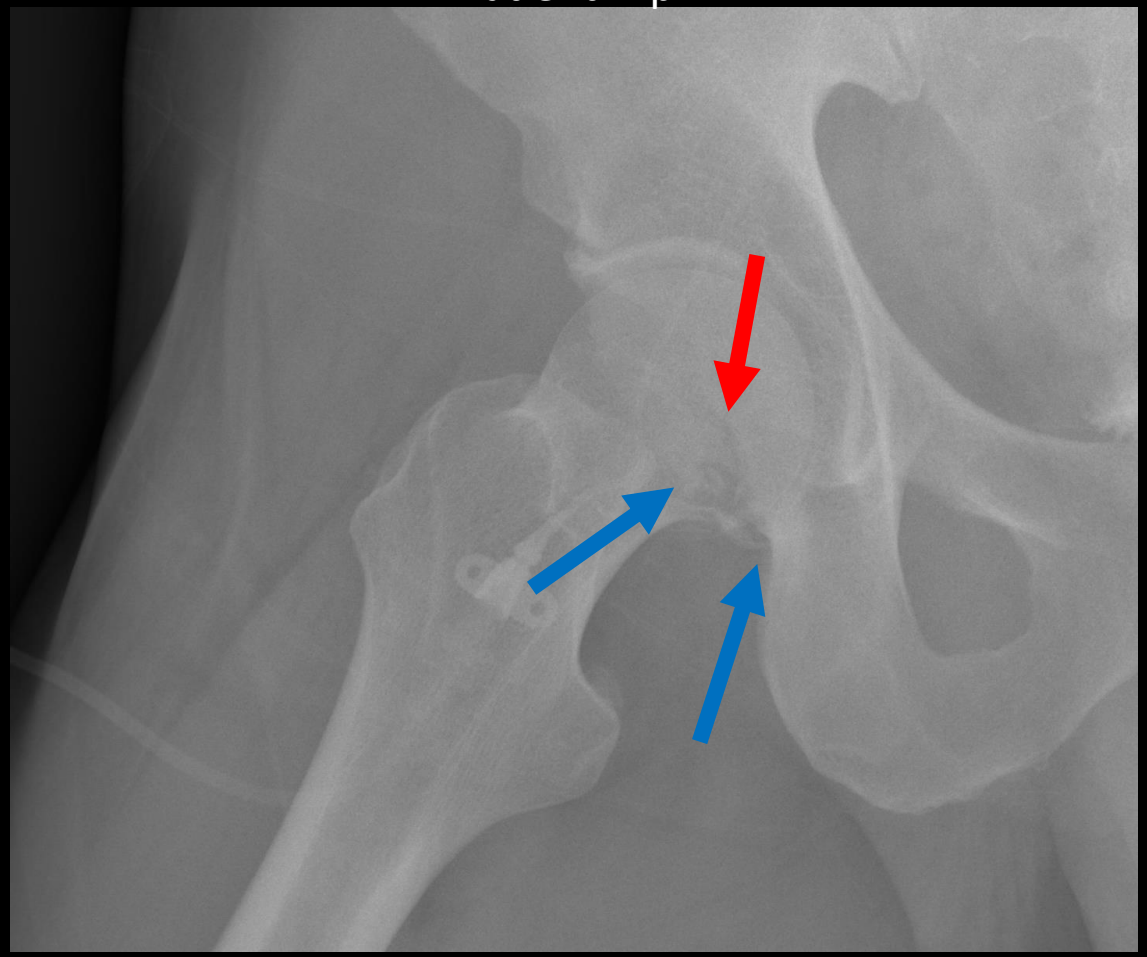
Pelvis AP DX— 7/27/20

Right Hip DX— 7/27/20



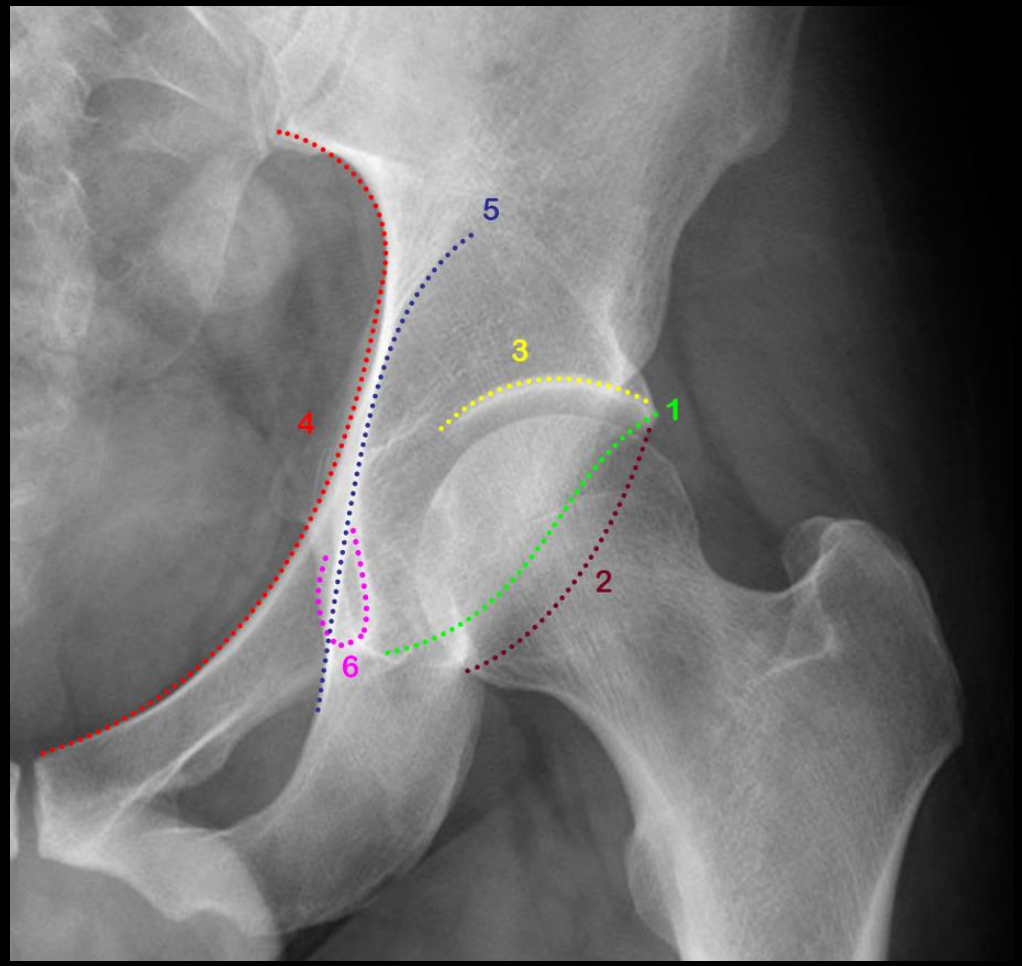
Right Hip DX— 7/27/20

Patient Hip



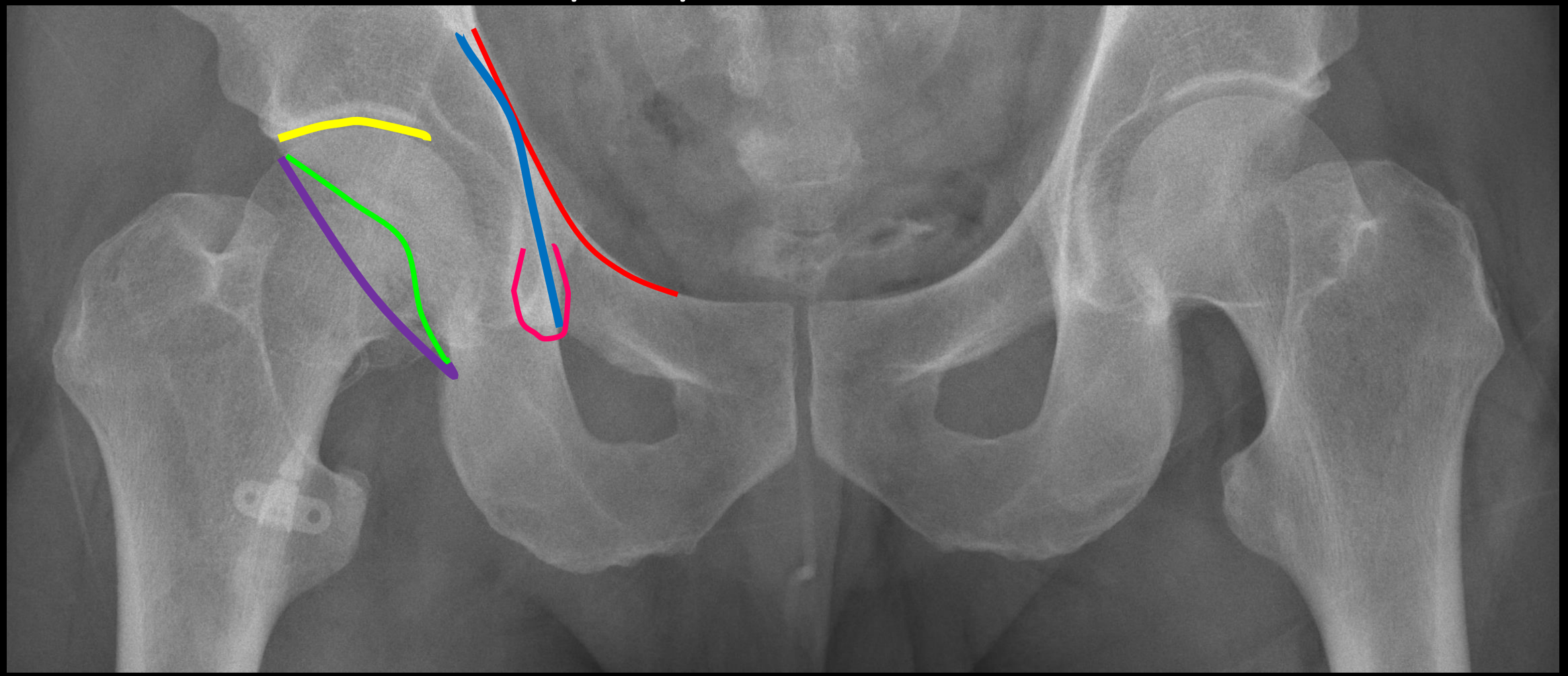
Normal Hip

Radiographic Landmarks of the Hip



1. Anterior acetabular wall
2. Posterior acetabular wall
3. Acetabular roof
4. Iliopectineal line
5. Ilioischial line
6. Radiographic U (Tear drop)

Pelvis AP DX— 7/27/20



ACR Appropriateness Criteria

Variant 1: **Acute hip pain. Fall or minor trauma. Suspect fracture. Initial imaging.**

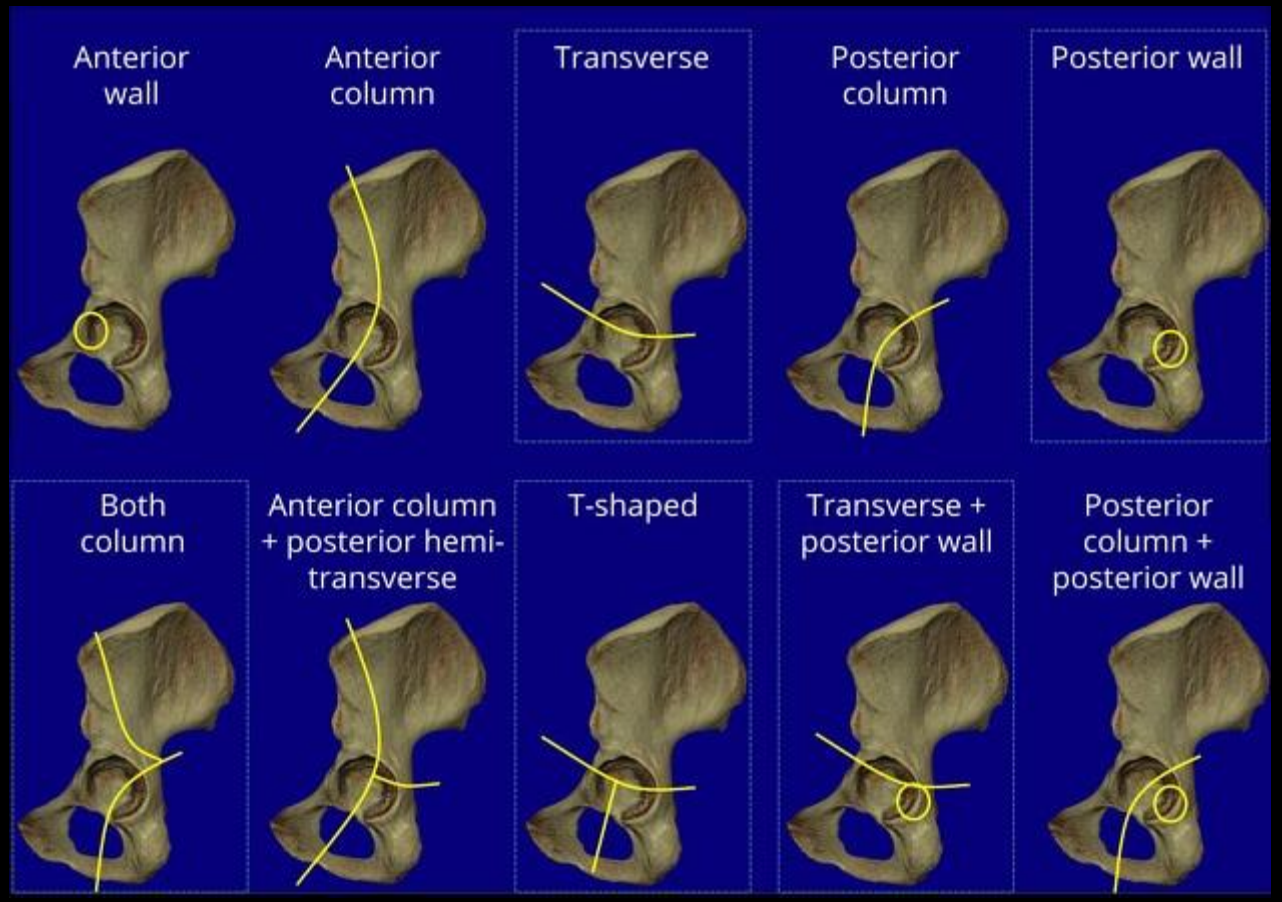
Procedure	Appropriateness Category	Relative Radiation Level
Radiography hip	Usually Appropriate	☢☢☢
Radiography pelvis	Usually Appropriate	☢☢
Radiography pelvis and hips	Usually Appropriate	☢☢☢
CT pelvis and hips with IV contrast	Usually Not Appropriate	☢☢☢
CT pelvis and hips without and with IV contrast	Usually Not Appropriate	☢☢☢☢
CT pelvis and hips without IV contrast	Usually Not Appropriate	☢☢☢
MRI pelvis and affected hip without and with IV contrast	Usually Not Appropriate	O
MRI pelvis and affected hip without IV contrast	Usually Not Appropriate	O
Bone scan hips	Usually Not Appropriate	☢☢☢
US hip	Usually Not Appropriate	O

https://acsearch.acr.org/docs/3082587/Narrative/

Judet and Letournel Classification

Elemental (simple)

Associated (complex)



Case courtesy of Dr Francis Deng, Radiopaedia.org, rID: 73218

Pipkin Classification

Pipkin	Description	Illustration
Pipkin 1	Femoral head fracture inferior to the fovea capitis. If nondisplaced, can be treated conservatively.	
Pipkin 2	Femoral head fracture extends above the fovea capitis (the medial fracture fragment includes the fovea). Typically treated operatively.	
Pipkin 3	Femoral head fracture (Pipkin 1 or 2) with femoral neck fracture. Increased risk of avascular necrosis. Typically treated with fixation in a younger patient and with arthroplasty in an older patient.	
Pipkin 4	Femoral head fracture (Pipkin 1 or 2) with an acetabular fracture. Treatment depends on the size and degree of displacement of the fragments.	

Mandell et al.

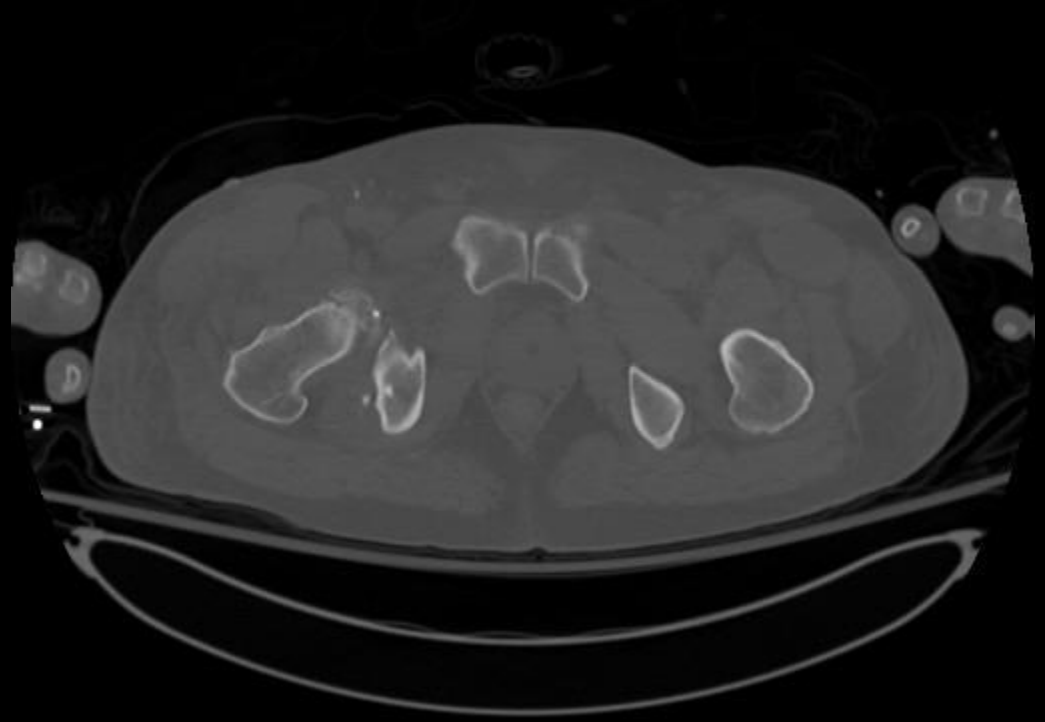
Final Diagnosis

- Comminuted fracture of the right inferior femoral head
- Comminuted fracture of the right posterior wall of the acetabulum
- Pipkin Type IV fracture of the right femoral head and posterior acetabulum

Treatment Options

- Risk of avascular necrosis if not treated urgently and appropriately
- Depends on location, size, displacement and stability
  - Excision
  - Open Reduction and Internal Fixation (ORIF)
  - Partial or Total Arthroplasty
- Fracture healing can take anywhere from 12 weeks to 12 months
  - Pain management
  - Physical therapy
- Risk of AVN or heterotopic ossification remains even after appropriate treatment

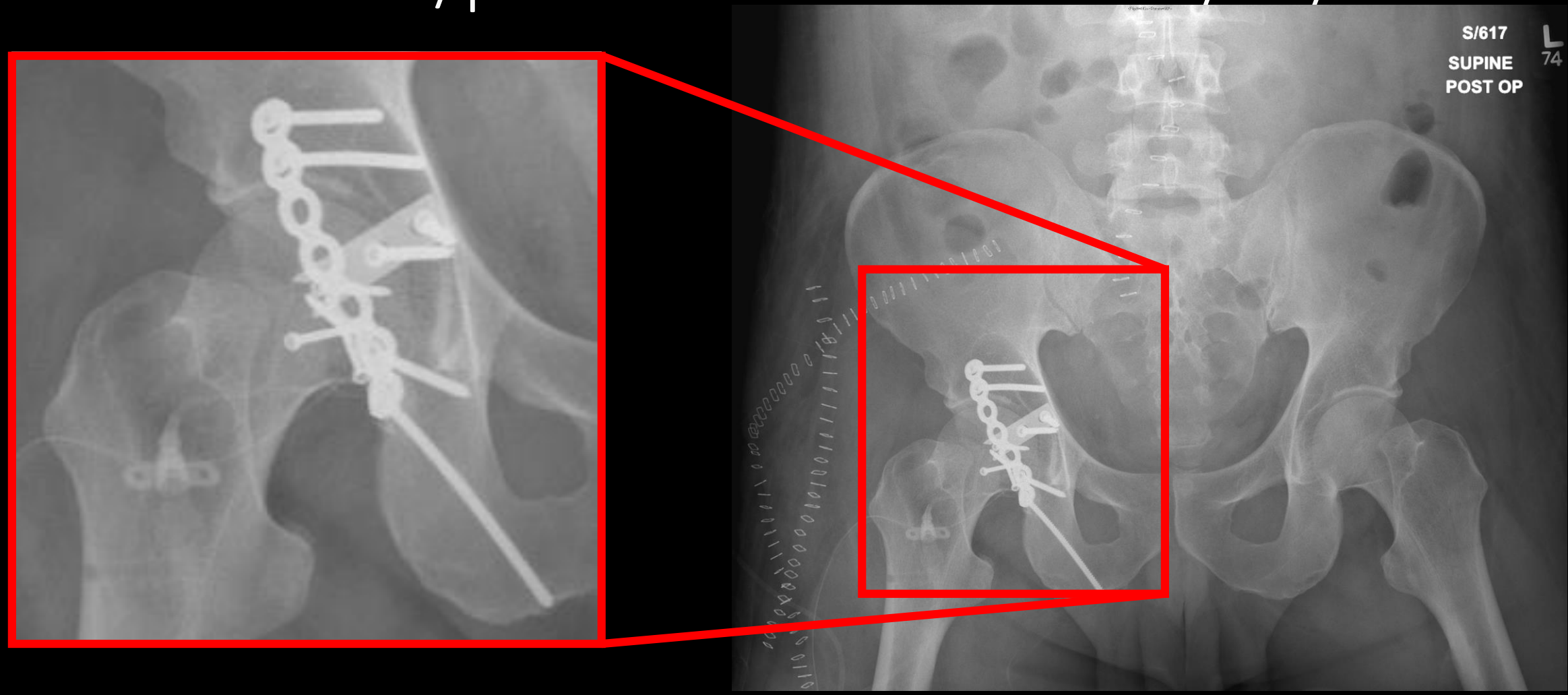
Axial Pelvic CT w/o IV contrast s/p Femoral Head ORIF– 7/29/20



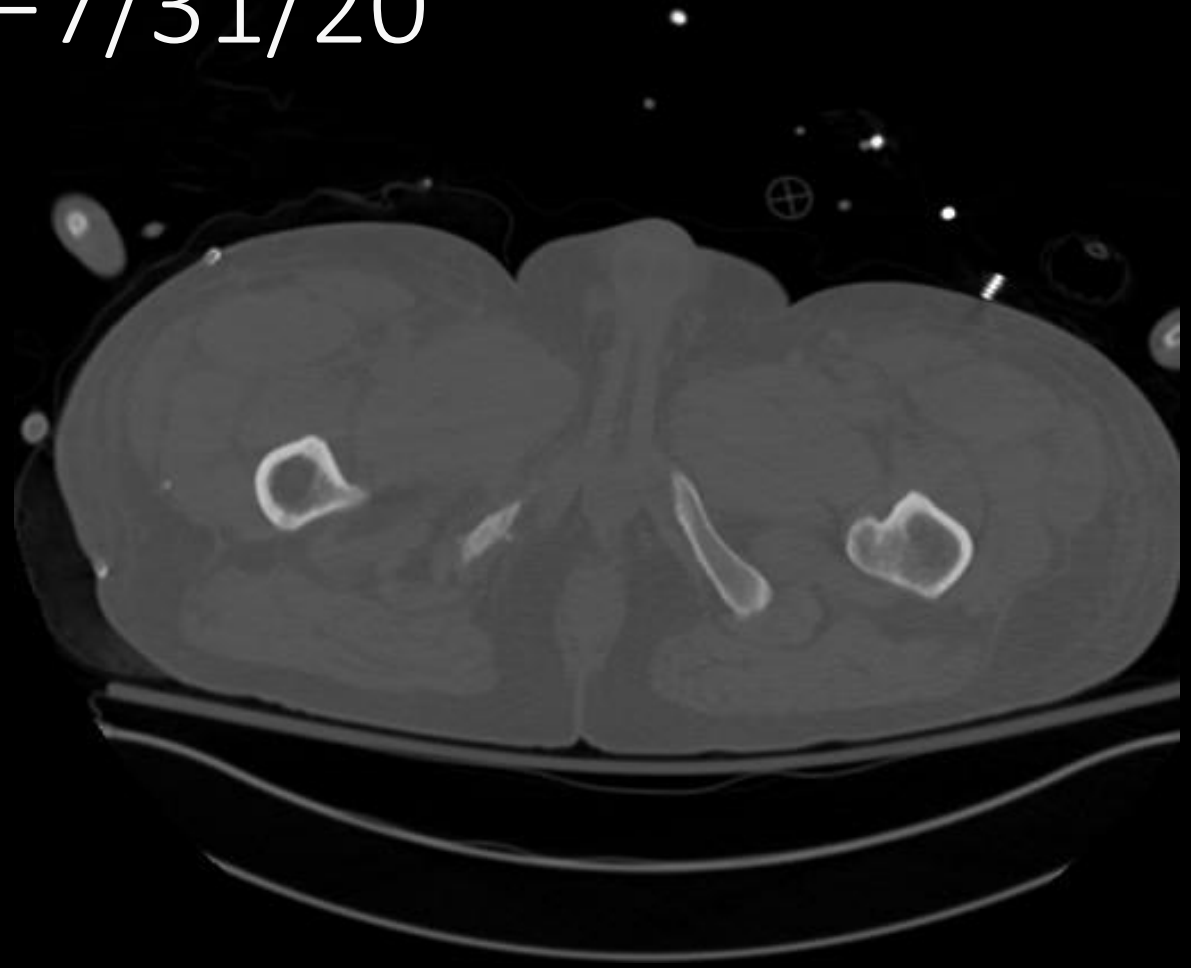
Coronal Pelvic CT w/o IV contrast s/p Femoral Head ORIF—7/29/20

Sagittal Pelvic CT w/o IV contrast s/p Femoral Head ORIF— 7/29/20

Pelvis AP DX s/p Acetabulum ORIF— 7/31/20



Axial Pelvic CT wo IV contrast s/p Acetabulum ORIF—7/31/20



Coronal Pelvic CT wo IV contrast s/p Acetabulum ORIF—7/31/20

Sagittal Pelvic CT w/o IV contrast s/p Acetabulum ORIF—7/31/20

Treatment Outcomes

- In one review, 88% of femoral head fractures treated by ORIF united without complication at 6 month follow up
- At 12 month follow up, 10% converted to hemi- or total arthroplasty
- All Pipkin III fractures with greater than 6 months to follow up failed or proceeded to AVN.
  - Not amenable to successful surgical fixation
- Nonbridging heterotopic ossification is common following operative intervention

Take Home Points

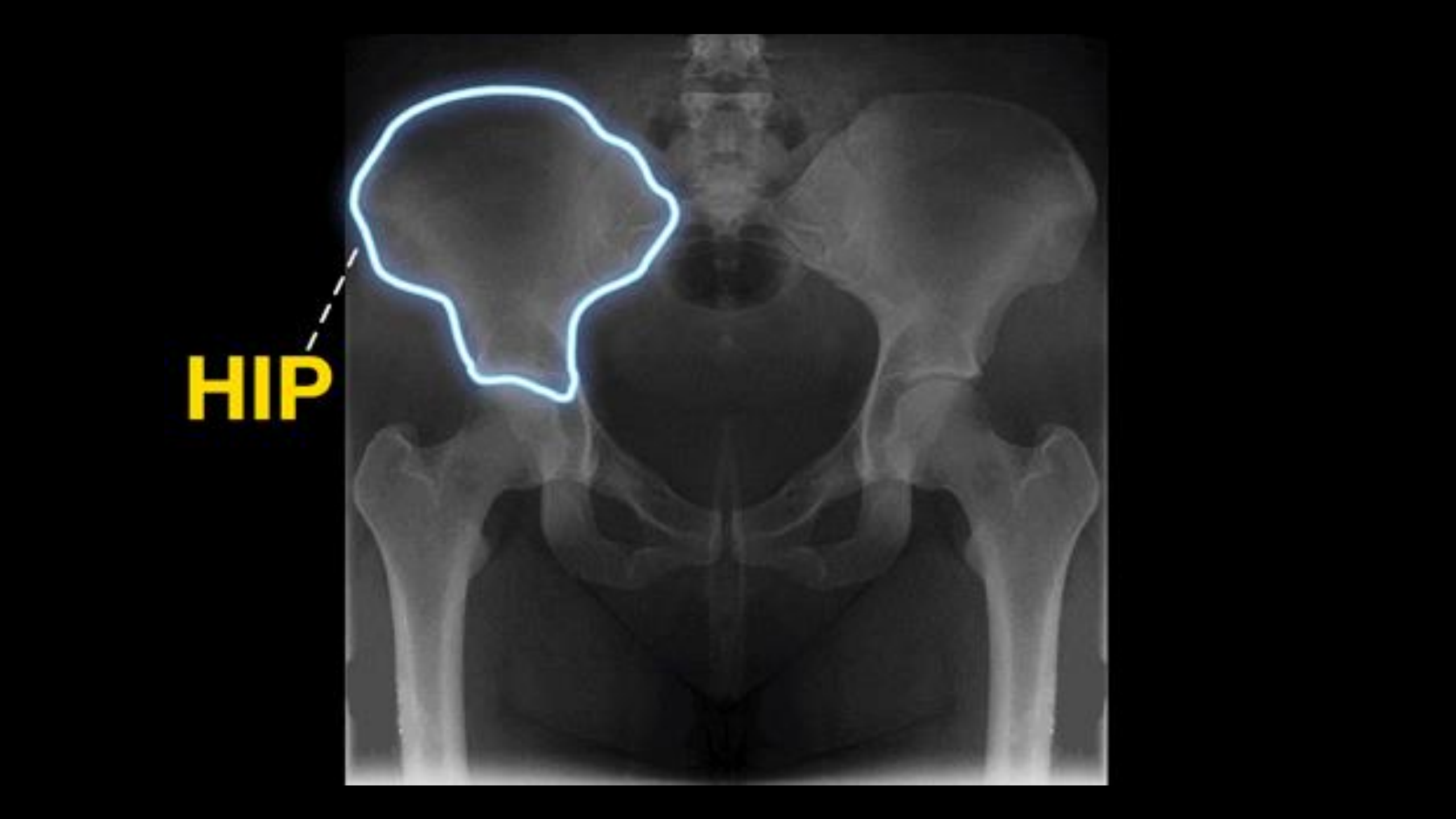
Final Diagnosis: Pipkin IV fracture of the right femoral head and posterior acetabulum

- Acetabular and femoral head fractures are uncommon and are usually a result of high impact trauma or insufficiency fracture
- Urgent reduction and surgical intervention are necessary to avoid union failure or avascular necrosis
- Radiographs are the initial test of imaging modality of choice for suspected hip fracture and are usually sufficient to make the diagnosis and plan treatment
- Fractures of the hip are classified by descriptions of their location, displacement or stability—all of which impact treatment

References

- Memorial Hermann Price Estimate Calculator: https://www.memorialhermann.org/patients-caregivers/pricing-estimates-and-information/
- ACR Appropriateness Criteria: https://acsearch.acr.org/docs/3082587/Narrative/
- Case courtesy of Dr Benoudina Samir, Radiopaedia.org, rID: 42261
- Case courtesy of Dr Francis Deng, Radiopaedia.org, rID: 73218
- Mandell, Jacob & Marshall, Richard & Weaver, Michael & Harris, Mitchel & Sodickson, Aaron & Khurana, Bharti. (2017). Traumatic Hip Dislocation: What the Orthopedic Surgeon Wants to Know. RadioGraphics. 37. 2181-2201. 10.1148/rg.2017170012.
- e-Anatomy: “Micheau A, Hoa D, e-Anatomy Atlas, www.imaios.com, DOI: 10.37019/e-anatomy”.
- J Orthop Traumatol (2017) 18:235–241 DOI 10.1007/s10195-017-0445-z


Questions?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