

Clinical Seminar IV

**Pelvis and Hip
Image Critique & Pathologies**

MI Program
2021

1

Pathologies
- Hip -

2

Developmental Dysplasia of the Hip (Congenital Hip Dysplasia)

Incomplete acetabulum formation

Cause: idiopathic, hereditary

Complications: Delay in walking

Radiographic appearance: Frog – hip; dislocated superiorly and posteriorly

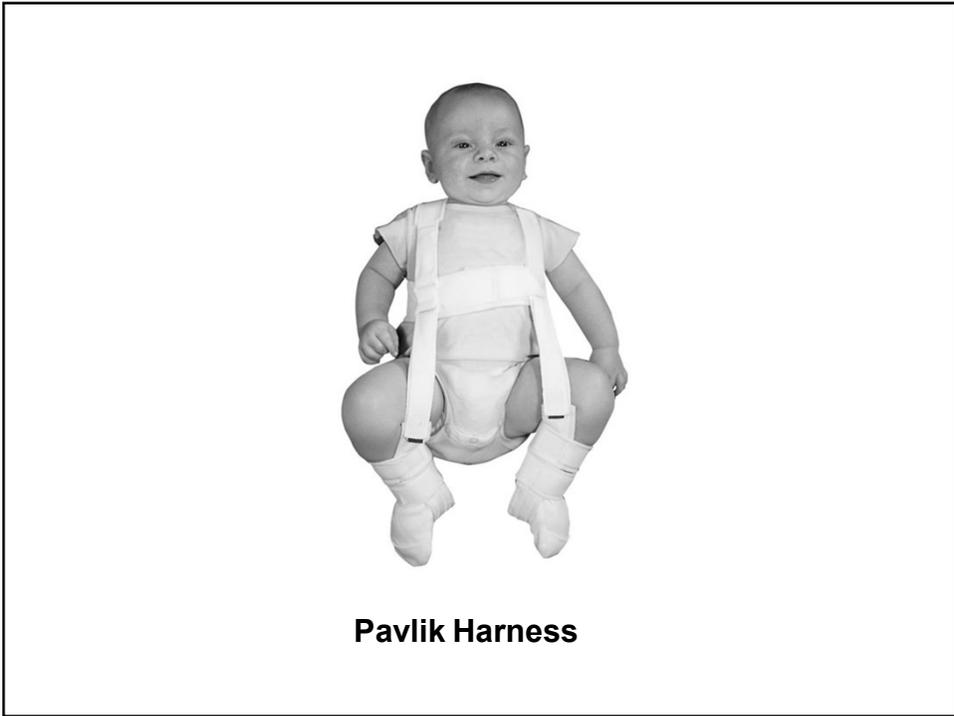
Technical: Neither additive or destructive/ no technical factor changes.
Pediatric technique with a free detector is best for lowering patient dose

Prognosis: Untreated hip dysplasia can lead to impaired joint mobility, chronic pain and early hip osteoarthritis.

3

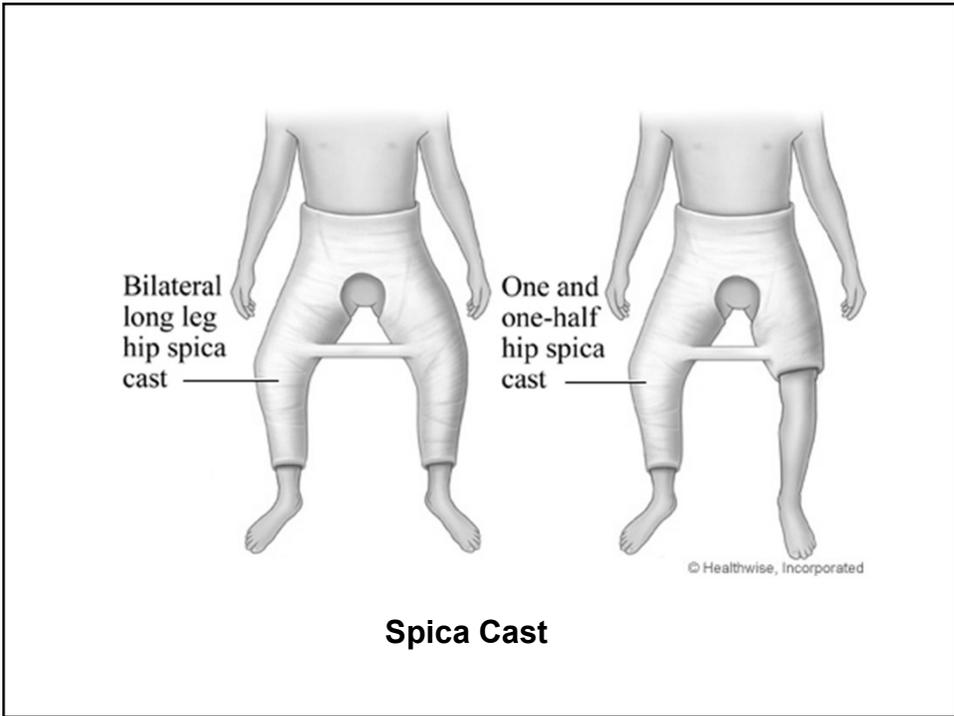


4



Pavlik Harness

5



Spica Cast

6

Legg-Calvé-Perthes disease

Interruption in blood supply to femoral head
(ischemic necrosis)

Cause: idiopathic; occurs predominantly in 5-10 yr old boys

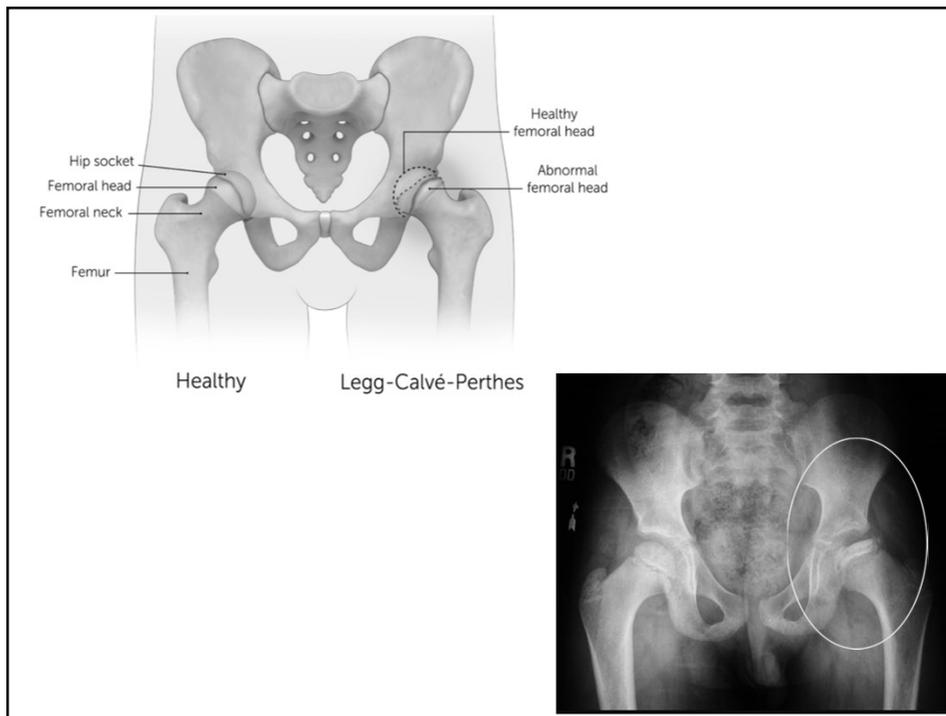
Complications: The head of the femur collapses causing inflammation, pain and limping

Radiographic appearance: Flattened femoral head

Technical: Destructive, but no technical factor change needed. A pediatric technique with a free detector is best for lowering patient dose

Prognosis: Eventually the body replaces the dead bone cells and reshapes the femoral head, however can lead to deformation of the hip joint and risk of arthritis

7



8



9

Slipped Capital Femoral Epiphysis (SCFE)

Femoral head slides posteriorly off the neck

Cause: Idiopathic during time of rapid bone growth typically in preteen or teens; More common in boys than girls

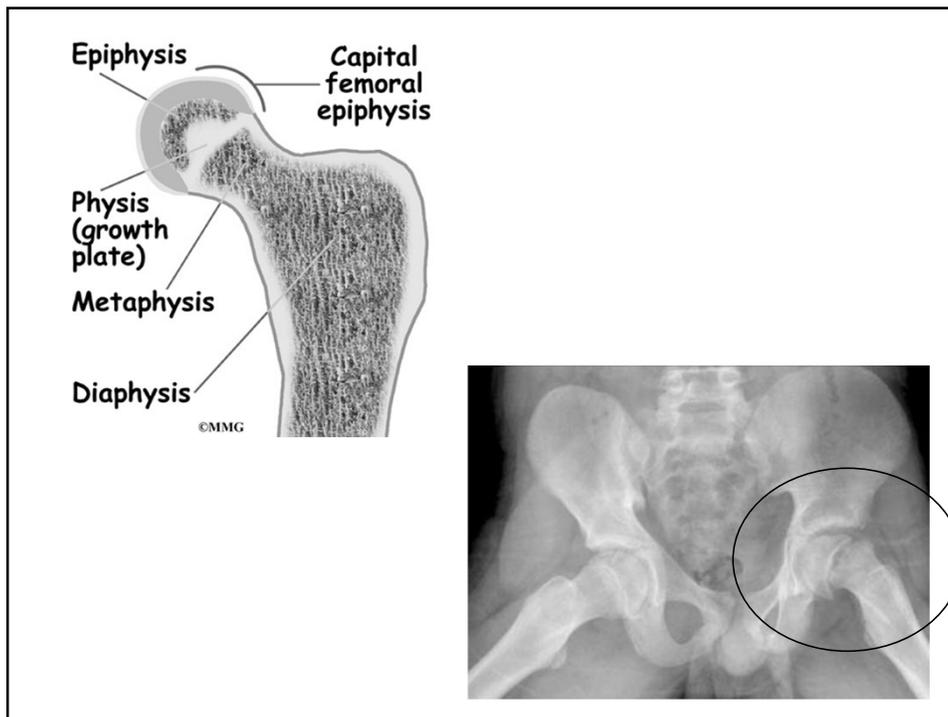
Complications: Pain and hip instability; can continue to slip if not surgically corrected

Radiographic appearance: Epiphysis appears shorter and epiphyseal plate wider

Technical: Neither additive or destructive, no technical factor change. A pediatric technique with a free detector is best for lowering patient dose

Prognosis: Surgery is required to stabilize the femoral head; if left untreated can lead to instability, leg length discrepancies and arthritis

10



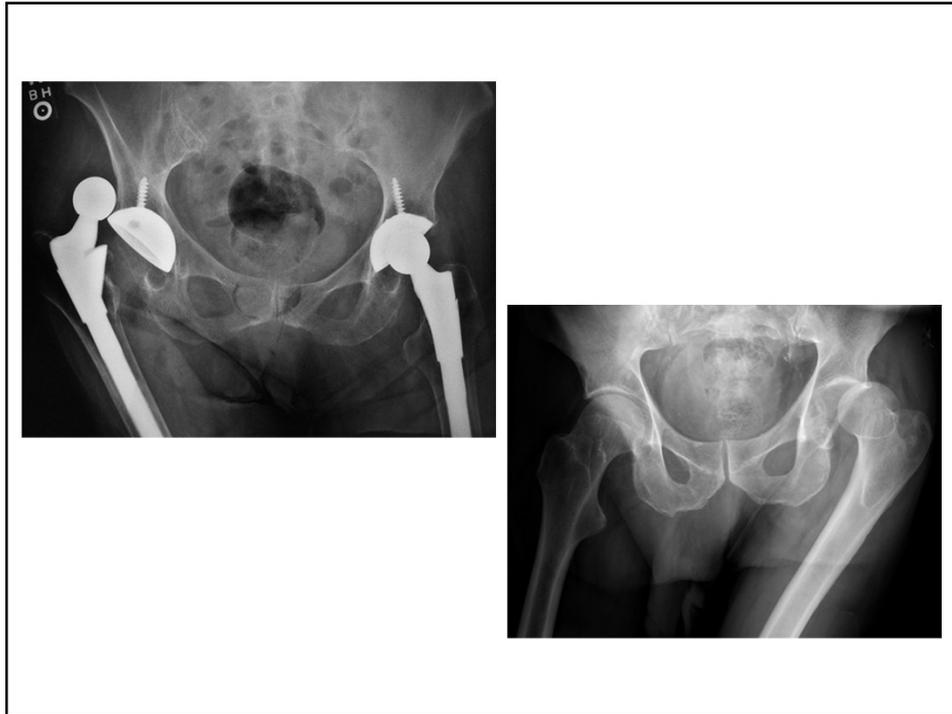
11

Hip Dislocation

The displacement of femoral head from acetabulum

- **Cause:** Trauma, congenital hip dysplasia
- **Complications:** Tearing of the muscles, ligaments and tendons; Nerve or blood vessel damage around joint; arthritis development
- **Radiographic appearance:** Bone displaced from normal location
- **Technical:** Neither additive or destructive, no technical factor change. May need to modify procedure to get view, based on patient's limited mobility.
- **Prognosis:** Depends upon severity of the dislocation. Typically, traumatic, or first-time dislocations without major damage to support structures or joint surfaces should return to normal in about 6 weeks. Complications (as listed above), surgery, and/or noncompliance with treatment will delay recovery, sometimes for months.

12



13

Proximal Femur Fracture

A break in the proximal femur bone affecting hip joint stability

Cause: Trauma, pathology

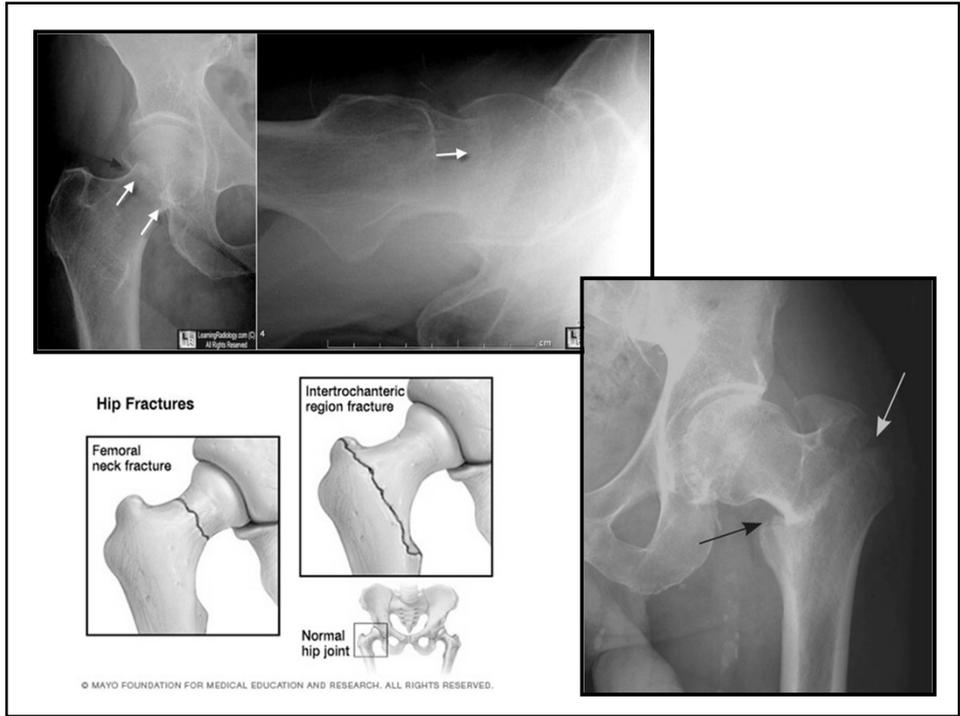
Complications: Prolonged immobilization can lead to blood clots, bedsores, UTIs, pneumonia and further loss of muscle mass

Radiographic appearance: A fracture line at either the femoral neck or between trochanters (intertrochanteric) is most common

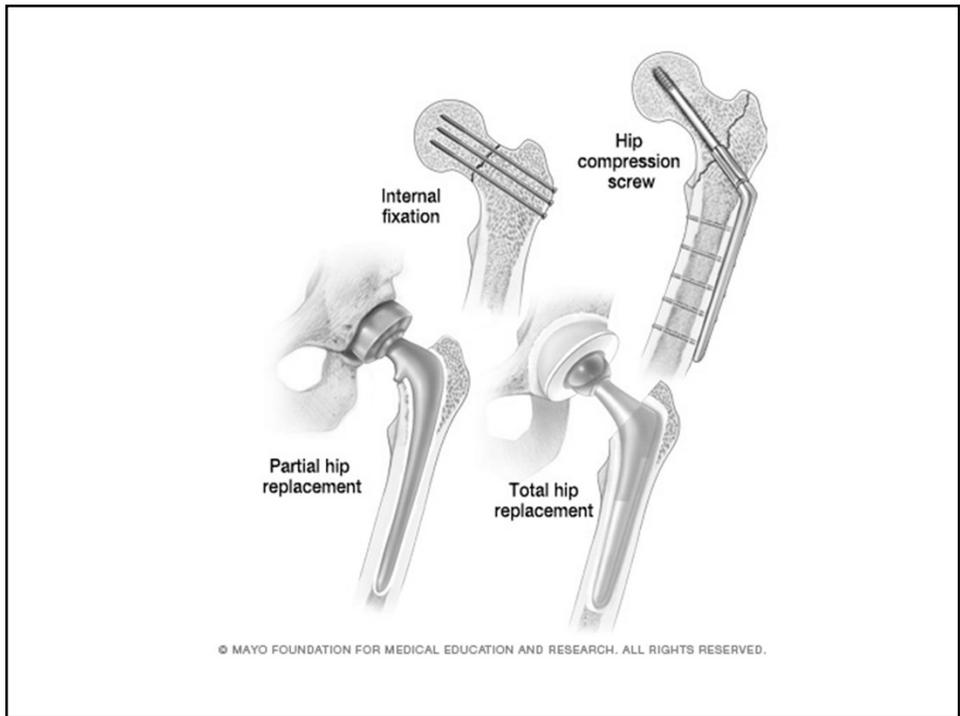
Technical: Neither additive or destructive, no technical factor change. Lateral view may require cross-table Danelius-Miller projection

Prognosis: Hip fractures are associated with significant morbidity, mortality, loss of independence, and financial burden. In usual care, the reported 1-year mortality after sustaining a hip fracture has been estimated at 20-30%

14



15



16

Pathologies - Pelvis -

17

Avulsion Fractures

Bony fragments torn from the pelvis

Cause: Forceful contraction of a tendon or ligament displaces bony fragments at the point of attachment, or force of muscles sliding over an apophyses (growth center in adolescents)

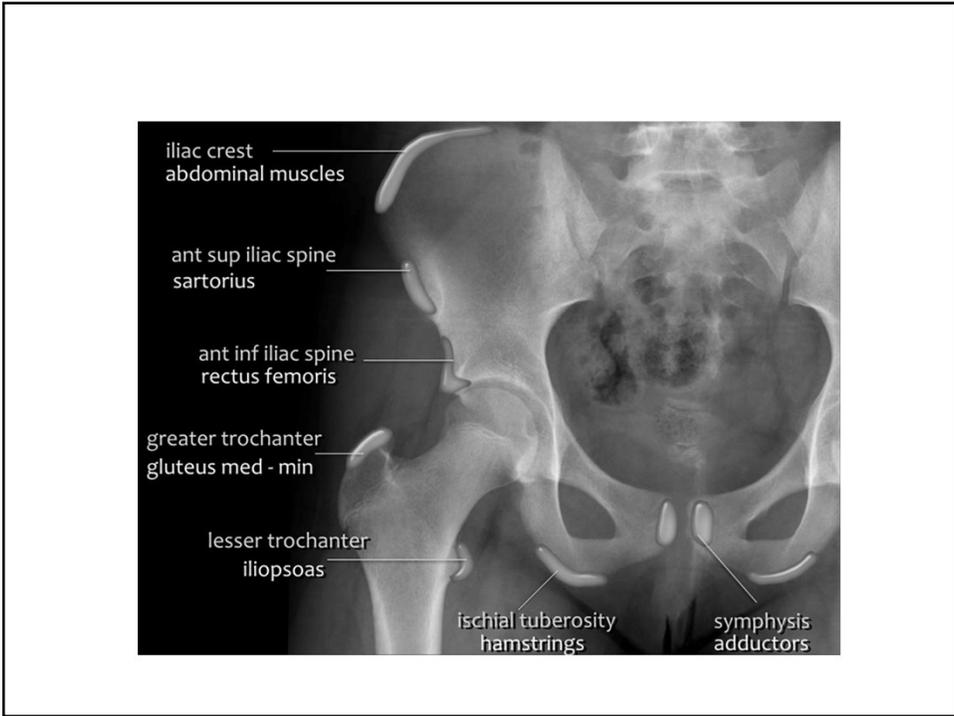
Complications: Tendon or ligament tear, Chronic pain, deformity

Radiographic appearance: Avulsed bony fragment adjacent to the parent bone

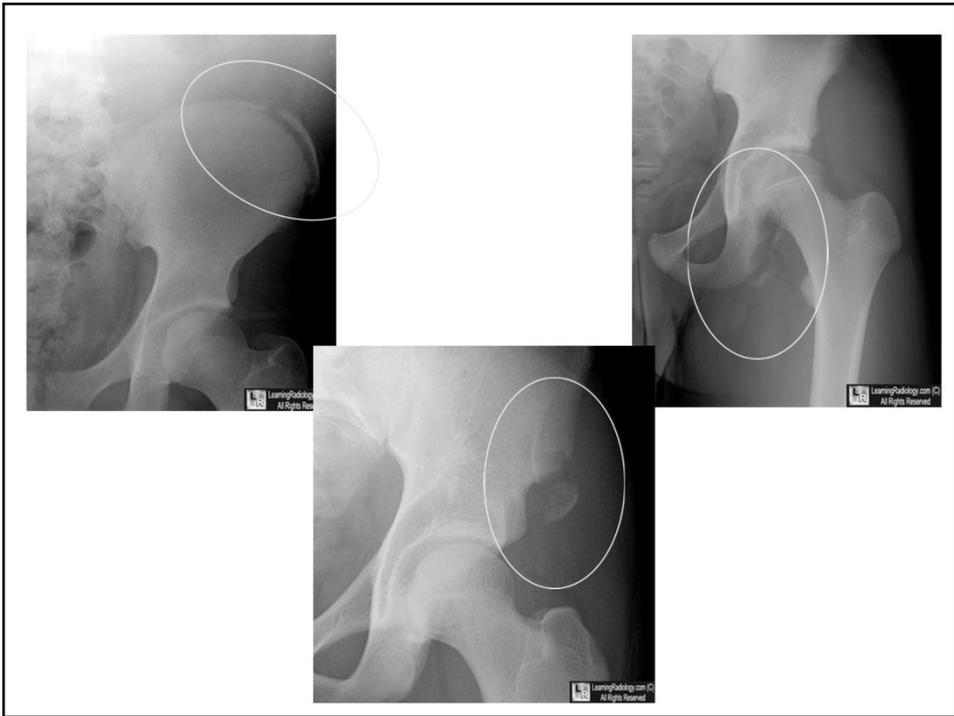
Technical: Proper technical factors are important to avoid over-penetration of bony fragments.

Prognosis: Most avulsion fractures will heal on their own with rest. Surgery may be required if there is a complete tear or a tendon or ligament or to reduce displaced fractures.

18



19



20

Pelvic Ring Fractures

Any traumatic disruption of the pelvic ring anteriorly and posteriorly in two or more places.

Cause: High-energy impact trauma include motorcycle crashes, pedestrian-vehicle crashes, motor vehicle crashes, falls from a height greater than 15 feet, and crush injuries; Low-energy trauma such as a fall in geriatric patients.

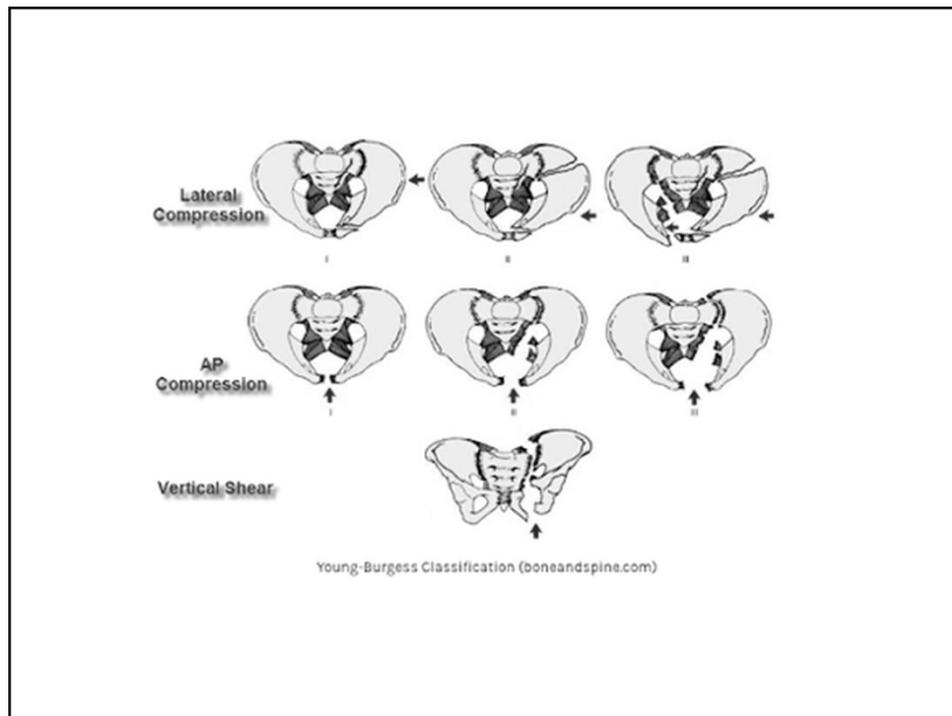
Complications: Internal hemorrhaging, nerve damage, and urethral or bowel injury with risk of sepsis

Radiographic appearance: Bilateral radiolucent lines across bones; Misalignment of SI joints, pelvic inlet

Technical: Neither additive or destructive, no technical factor change. May have to modify positioning, depending on patient's ability.

Prognosis: Depends on the severity of the fracture and any associated injury.

21



22

Open Book Pelvic Fracture

Common pelvic ring fracture caused by anterior compression force of the pelvis, causing diastasis of the symphysis pubis of more than 5 mm.

Cause: Anterior blunt force trauma

Complications: Internal hemorrhaging, posterior pelvic fractures, nerve damage, and urethral or bowel injury with risk of sepsis

Radiographic appearance: pubic symphysis opened wider (5mm or more) with increased likelihood of SI joint disruption

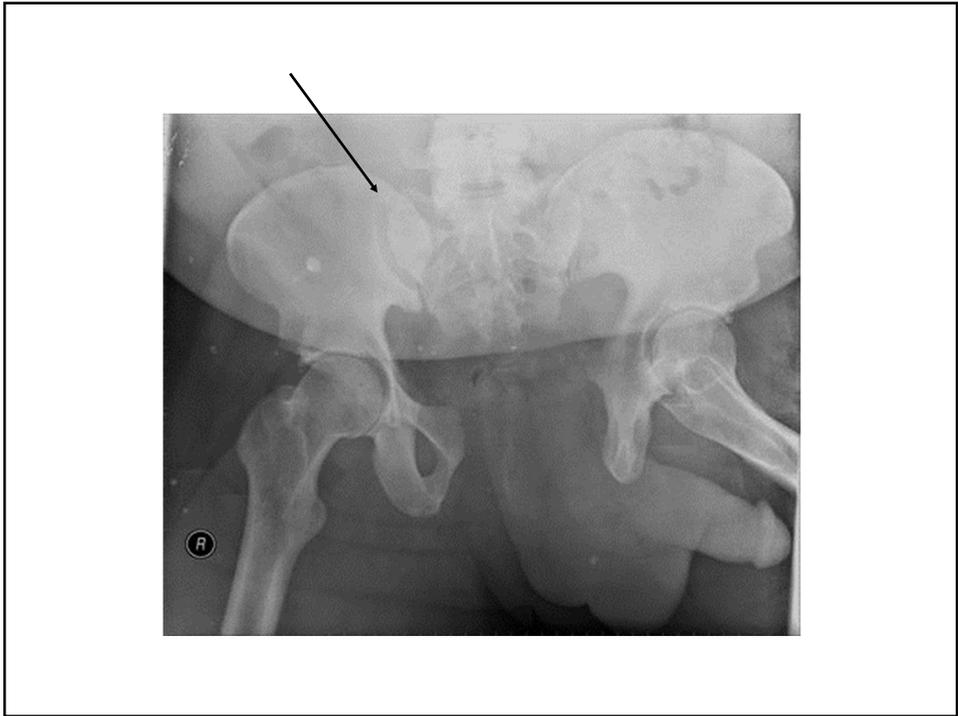
Technical: Neither additive or destructive, no technical factor change. May have to modify positioning, depending on patient's ability.

Prognosis: Depends on the severity of the fracture and any associated injury. Of all pelvic fractures, open-book injuries have the highest risk of death or disability.

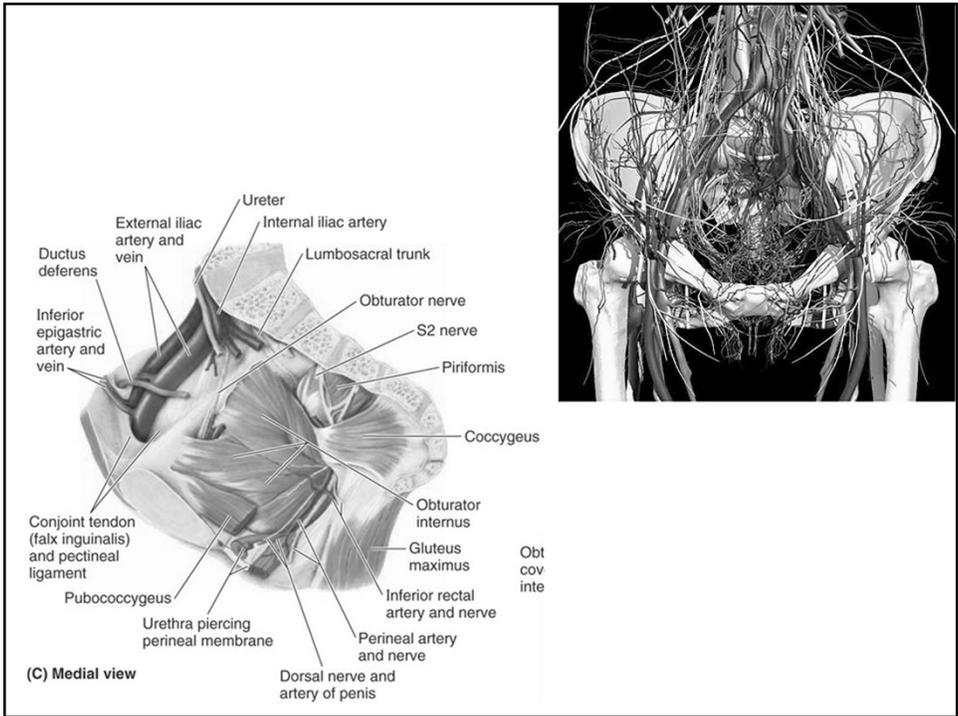
23



24



25



26

T - Pod



27



28

Acetabulum Fracture

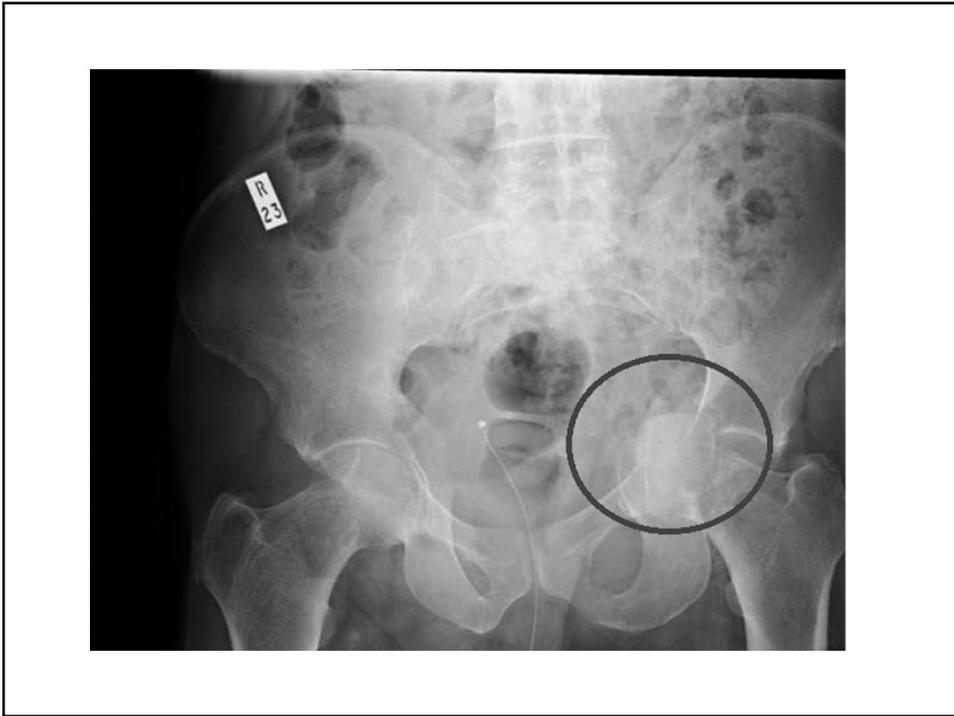
Fracture of the acetabulum

- **Cause:** High-energy trauma (MVC) or a minor injury coupled with osteoporosis in older adults
- **Complications:** DVT, pulmonary embolism, muscle complications (inactivity), avascular necrosis of the head of the femur
- **Radiographic appearance:** fracture, usually fragmented, through acetabulum, possible dislocation of the femur
- **Technical:** Neither additive or destructive, no technical factor change. May need to modify the positioning of patient due to limited mobility..
- **Prognosis:** Surgery most often needed for high-energy trauma patients to remove bone debris from the joint and reset the cartilage on the acetabular surface. Elderly patients may avoid surgery if the joint is still relatively stable.

29



30



31



32

Image Critique

33

*****How to repeat pelvis if anatomy is clipped*****

Initial image (clipped rt. trochanter)



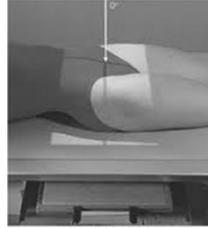
Repeat of the pelvis for clipped anatomy-
to include midline



34

AP

- Entire pelvis along with the proximal femora
- Both ilia and both greater trochanters should be equidistant to the edge of the radiograph.
- Lower vertebral column should be centered to the middle of the radiograph.
- No rotation
 - Both ilia symmetric in shape
 - Symmetric obturator foramina
 - Ischial spines equally seen
 - Sacrum and coccyx aligned with pubic symphysis
- Proper rotation of proximal femur
 - Femoral necks in their full extent without superimposition
 - Greater trochanters in profile
 - Lesser trochanters, if seen, visible on the medial border of the femora
- RH - Any orthopedic appliance should be demonstrated in its entirety



***Narrowed obturator foramina indicate rotation in that direction.**

35

1

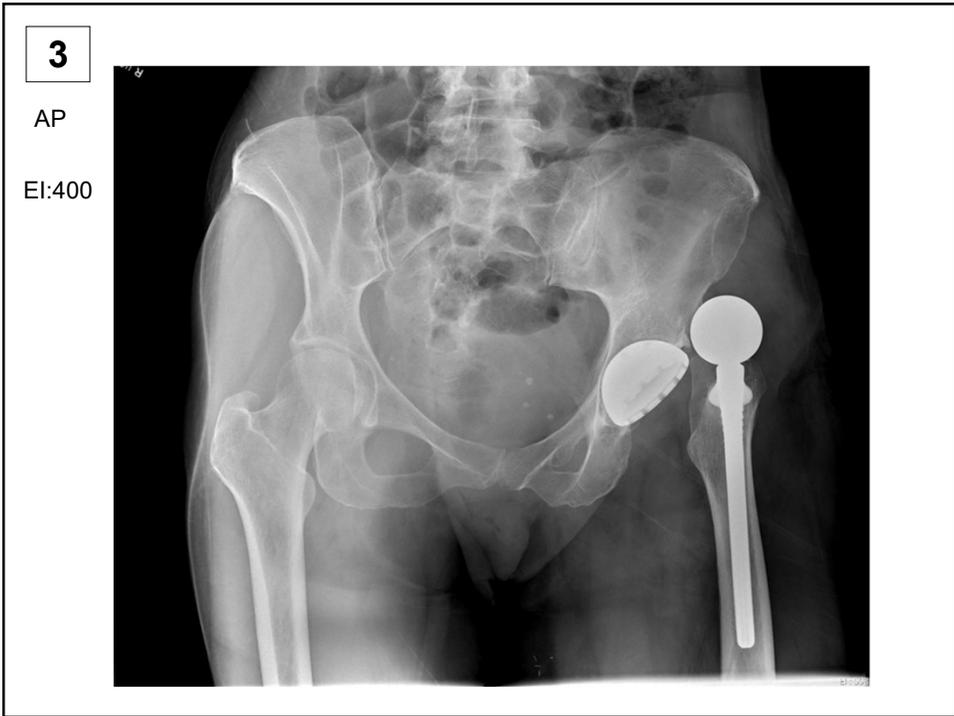
AP



36



37



38

Frog Pelvis (Modified Cleaves)

- No rotation of the pelvis, as evidenced by a symmetrical appearance.
- Acetabulum, femoral head and femoral neck
- Lesser trochanter on the medial side of the femur.
- Femoral neck without superimposition by the greater trochanter; excess abduction causes the greater trochanter to obstruct the neck.
- Femoral axes extended from the hip bones at equal angles.



Copyright © 2003, Mosby, Inc. All Rights Reserved.



39

4

Frog

EI:630



40



41

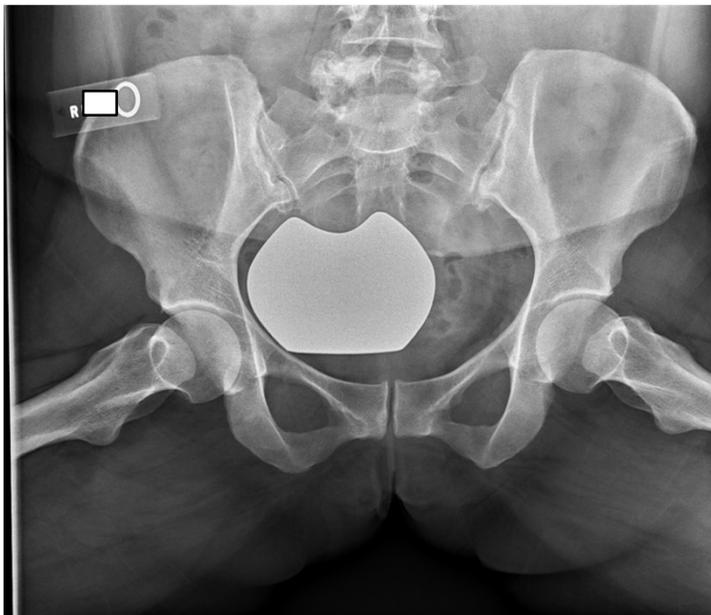


42

7

Frog

EI:800



43

8

Frog

EI:800



44

AP Obliques (Judet method)

- Entire pelvis up to and including the lesser trochanters visualized on both sides.
- The broad surface of the iliac wing closest to the IR should be demonstrated without rotation.
- The acetabulum closest to the IR should be seen in profile.
- The hip joints, proximal femur and sacroiliac joint should be clearly demonstrated.

*Merrill's: The ilioischial column and anterior acetabula rim visualized on side down hip. The iliopubic column and posterior acetabula rim visualized on elevated hip.



45

9

OBL

EI:400



46

10

OBL

EI:400



47

11

OBL

EI:400



48

12

OBL

EI:200



49

13

OBL

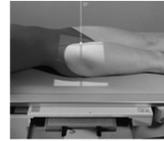
EI:400



50

AP Hip

- Regions of the ilium and pubic bones adjoining the pubic symphysis
- Hip joint
- Proximal one third of the femur
- Femoral head, penetrated and seen through the acetabulum.
- Entire long axis of the femoral neck should be demonstrated and not foreshortened
- Greater trochanter should be visualized in profile.
- Lesser trochanter is usually not projected beyond the medial border of the femur, or only a very small amount of the trochanter visible.
- Any orthopedic appliance should be demonstrated in its entirety
- RH - Pubic symphysis MUST be visualized on this view
- ❖ *RH – center on hip joint*
- ❖ *Merrill's states to center on femoral neck*



Copyright © 2005, Mosby, Inc. All Rights Reserved.



51

14

AP

EI:400

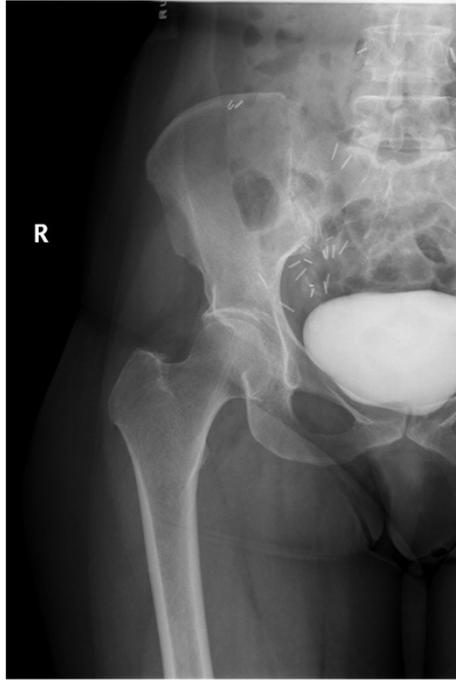


52

15

AP

EI:630



53

16

AP



54

17

AP

EI:400



55

18

AP

EI:800



56

Frog Hip -Modified Cleaves (unilateral)

- No rotation of the pelvis
- Acetabulum, femoral head, and femoral neck
- Lesser trochanter on the medial side of the femur
- Femoral neck without superimposition by the greater trochanter; excessive abduction causes the greater trochanter to obstruct the neck
- Femoral axes extended from the hip bones at equal angles
- RH – Any orthopedic appliance in its entirety
- ❖ *RH – center on hip joint*
- ❖ *Merrill's states to center on femoral neck*



57

19

Frog

EI:400



58

20

Frog

EI:400



59

21

Frog

EI:400



60

22

Frog

El:400



61

23

Frog

El:280



62

24

Frog

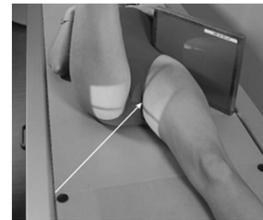
EI:400



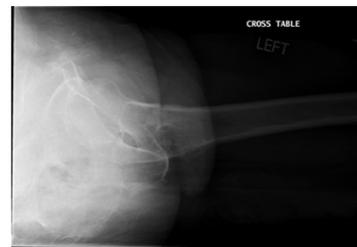
63

Trauma Hip – Axiolateral (Danelius-Miller Method)

- Hip joint with the acetabulum
- Femoral neck clearly without overlap from the greater trochanter.
- Small amount of the lesser trochanter on the posterior surface of the femur.
- Small amount of the greater trochanter on the anterior and posterior surfaces of the proximal femur when the femur is properly inverted.
- Ischial tuberosity below the femoral head and neck.
- Soft tissue shadow of the unaffected thigh not overlapping the hip joint or proximal femur
- Any orthopedic appliance demonstrated in its entirety. (exception: femur rod)



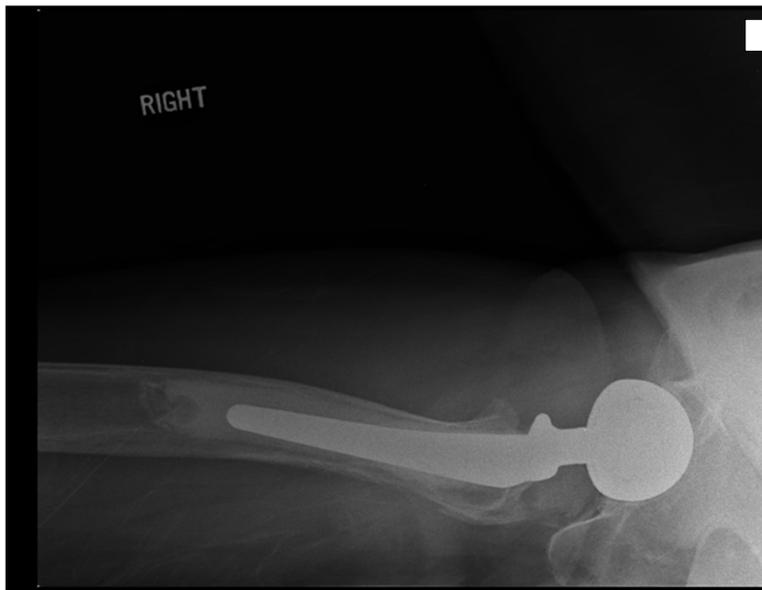
Copyright © 2003, Mosby, Inc. All Rights Reserved.



64

25

EI:800

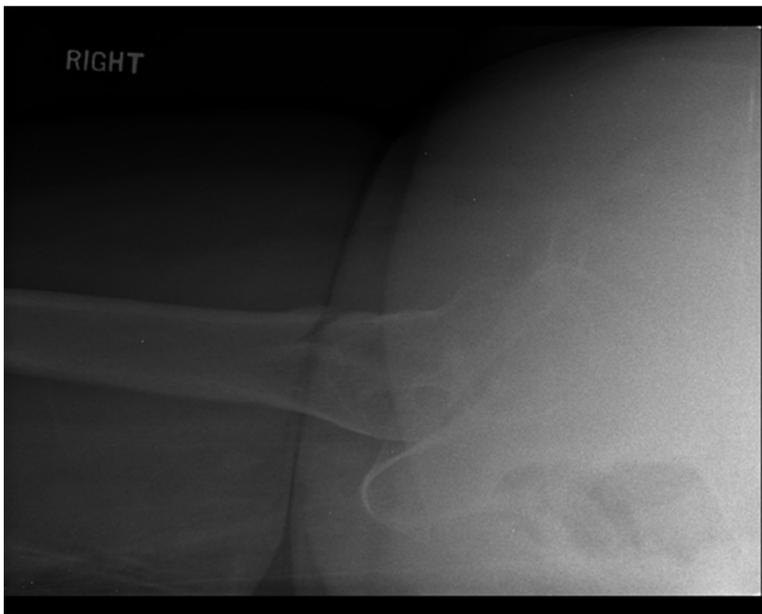


Cross-table

65

26

EI:630



Cross-table

66

27

EI:1000

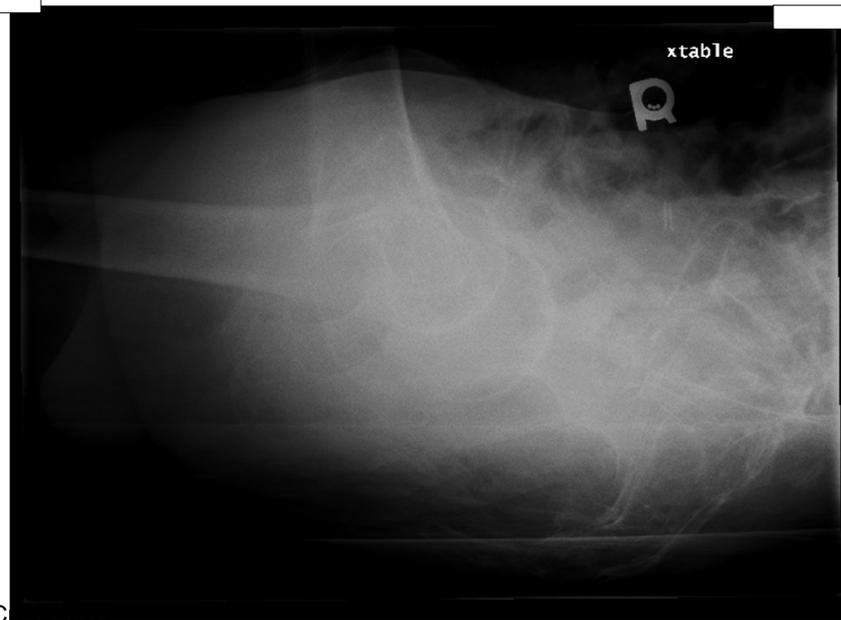


Cross-table

67

28

EI:400

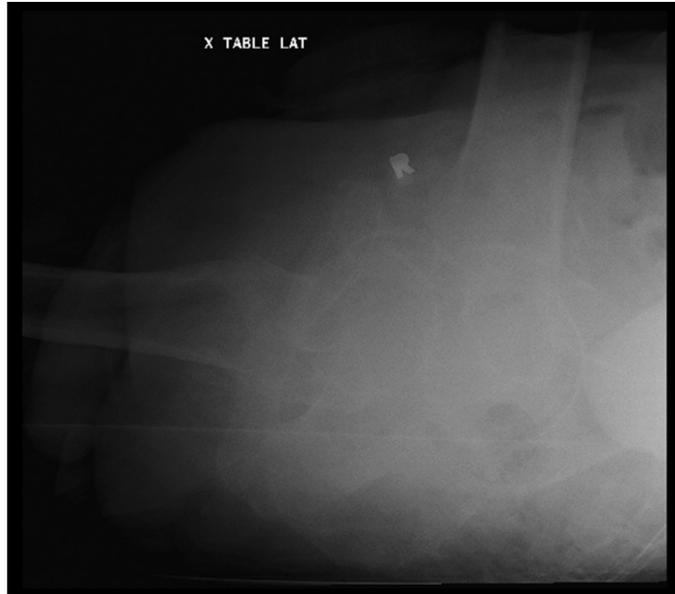


C

68

29

EI:400



Cross-table

69

30

EI:800



70