

Imaging the Musculoskeletal System

(Part Two)

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OBJECTIVE

Increase level of confidence in looking at different radiology images

Learn to be competent in interpreting findings

- ✓ Understanding basics of image formation and anatomical land marks
- ✓ Developing system of analyzing findings

“Where to look & What to look for”

- ✓ Recognizing imaging features axial spondyloarthritis

IMPORTANT
SITES

BONE DENSITY & TEXTURE
BONE MARROW
ARTICULAR CORTICES
SOFT TISSUE

OUTLINES

- ✓ Introduce Imaging approach to skeletal trauma and Identify important findings including sequelae and complications
- ✓ Introduce Imaging approach to skeletal inflammatory process “arthritis” and Identify important findings including sequelae and complications

IMAGING OF MUSCULOSKELETAL SYSTEM PATHOLOGY

CONGENITAL

ARTHRITIS

METABOLIC

NEOPLASTIC

TRAUMA

TRAUMA

INFECTIOUS

HEMATOLOGICAL

IMAGING OF MUSCULOSKELETAL TRAUMA

TERMINOLOGY IN BONE TRAUMA

FRACTURES

Describe Fracture Location

Diaphyseal
Metaphyseal
Peri-articular / Intra-articular

Describe Fracture Alignment

Displaced / Non-displaced
Depressed
Angulated

Describe Fracture Severity

Simple
Comminute / Segmented

Dislocation vs. Subluxation

Open vs. Closed

Green stick & Torus fractures

Physeal injuries

Stress fractures

Pathological fractures

IMAGING OF MUSCULOSKELETAL TRAUMA

IMPORTANT CONCEPTS IN IMAGING BONE TRAUMA

- ✓ Two perpendicular views.
- ✓ Radiograph should include the joint nearest to the trauma.
- ✓ The paired bone concept.
- ✓ The weakest link concept (Adult vs. Children).
- ✓ Comparison films.

IMAGING OF MUSCULOSKELETAL TRAUMA

THE WEAKEST LINK

- ✓ The soft tissue structures (muscles / ligaments / tendons) in **Adults**
- ✓ The physeal plate (growth plate) in **Children**

IMAGING OF MUSCULOSKELETAL TRAUMA

- ✓ Two perpendicular views.



IMAGING OF MUSCULOSKELETAL TRAUMA

- ✓ Two perpendicular views.

A 6 YO BOY WITH TRAUMA



IMAGING OF MUSCULOSKELETAL TRAUMA

- ✓ Two perpendicular views.



IMAGING OF MUSCULOSKELETAL TRAUMA

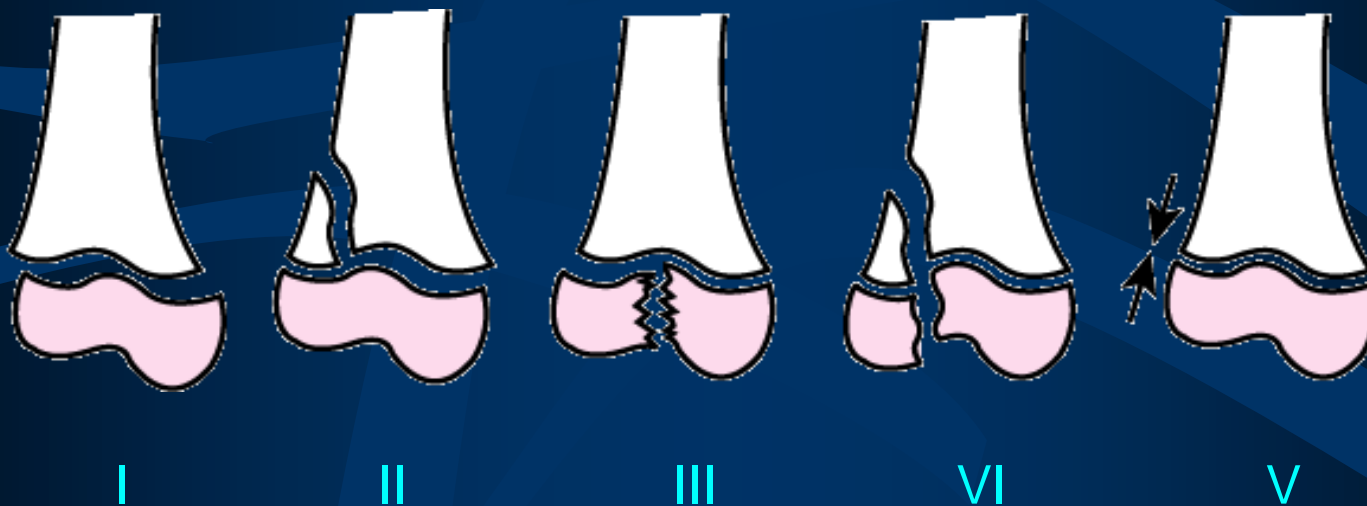
✓ Two perpendicular views.



IMAGING OF MUSCULOSKELETAL TRAUMA

- ✓ Physeal plate (growth plate) Injury.

Weakest Link Point (CHILD)



IMAGING OF MUSCULOSKELETAL TRAUMA

✓ Physeal plate (growth plate) Injury.

Weakest Link Point (CHILD)

Salter-Harris 1

Normal

Widened growth plate

Widened growth plate

Traumatic Osteolysis of epiphyseal plate
Salter-Harris injury Type1

IMAGING OF MUSCULOSKELETAL TRAUMA

- ✓ Physeal plate (growth plate) Injury.

Weakest Link Point (CHILD)

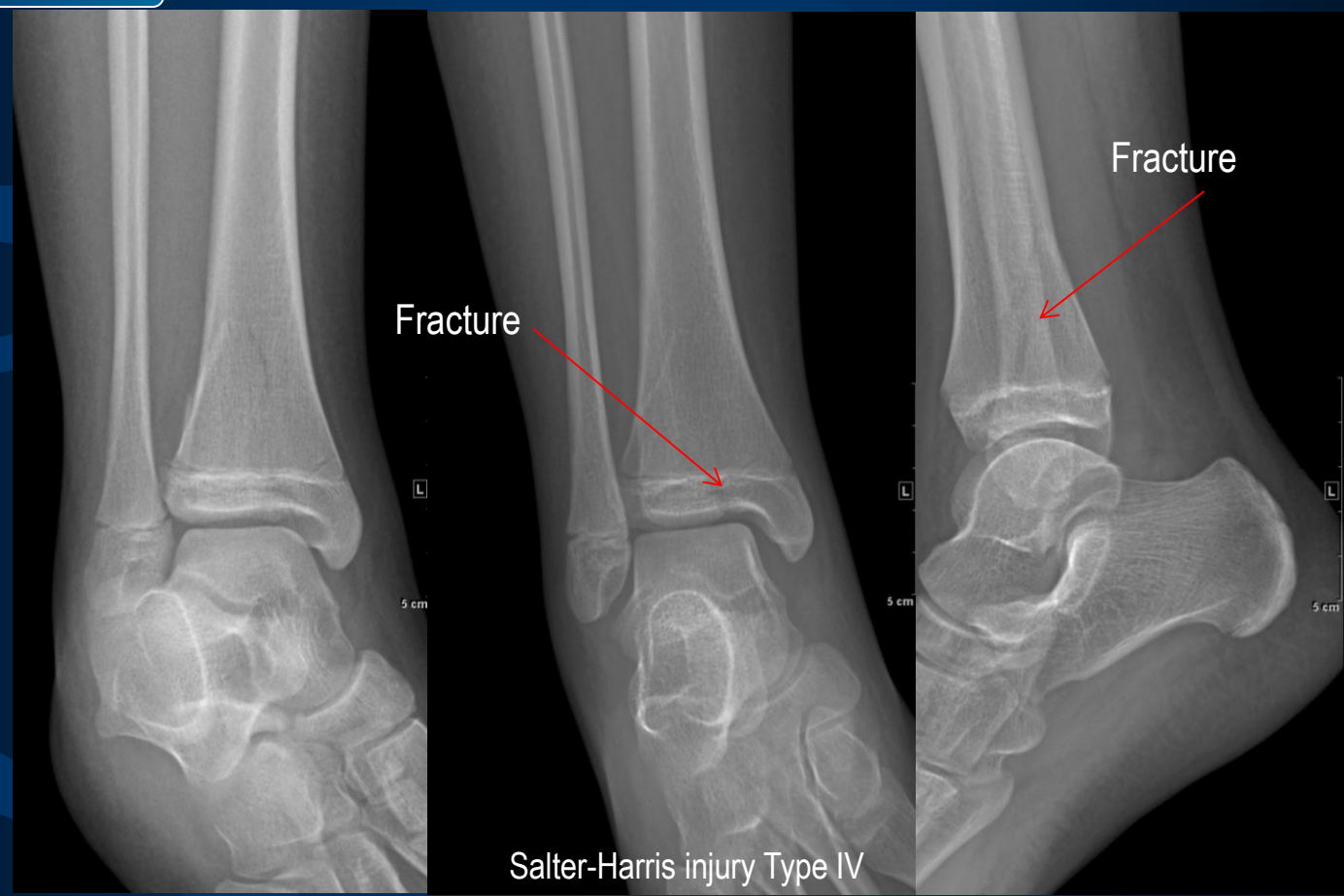
11years old boy with swelling of wrist pain



IMAGING OF MUSCULOSKELETAL TRAUMA

✓ Physeal plate (growth plate) Injury. A 12 years old girl fall down

Weakest Link Point (CHILD)



IMAGING OF MUSCULOSKELETAL TRAUMA

- ✓ Physeal plate (growth plate) Injury. A 12 years old girl fall down

Weakest Link Point (CHILD)

Computed Tomography delineate fracture more clear



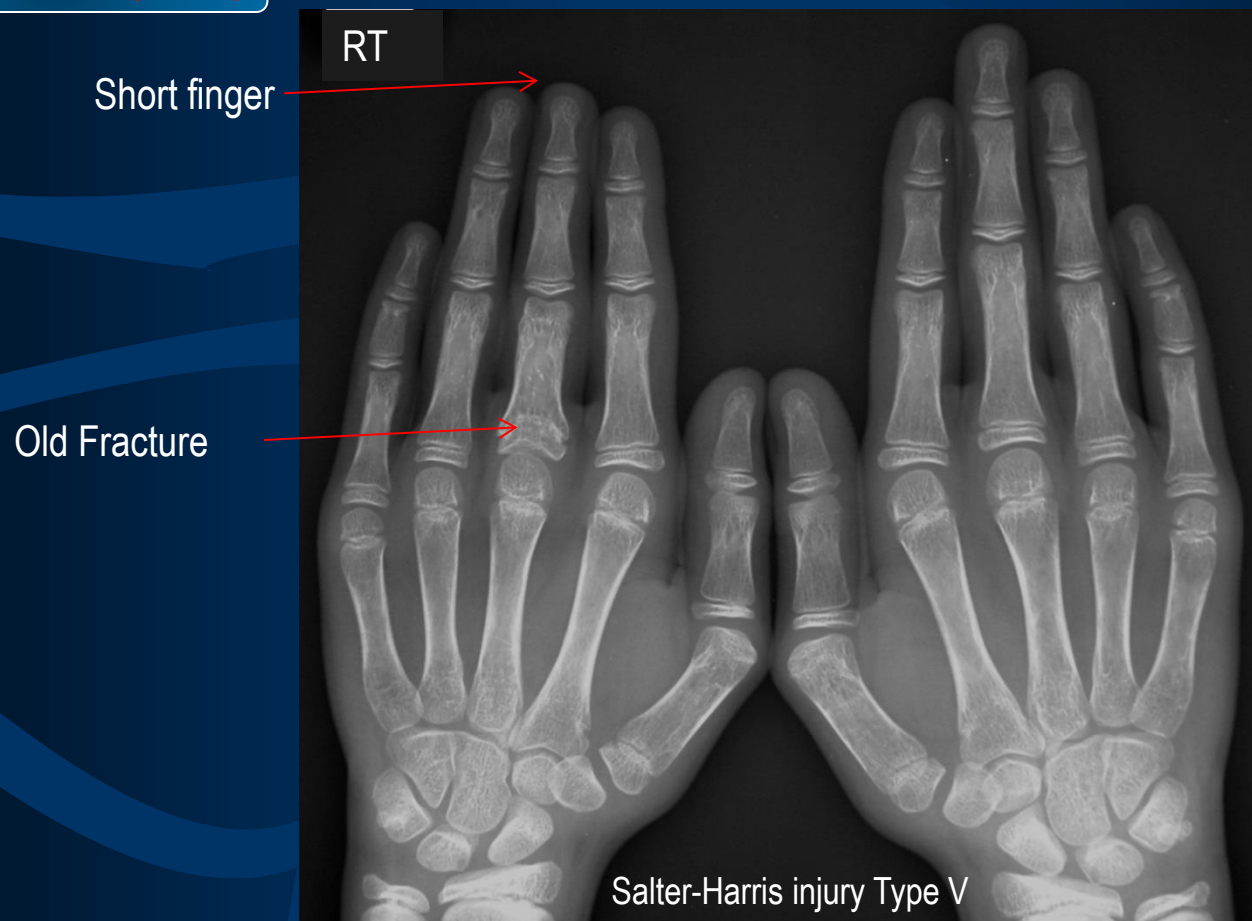
Salter-Harris injury Type IV

IMAGING OF MUSCULOSKELETAL TRAUMA

- ✓ Physeal plate (growth plate) Injury.

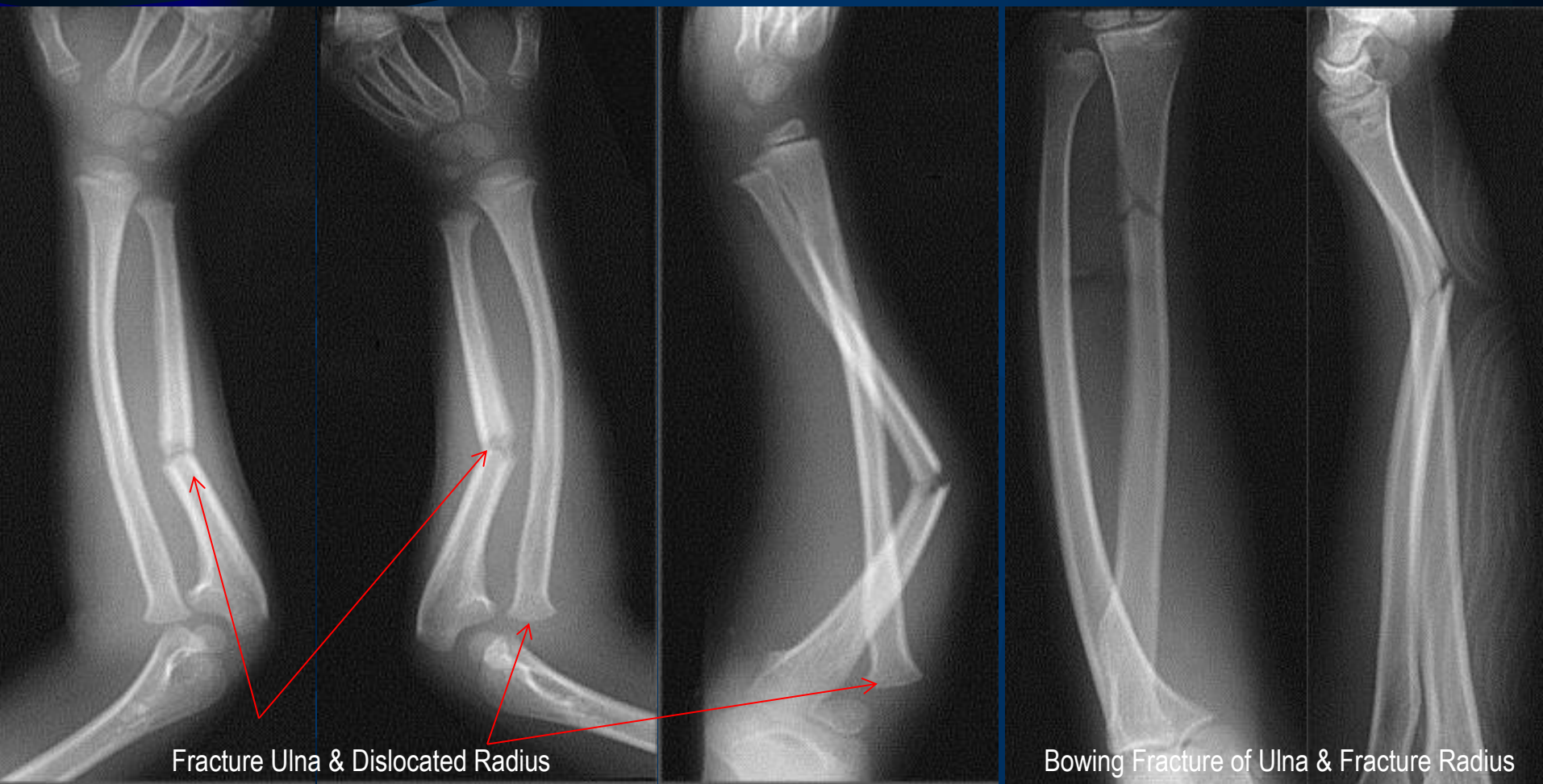
Weakest Link Point (CHILD)

A 9 years old boy with right hand pain



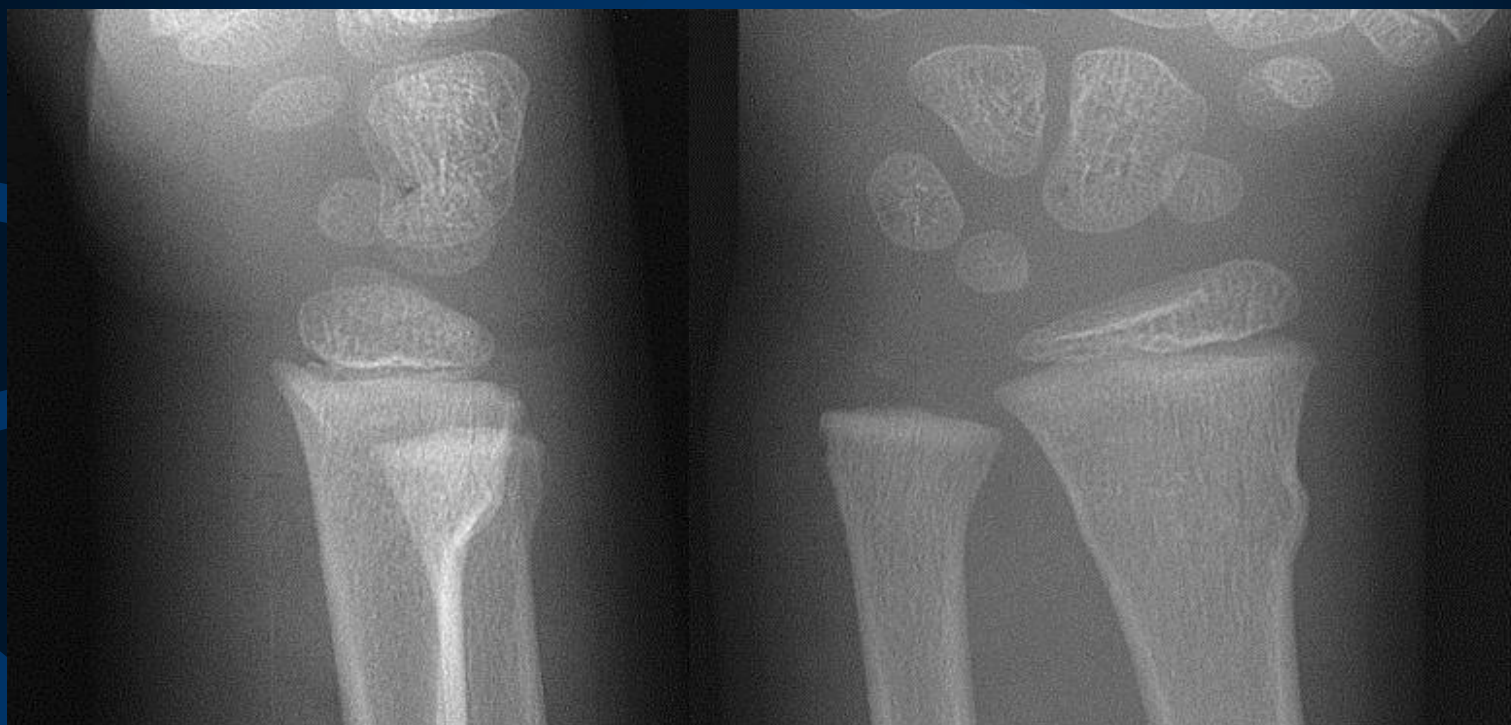
IMAGING OF MUSCULOSKELETAL TRAUMA

- ✓ Radiograph should include the joint nearest to the trauma & Paired bone concept



IMAGING OF MUSCULOSKELETAL TRAUMA

✓ Torus Fractures



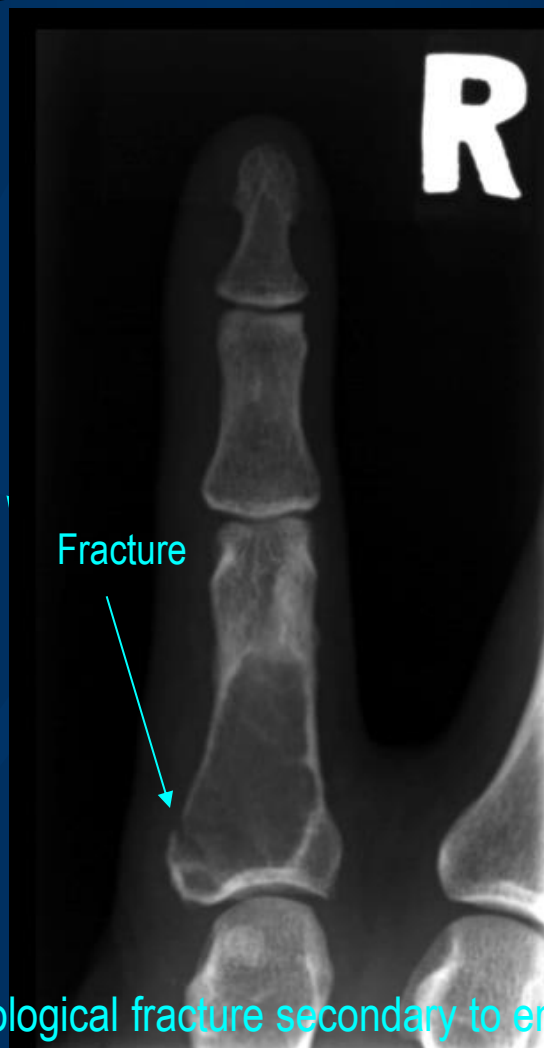
IMAGING OF MUSCULOSKELETAL TRAUMA

✓ Greenstick Fractures



IMAGING OF MUSCULOSKELETAL TRAUMA

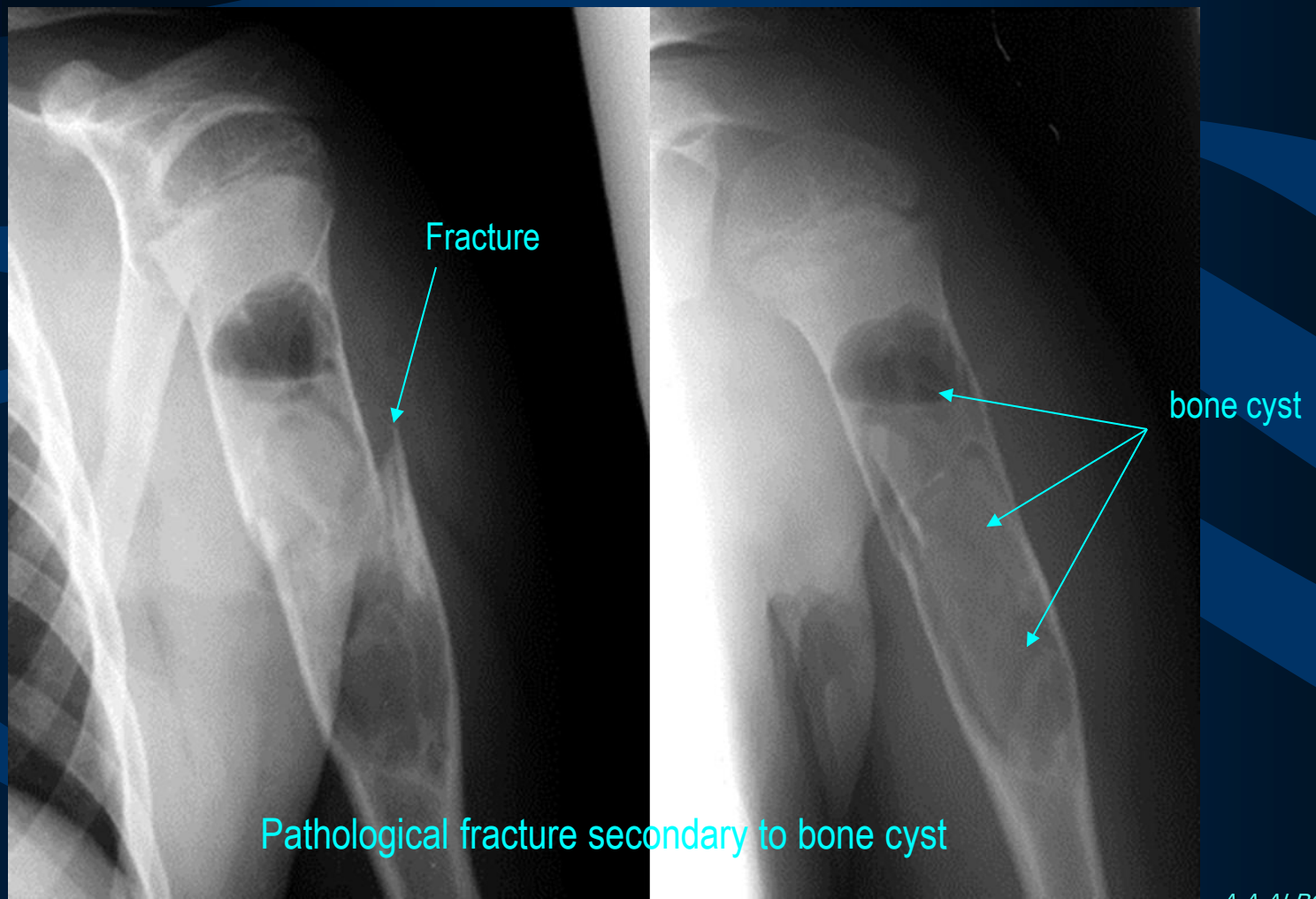
✓ Pathological Fracture



Pathological fracture secondary to enchondroma

IMAGING OF MUSCULOSKELETAL TRAUMA

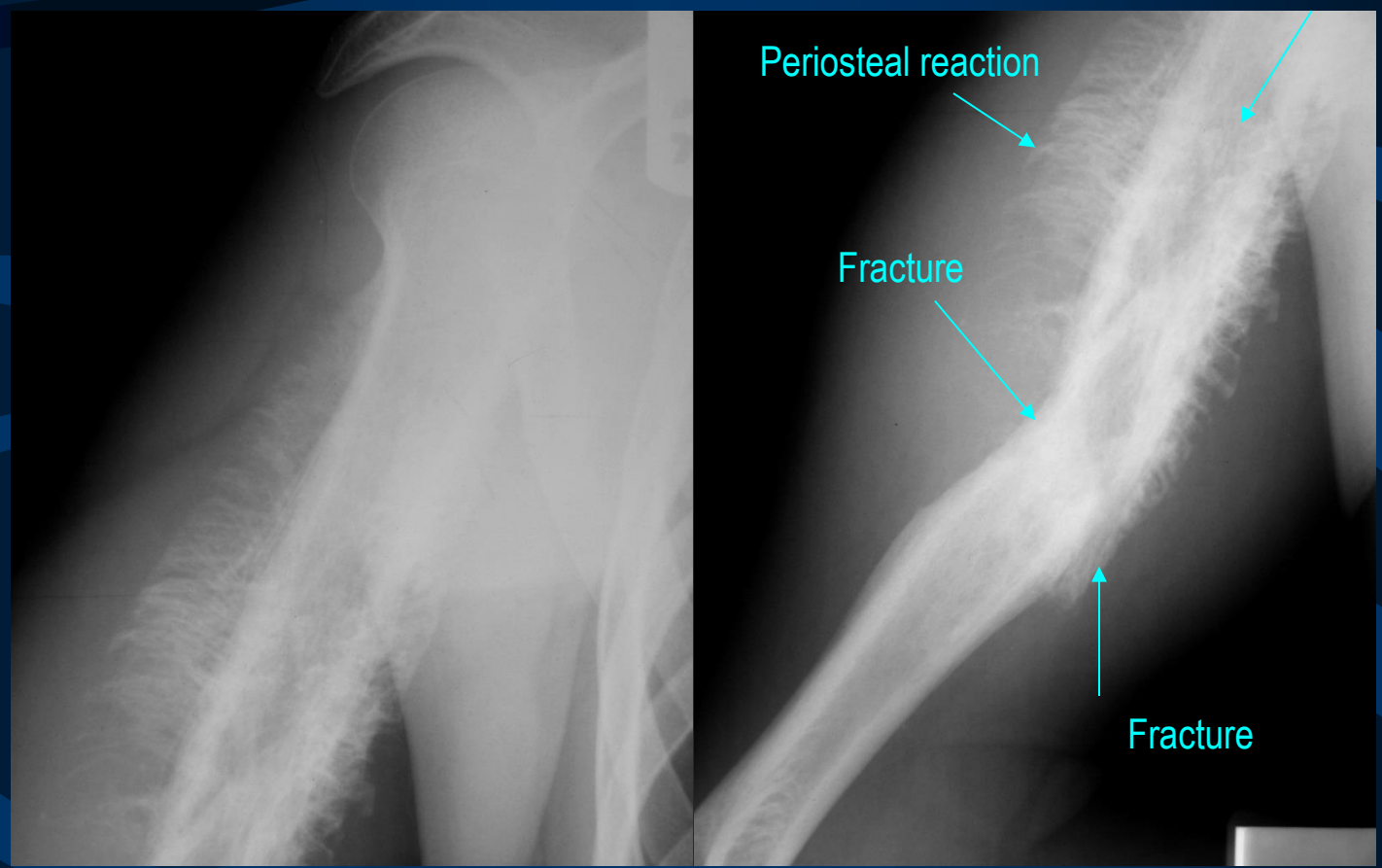
✓ Pathological Fractures



IMAGING OF MUSCULOSKELETAL TRAUMA

✓ Pathological Fractures

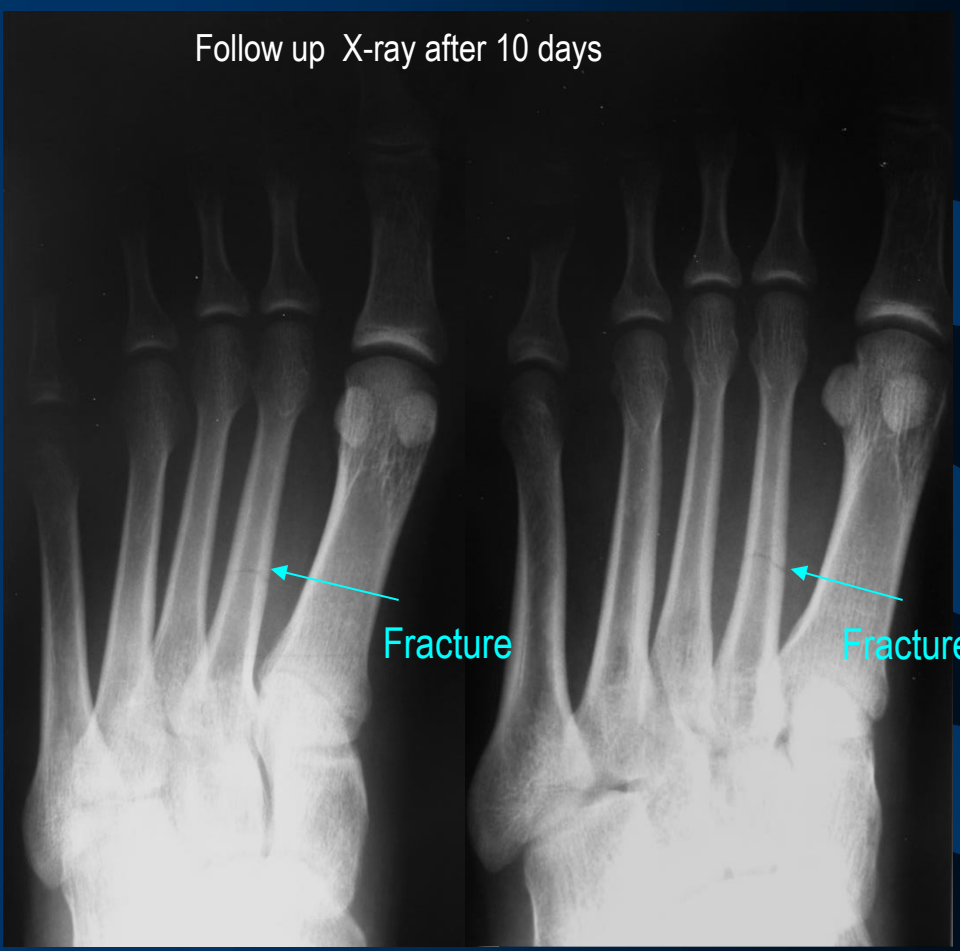
Heterogeneous bone texture



Pathological fracture secondary to osteosarcoma

IMAGING OF MUSCULOSKELETAL TRAUMA

✓ Stress Fractures



IMAGING OF MUSCULOSKELETAL TRAUMA

- ✓ Correlation with cross sectional Imaging

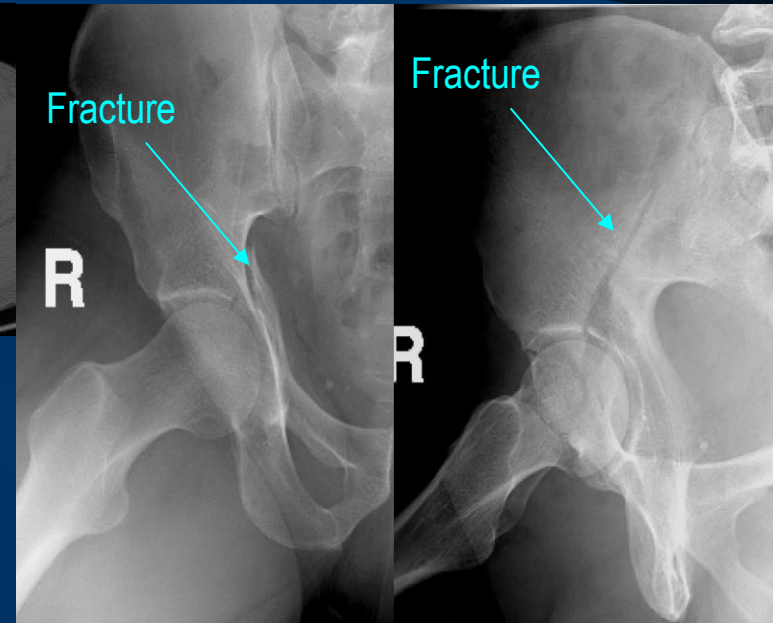
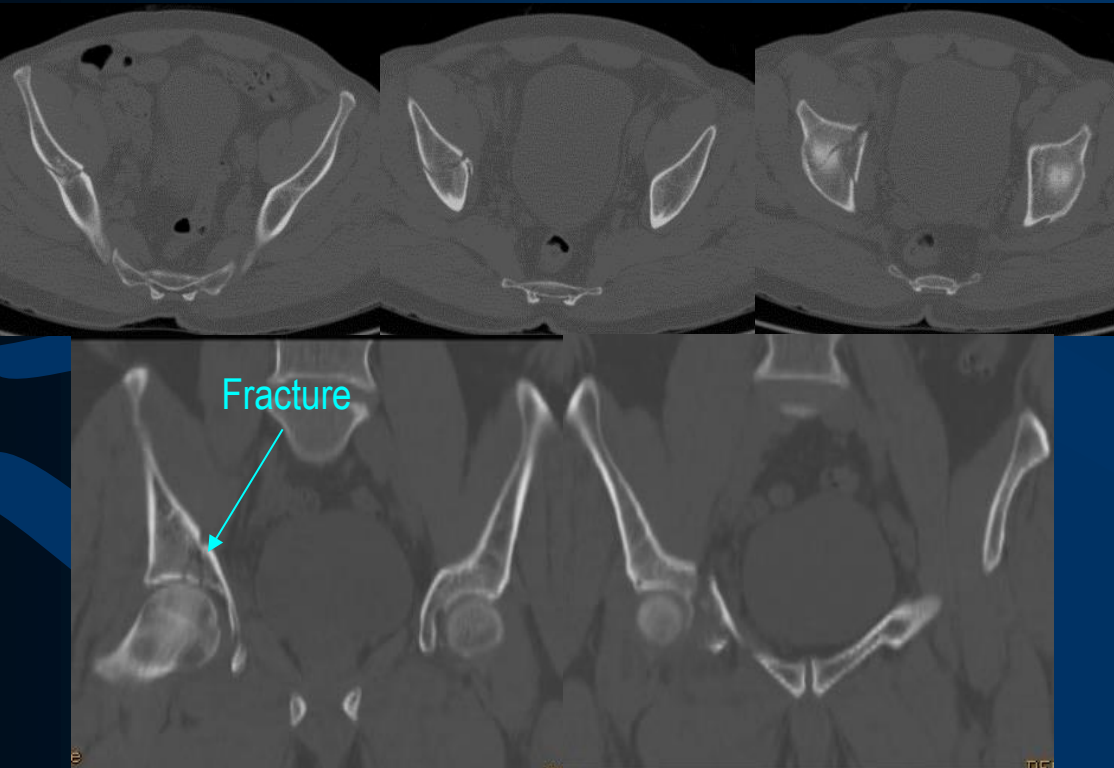
A 55 years old man with hip pain and limping



IMAGING OF MUSCULOSKELETAL TRAUMA

- ✓ Correlation with cross sectional Imaging

A 55 years old man with hip pain and limping



Supra-acetabular fracture

IMAGING OF MUSCULOSKELETAL TRAUMA

✓ Correlation with cross sectional Imaging

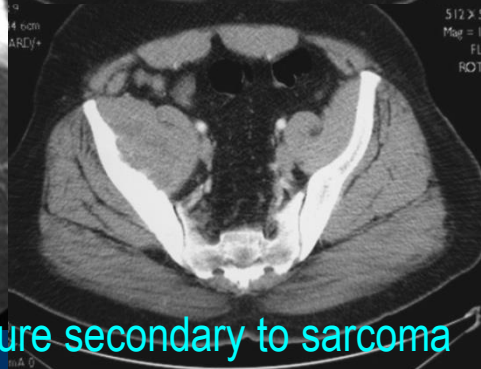
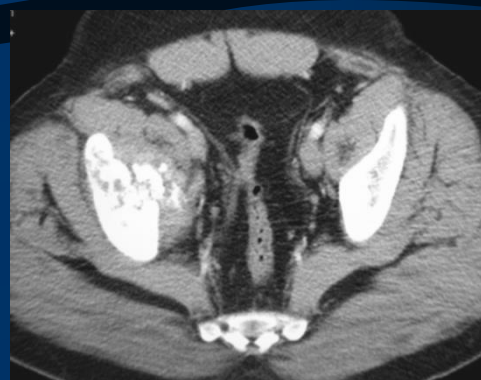
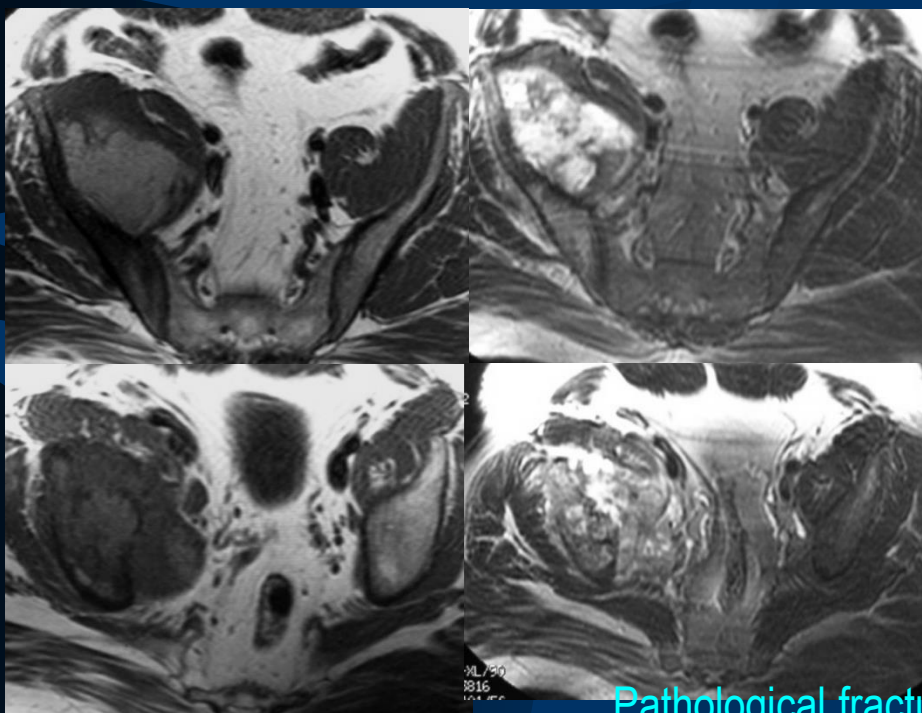
A 50 years old man with hip pain and limping



IMAGING OF MUSCULOSKELETAL TRAUMA

✓ Correlation with cross sectional Imaging

A 50 years old man with hip pain and limping



Pathological fracture secondary to sarcoma

IMAGING OF MUSCULOSKELETAL TRAUMA

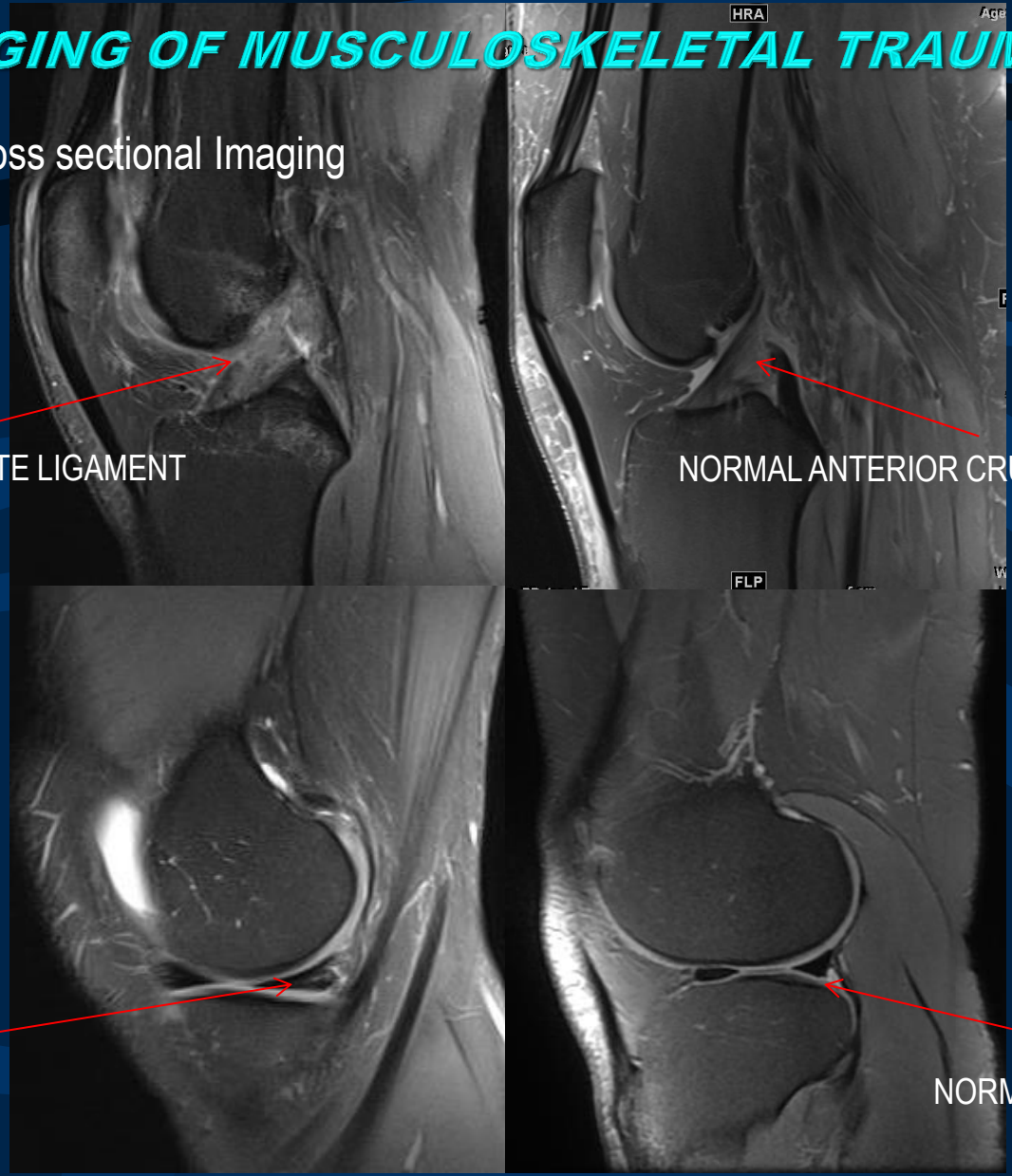
✓ Correlation with cross sectional Imaging

TORN ANTERIOR CRUCIATE LIGAMENT

NORMAL ANTERIOR CRUCIATE LIGAMENT

TORN MENISCUS

NORMAL MENISCUS



IMAGING OF MUSCULOSKELETAL SYSTEM PATHOLOGY

ARTHRITIS

TYPES

- ✓ INFLAMMATORY
- ✓ DEGENERATIVE
- ✓ METABOLIC
- ✓ INFECTIOUS

IMAGING OF MUSCULOSKELETAL ARTHRITIS

FEATURES TO LOOK FOR

Bone density

Osteopenia vs. Osteosclerosis

--- Periarticular / Generalized

Bone cortex

Osteolytic vs. Osteoproliferation

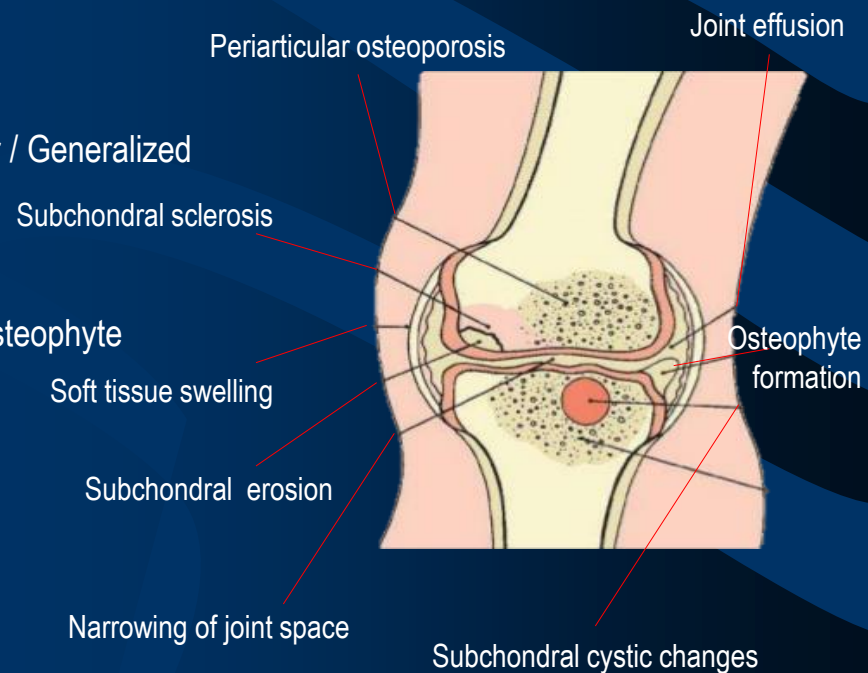
--- Erosive / Osteophyte

Bone alignment

Distribution / Deformities

Soft tissue changes

Effusion / Density / Calcification



IMAGING OF MUSCULOSKELETAL ARTHRITIS

✓ Rheumatoid Arthritis

CASE NO. 1

48 years- old female presented with joint pain of the hands & feet
X-ray of hand requested

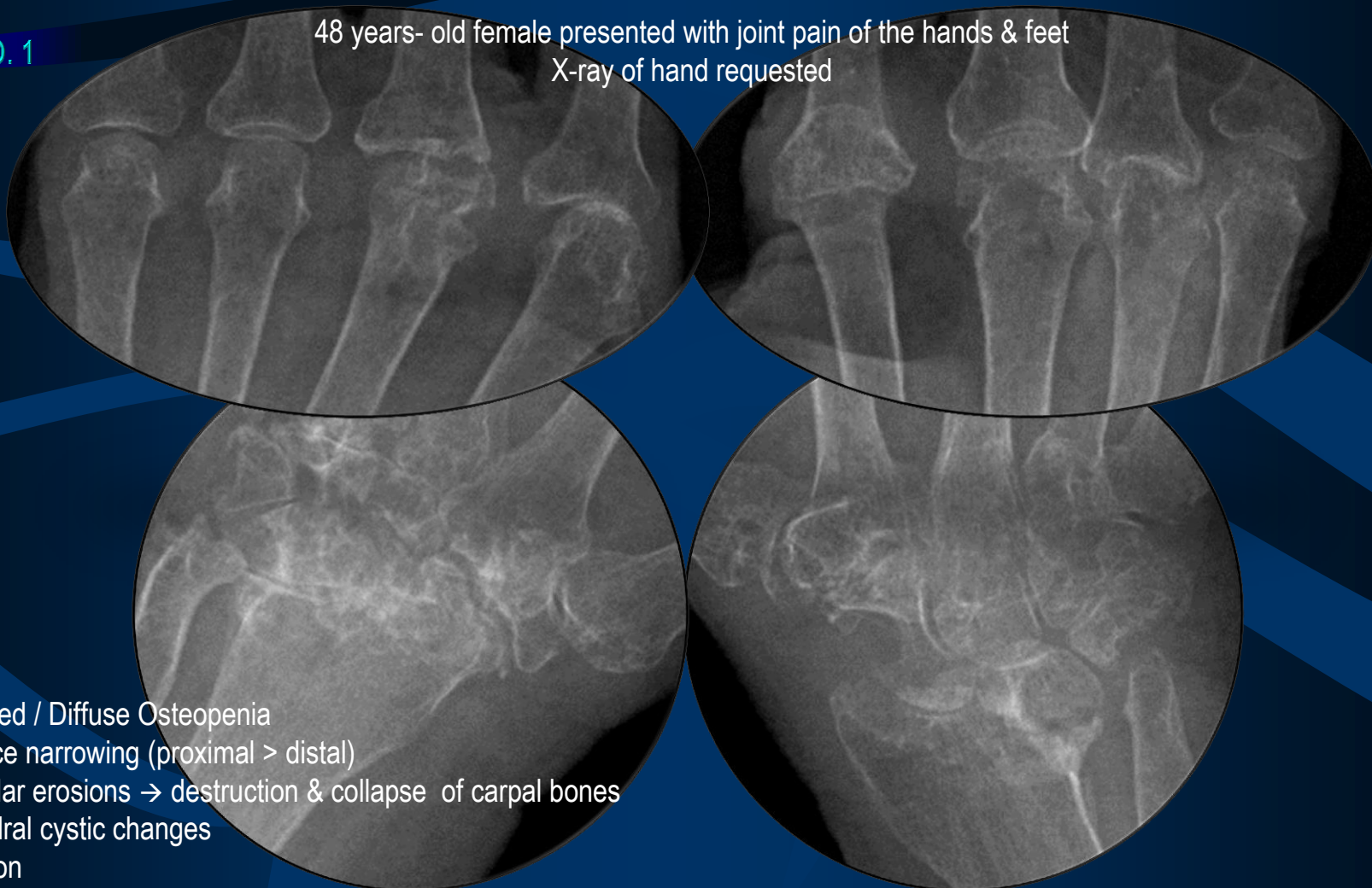


IMAGING OF MUSCULOSKELETAL ARTHRITIS

✓ Rheumatoid Arthritis

CASE NO. 1

48 years- old female presented with joint pain of the hands & feet
X-ray of hand requested



FINDINGS

- Generalized / Diffuse Osteopenia
- Joint space narrowing (proximal > distal)
- Periarticular erosions → destruction & collapse of carpal bones
- Subchondral cystic changes
- Subluxation

IMAGING OF MUSCULOSKELETAL ARTHRITIS

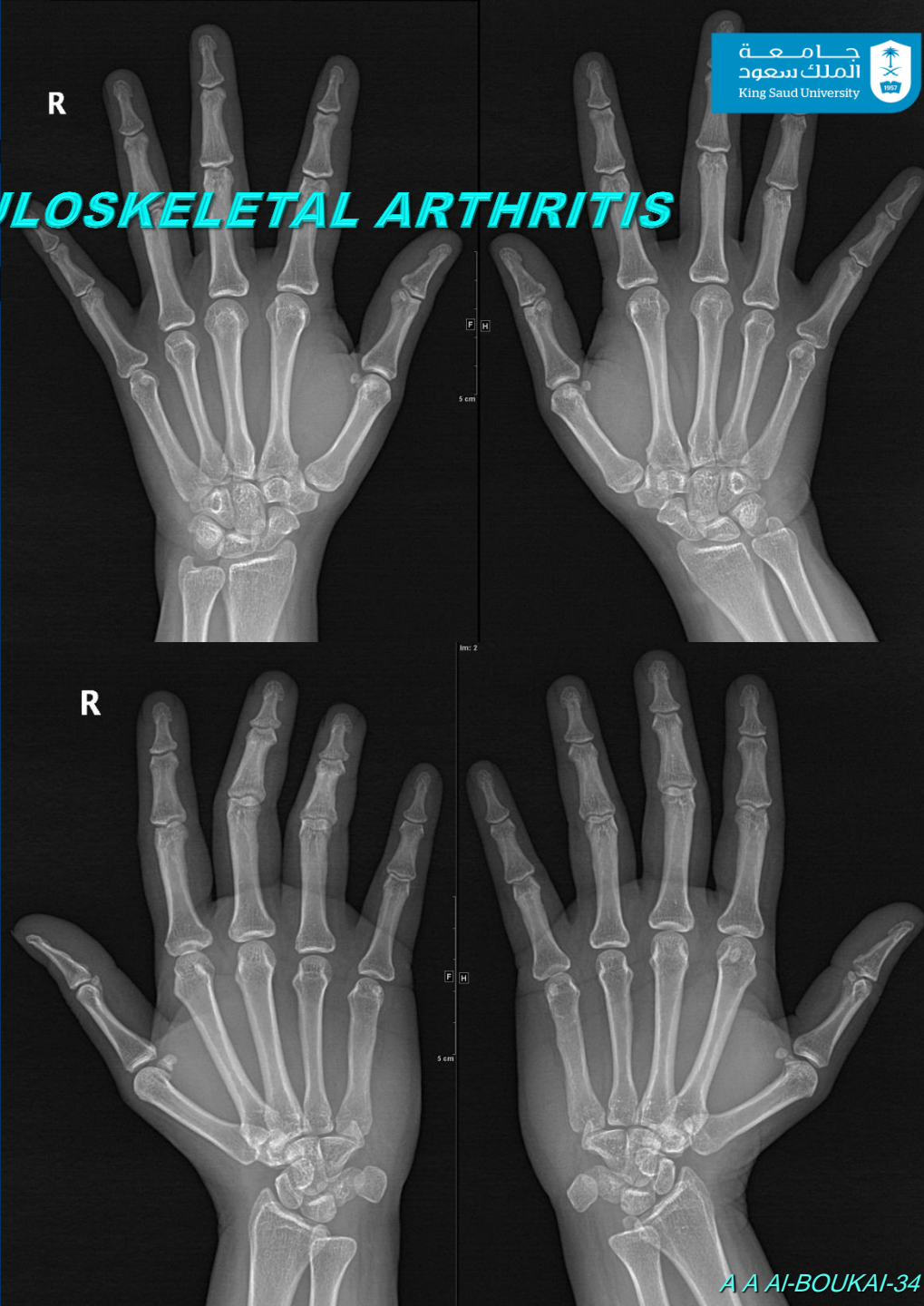
✓ Rheumatoid Arthritis

40 YO WOMAN WITH JOINT PAIN

FINDINGS

- Normal bone density & texture
- Preserved Joint space
- No erosions
- Normal alignment
- Normal soft tissue

NORMAL



IMAGING OF MUSCULOSKELETAL ARTHRITIS

✓ Rheumatoid Arthritis

COMPARISON



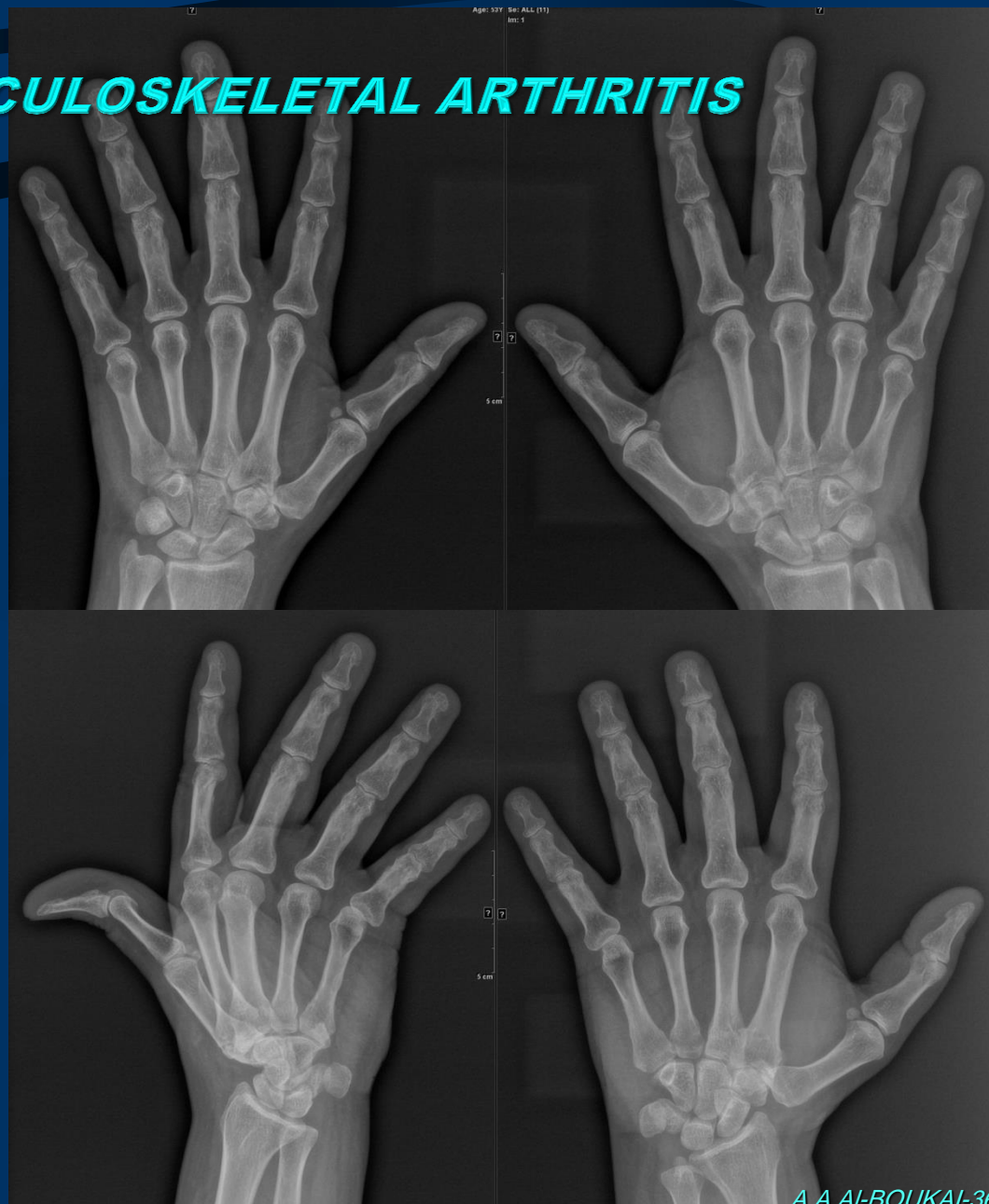
IMAGING OF MUSCULOSKELETAL ARTHRITIS

✓ Rheumatoid Arthritis

53 YO MAN SMALL JOINT PAIN

FINDINGS

- Periarticular osteopenia
- Preserved Joint space
- No erosions
- Normal alignment
- Normal soft tissue



IMAGING OF MUSCULOSKELETAL ARTHRITIS

✓ Rheumatoid Arthritis

53 YO MAN SMALL JOINT PAIN



FINDINGS

- Periarticular osteopenia
- Preserved Joint space
- No erosions
- Normal alignment
- Normal soft tissue

IMAGING OF MUSCULOSKELETAL ARTHRITIS

✓ Rheumatoid Arthritis



IMAGING OF MUSCULOSKELETAL ARTHRITIS

✓ Rheumatoid Arthritis

29 YO WOMAN WITH ARTHRALGIA



FINDINGS

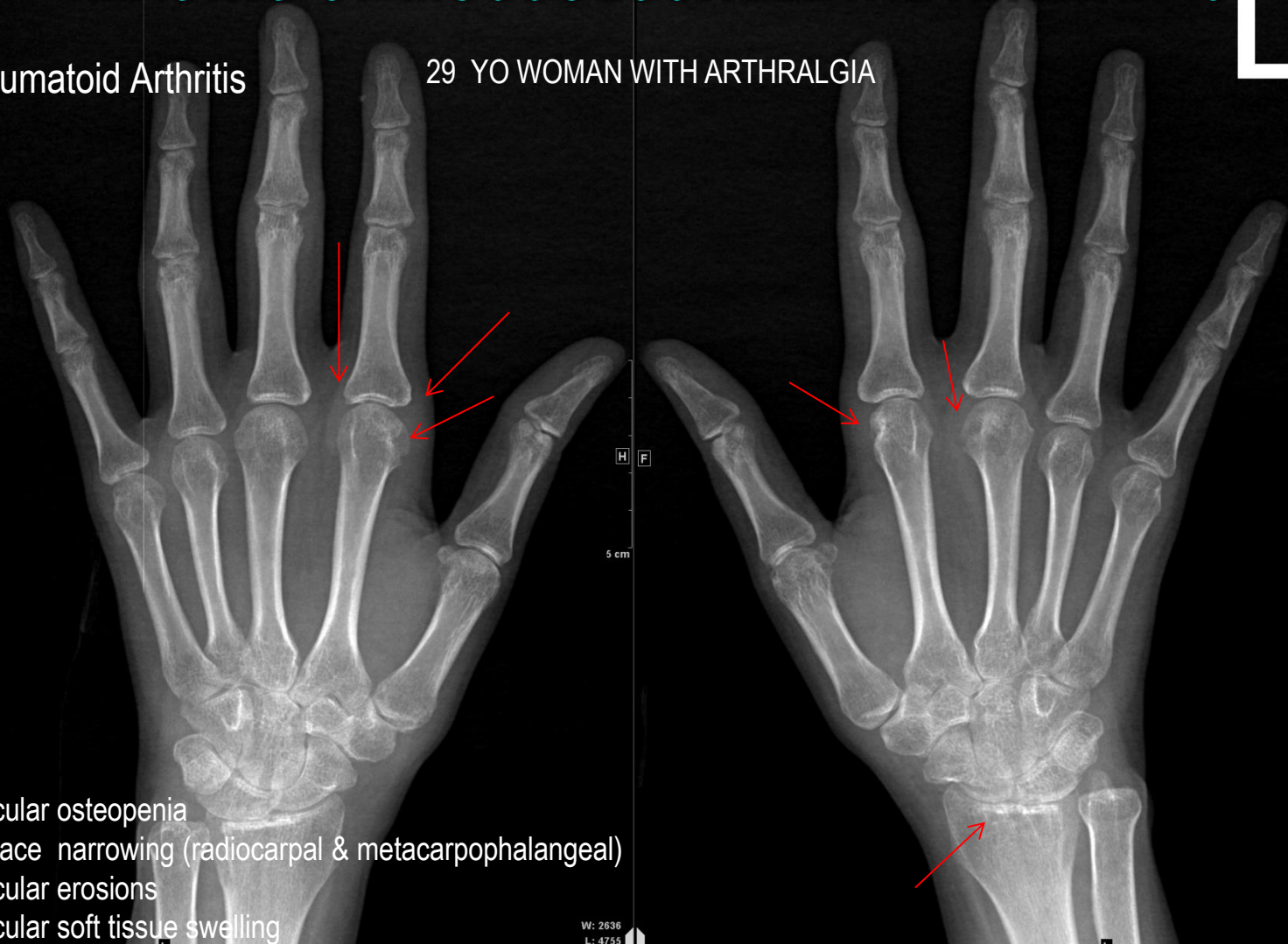
- Periarticular osteopenia
- Joint space narrowing (radiocarpal & metacarpophalangeal)
- Periarticular erosions
- Periarticular soft tissue swelling
- Normal alignment

IMAGING OF MUSCULOSKELETAL ARTHRITIS



Rheumatoid Arthritis

29 YO WOMAN WITH ARTHRALGIA



FINDINGS

- Periarticular osteopenia
- Joint space narrowing (radiocarpal & metacarpophalangeal)
- Periarticular erosions
- Periarticular soft tissue swelling
- Normal alignment

IMAGING OF MUSCULOSKELETAL ARTHRITIS

✓ Rheumatoid Arthritis & Deformities



- ✓ Osteoporosis
 - Early: Juxtaarticular
 - Later: Diffuse
- ✓ Erosions
- ✓ Cartilage destruction
- ✓ Deformities

IMAGING OF MUSCULOSKELETAL ARTHRITIS

✓ Osteoarthritis

CASE NO. 2

Elderly male patient presented with joint pain of the hands X-ray of hand requested

FINDINGS

- Normal bone density, subchondral sclerosis
- Joint space narrowing (Distal interphalangeal)
- No erosions
- Marginal osteophytes, look like sharpening of the joint edges



IMAGING OF MUSCULOSKELETAL ARTHRITIS

✓ Osteoarthritis

CASE NO. 2



FINDINGS

- Normal bone density, subchondral sclerosis
- Joint space narrowing (Distal interphalangeal)
- No erosions
- Marginal osteophytes, look like sharpening of the joint edges
- Distribution: weight bearing joints (hips, knees, back)
- In the hands: DIPs, PIPs, CMC of thumb

IMAGING OF MUSCULOSKELETAL ARTHRITIS

✓ Erosive Osteoarthritis

CASE NO. 3



FINDINGS

- Normal bone density, subchondral sclerosis/cyst
- Joint space narrowing (Distal interphalangeal)
- Erosions (proximal & distal)
- Marginal osteophytes, look like sharpening of the joint edges

IMAGING OF MUSCULOSKELETAL ARTHRITIS

✓ Psoriatic Arthritis

CASE NO. 4



FINDINGS

- Normal bone density, subchondral sclerosis/cyst
- Joint space narrowing (distal & proximal) → fusion
- Erosions (proximal & distal)
- Marginal osteophytes
- Deformities

IMAGING OF MUSCULOSKELETAL ARTHRITIS

✓ Gouty Arthritis

43 year-old male patient presented with hands and feet pain and swelling
X-ray of hand requested

CASE NO. 5



FINDINGS

- Normal bone density
- Preserved joint space
- Dense periarticular soft tissue tophi
- Erosions (periarticular & marginal → overhanging sign)
- Periostitis & Marginal osteophytes
- Deformities

IMAGING OF MUSCULOSKELETAL ARTHRITIS

✓ Gouty Arthritis



FINDINGS

- Normal bone density
- Preserved joint space
- Dense periarticular soft tissue tophi
- Erosions (periarticular & marginal → overhanging sign)
- Periostitis & Marginal osteophytes
- Deformities

