musculoskeletal system

Dr Bilal Al-Badayneh, MBBS, JBR
Neuro and MSK radiologist

- What is the muscyloskeletal system ?

  Is all of the bones in the body and the associated tissues such as muscles, tendons, ligaments and cartilage that connect them.

- The average adult human skeleton has around 206 bones.

· The largest sesamoid bone in the body is patella

Imaging modalities

- ***Plain film:***

· views should always be obtained in two projections (AP / LATERAL)

  - Plain films still remain the mainstay of radiological investigation of the skeletal system .
  - views should always be obtained in two projections.

Ultrasound :

- neonatal hip for congenital dislocation .
- soft tissue lesions and abscesses.
- joint effusions .
- Muscular and tendinous tears.

Ultrasound:
1- in CDH :"congenital dislocation of hip" → any baby should have a pelvic plain x-ray at three months even if diagnosed by the ultrasound
2- joint effusion → as if we suspect baker's cyst so we need US

initial > xray /
best > CT

CT in skeletal system

We need CT scan of the spine because the x-ray sometimes doesn't give the result of the definite fracture The doctor should define the area that should be scanned to avoid high exposure

CT is very helpful in :

- assessment of bone tumours prior to surgery .
- evaluation of certain fractures , such as the acetabulum, spine and calcaneum .
- study of the spinal column .

MRI / Skeletal system

- MRI assists the investigation of bone tumours, soft tissue masses and joint .

- MRI is extremely sensitive in injuries to cartilage , muscle , ligaments, menisci and tendons.

Osteoarthritis

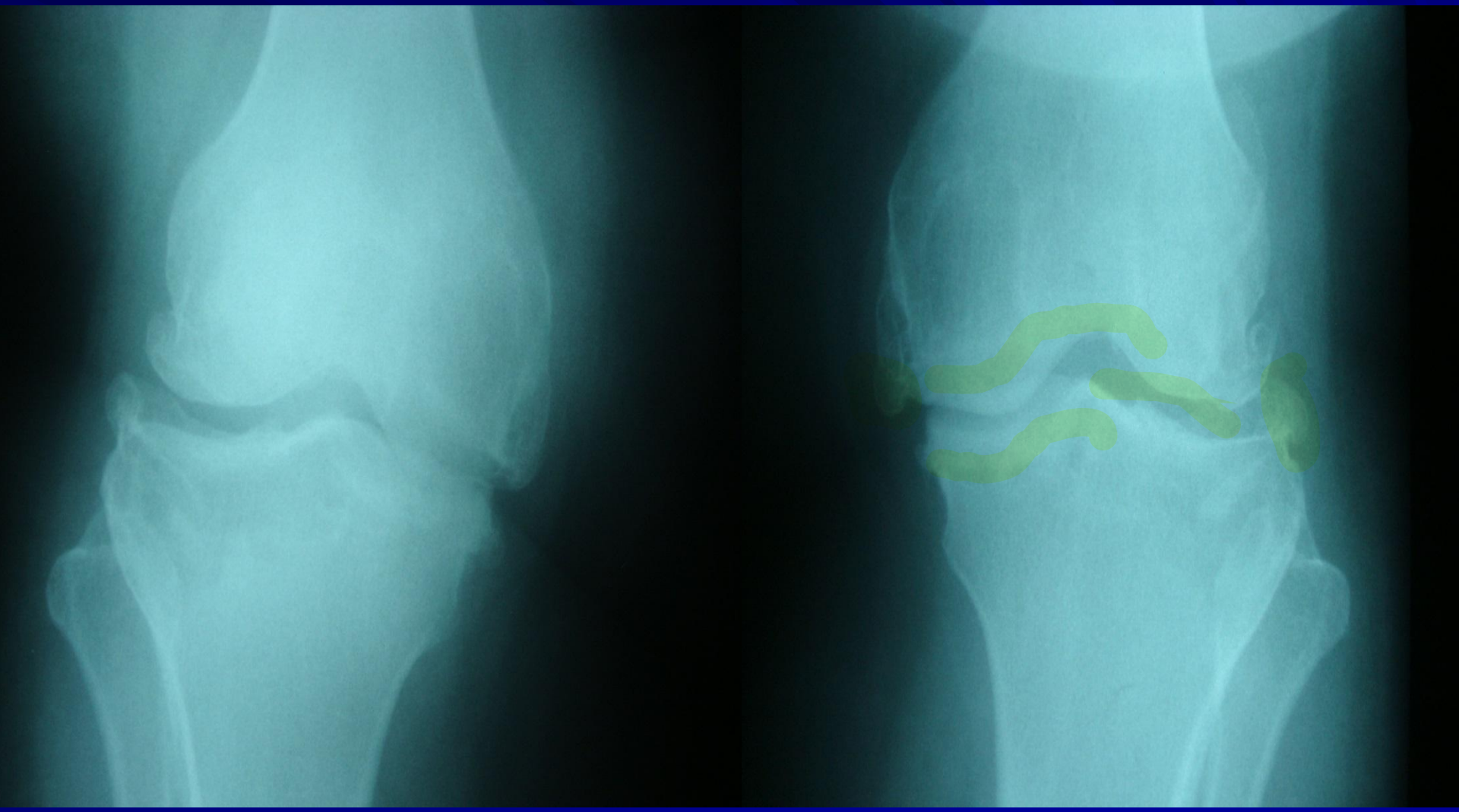
(degenerative joint disease)

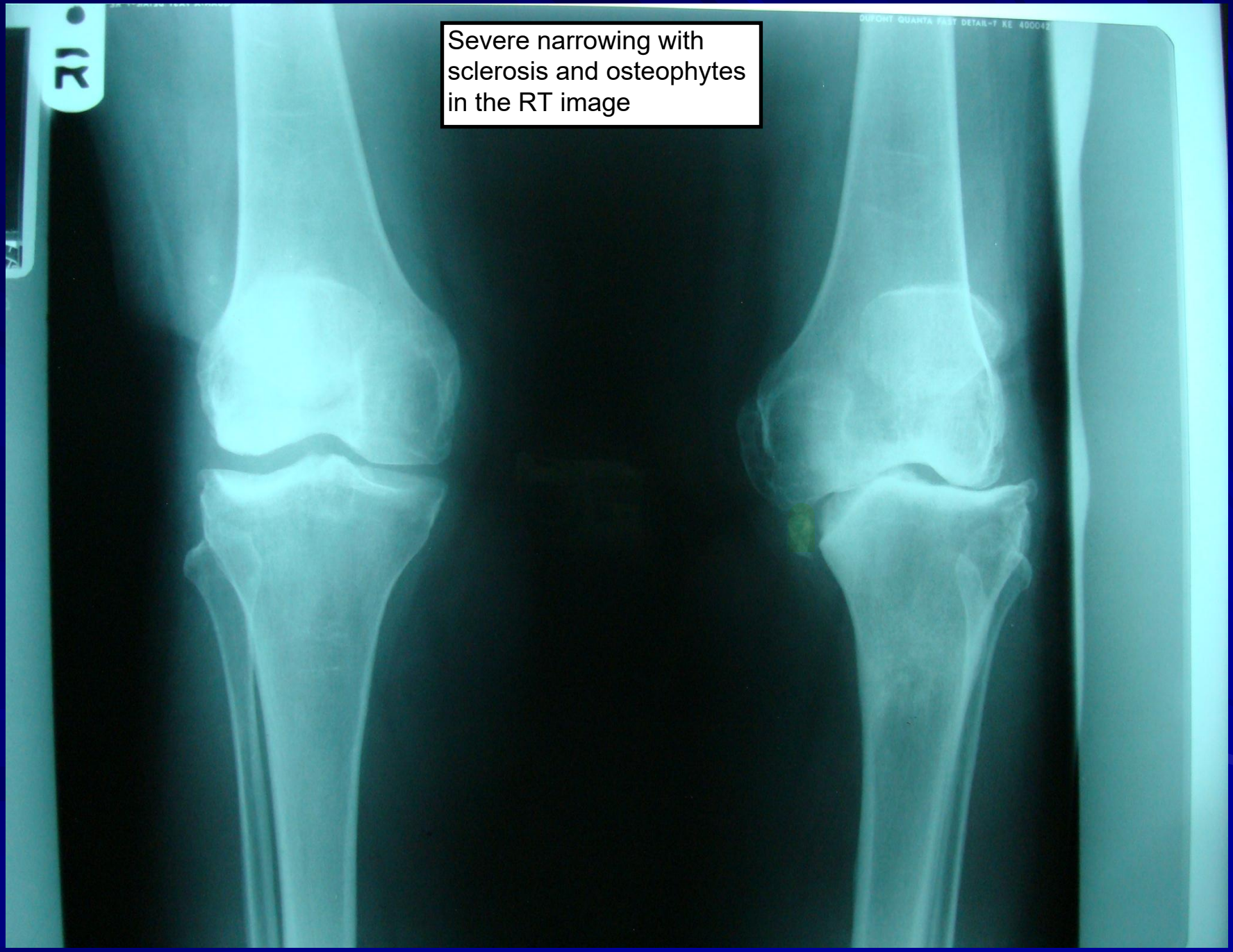
- Is a degenerative condition affecting the articular cartilages and subchondral bone.
- Is part of the normal aging process.
- Secondary osteoarthritis results from previous trauma and joint infection.
- Any joint may be affected, but the knees, hips, and shoulders are frequently involved.

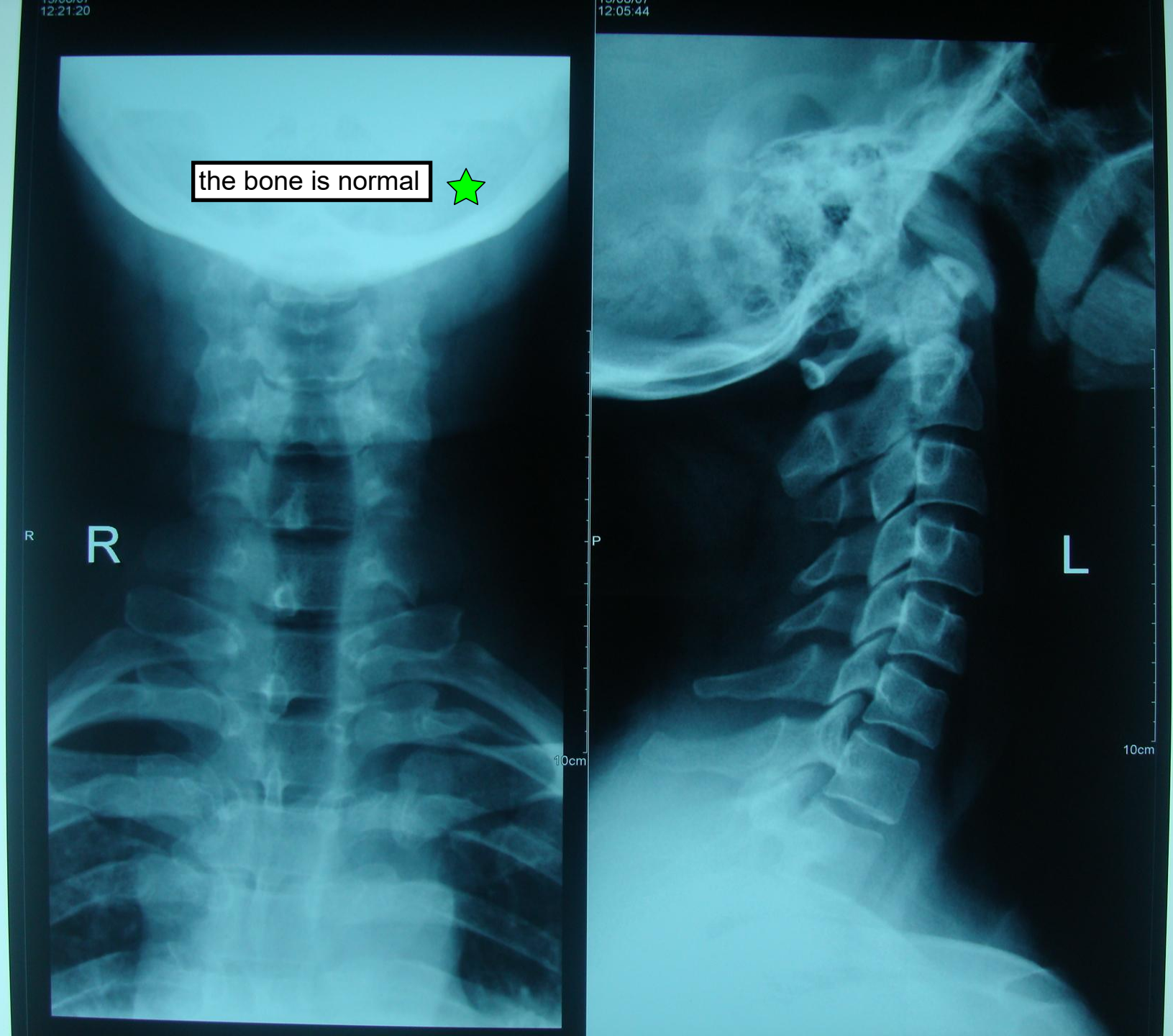
Osteoarthritis / 2

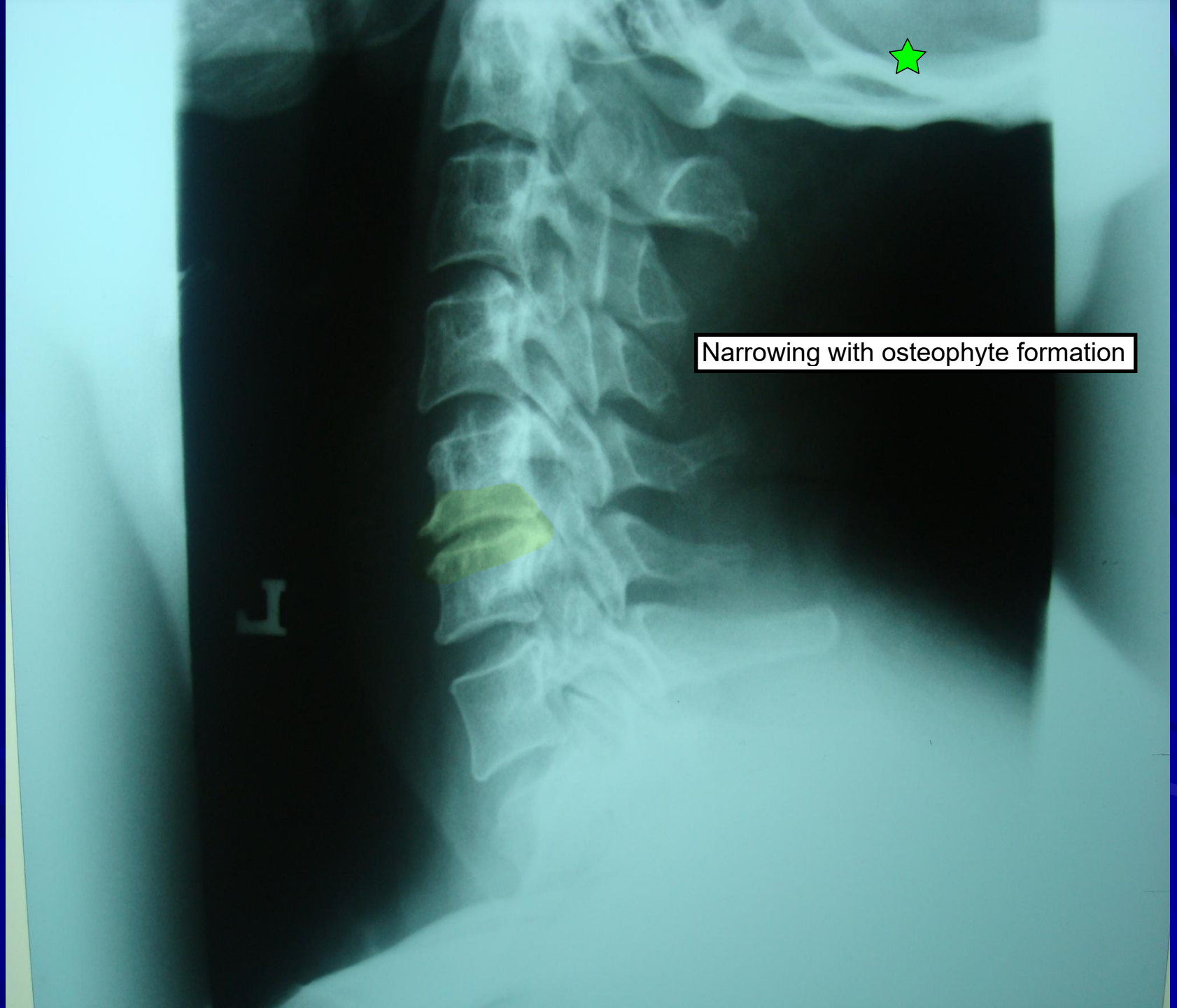
Radiological features:

- **Osteophytes formation:** are spurs of bone which forms at joint margin.
- **Joint space narrowing.**
- **Sclerosis with Secondary degenerative cysts formation.**
- **Loose bodies:** result from separation of cartilage and osteophytes.
- Articular chondral loss or thinning.




Severe narrowing with sclerosis and osteophytes in the RT image


12:21:20
the bone is normal
R
R
10cm
12:05:44
P
L
10cm


Narrowing with osteophyte formation


SAM

Osteomyelitis ★

Infection of bone tissue

* Hematogenous vs direct spread.

* Staphylococcus Aureus is responsible for the majority of cases.

neonates: metaphysis and/or epiphysis ★

children: metaphysis ★

adults: epiphyses and subchondral regions

Coneventional Radiological features:

- May be normal in the first 10 days or two weeks. ★
- The earliest sign is soft tissue swelling due to edema.
- Periosteal reaction
- Bone destruction

·periosteal reaction :the outlines are irregular like the saw
·osteomyelitis and malignancy “METS” have the same signs on the bone so we can differentiate between them clinically

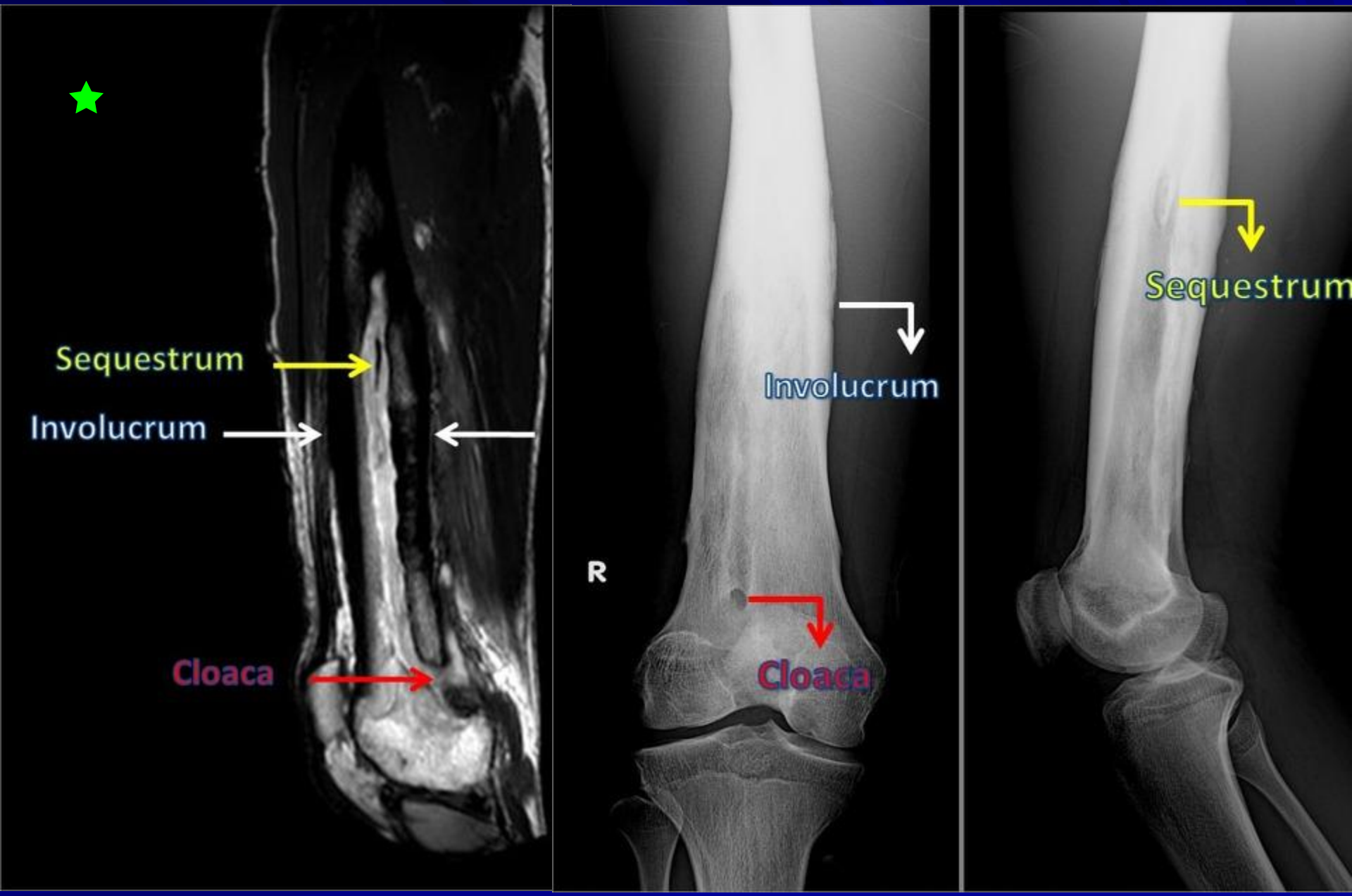
- MRI

Bone marrow edema is the earliest sign.

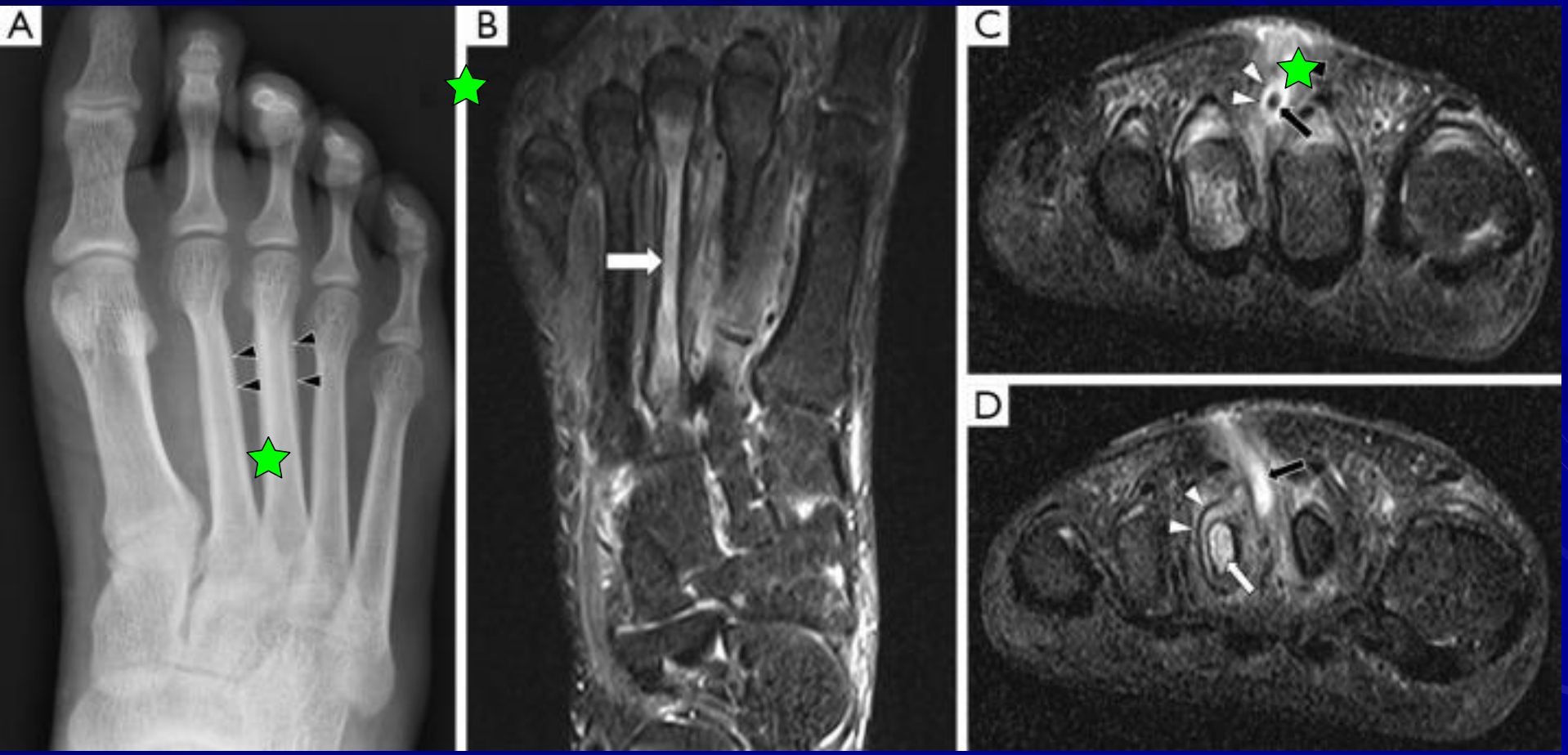
The cloaca is an opening in an involucrum which allows drainage of purulent and necrotic material out of the dead bone.

Involucrum is a complication of osteomylitis and represents a thick sheath of periosteal new bone surrounding a sequtrum.

Sequtrum is defined as a piece of devitalised bone that has been separated from its surrounding bone during the process of necrosis.


Sequestrum
Involucrum
Cloaca
R
Involucrum
Cloaca
Sequestrum

The black spot in pic C is foreign body causes reaction and infection and direct spread if infection to the bone



Multiple Myeloma

- Is a tumor of plasma cells (malignant proliferation).
- The most common bones involved are: the skull, spine, pelvis and ribs.
- The disease may occur in a disseminated form, or as a localized solitary mass (Plasmacytoma).

The most common bones involved are the skull, spine, pelvis and ribs → so if we suspect a multiple myeloma in a Pt, we need to make a lateral skull , chest , spine , pelvis x-ray → lytic lesion (black) → if single called “plasmacytoma”

Multiple Myeloma / 2

Radiological features:

- At time of presentation 80% have skeletal abnormalities.

Plain films reveal:

- Generalized osteoporosis.
- Scattered lytic lesions with well defined margins
- Compression fractures of the vertebral bodies.

Osteoporosis is a bone disease that occurs when the body loses too much bone, makes too little bone, or both. As a result, bones become weak and may break from a fall or, in serious cases, from sneezing or minor bumps

pushed out lesions with sharp edges through cortex

Bone metastasis

- Are the most common malignant bone tumors.
- Any primary tumor may metastasize to bone, but the most frequents are:

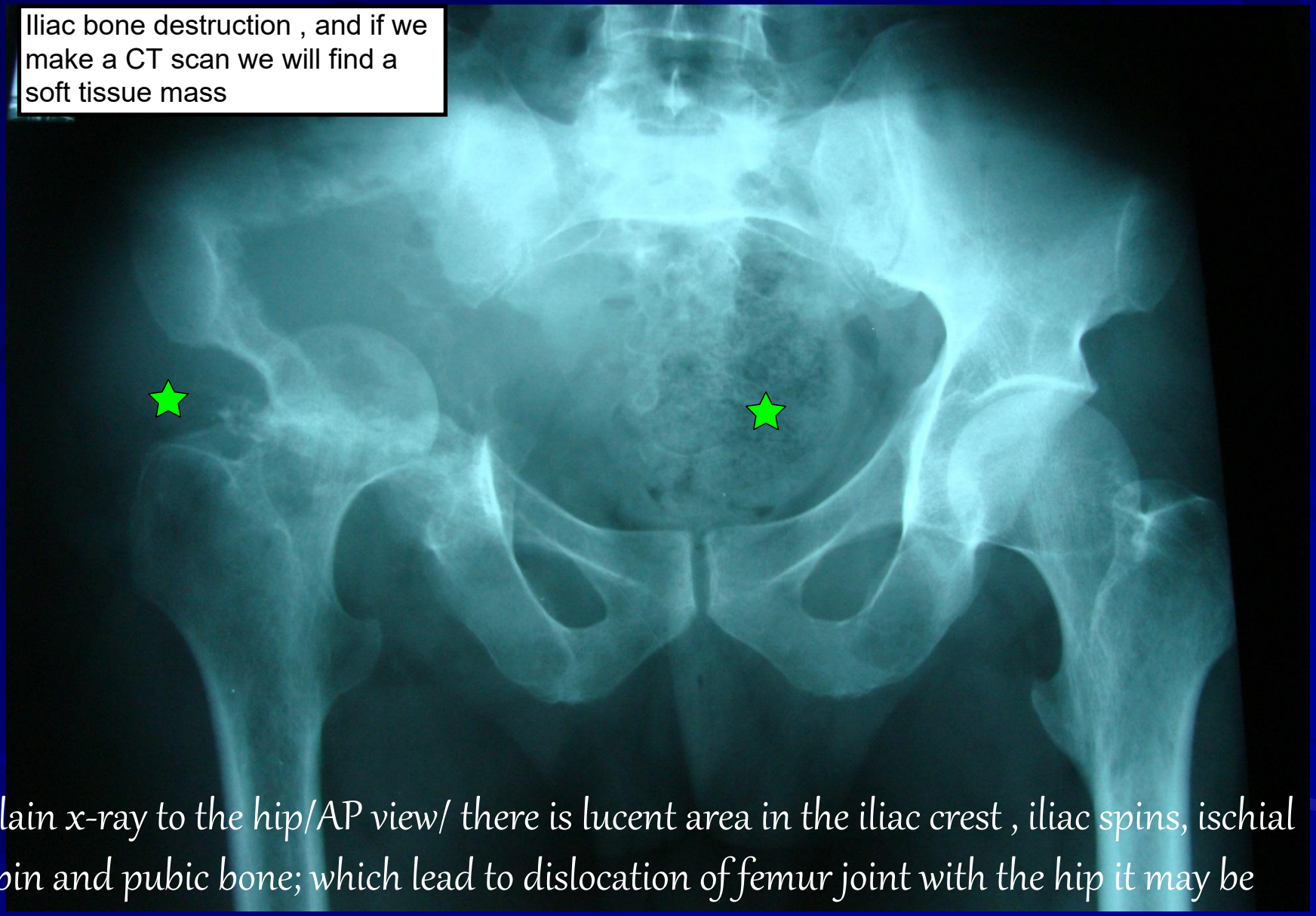
Breast: usually lytic in nature but may be sclerotic or mixed.

Prostate: the vast majority are sclerotic.

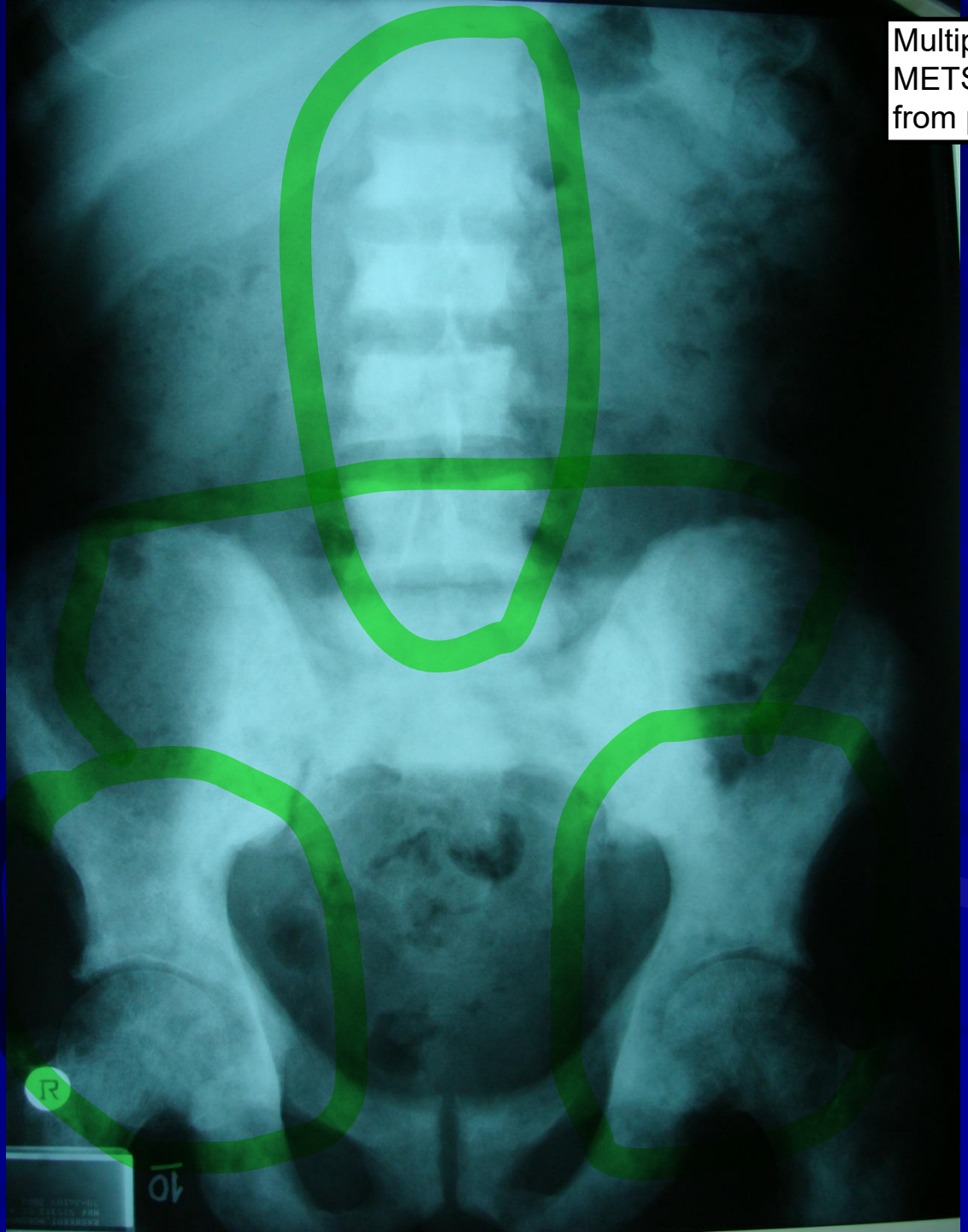
Lung, Kidney, thyroid,: lytic lesions

Adrenal gland: predominantly lytic.


Multiple lytic lesions
Not clear-hazy we need history



Plain x-ray to the hip/AP view/ there is lucent area in the iliac crest , iliac spins, ischial spin and pubic bone; which lead to dislocation of femur joint with the hip it may be caused by primary osteolytic or secondary metastasis



Multiple vertebral body METS → most commonly from prostate

Skeletal trauma

- Plain films are the initial evaluation of a patient with suspected skeletal trauma.
- At least two views (A.p, and lateral) should always be obtained.
- In any significant head or spine injury, CT scan is the initial investigation.
- CT will detect fractures as well as underlying intracerebral hemorrhage or contusions.

FRACTURES

Fracture: is a break in the continuity of bone.

Closed fracture: Fracture with intact skin.

Open fracture: Fracture with skin and soft tissue wound connecting the fracture to the external environment.

Open fracture → penetrates the skin

Types of fracture

- Linear fracture.
- Comminuted fracture: a fracture with multiple fragments
- Avulsion fracture: a fragment of bone is detached from the site of a ligament or tendon insertion.
- Pathological fracture: a fracture through diseased bone.

Pathological fracture → as if there is a cyst or a lesion and a fracture occurs there

Types of fractures /2

- Greenstick fracture: Incomplete fracture that usually occurs in children . The bone may also buckle without an actual break.
- Compression fracture: force is applied in the longitudinal axis of bone, usually occurs in the spine.
- Depressed fracture: usually occurs in the skull.

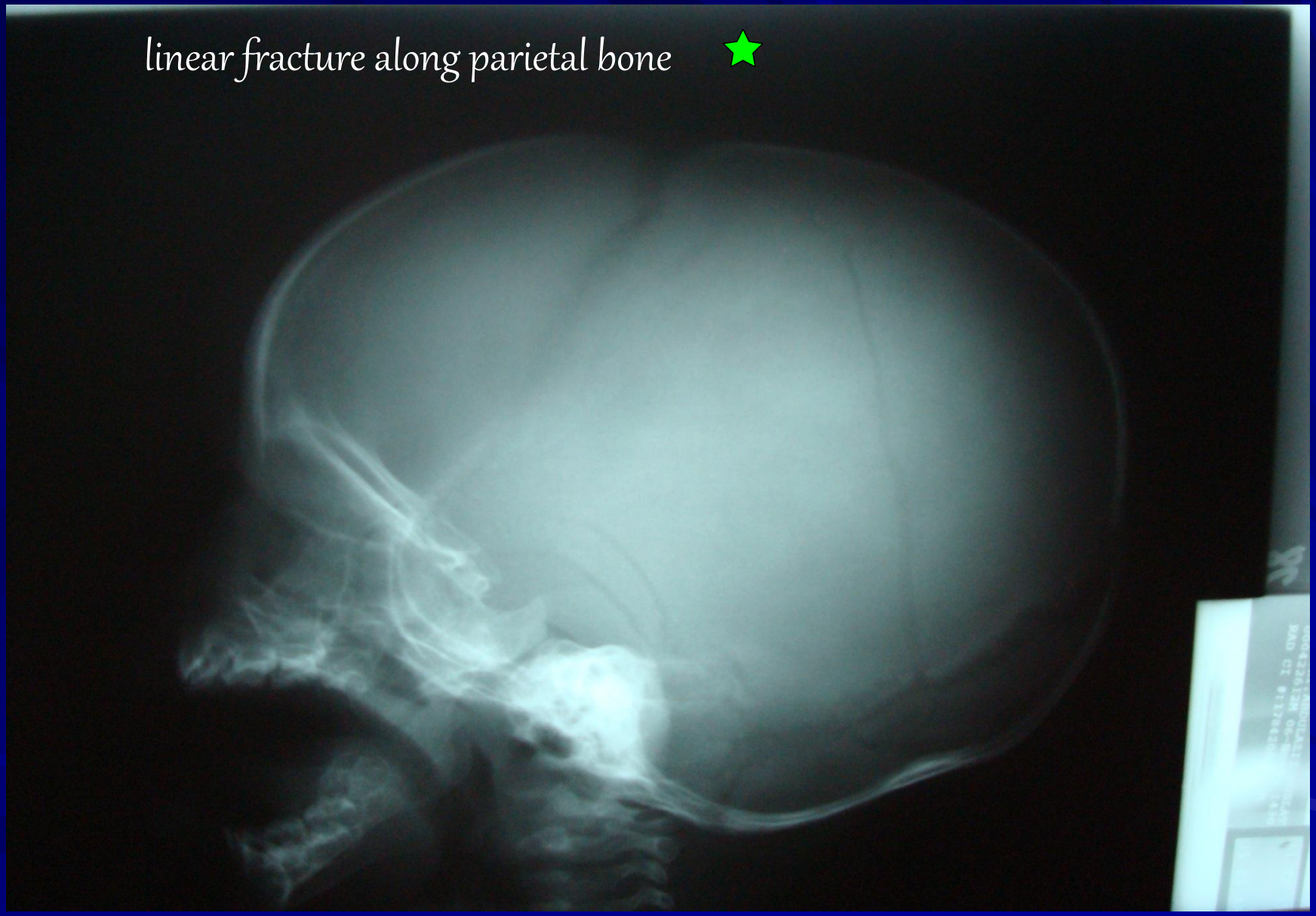
Green stick fracture : especially at the area of the radius in childs
Boxer's fracture : usually at the base of the 4th or 5th metacarpal bone

Types of fractures /3

- Stress fracture: Is incomplete fracture caused by repeated stress , or over-use to bone, in the form of a fine crack.

  most common in the proximal shaft of the tibia and fibula (long distance runners and ballet dancers).

- **March fracture:** is a type of stress fracture, also known as fatigue fracture of second and third metatarsal bones caused by recurrent overstress, is more common in soldiers.


linear fracture along parietal bone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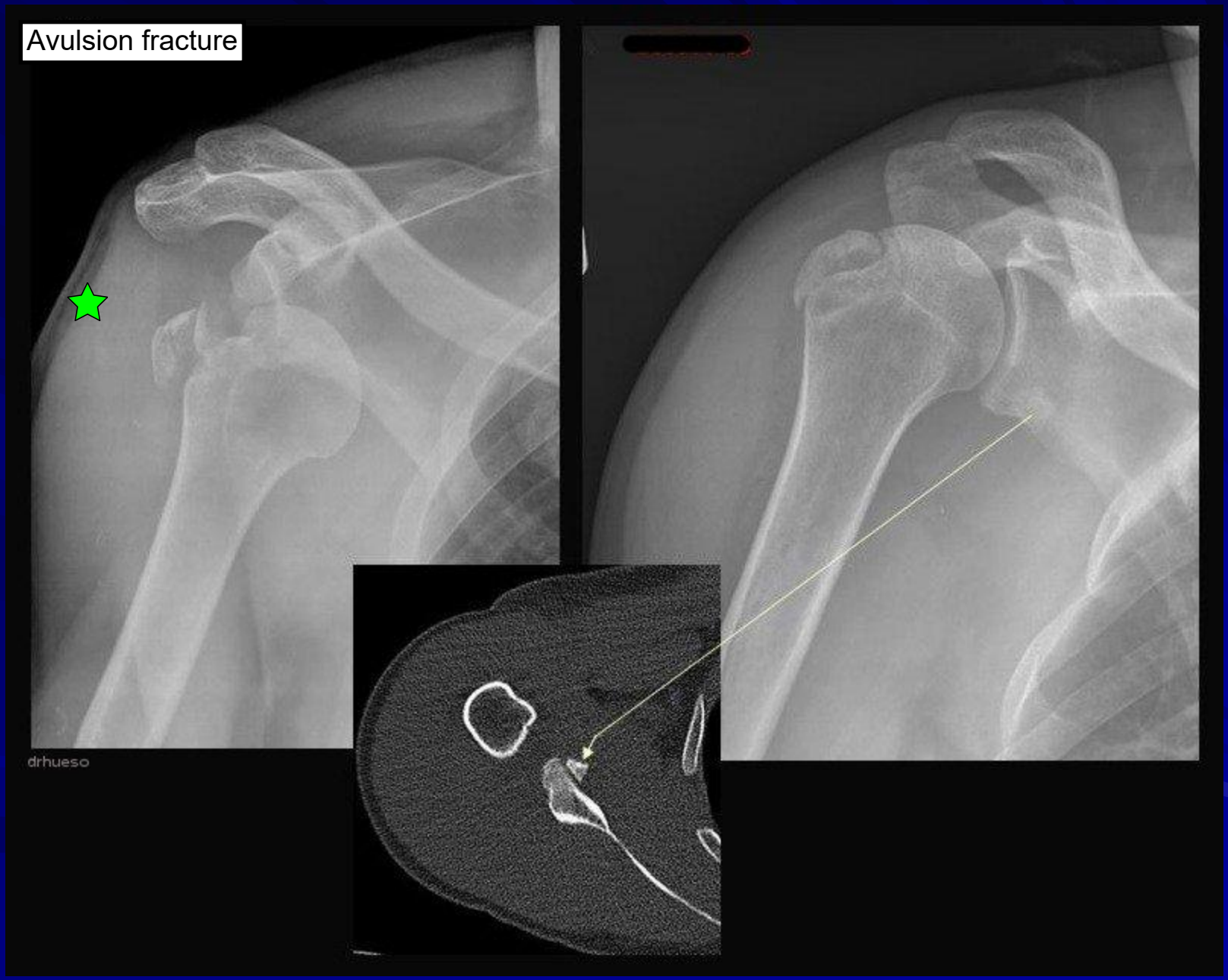
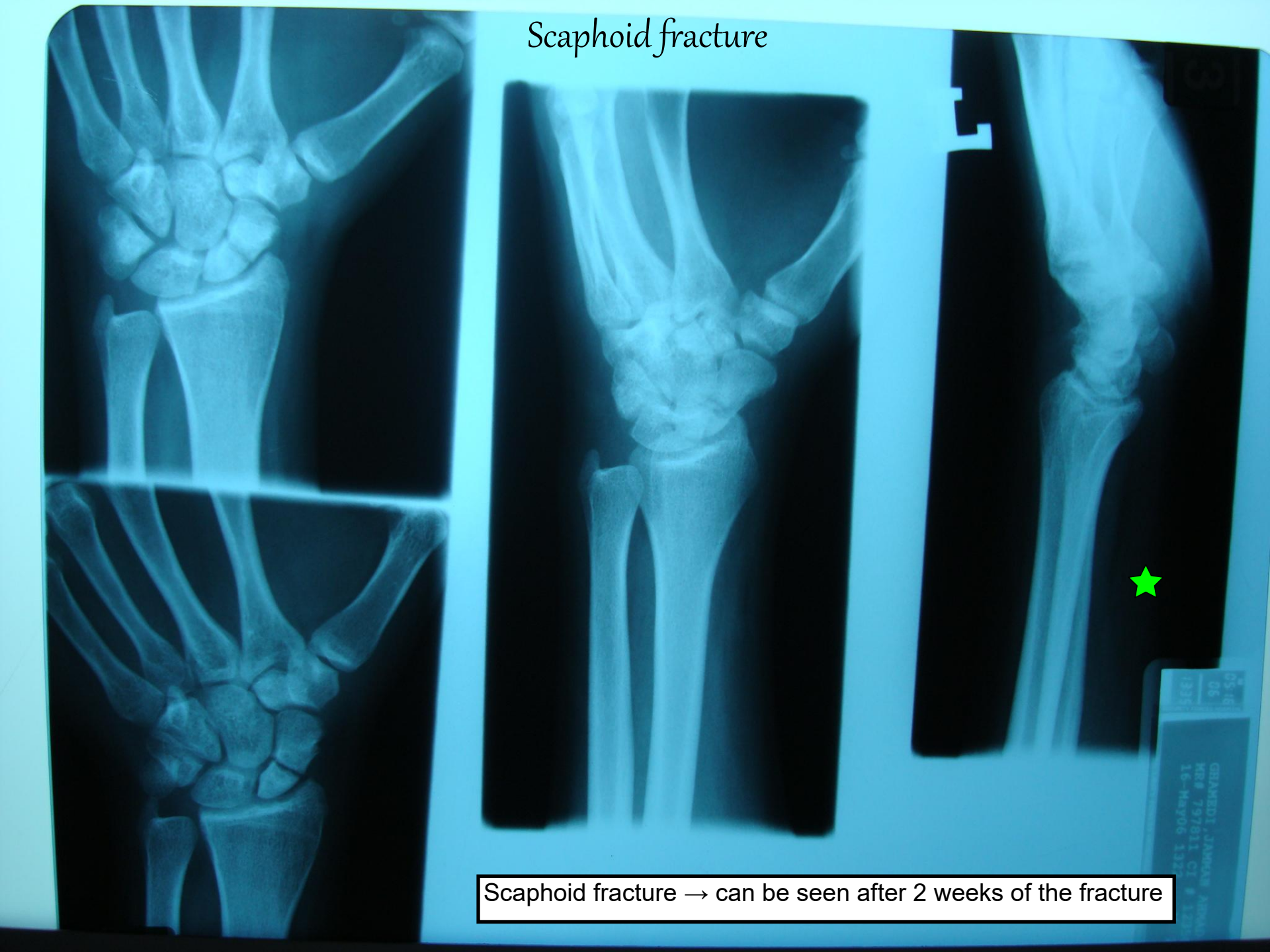

Avulsion fracture
drhueso

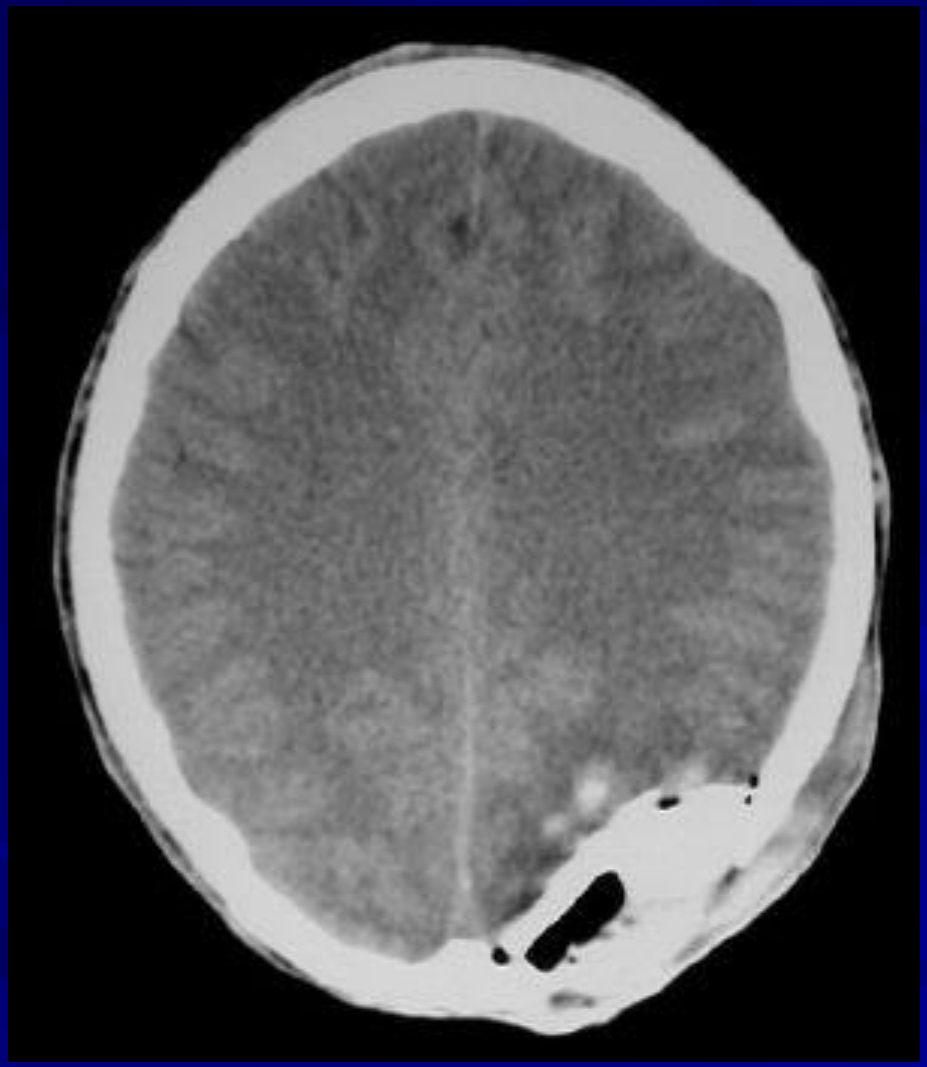
Scaphoid fracture

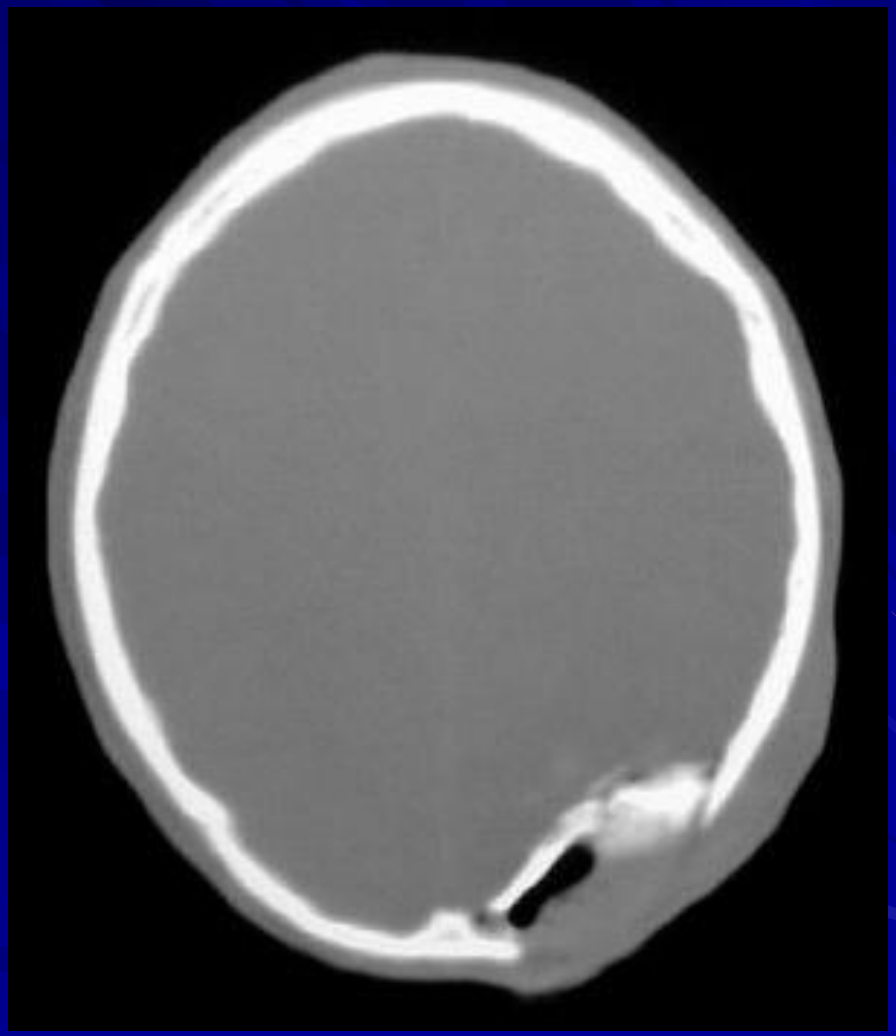


Scaphoid fracture → can be seen after 2 weeks of the fracture

Scaphoid fracture

Occipital depression>>
depressed fracture





Distal radius fracture on lateral view

Comminuted fracture (open or closed depends on the skin)

Buckling fracture

Green stick fracture

pathological fracture due to cyst

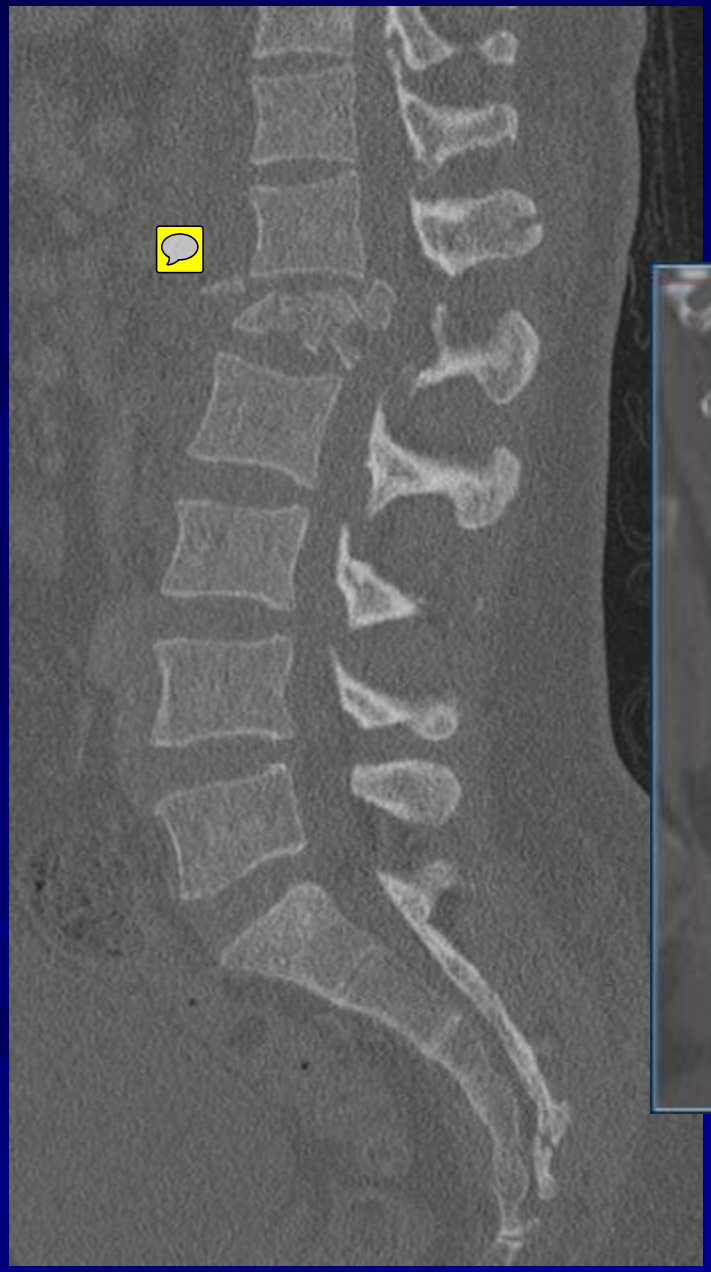
SPINAL INJURIES

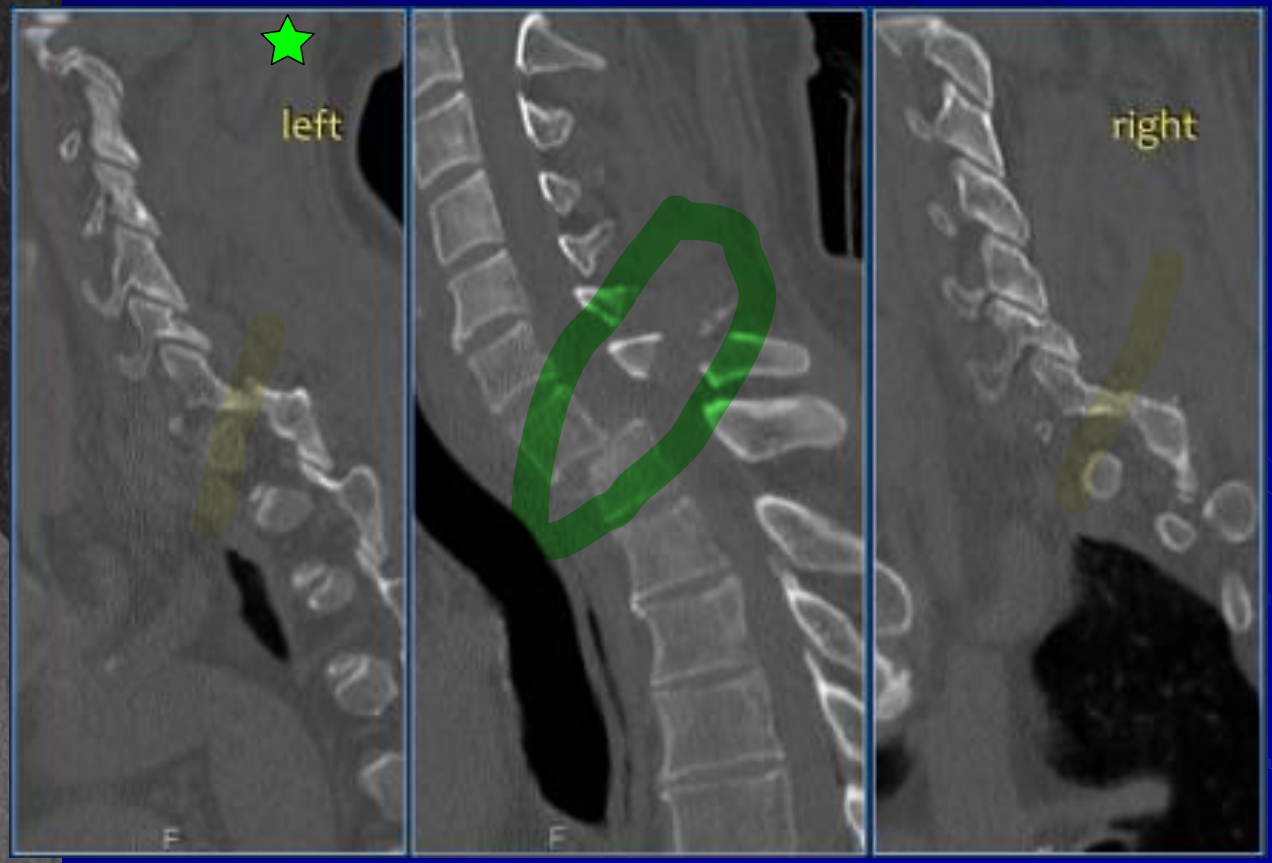
The spinal injury can be classified in three types:

1 - Compression fracture.
2- Burst fracture.
3- Fracture-Dislocation.

- fractures are 2 types : stable , unstable
- any fragment may compress on the spinal cord

dislocation



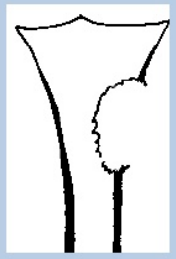


Benign bone tumour

- Are generally well defined and have a sharp narrow zone of transition between normal and abnormal bone . (where in malignant tumour is ill-defined)
- Benign lesions sometimes cause thinning of the adjacent cortex, however cortical destruction is more typical of malignant lesions .
- A well defined sclerotic margin is in favour of benign lesions and rare in malignant lesions .
- Periosteal reaction: lamillated (onion), sun-burst and codman triangle (interrupted).

Benign bone tumours / 2

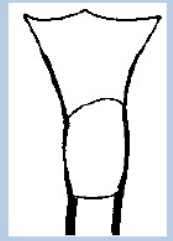
- *Non-ossifying fibroma*
- *Chondroma*
- *Osteochondroma*
- *Osteoma*
- *Ostoid osteoma*
- *Osteoblastoma*
- *Simple bone cyst*
- *Aneurysmal bone cyst*
- *Haemangioma*
- *Giant cell tumor*

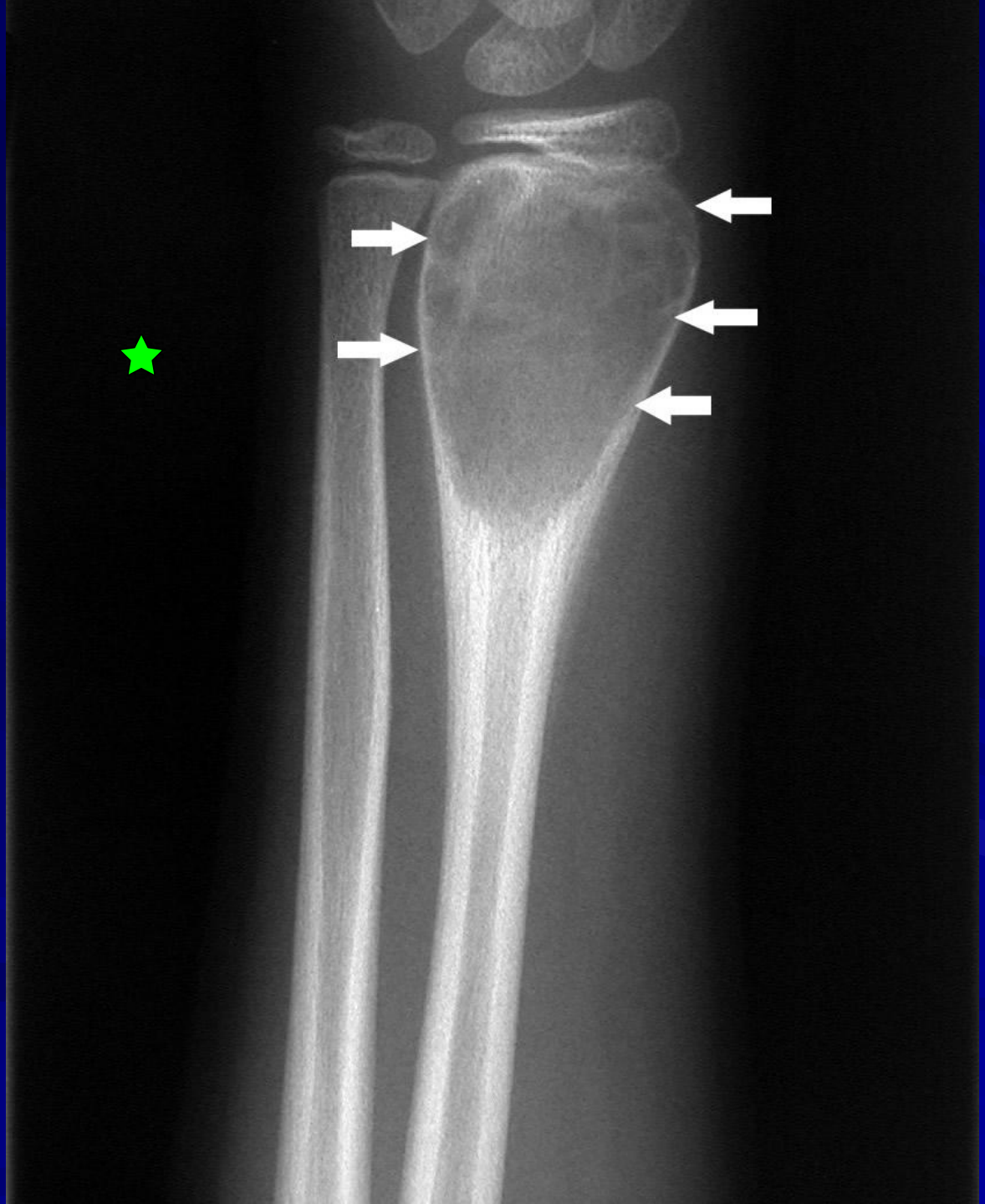


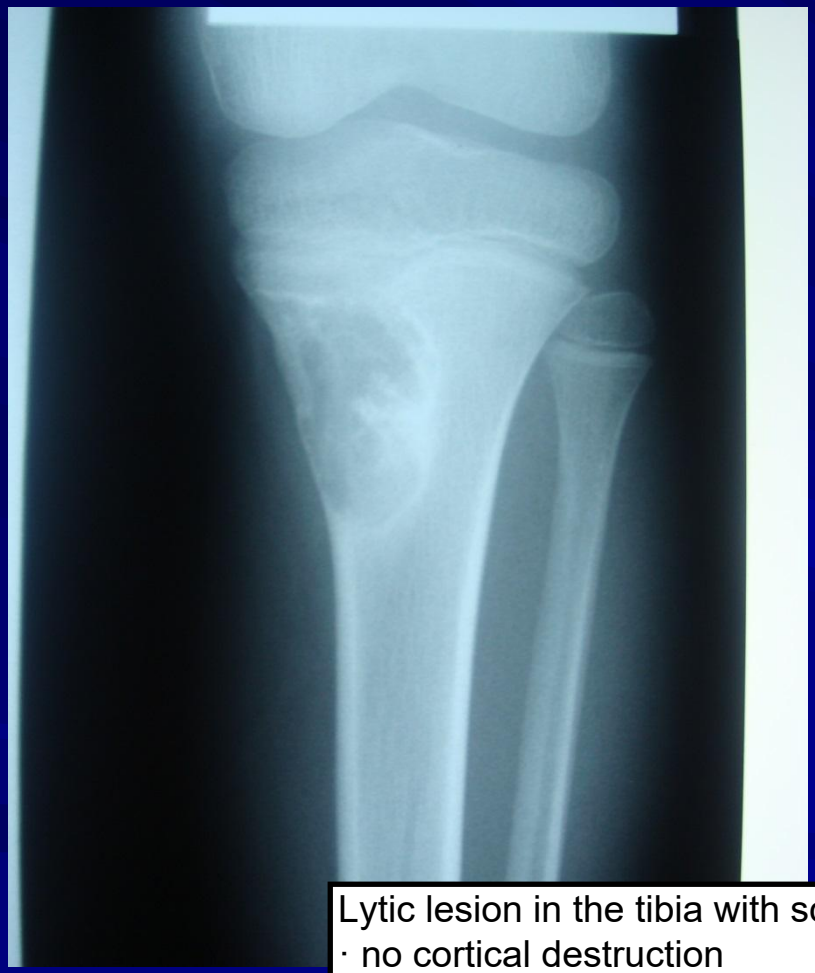
Cortical erosion

"Cortical Erosion"
destruction of cortex by a lytic or sclerotic process.

"Endosteal Scalloping"
Thinning of the cortex by an intraosseous process







Lytic lesion in the tibia with sclerotic rim
· no cortical destruction
· no soft tissue mass
· there is a thinning in the cortex not destruction (intact cortex)

Malignant bone tumour

- Are destructive lesions , often associated with periosteal reaction , and have a wide zone of transition between normal and abnormal bone.
- Periosteal reaction: lamillated (onion), sun-burst and codman triangle (interrupted).
- The most common malignant bone tumour is a metastasis and it’s often solitary .

Malignant bone tumors / 2

Radiological features :

- Plain film: shows an area of bone destruction
- CT and MRI are the best imaging modalities to evaluate tumours and determine bone and soft tissue involvement
- Features that may be verified by CT / MRI:

  - tumour vascularity
  - infiltration of surrounding tissue
  - relationship to nerves and vessels

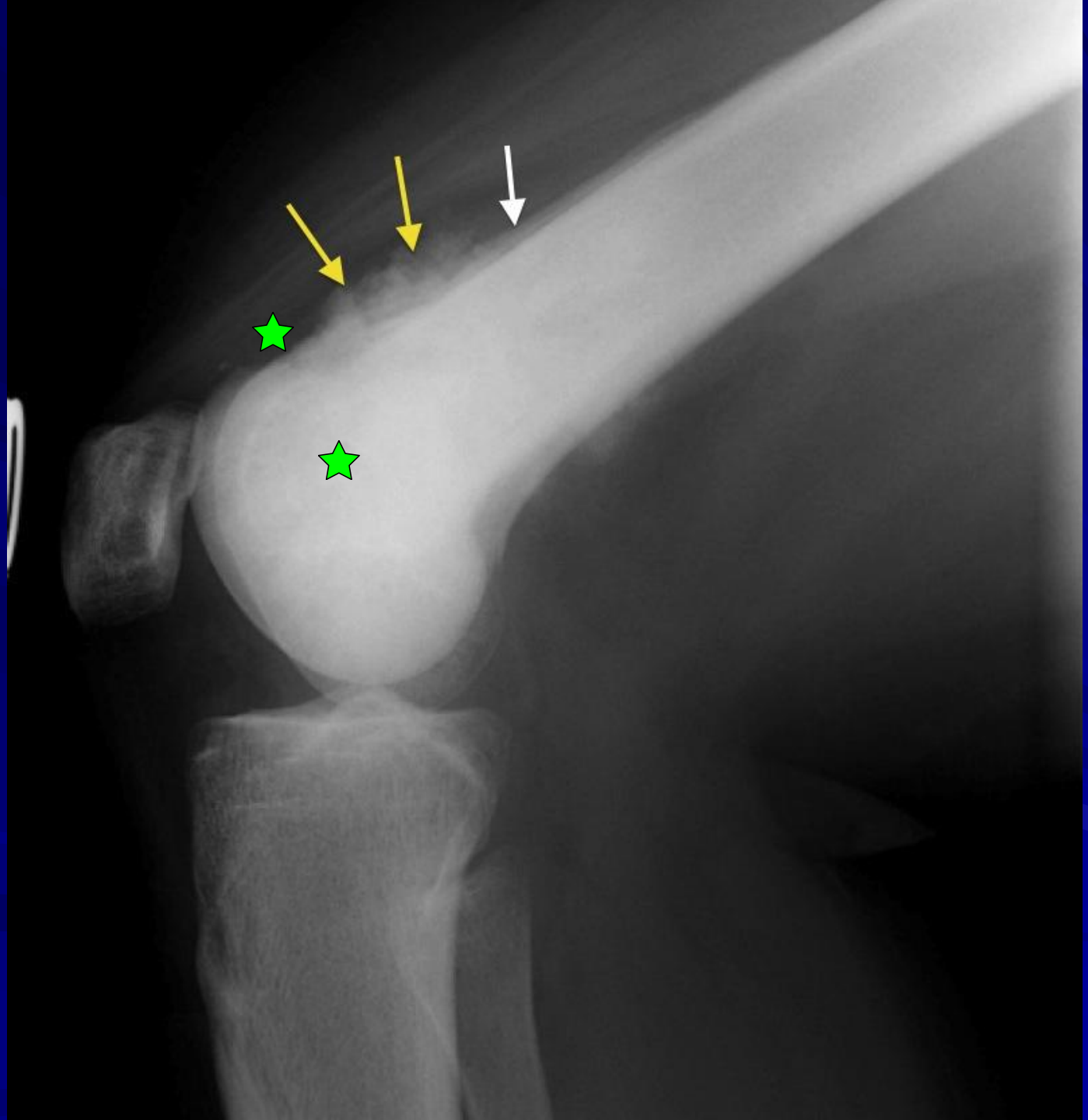
Malignant bone tumours / 3

The most common primary malignant bone tumors are:

- ***Osteogenic sarcoma***
- ***Ewings tumour***
- **Chondrosarcoma**
- **Fibro sarcoma**

Determined according to the age

Destructive lesion and soft tissue swelling
wee need CT & MRI




Thank
You