Radiology

In this file we used the outlines from the doctors slides and used our personal notes , text books , and the internet to try to cover the subjects as good as possible

Sorry we don't hold responsibility for any missing information or perhaps – perhaps – wrong material. We tried our best to present this lectures in the best way , and we hope that what we wrote is enough to cover the subjects

Special thanks to those who helped us with this file . Special thanks to 424 Students , Dr.zizou – who helped me in writing the Trauma Lecture - , and to all who made our journey much easier . We hope to keep preparing files for this course so let us know if you have any comments or suggestions .

Please feel free to post in www.ksums.com for anything related to this file .

Best Whishes

Dart

Introduction to Radiology

Dr.Fahad Al-Bader

- Regular x-rays (plain x-rays) account for about 80% of imaging examinations.

- X-ray examinations, or plain x-rays, are made by an x-ray beam passing through the patient. **The x-rays are absorbed in different amounts by the various tissues or materials in the body.**

- X-ray machine is composed of an **X-ray source or X-ray tube**, an **X-ray detection system**, and **positioning hardware** to align these two components with the object to be imaged.

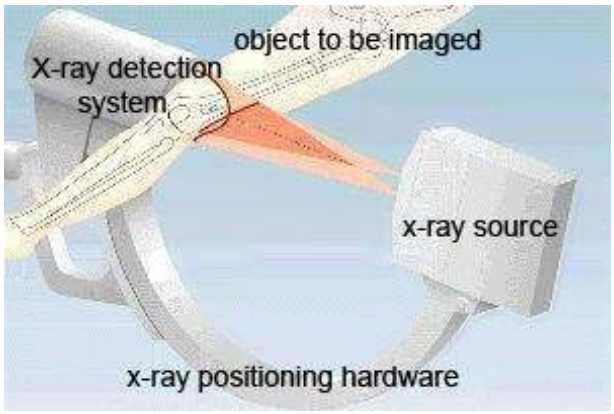


Figure 1-1

- The classic imaging **receptor** is a film/screen combination. Newer systems are called *computed radiography* or *digital radiography*.

- Four basic densities, or shades, are visible on plain films.These are **air**, **fat**, **water (blood and soft tissue)**, and **bone**, Air is black or very dark. On x-rays, fat is generally gray and darker than muscle or blood (Fig. 1–2). Bone and calcium appear almost white.

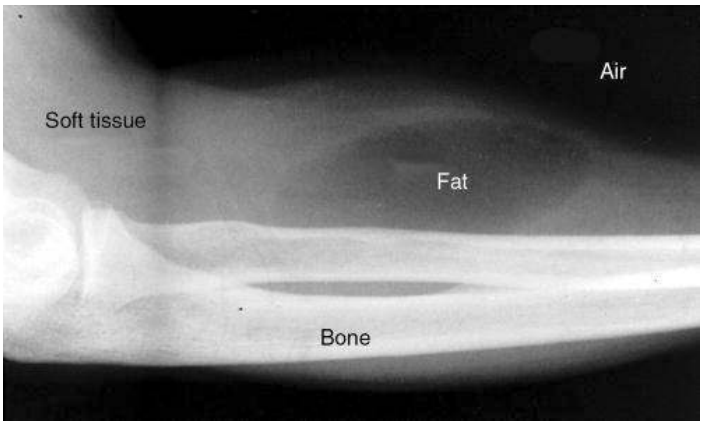


Figure 1-2 The four basic densities on an x-ray.The abnormality in this case is the fat in the soft tissue of the forearm, which is due to a lipoma.

- X-ray radiation **Cause ionization in the body** (**very imp. to know which technique causes ionization and which don't**) **MCQ**.

- Remember that standard or plain x-rays are **two-dimensional presentations** of **three-dimensional information**. That is why **frontal and lateral views** are often needed.

- Chest x-rays are usually described as **posteroanterior (PA)** or **anteroposterior (AP)** (Fig. 1–3).

- These terms indicate the direction in which the x-ray beam traversed the patient on its way to the detector. **PA means that the x-ray beam entered the *p*osterior aspect of the patient and go out *a*nteriorly**. **AP means that the beam direction through the patient was *a*nterior to *p*osterior**. A left lateral decubitus view is one taken with the patient's left side down.

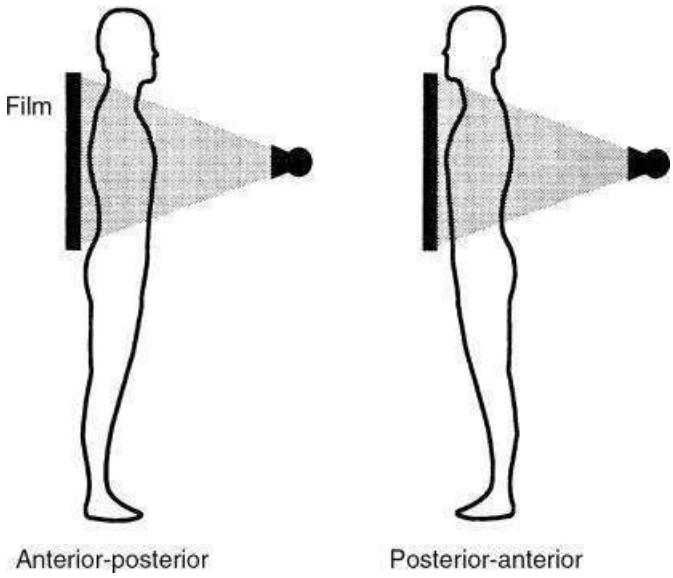


Figure 1-3 Typical x-ray projections. X-ray projections are typically listed as AP or PA. **Lateral (LAT) and oblique (OBL) views also are commonly obtained.**

- Use of contrast agents permits visualization of anatomic structures that are not normally seen.

- Contrast agents are used to fill either a **hollow viscus** (such as the stomach) or **anatomic tubular structures** that can be accessed in some way (such as blood vessels, ureter, and common bile duct).

- Contrast agents are administered orally, rectally, or retrograde into the ureter or bladder incur little or no risk **unless aspiration** or **perforation** occurs. With the intravenously or intra-arterially administered agents, a **small** but **real risk of contrast reaction exists**.

- CT is highly contraindicated in pregnancy because of the radiation effect on the fetus

ULTRASOUND

- Ultrasound examination **uses high-frequency sound waves** to make images.

- The image is made by sending high-frequency sound into the patient and assessing the magnitude and time of returning echoes (الإيكو هو الصدى).

- Tissues such as **liver** and **spleen** give a picture with **small echoes due to the fibrous interstitial tissue** (Fig. 1–4). High-intensity echoes are caused by calcification, fat, and air.

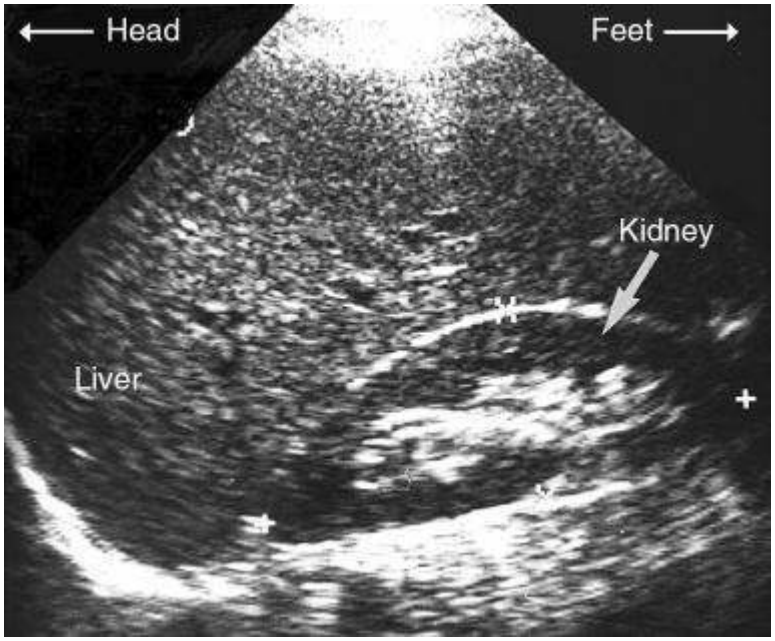


Figure 1-4 Ultrasound examination of the liver and kidney.

- Ultrasound exams do not use ionizing radiation (like for example - x-ray) **MCQ**.

- That is why we use Ultrasound rather than x-ray in examining fetus in pregnancy .

+ Advantages of Ultrasound

- US is noninvasive (no needles or injections) and is usually painless.
- US is widely available and less expensive than other imaging methods.
- US uses no ionizing radiation .
- US gives a clear picture of soft tissues that do not show up well on x-ray images.
- US no health problems and may be repeated if medically indicated.
- US is the preferred imaging modality for the diagnosis and monitoring of pregnant women and their unborn infants.
- Ultrasound provides real-time imaging, making it a good tool for guiding minimally invasive procedures such as needle biopsies and needle aspiration of fluid in joints or elsewhere.

+ **Limitation of Ultrasound**

- Ultrasound waves are **reflected by air or gas**; therefore ultrasound is not an ideal imaging technique for the bowel. Barium exams and CT scanning are the methods of choice for bowel-related problems.

- Ultrasound waves do not pass through air; therefore an evaluation of the stomach, small intestine and large intestine **may be limited** – even though it might be used -. Intestinal gas may also prevent visualization of deeper structures such as the pancreas and aorta (although we use ultrasound to examine these structures but inestinal gas may prevent clear visualization)

- Patients who are obese are more difficult to image because tissue attenuates (weakens) the sound waves as they pass deeper into the body.

- **Ultrasound has difficulty penetrating bone** and therefore can only see the outer surface of bony structures and not what lies within. For visualizing internal structure of bones or certain joints, other imaging modalities such as MRI are typically used.

+ **Preparation of Ultrasound**

- preparation depends on the type of examination you will have. For some scans your doctor may instruct you not to eat or drink for as many as 12 hours before your appointment . For others you may be asked to drink up to six glasses of water two hours prior to your exam and avoid urinating so that your bladder is full when the scan begins.

+ **Uses of Ultrasound**

- Ultrasound is a useful way of examining many of the body's internal organs, including but not limited to the:

  - heart and blood vessels, including the abdominal aorta and its major branches
  - liver
  - gallbladder
  - spleen
  - pancreas
  - kidneys
  - bladder
  - uterus, ovaries, and unborn child (fetus) in pregnant patients
  - thyroid and parathyroid glands
  - scrotum (testicles)

- **Doppler ultrasound** images can help the physician to see and evaluate:

  - blockages to blood flow (such as clots)
  - narrowing of vessels (which may be caused by plaque)
  - tumors and congenital malformation

COMPUTED TOMOGRAPHY (CT Scan)

- Computed tomography (CT) is accomplished by passing a rotating fan beam of x-rays through the patient and measuring the transmission at thousands of points.

- The data are handled by a computer that calculates exactly what the x-ray absorption was at any given spot in the patient.

- The data can be displayed on a screen, or photographed.

- Compared with plain x-rays, CT uses about 10 to 100 times more radiation.

- It causes Ionization in the body.

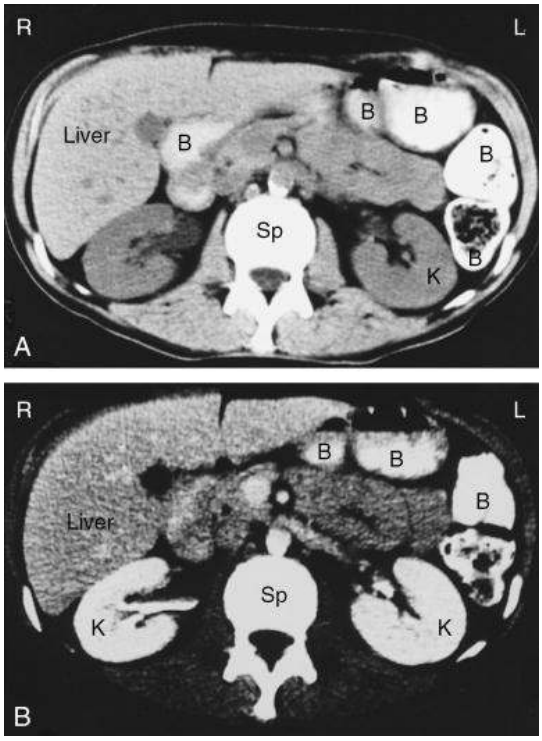


Figure 1-5 Computed tomography (CT). B = Bowel , K = Kidney

- In general, the basic four densities on CT images are the same as those in plain x-rays: air is black, fat is dark gray, soft tissue is light gray, and bone or calcium and contrast agents are white.

- One advantage of CT is that actual x-ray absorption of a specific tissue can be displayed. The greater sensitivity of CT compared with plain x-rays allows areas of tiny punctate calcification to be seen.

- CT scans are presented as a series of slices of tissue.

- Thus CT is a **two-dimensional** display of **two-dimensional information**, and objects appear where they really are in space.

- The scans or slices are shown as if you are viewing the patient from the foot of the patient's bed. **Thus the individual's right side is on your left** (Fig. 1–6). This also is the convention used for the transverse images of ultrasound and magnetic resonance imaging (MRI).

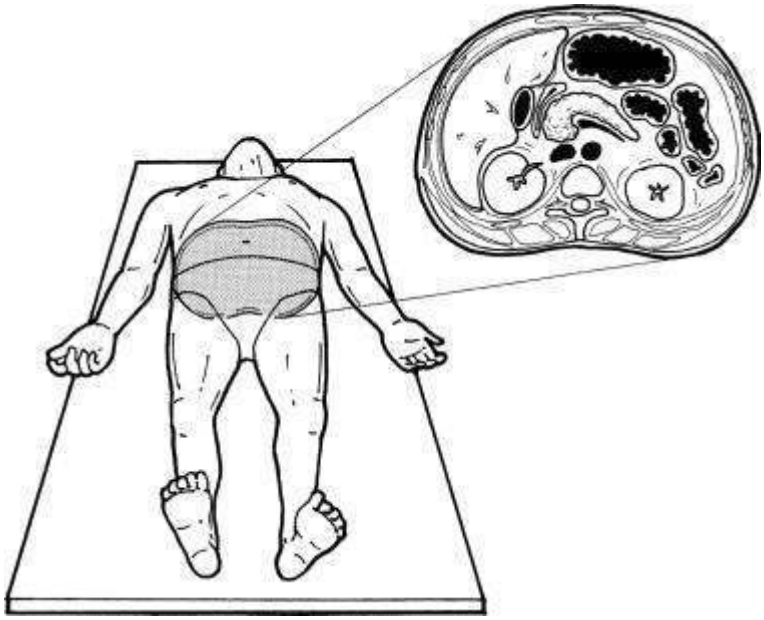


Figure 1-6 Orientation of computed tomography (CT) and magnetic resonance (MR) images. CT and MR usually present images as transverse (axial) slices of the body. If, as you stand and look at the patient from the foot of the bed, you think of these images as slices lifted out of the body, you will have the orientation correct.

- CT is essential in the evaluation of many traumatic conditions in various bone and soft tissue tumors because of its cross sectional imaging capabilities.

- Contrast agents, frequently used in CT scans, are usually the same used in other imaging studies.

- CT is highly contraindicated in pregnancy because of the radiation effect on the fetus

MAGNETIC RESONANCE IMAGING (MRI)

- Magnetic resonance imaging (MRI) generates images by applying a varying magnetic field to the body.

- The primary advantages of MRI are that it obtains exquisite images of the **central nervous system** and stationary soft tissues (such as the knee joint).

- It also does not use ionizing radiation.

- Disadvantages of MRI (very sensitive to patient movement , cannot bring metallic objects near the machine – so if the patient have metallic implants like MR is avoided , and high cost).

- MRI can distinguish abnormal tissues from normal tissues much more accurately than other imaging tests (x-ray, CT, etc).

- MR images allow the physician to clearly see even very small tears and injuries to tendons, ligaments and muscles and some fractures that cannot be seen on x-rays.

- MR images of the soft-tissue structures of the body (particularly muscles, bones and joints) are clearer and more detailed than with other imaging methods. This detail makes MRI an invaluable tool in early diagnosis and evaluation of many conditions, including tumors.

+ Contraindication of MRI

- Any **electrically**, **magnetically** or **mechanically** activated implants (like cardiac pacemakers, cerebral aneurysm clips) are considered as an **absolute contraindication** .

- Pregnancy : MRI has no harmfull effect on fetus but it is **relatively contraindicated** during the first trimester of pregnancy (Risk Vs Benefit ratio to be assessed) **MCQ**.

- claustrophobia is also relatively contraindicated

In all the previous Radiology Modalities body reaction to contrast agents (there is a low but non-negligible level of risk) should be considered .

MCQs about this subject included :

* what modality causes ionizing in the body (CT + X-RAY)

* what modality is absolutely contraindicated in pregnancy (CT + X-RAY) and what is relatively contraindicated (MRI - benefit vs risk -) and what is safe to be used (ULTRASOUND) .

Done

Investigation and Anatomy of Musculoskeletal System

Dr.Nizar A. Al-Nakshabandi

Imaging Techniques in Orthopaedics

+ Imaging Techniques in Orthopaedics

- Conventional Radiography
- Fluoroscopy
- Computed Tomography
- Arthrography
- Angiography
- Ultrasound
- Scintigraphy
- Magnetic Resonance Imaging

- Use of Radiological Techniques methods in evaluating the presence, type, and extents of various bone, joints and soft tissue abnormality.

- Therefore, both the Radiologist and Orthopaedic Surgeon must know the indication for use of each technique, the limitation of particular modality, and appropriate imaging approaches for abnormalities at specific sites.

- The question "**What modalities should I use for this particular problem**" is frequently asked by Radiologists and Orthopaedic Surgeons alike.

- No matter what secondary technique is used, **Conventional Radiograph should be available for comparison most of the time**.

- The choice of imaging technique is dictated by the type of suspected abnormality.

- For instance, if you suspect bone metaplasia and after obtaining a conventional radiograph, the next examination should be MRI which detects the necrotic changes in bone long before Plain Films, Tomography, CT or Scintigraphy becomes positive.

- In evaluation of internal derangement of the knee, **conventional films should be obtained first** , if the abnormality is not obvious should again be followed by MRI since this modality provides exquisite contrast resolution of the bone marrow, articular cartilage, ligaments, menisci and soft tissue.

- MRI is used to investigate internal bone structure and knee joint .

- CONVENTIONAL RADIOGRAPHY:

- The most frequently used modality for evaluation of bone and joint disorder and particularly in **trauma** is conventional plain film radiography.

The radiologist should obtain at least two (2) views of the bone involved at 90° angles to each other with each view including two adjacent joints. This decreases the risk of missing an associated fracture, subluxation, and/or dislocation at the site remote from the primary injury.

- In children, obtaining a radiograph of the normal and affected limb for comparison is also wise. Usually, the standard films compromised the arterio-posterior and lateral views.

- Occasionally, oblique and special views are necessary particularly in evaluating complex structures, such as the elbow, wrist, ankle, and pelvis.

- A **weight bearing** (In orthopedics, weight bearing is the amount of weight a patient puts on the leg on which surgery has been performed) view may be of value for a dynamic evaluation of the joint space under the weight of the body.

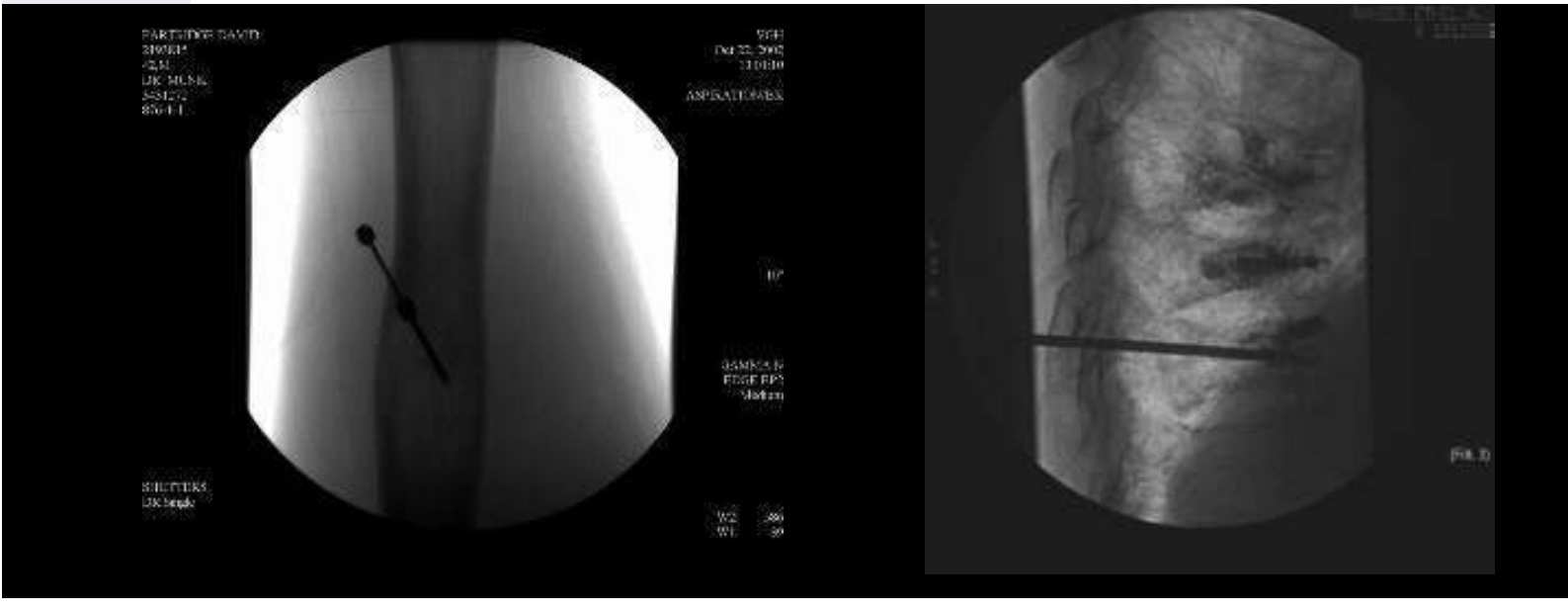
Figure 2.1 : AP and Lateral View

- FLUOROSCOPY:

- Fluoroscopy is a fundamental diagnostic tool for many radiological procedures including Arthrography, Tenography, Vasography, Arteriography and Percutaneous for Bone or Soft Tissue Biopsy.

- Fluoroscopy combined with videotaping is useful in evaluating the status of joints.

- In arthrography, checking proper placement of the needle and to monitor the flow of contrast agent, and intra-operatively to assess reduction of a fracture or placement of hardware.



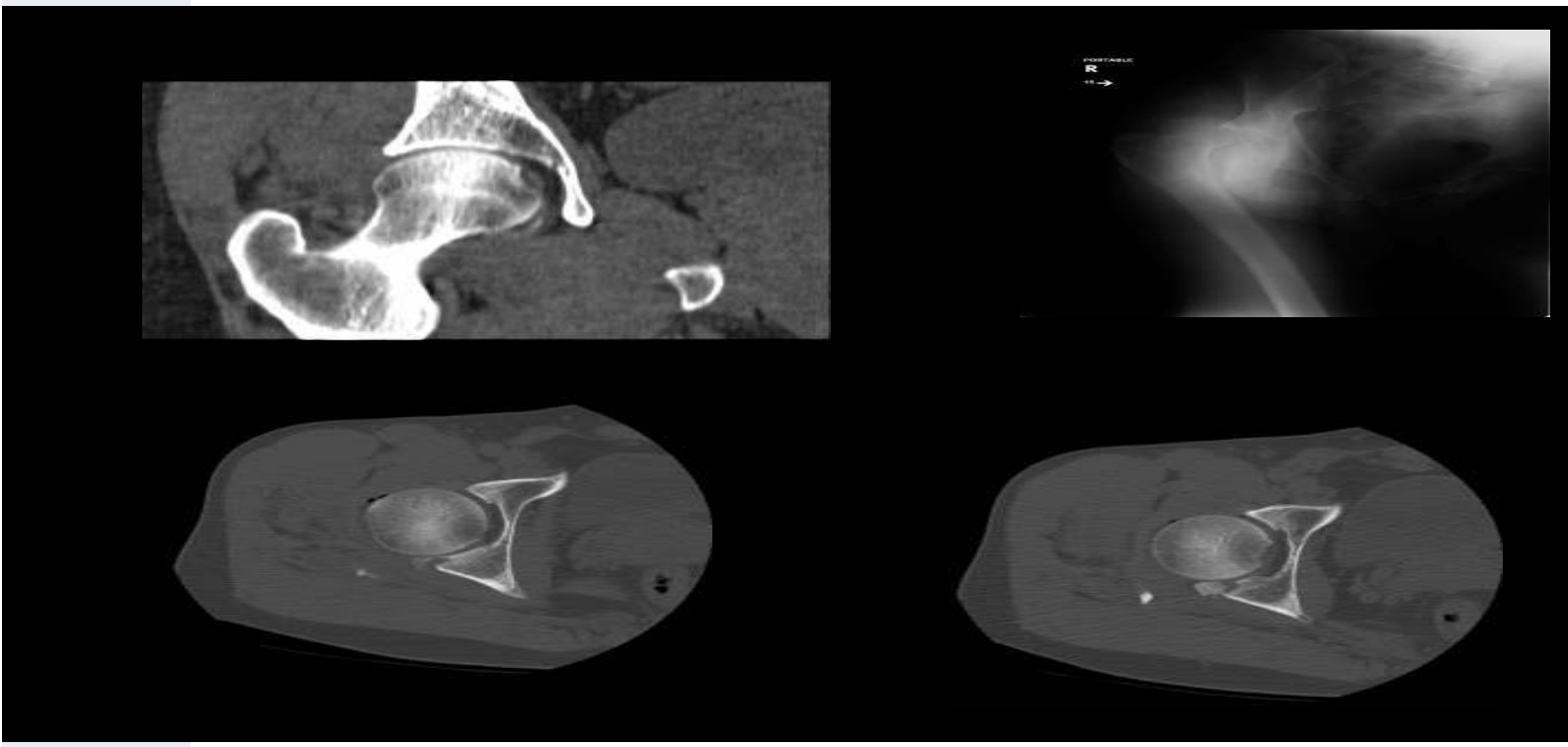
- COMPUTED TOMOGRAPHY:

- CT is radiological modality containing an x-ray source, detectors and the computer data processing system. The essential component of a CT system include a circular scanning gantry which holds the x-ray tube, and imaging sensors, a table for a patient, an x-ray generator and a computerized data processing unit. The patient lies on the table and is placed inside the gantry.

- The x-ray tube is rotated 360^{o} around the patient while the computer collects the data and formulates an axial image or slice. Each cross sectional slice represents a thickness between 3mm in 1.5cm of body tissue.

- CT is described in details in the First Lecture .

- in Trauma CT is used in detection of :
  - Intraarticular abnormalities
  - Detection of small bony fragements

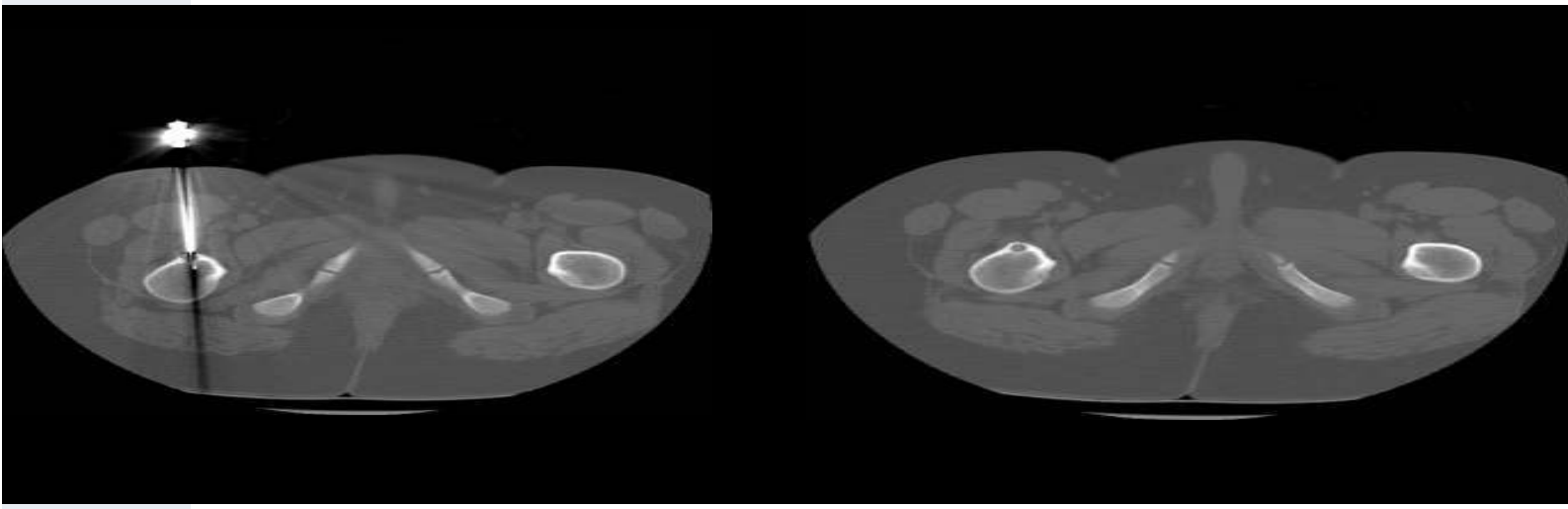


- CT vs X-RAY

- Advantages :
  - Excellent contrast resolution.
  - Measures the tissue attenuation coefficient
  - Obtain transaxial images
  - Reformation
- Disadvantages:
  - Radiation
  - Inability to make a specific diagnosis

- Uses of CT in Tumors :

- Describe tumors extent
- Soft tissue extension.
- Presence of Calcification
- Biopsy



- Arthrography :

- Arthrography is introduction of contrast agent positive contrast iodine iodide solution negative contrast, air or combination of both into the joint space. It is simple and effective .

- Although virtually every joint can be injected with contrast, the examination in the present time is mostly frequently performed in shoulder, breast, ankle and elbow.

- It is important to obtain preliminary (early) films prior to any arthrographic procedure since contrast may obscure (hide) some joint abnormalities that can be easily detected on Conventional Radiographs.

- The examination of any of the joints, it can be combined with CT or MRI .

- There are relatively few absolute contraindications to arthrography. Even hypersensitivity to iodine is a relative contraindication since in this case a single contrast study using only air can be performed.

- ANGIOGRAPHY:

The use of contrast material injected into selective branches of both arterial and venous circulation has aided greatly in assessing the involvement of the circulatory system in various condition and has provided a precise diagnostic method for local pathology.

In evaluation of tumors, arteriography is used mainly to mop-out bone lesions demonstrate the vascularity of the lesion and assess the extent of the disease.

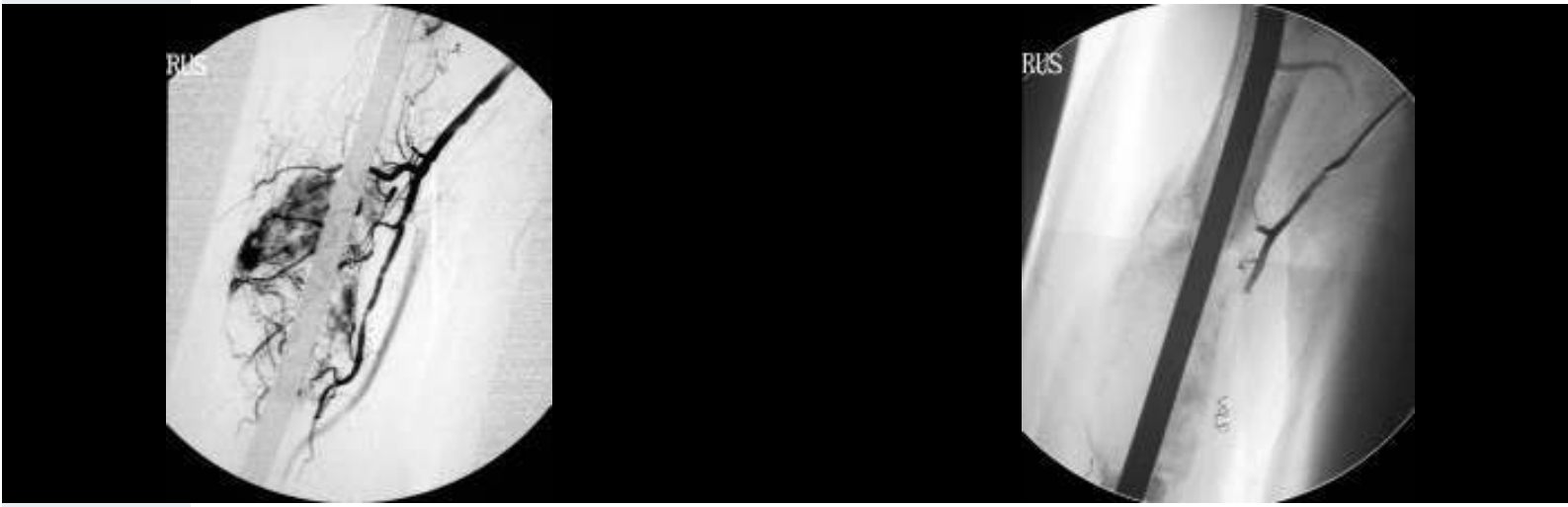
It is also used to demonstrate the vascular supply of a tumor and to locate vessels suitable for pre operative intraarterial chemotherapy.

It is very useful in demonstrating the area suitable for open biopsy, since the most vascular part of tumor contain the most aggressive component of the lesion.

Occasionally, arteriography can be used to demonstrate abnormal tumor vessels.

Arteriography is often extremely helpful in planning for limb salvage procedure since it demonstrate the regional vascular anatomy and thus, commit a plan to be drawn up for the tumor presection.

It is also sometimes use to outline the major vessels prior to resection of a benign lesions. It can also be combined with interventional procedure such as embolization of hypervascular tumors prior to further treatment.



- ULTRASOUND:

- Over the past several years, ultrasound has made an enormous impact in the field of radiology, however it is only rarely used its skeletal radiology.

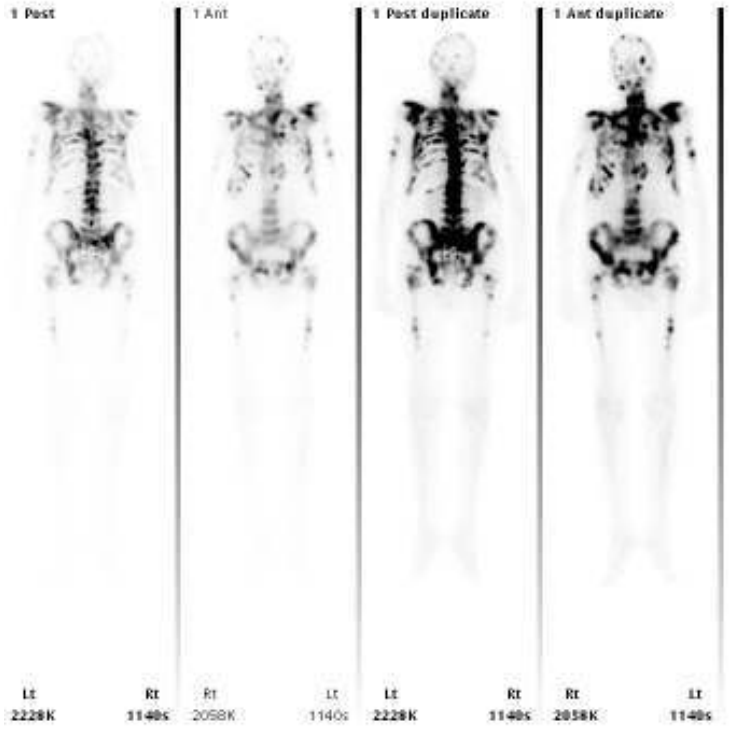
- Applications of ultrasound in orthopaedics include evaluation of the rotator cuff, injuries to various tendons, e.g. the achilles tendons, and occasionally soft tissue tumors such as hemangioma .

- The most effective application however is in evaluation of the infant hip for which ultrasound has become the imaging modality of choice .

- Ultrasound was described in details in the first lecture

- SCINTIGRAPHY RADIONUCLIDE BONE SCAN:

- One major advantage of skeletal scintigraphy over all other imaging techniques is its ability to image the entire skeleton at once. It provides a metabolic picture. It is particularly helpful in condition such as fibrodysplasia, Langerhans Cell Histocytosis or metastatic cancer.



MAGNETIC RESONANCE IMAGING:

- The musculoskeletal system is ideally suited for evaluation by MRI since different tissue displayed different signal intensities on T1 & T2 weighted images.

(the two basic types of images are T1 and T2. T1 images show fat as a white or bright signal, whereas water (or cerebrospinal fluid [CSF]) is dark. On a T2 image, fat is dark, and blood, edema, and CSF appear white)

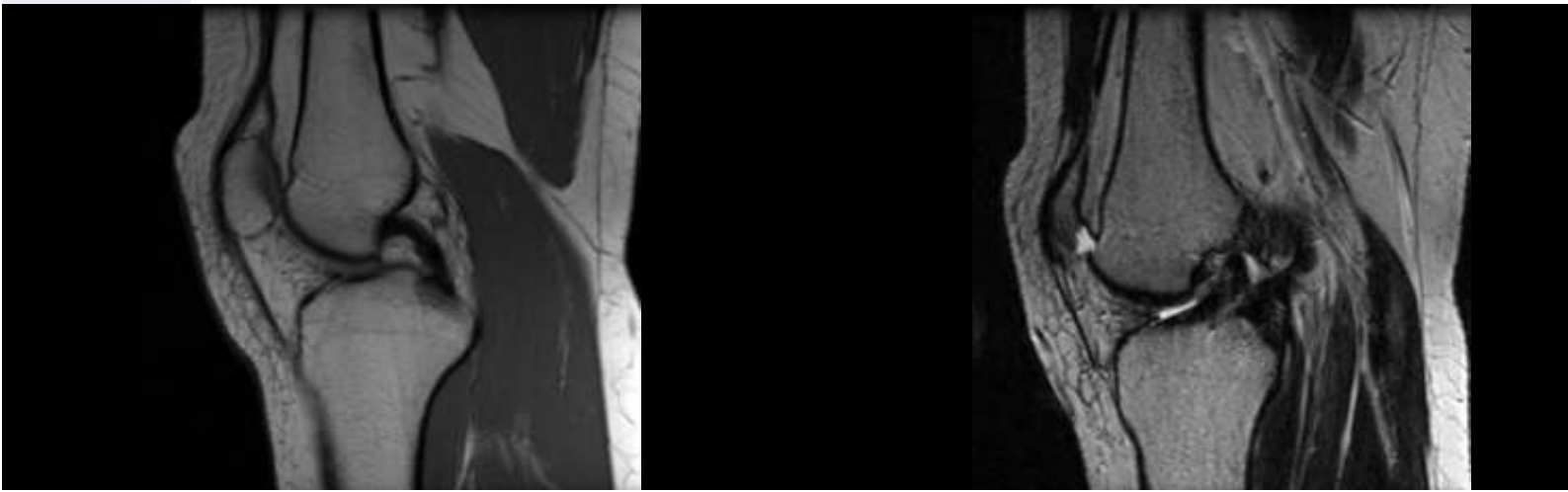
- The images displayed may have a low signal intensity, intermediate signal intensity, or high signal intensity .

- Traumatic conditions of the bone, and soft tissue are particularly well suited to diagnose and evaluate by MRI.

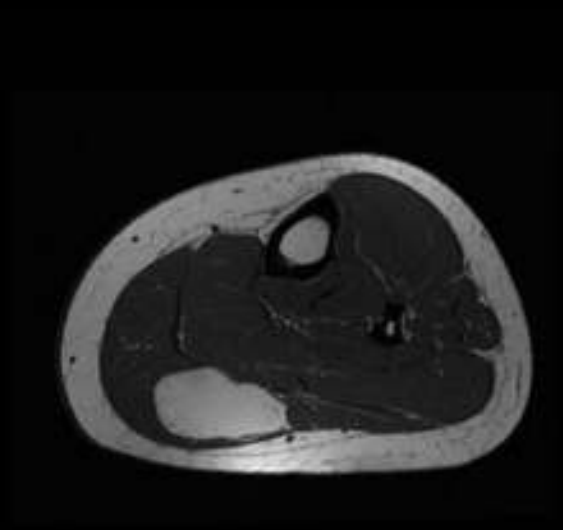
- Some abnormalities such as bone contusions or trabecular micro fractures not seen on radiography and CT are well demonstrated by this technique.

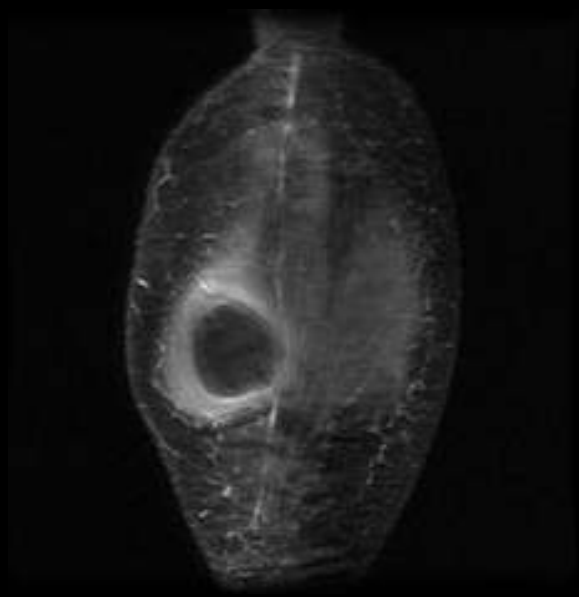
- The use of intravenous gadolinium (contrast) produces enhancement in MRI.

- Magnetic Resonance arthrography has become popular by recent years.



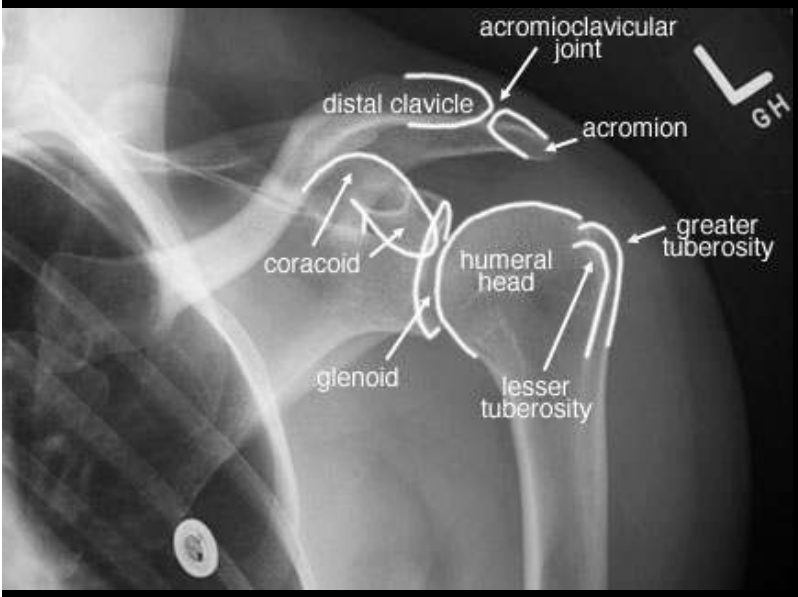
Relation to neurovascular bundle

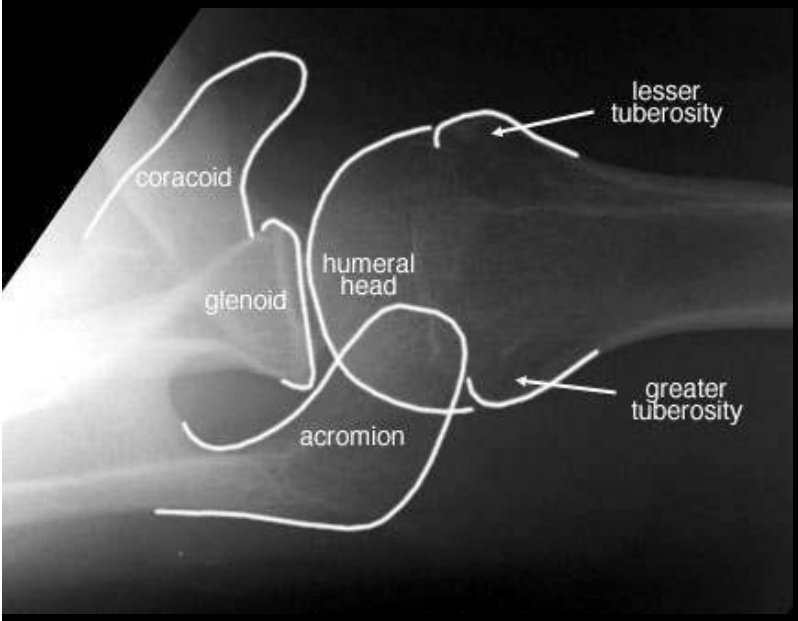


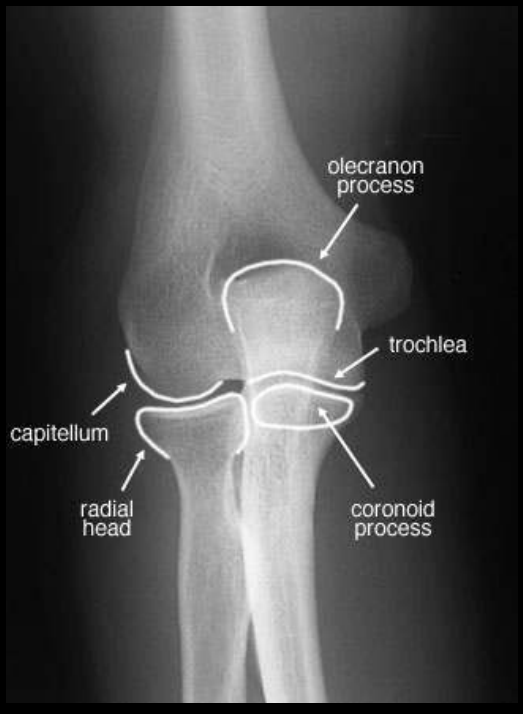


Tumor composition

* Radiologic Anatomy of Upper and Lower Limb








coronoid process
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radius
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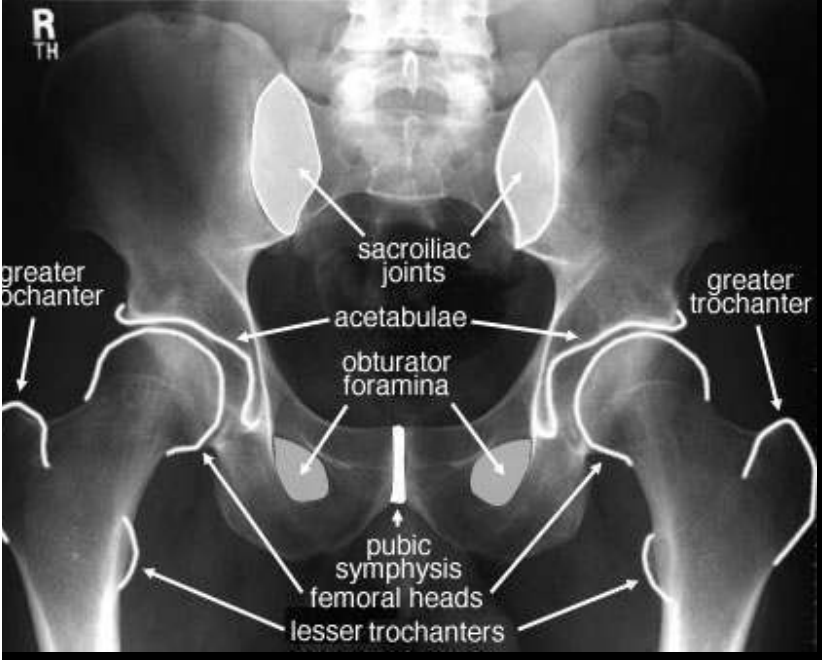
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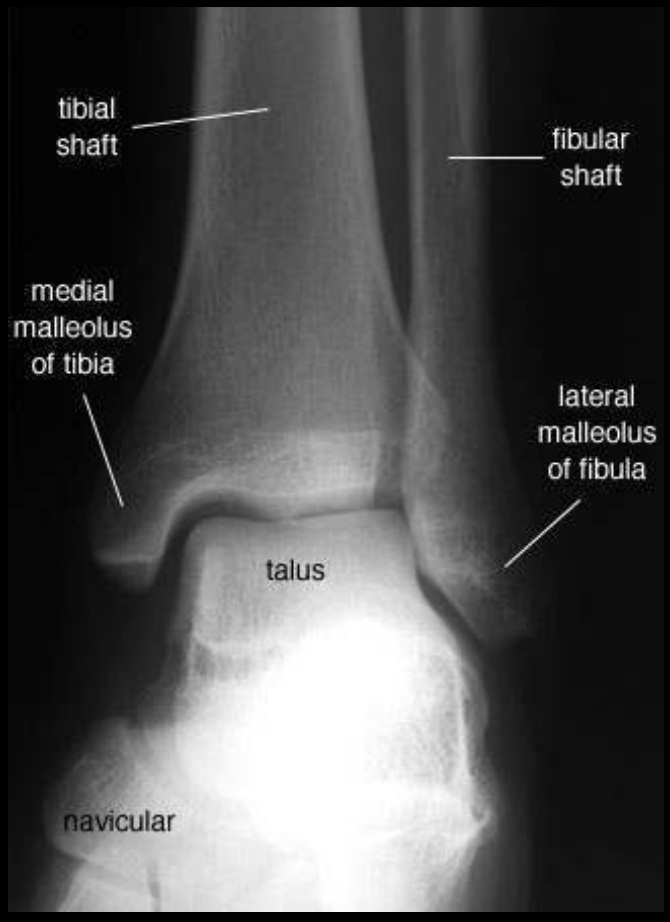
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fibula
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talus
calcaneus
navicular
cuboid


MT = metatarsal
cun = cuneiform
1st DP
2 DP
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3 MP
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5 DP
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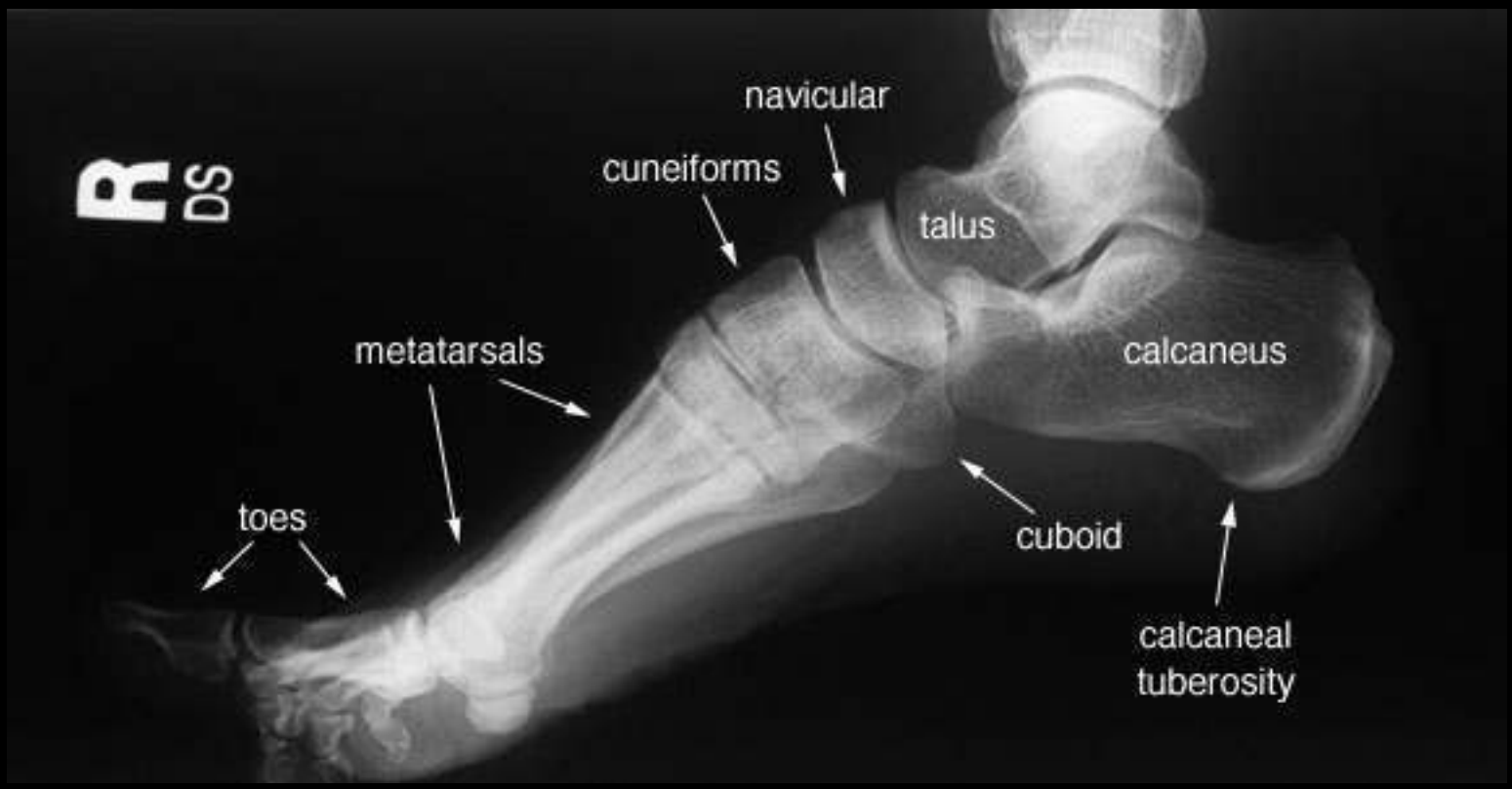
R
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navicular
cuneiforms
talus
metatarsals
calcaneus
toes
cuboid
calcaneal tuberosity

Musculoskeletal Trauma

Dr. Ahmad A. Al-Boukai

Musculoskeletal Trauma - Terminology

- DISLOCATION vs. SUBLAXATION

- Dislocation occurs when bones in a joint become displaced or misaligned . It is often caused by a sudden impact to the joint.
The ligaments always become damaged as a result of a dislocation.

- Sublaxation is an incomplete or partial dislocation of a joint or organ.

- CLOSED vs. OPENED FRACTURES

- A closed fracture is a broken bone that does not penetrate the skin while open (compound) fractures involve wounds that communicate with the fracture and may expose bone to contamination

- GREENSTICK vs. TORUS FRACTURES

- Due to the pliability of pediatric bone, the bone does not completely fracture. The medial side of the radius is open where as the lateral cortex has simply buckled.

- PHYSEAL INJURIES

- Physeal fractures may be defined as a disruption in the cartilaginous physis of long bones that may or may not involve epiphyseal or metaphyseal bone.

- STRESS FRACTURES

- Stress fractures are overuse injuries of bone. These fractures, which may be nascent or complete, result from repetitive subthreshold loading that, over time, exceeds the bone's intrinsic ability to repair itself . It typically occurs in weight-bearing bones, such as the tibia and metatarsals (bones of the foot).

- PATHOLOGICAL FRACTURES

- A pathologic fracture occurs when a bone breaks in an area that is weakened by another disease process. Causes of weakened bone include tumors, infection, and certain inherited bone disorders. There are dozens of diseases and conditions that can lead to a pathologic fracture.

* Basic principle in radiology of bone trauma

- Radiograph should include the joint nearest to the trauma.

- The paired bone concept (if one is broken the other well be bowed or dislocated so you should check it too)

- The weakest link concept (Adult *vs.* Children).

- Comparison films (like in children when you cannot be sure if this is abnormal you take an image of the other arm or leg for example and compare).

- The weakest link

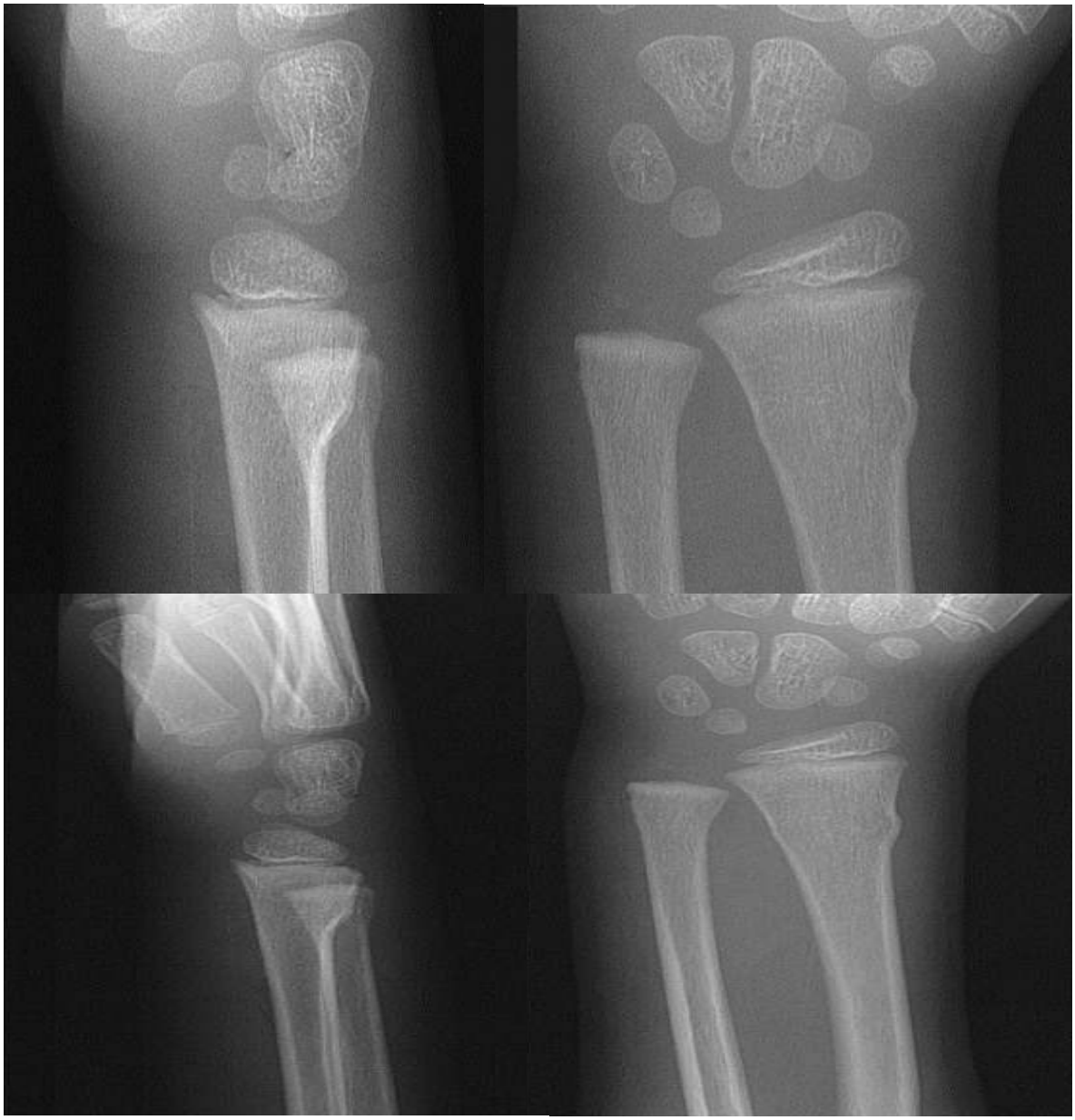
- The soft tissue structures (muscles/ ligaments/ tendons) in **Adults**
- The physeal plate (growth plate) in **Children**

Dislocation and Sublaxation

Dislocation

Sublaxation

* Torus Fracture



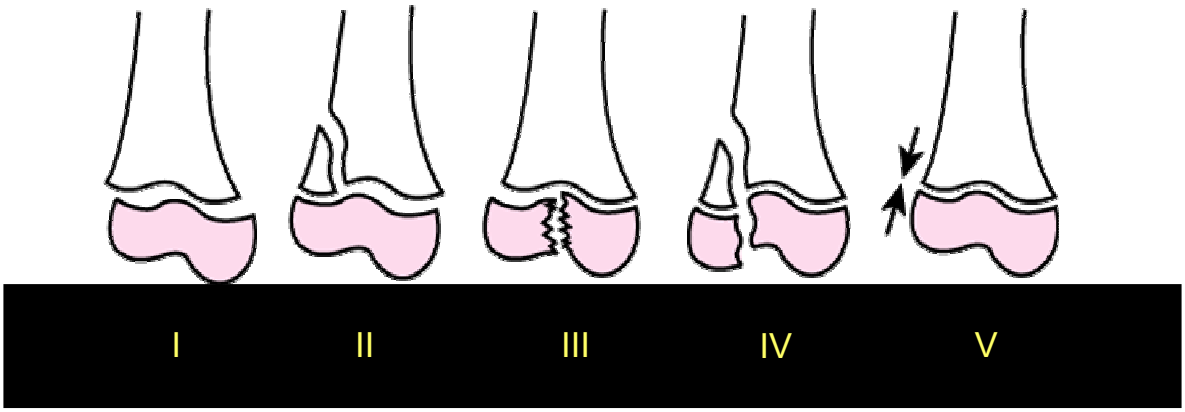
This x-ray shows a "buckle" or "Torus" fracture of the radius (forearm). This fracture is most common in children between the ages of 5 and 11. Typically, the child reports having fallen onto his or her outstretched hand. The main clue to diagnosis is pain that persists longer than a couple hours, especially if the child does not want to use the arm.

* Greenstick fracture and Bowing Fracture

Greenstick fracture
Due to the pliability of pediatric bone, the bone does not completely fracture. The medial side of the radius is open where as the lateral cortex has simply buckled.

Bowing fracture when one bone break the other bow (arc forming the shape of english letter C)

Salter-Harris injury



Salter-Harris Fractures

Type I : injuries refer to epiphyseal separation without any x-ray evidence of metaphyseal or epiphyseal fragment. If undisplaced, there is little potential for growth disturbance. This fracture is common with birth injuries, and in cases of child abuse.

Type II : injuries consist of a transverse fracture plane travelling through the cartilage plate and exiting through the metaphysis. Type II injuries are the most common form of growth plate injury.

Type III : fractures consist of a transverse fracture through the growth plate, with extension through the epiphysis. The Tilaux fracture is a Type III growth plate injury.

Type IV : consists of a longitudinally oriented fracture which extends perpendicular to the growth plate through the metaphysis and epiphysis. The fracture fragment commonly migrates towards the diaphysis of the bone and operative fixation is usually recommended.

Type V : injuries are difficult to recognize radiographically, and consist of a crushing force to the growth plate which may lead to growth disturbance.

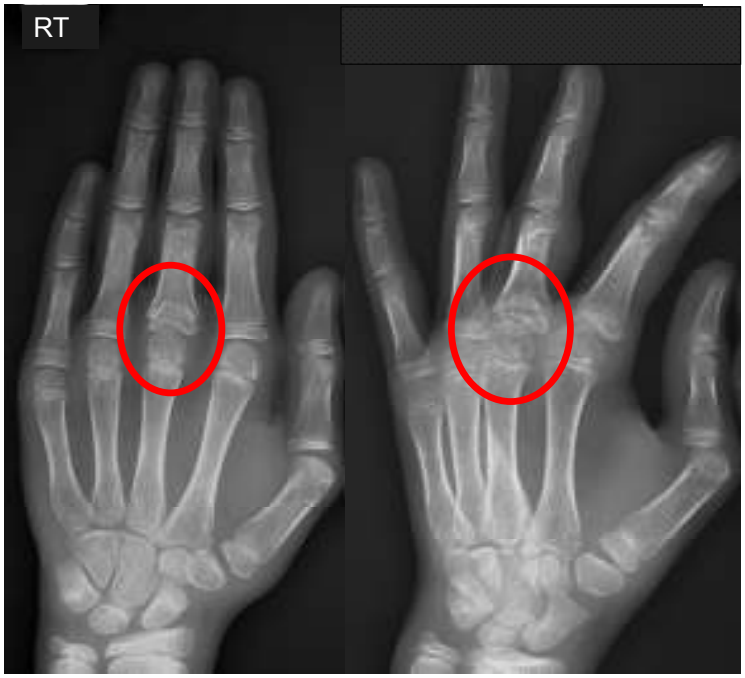
Growth plate injury (Salter-Harris injury type I)

Clinical History: 11years old boy with swelling of wrist pain

Growth plate injury (Salter-Harris injury type II)

9years old boy with pain

Osteochondritis
is a painful condition within a joint of the body in humans or animals, in which fragments of cartilage or bone have become loose within a joint, leading to pain and inflammation.

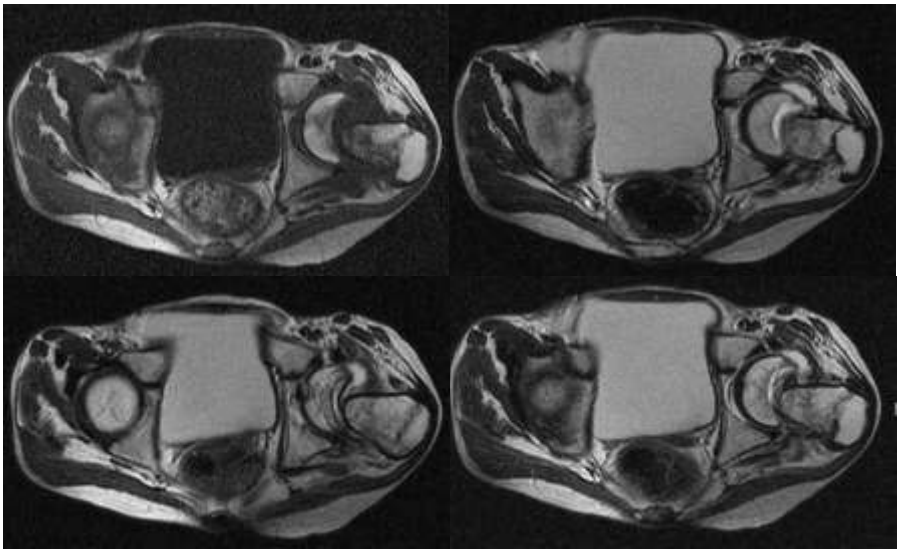


Osteochondritis

CLINCAL CASE

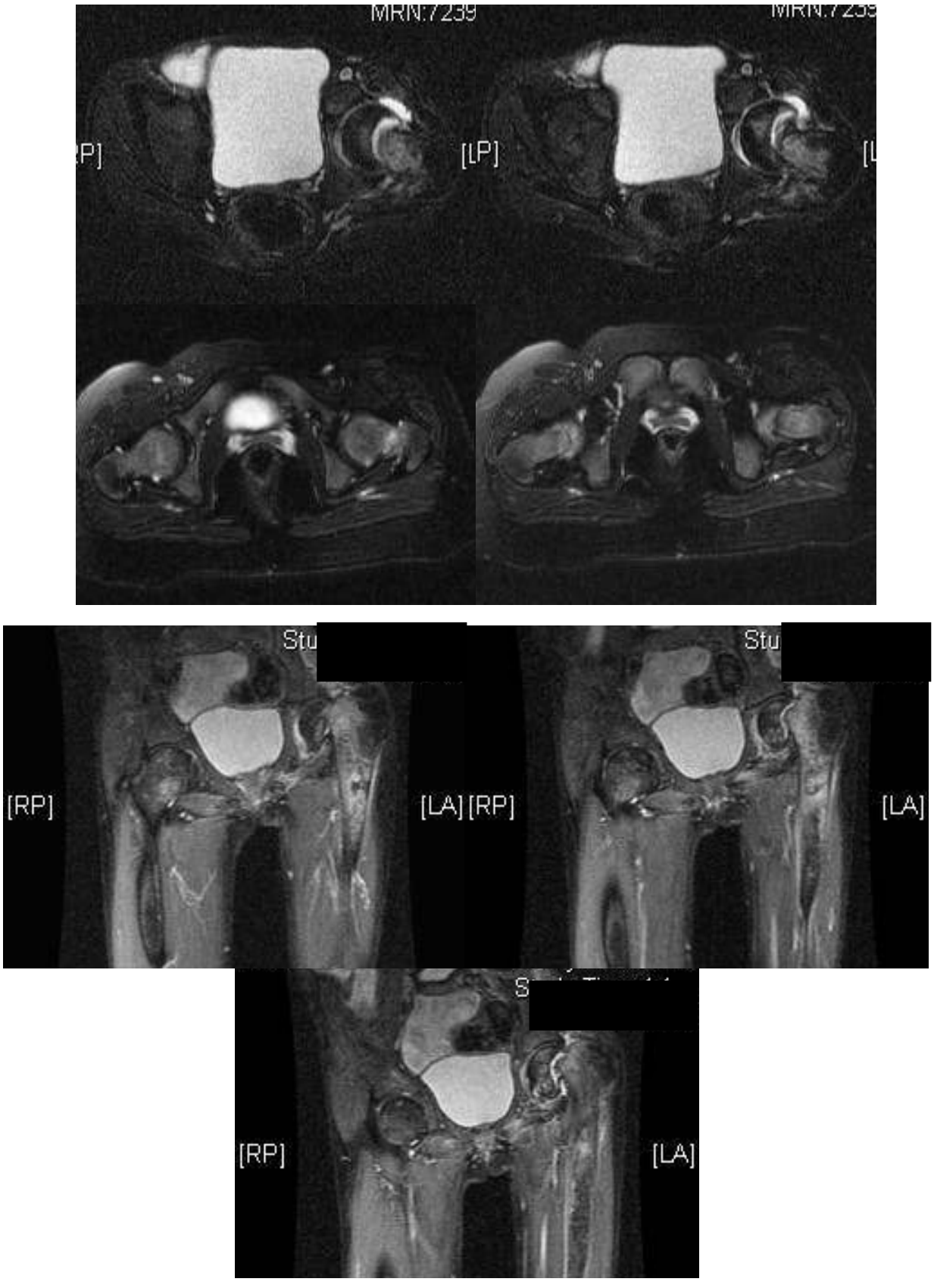
17 years old lady, HIV limping with hip pain
(HIV patients sometimes have weak hip joint not known if it was of the virus or of it's treatment)

Slipped Capital Femoral Epiphysis



Slipped Capital Femoral Epiphysis (SCFE) is a fracture through the epiphyseal growth plate

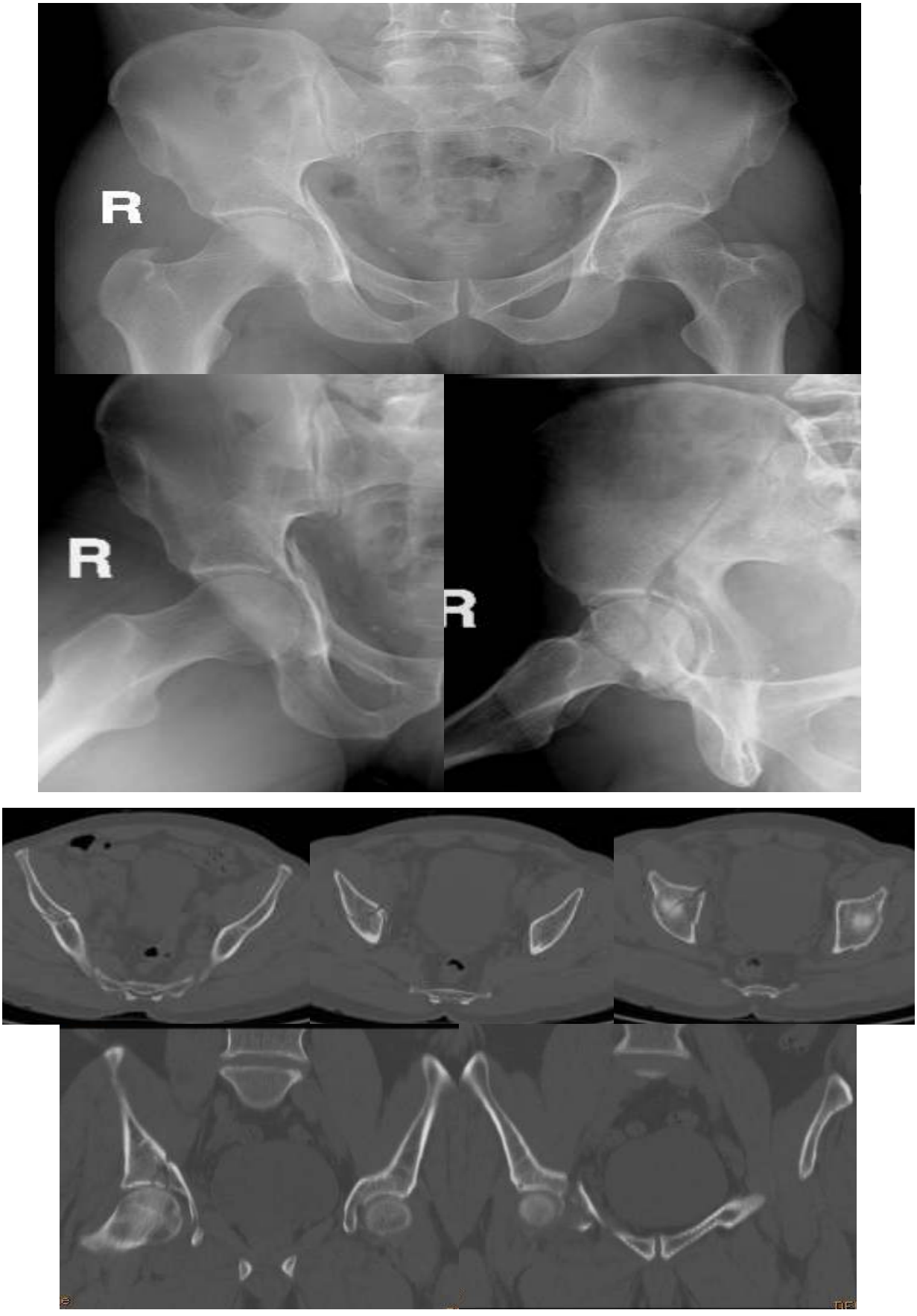
CLINCAL CASE



C.H :17 years old lady, HIV limping with hip pain

Slipped Capital Femoral Epiphysis

CLINCAL CASE



Clinical History: 55 years old patient limping with hip pain

Supra-acetabular fracture

CLINCAL CASE

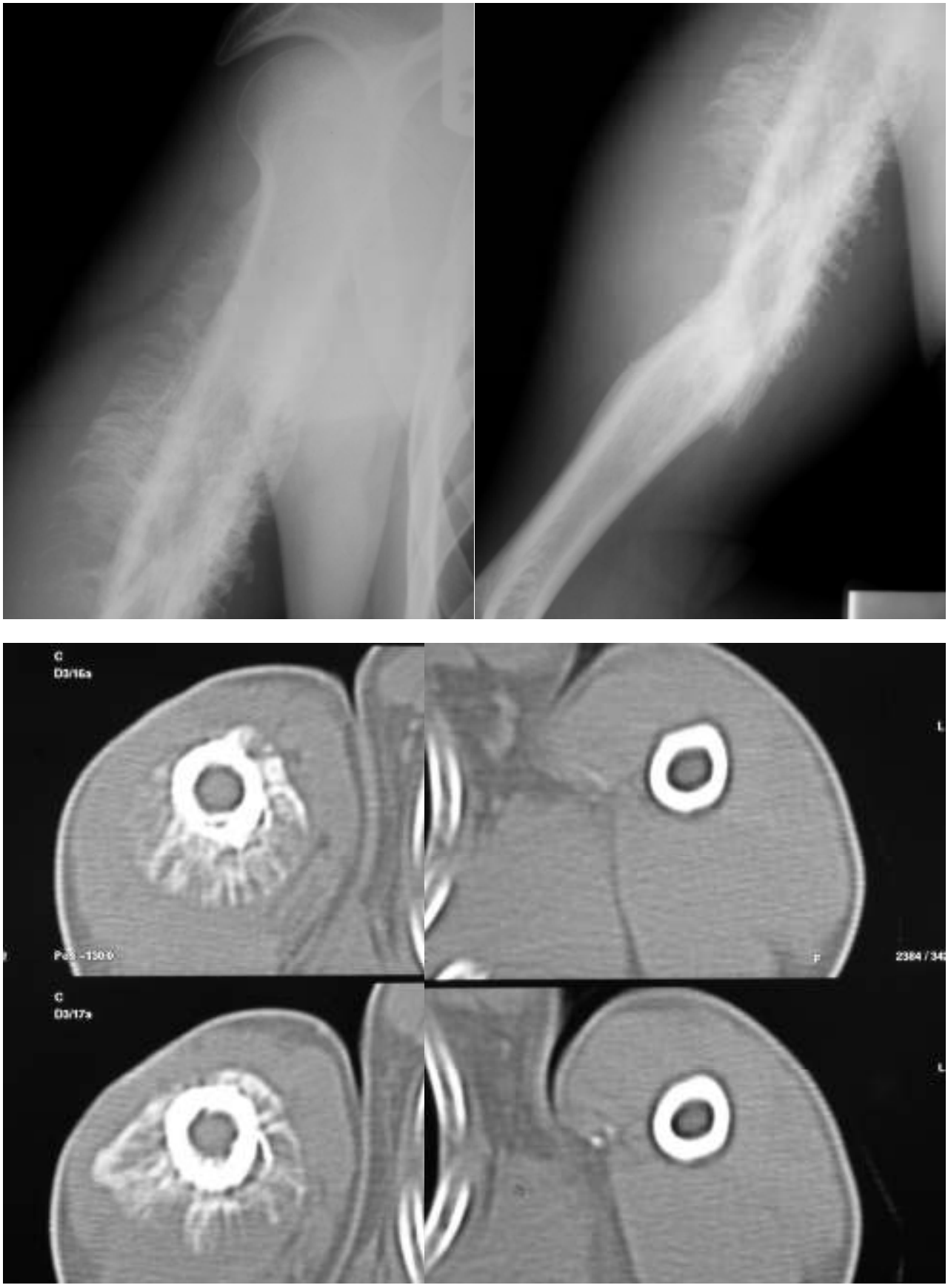
Clinical History: 50 years old patient limping with hip pain

* CLINCAL CASE (pathologic fracture)

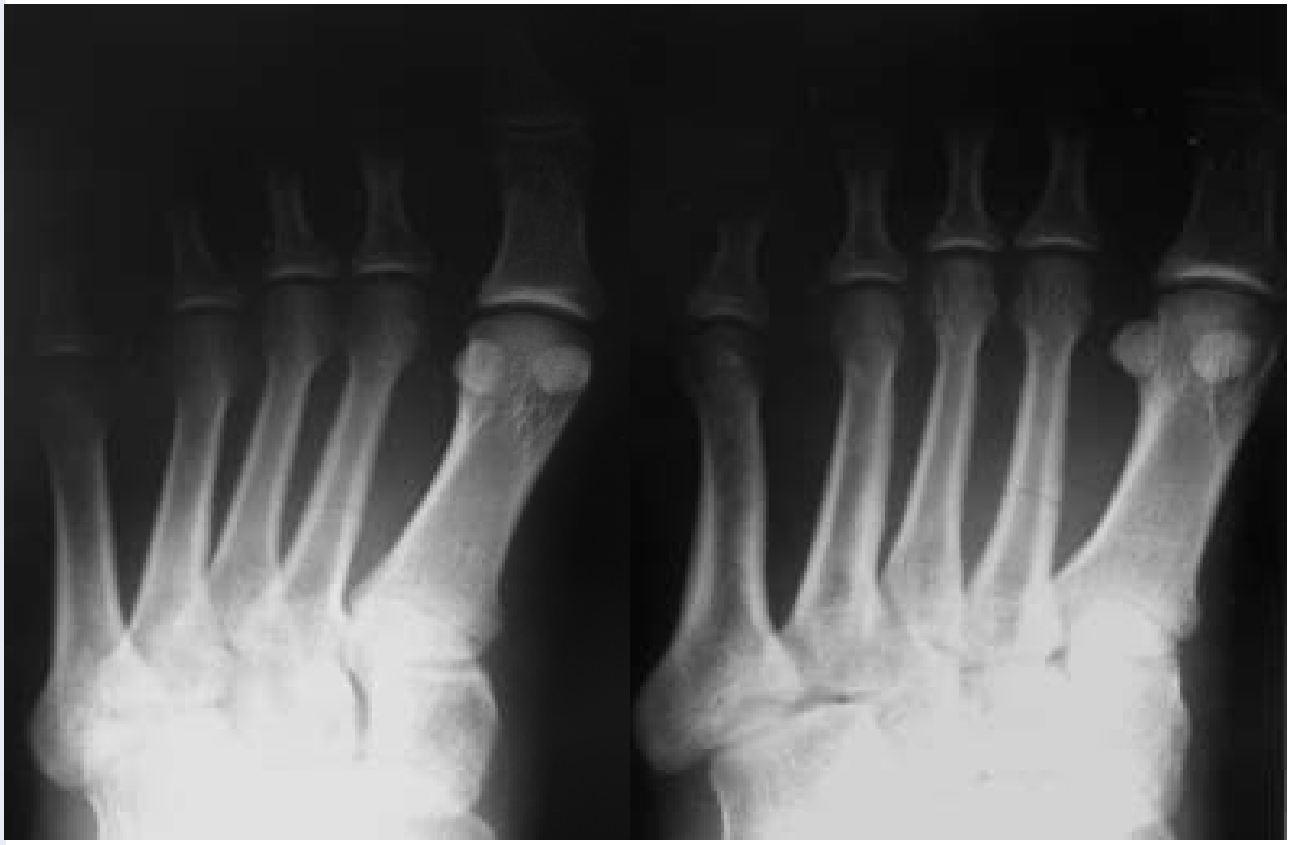
- Diagnosis:
Unicameral bone cyst

- Discussion:
Two radiographs of a pathologic fracture in a simple bone cyst of the proximal humerus. Within the cyst is noted a small, thin, linear bony fragment which is displaced from the site of the fracture. An excellent sign of unicameral bone cyst. The fallen fragment secondary to pathologic fracture is pathognomonic for this cyst. A portion of the wall of the cyst has undergone a pathological fracture and subsequently floated down (fallen) via gravity into the dependent portion of the cyst.

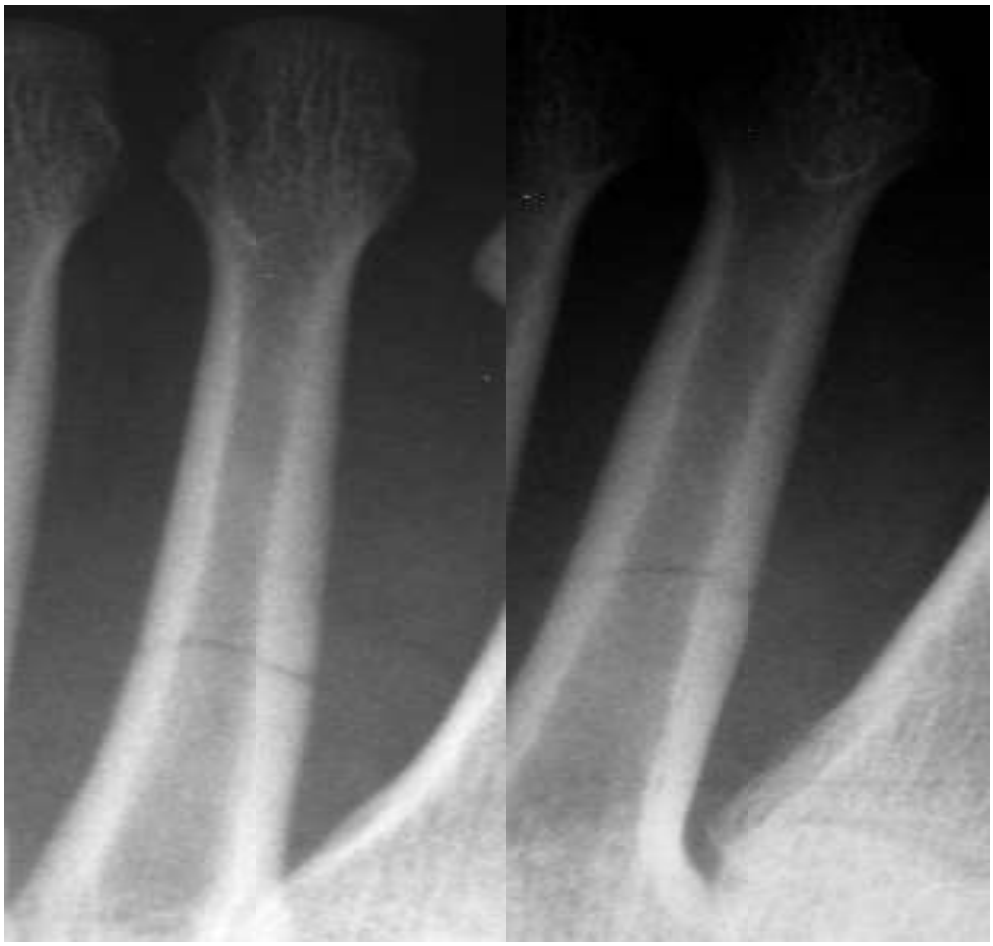
Pathologic Fracture



Stress Fracture



Stress Fracture



Musculoskeletal Non-Trauma

Dr. Nizar Al-Nakshabandi

Bone Tumors

- Bone tumors **benign** or **malignant**

- Malignant can be **primary** or **secondary**

- They are **uncommon** except for **secondary** deposits in patients with known metastatic disease

- **Breast**, **prostate**, and **lung**. People with the multifocal malignant disease of myeloma often have bone deposits.

Figure : Lytic bone metastases (Lytic or lysis is the process of disintegration or destruction of a cell)

- Diagnosis of the type of tumour is a task for the specialist, but the non specialist needs to know four things:

1. How to detect the lesion.
2. How to describe it.
3. The features of benign and malignant lesions.
4. Which other modalities are available to characterize the lesion and find the extent of the disease.

- How to Detect a Lesion ?

1. Look at the bone:
   - start in the centre of the bone and work outwards
   - check the medullary cavity and trabecular pattern
   - examine the cortex
2. Look around the outline of the cortex for a loss of continuity or periosteal reaction.
3. Look at the joints.
4. Look at the soft tissues for any mass or swelling.

- What to look for ?

- Prostate secondaries in the male, and occasionally breast carcinoma secondaries in females, excite an osteoblastic reaction and are sclerotic
- Osteosarcoma
- Most bone tumours, both benign and malignant, are **radiolucent** because they destroy bone
- Look for expansion or collapse of a bone.
- Look for a **periosteal reaction** (elevation of the periosteum by pus, blood, tumour, and new bone formed on its deep surface). **MCQ**

- How to describe it ?

Start with the site, size, and shape and then describe the features from inside out :

1- Look at the matrix (is it radiolucent or calcified?).
2- Look at the border, is it:
   • well defined, i.e. circumscribed or geographic (meaning like a map)— can be with or without a sclerotic margin? or
   • poorly defined?
3. Check for a periosteal reaction.
4. Look for a soft-tissue mass.

look at the border

periosteal reaction

soft tissue mass

- Features of benign and maligant lesions

- These are better described as indolent (lazy) or aggressive lesions because this will include non-neoplastic pathology.

- Indolent lesions (benign tumours and cysts) have features of:
  - organized new bone or calcification in the matrix (not with cysts)
  - a well-defined margin, perhaps with a thin sclerotic line
  - an adjacent bone cortex that may be thinned or expanded
  - no extension into the soft tissues or across the epiphyseal plate

- Characteristics of aggressive lesions (both aggressive benign tumours and malignant lesions, and osteomyelitis) are:
  - bone destruction
  - Periosteal reaction
  - Soft tissue mass

Distal femur in 19-year-old male , has poorly defined mass that has sclerotic matrix . This is an aggressive lesion that is forming bone . The patella is displaced anteriorly The process invaded soft tissue and is forming bone . Likely diagnosis Osteosarcoma . Next step MRI to define the extent of the tumor

Lyctic and sclerotic lesions
secondary to breast cancer

Consider the appearance of the bones around 2nd and 3rd metatarsophalangeal joints . The abnormal radiolucency with poorly defined margin

diagnosis : this is a case of osteomyelitis and septic artharitis due to DM . (notice the first toe has been removed and arterial wall has been calcified)

Indolent lesion in medullary cavity of the tibia , well defined

Joint is normal , soft tissue is normal

Arthropathy

-Major criteria for diagnosing arthritis on X-ray:

(you need to fine one of the following)

- joint space narrowing
- osteophyte (outgrowth of bone) formation or subchondral sclerosis
- periarticular bone erosion

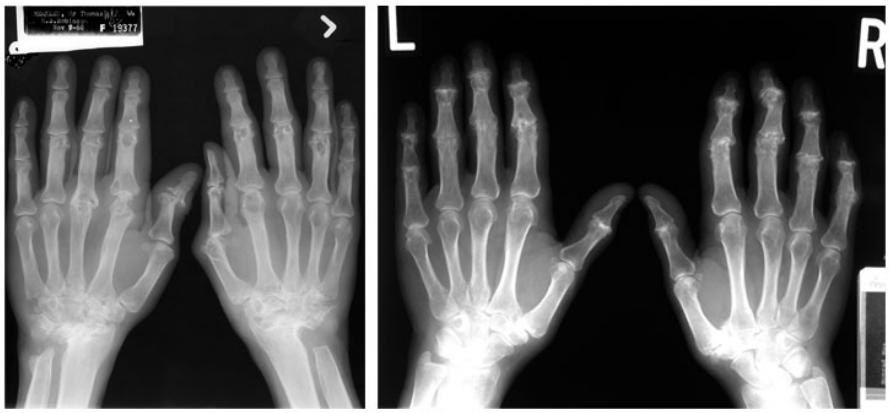
- MONOARTHROPATHY:

• **Trauma** (Usually an obvious history associated fractures and joint effusion)
• **Septic Arthritis** (Joint may be radiographically normal at time of initial presentation , Later, a joint effusion and swelling of surrouding soft tissues may occur followed by bone erosion and destruction Scintigraphy – Nuclear medicine - usually positive at time of presentation)
• **Gout** (Crystal-induced Arthopathy)
• **Osteoarthritis**
• **Early presentation of Rheumatoid Arthritis**

- POLYARTHROPATHY:

• **Rheumatoid Arthritis**

- Symmetrical distribution
- Apex predominantly small joints especially the metacarpo-phalangeal , metatarso-phalangeal , carpo-proximal interphalangeal.
- Soft tissue swelling overlying joints is an early sign.
- EROSION :
  - -Occur earlier in the feet than the hands.
  - Affects metatarso and metacarpal heads, articular surface of the phalanges and carpal bones.
  - Periarticular osteoporosis
  - Abnormalities of joint alignment.
  - Subluxation of MCP joints, Ulnar deviation
  - Subluxation of the metatarso-phalangeal joints, lateral deviation of toes.
  - Axial involvement is rare apart from the cervical spine where erosions of the odontoid peg is most significant feature.



Other Connective Tissue Arthropathies

- Other Connective Tissue Arthropathies

- SLE
- Systemic Sclerosis
- Polymyositis
- Dermatomyositis

- tend to present with symmetrical artropathy involving the peripheral small joints especially the MCP joint and proximal interphalangeal joints.

- Soft tissue swelling and periarticular osteoporosis.

- Erosions less common than Rheumatoid Arthritis.

- Soft Tissue calcification especially around joints, alignment deformities

- Generalized Osteoporosis (fading of bone)

- Sero-negative Inflammatory Arthropathies :

- Ankylosing spondylitis (may occur alone or associated with osteo inflammatory bowel disease (Crohn's Disease, Ulcerative Colitis)) .
- Rieter's disease
- Psoriatic Artropathy
- Juvenile Chronic Arthritis

- Ankylosing spondylolitis

- Asymmetric polyartropathies
- Predilection for spine in SIJ
- Spine changes
- Syndesmophytes
- Ankylosis giving bamboo spine
- Early erosion with irregular joint margins
- Later sclerosis and joint effusion
- Peripheral joints

Ankylosing spondylolitis

Ankylosing spondylolitis

- Gout (metabolic arthritis)

- is a disease due to a congenital disorder of uric acid metabolism. In this condition, monosodium urate or uric acid crystals are deposited on the articular cartilage of joints, tendons and surrounding tissues due to elevated concentrations of uric acid in the blood stream .

- **Pseudogout** is a very similar disease, but caused by deposition of calcium pyrophosphate, not uric acid . (also causes arthritis)

- distribution :**1st metacarpo-phalangeal** joint in 70% of the cases . Other joints of the lower limbs, ankles, knees, intertarsal joints.

- also could include (Achilles tendon , Olecranon Bursa , and Helix of the ear)

- Asymmetric often **monoarticular**

- Acute gout : Soft tissue swelling with no bony changes
- Chronic gouty arthritis : Occurs with recurred acute gout.

- Calcification of articular cartilage especially the menisci of the knee.

- Arthritis could also be cause by infection

Joint space narrowing

Calcium deposition in knee joint caused by many diseases including gout

MCQs about this subject included :

* which on of the following is Monoarthropathy ? (gout , septic arthritis , etc …)
* what is **periosteal reaction** ?

Done