OSTEO-ARTICULAR SYSTEM

Definition:

- Fracture: A simple definition of the word fracture is a broken bone.
- It is usually diagnosed in the ER with the use of X-ray.
- A good therapeutic way of healing a fracture (if no surgery is required) is immobilizing via a cast or brace.
- Fractures can be the result of various accidents such a sports injury, accident, falling on it….

Imaging semiology of fractures:

- Line of fracture
- Displacement of fractured fragments

Classification of line of fracture:

- Complete
  - By mechanism;
  - By number
  - By direction of fracture's line
- Incomplete
  - By mechanism;

Types of Fractures

COMPLETE

- bone is completely broken into 2 or more fragments.
- -eg:
  - transverse fracture
  - oblique fracture
  - spiral fracture
  - impacted fracture
  - comminuted fracture
  - segmental fracture

INCOMPLETE

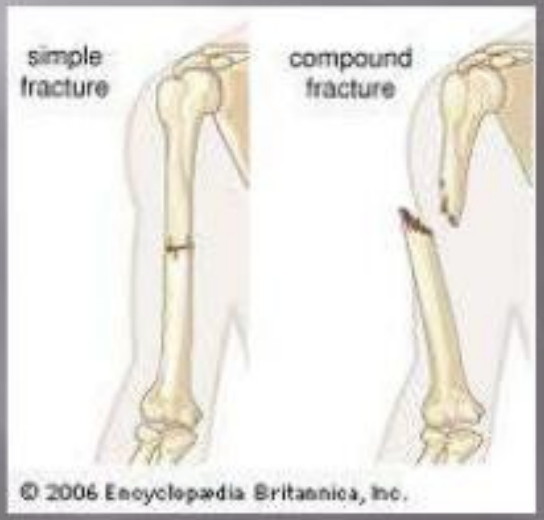
- bone is incompletely divided and the periosteum remains in continuity.
- -eg:
  - greenstick fracture
  - torus fracture
  - stress fracture
  - compression fracture.

Types of line of fracture: by number:

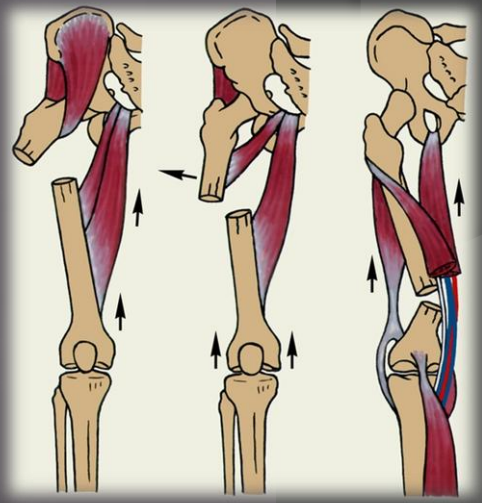
- Unique
- Multiple
- Communited
- Concurrent

Unique (simple) fracture

- Simple fracture is also known as closed fracture
- This fracture has no open skin wound (as opposed to an open or compound fracture)
- The use of cast for immobilization is required



Simple fracture have no open skin wound

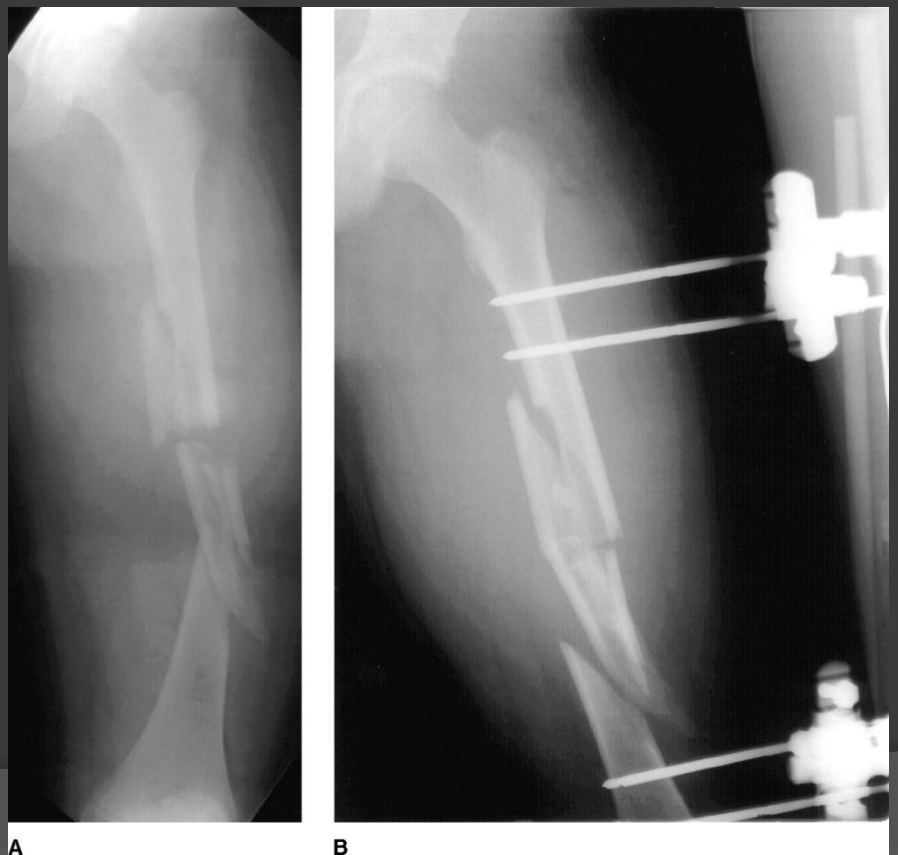


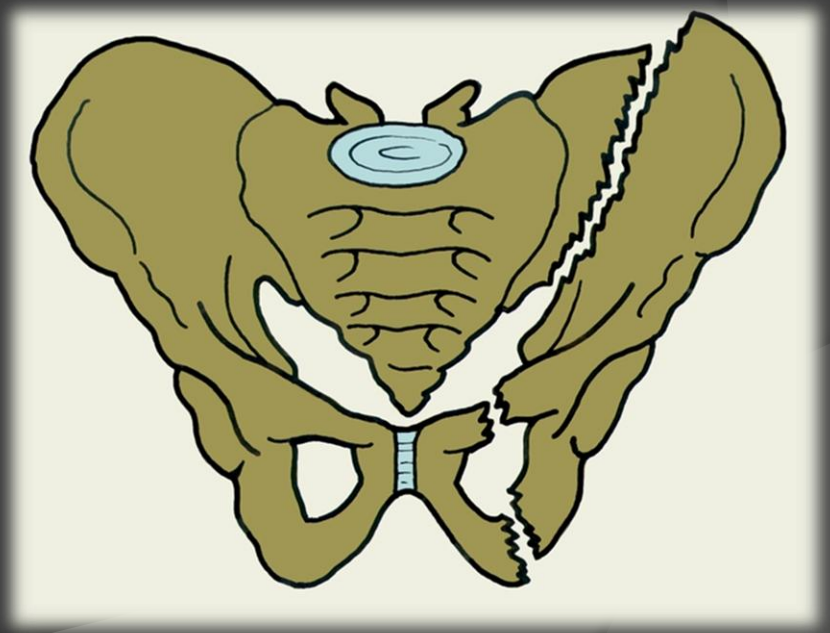
Simple fracture

Boxer’s Fracture

The
fracture involves the distal
metacarpal neck
The distal fracture fragment
is angulated and
rotated.

Multiple fracture = more than one line of fracture

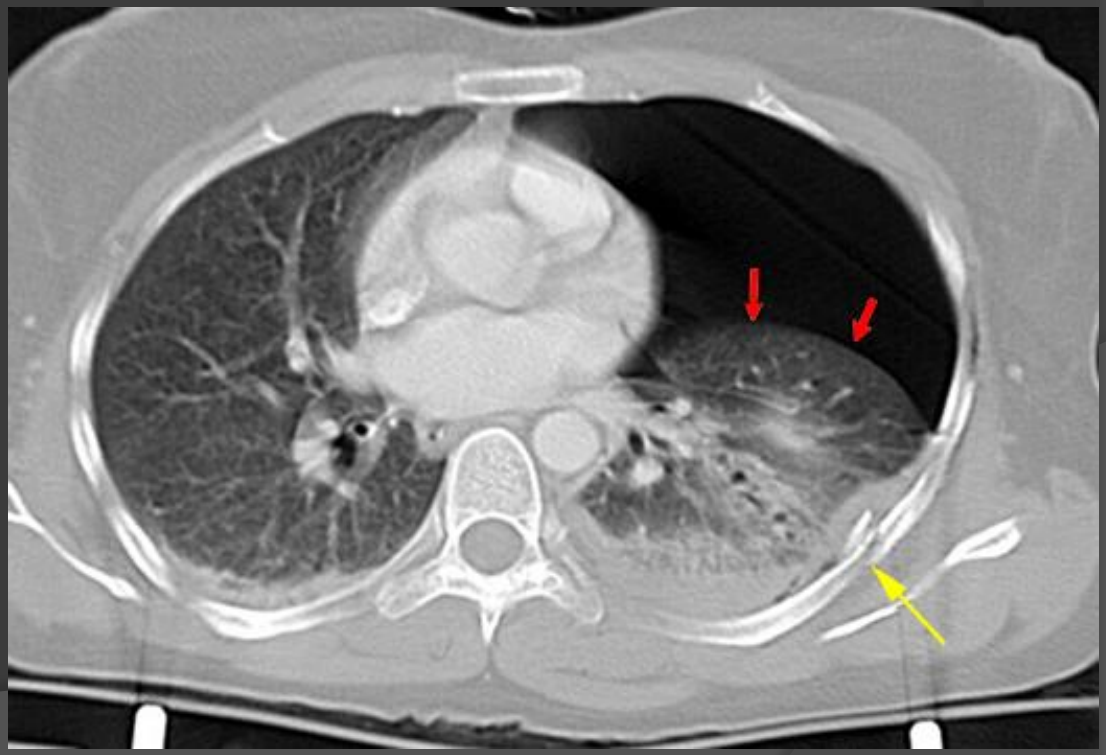




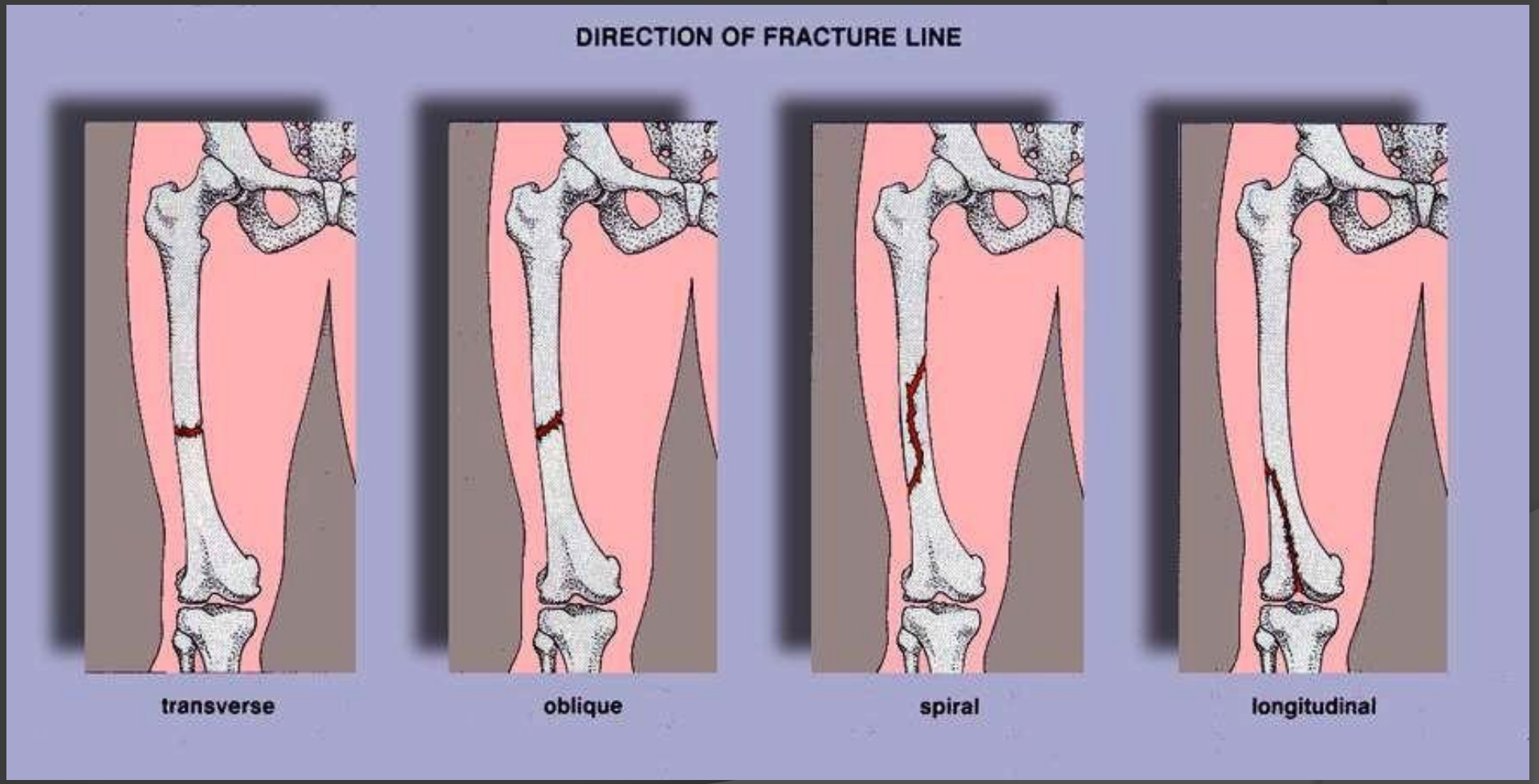
Comminuted fracture

- Comminuted fracture - a fracture in which the bone breaks into more than two fragments; usually caused by severe forces

Concurrent fracture



Complete fracture
Types of fracture: by direction



Transverse Fracture

- A fracture that occurs at a right angle to the bone's axis

Oblique Fracture

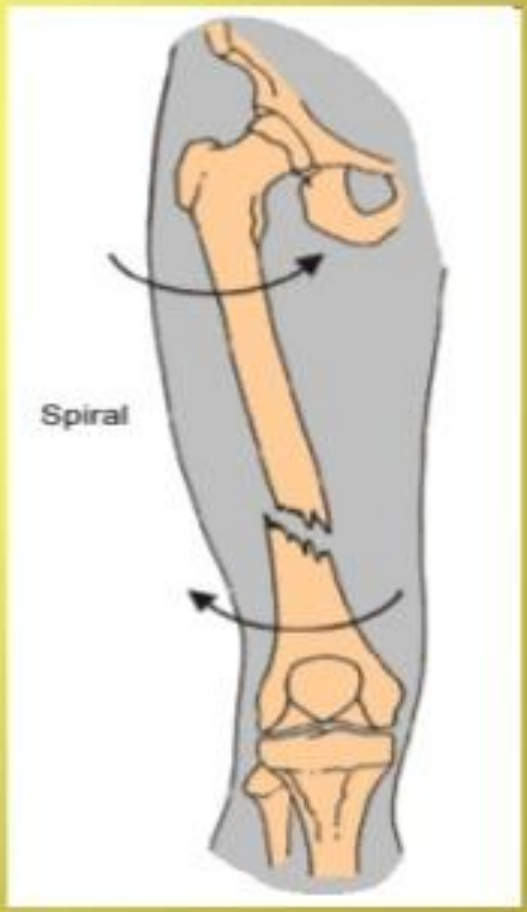
- When the bone is broken on a steep angle

fibula

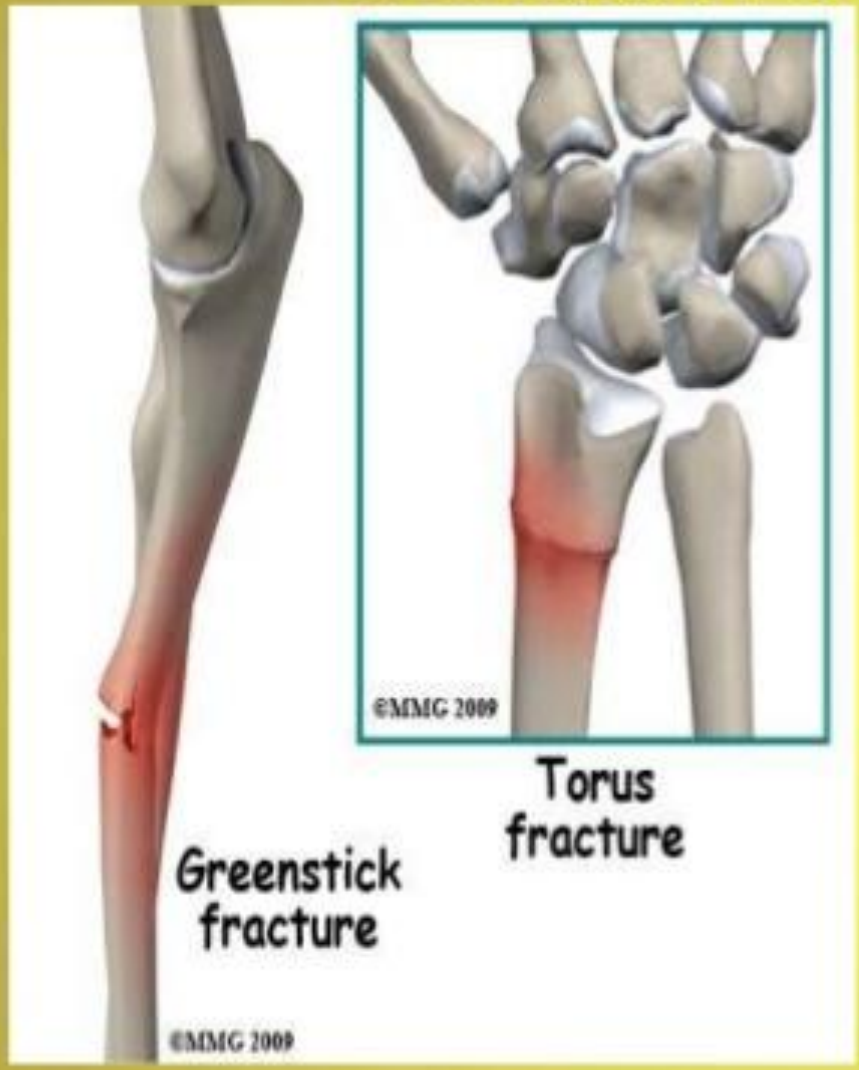
Spiral Fracture

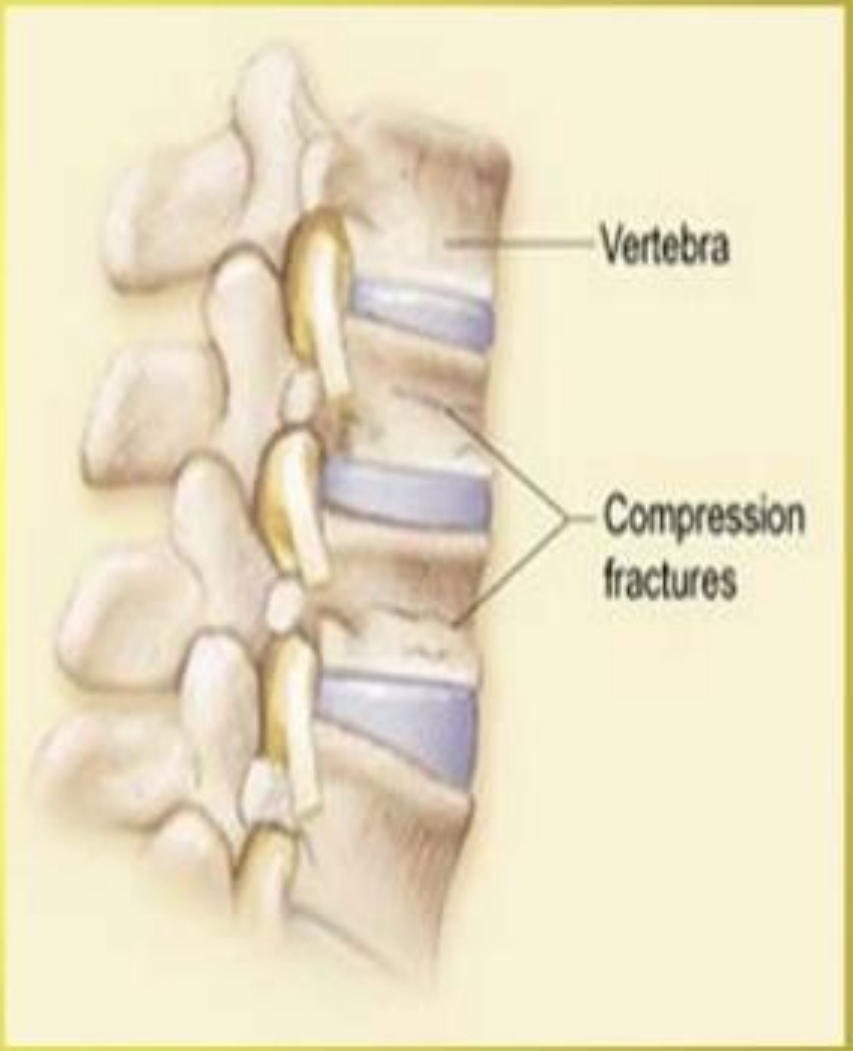
- Fracture where at least one part of the bone has been twisted

Spiral fracture of femur



INCOMPLETE FRACTURE





Greenstick fracture

- This fracture has an incomplete break: one side of the bone is broken and the other side is bent.
- Usually found in children because they have softer skin and more pliable bone structure

Common in children

Incomplete break

Greenstick

- An incomplete fracture in a long bone of a child (bones are not yet fully calcified and they break like a green stick)

Greenstick Fracture

The greenstick fracture results from direct trauma. There is an incomplete fracture of a long bone (radius or ulna) with cortical disruption on one side and deformity on the other, resulting in bowing of the bone.

Compression Fractures

- Compression Fracture usually occurs in the vertebrae.
- When the front portion of vertebrae in the spine collapses due to Osteoporosis which causes bones to become brittle and susceptible to fracture , with or without trauma.
- An x-ray of the spine can reveal the bone injury , however sometimes a CT scan or MRI will be used to insure that no damage is done to the spinal cord.

Compression Fracture

Compression fractures of the spine are common in elderly and osteoporotic patients. They result from anterior or lateral flexion. The typical appearance is loss of height of the anterior aspect of the vertebral body with preservation of the posterior elements and generally the posterior aspect of the vertebral body.

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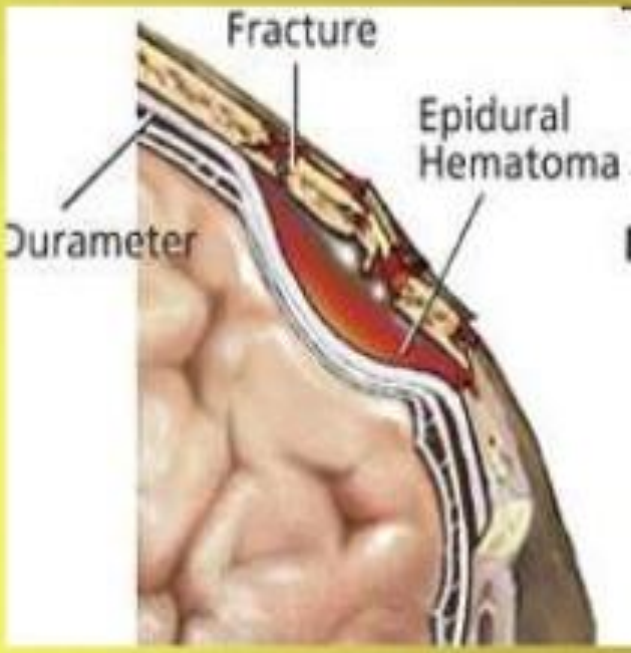
Hairline Fracture

- A very thin crack or break in the bone

Hairline fracture of the foot

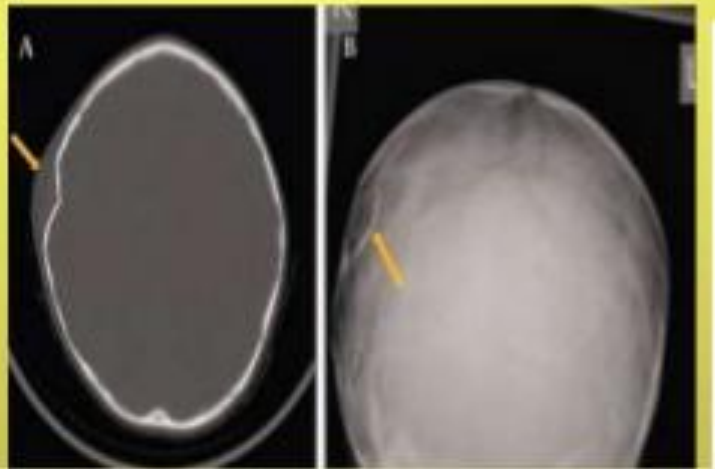
Depression Fracture

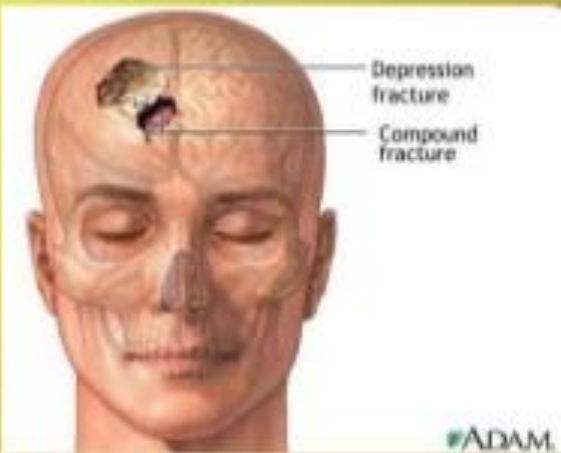
A depressed skull fracture is a break in a cranial bone (or "crushed" portion of skull) with depression of the bone in toward the brain.



The brain can be affected directly by damage to the nervous system tissue and bleeding.

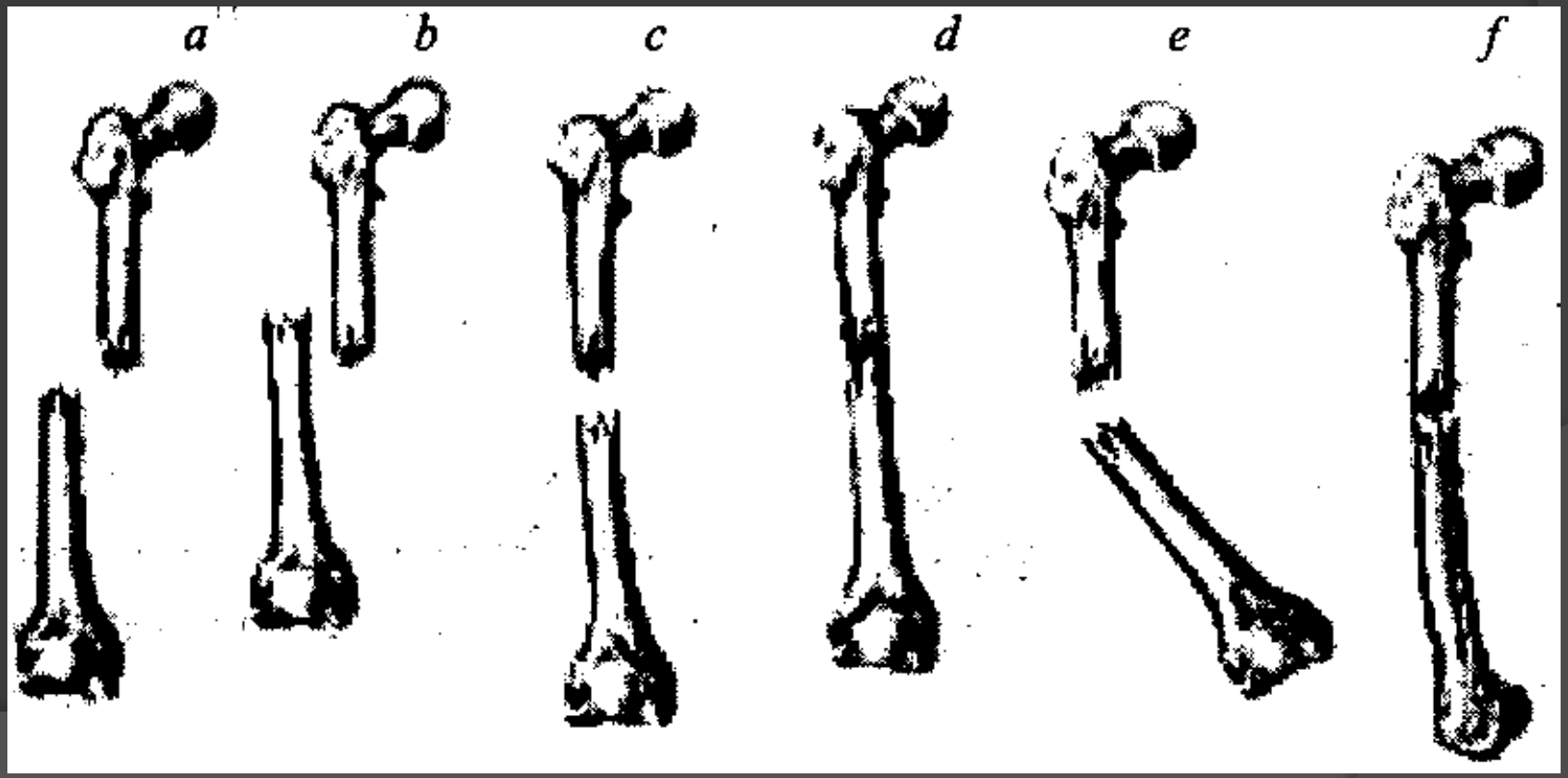
The brain can also be affected indirectly by blood clots that form under the skull and then compress the underlying brain tissue (subdural or epidural hematoma).





Symptom of fracture – displacement of fragments

- a. Lateral
- b. Longitudinal by sliding
- c. Longitudinal with elongated extremity
- d. Longitudinal by interlocking
- e. Angular
- f. Rotation



Radiograph of the femur

- Shortening of the bone by sliding of the fragments

Imaging semiology of luxation (dislocation)

- When the bones at a joint are no longer in proper contact.
- Can be caused by severe twisting or indirect force, or even a muscular contraction
- Most frequently dislocated joints
  - Shoulder
  - Elbow
  - Thumb
  - Finger
  - Jaw
  - Knee

Dislocations

- Posterior elbow

Radiograph of the elbow

- **Parcial changes in correlation of articular surfaces (subluxation)**

Imaging diagnosis of osteoarticular pathology

- Changes in shape and dimensions
    1. Bone atrophy / hypertrophy
    2. Bone inflation
    3. Bone deformation
- Changes of structure
    1. Osteoporosis
    2. Osteosclerosis
    3. Destruction
    4. Osteonecrosis
    5. Osteolysis
- Changes in periosteum
    1. Periostosis
    2. periostitis
- Changes in soft tissues

Changes in shape and dimensions

Bony deformity

- **Arched**
- **Angular**
- **S-shaped**

Deformity of bone

- May be localized or generalized

Deformity of bone

- Enlongated finger

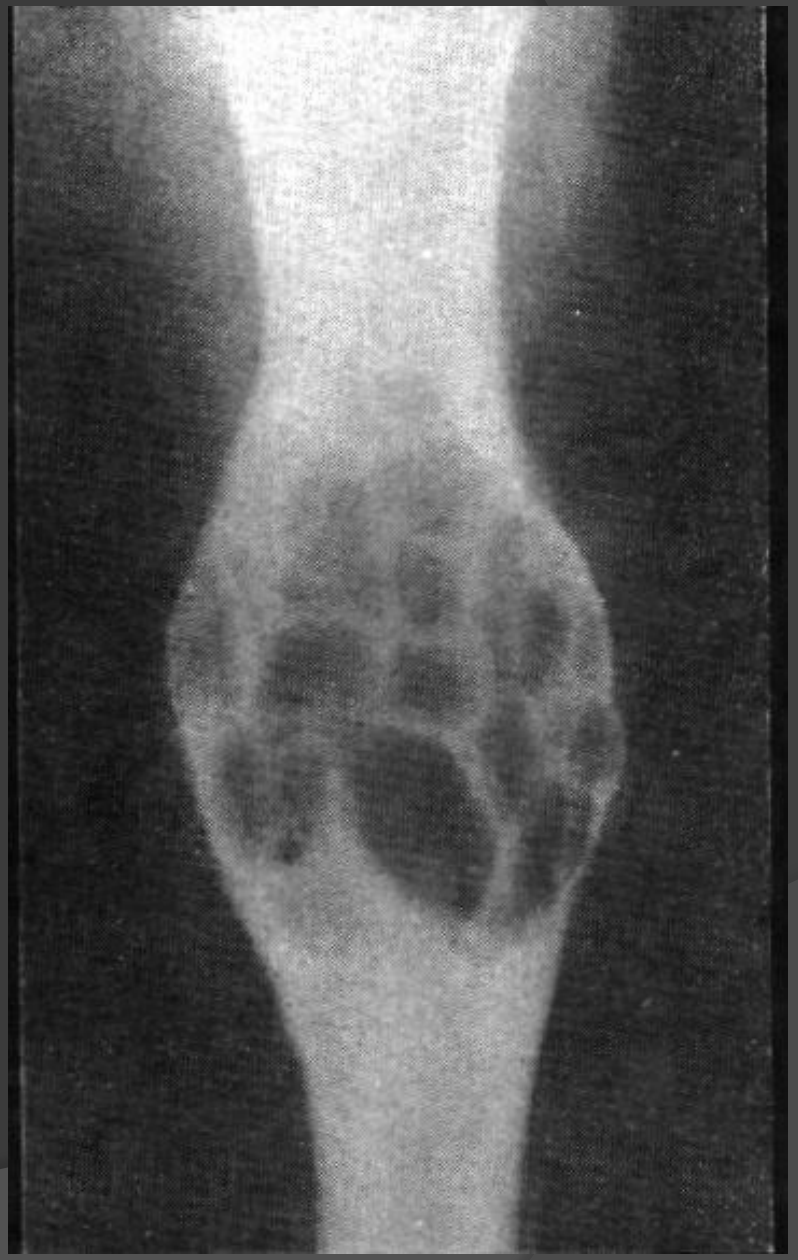
- Multiple exostoses

Radiograph of the leg

- Bone deformation by compression

X-ray of the femur

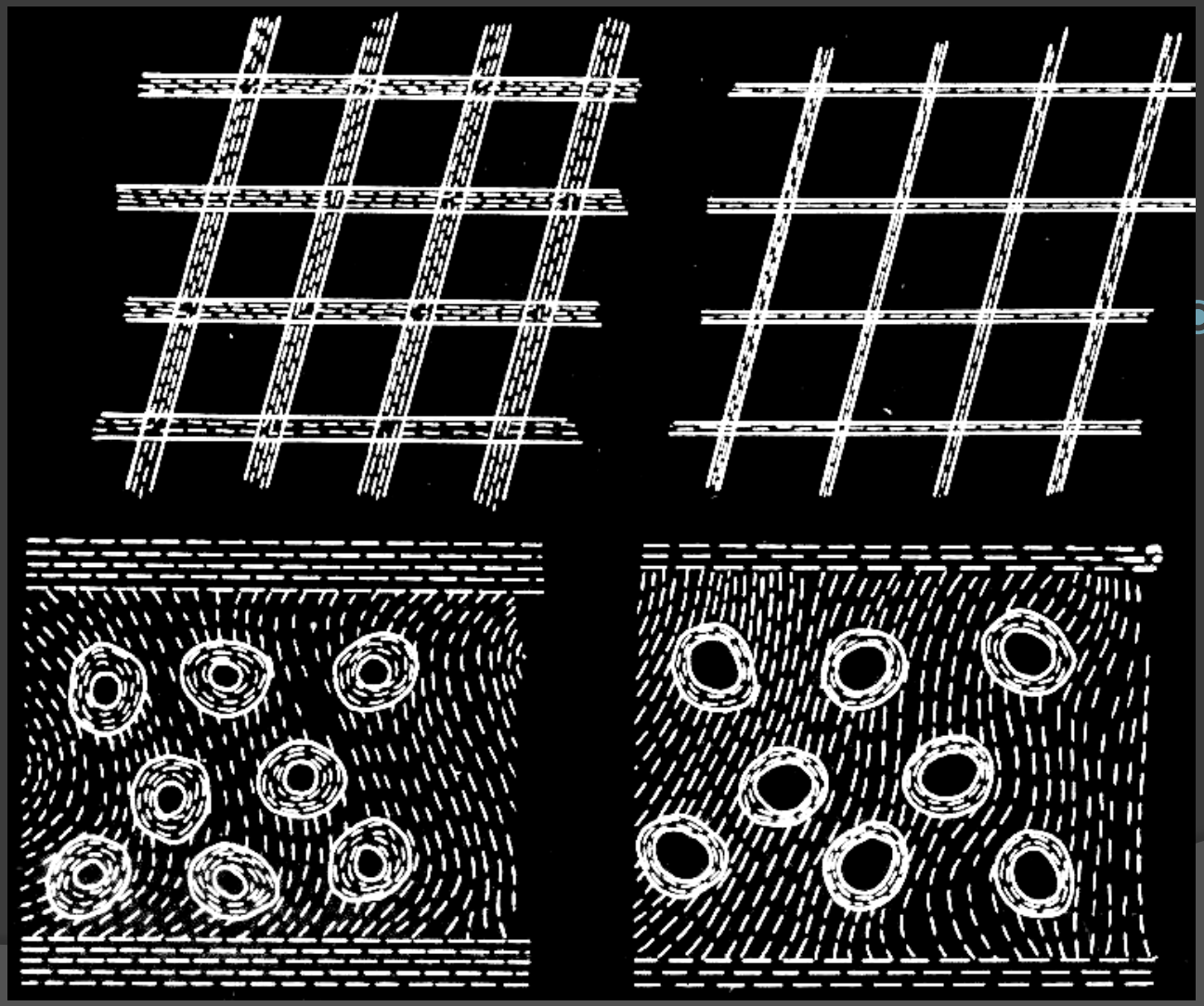
- Blown bone (bone inflation)



Changes of structure

Osteoporosis

Normal



- Spongiose bone
- Compact bone

X-ray of lumbar part of spine

X-ray of the knee

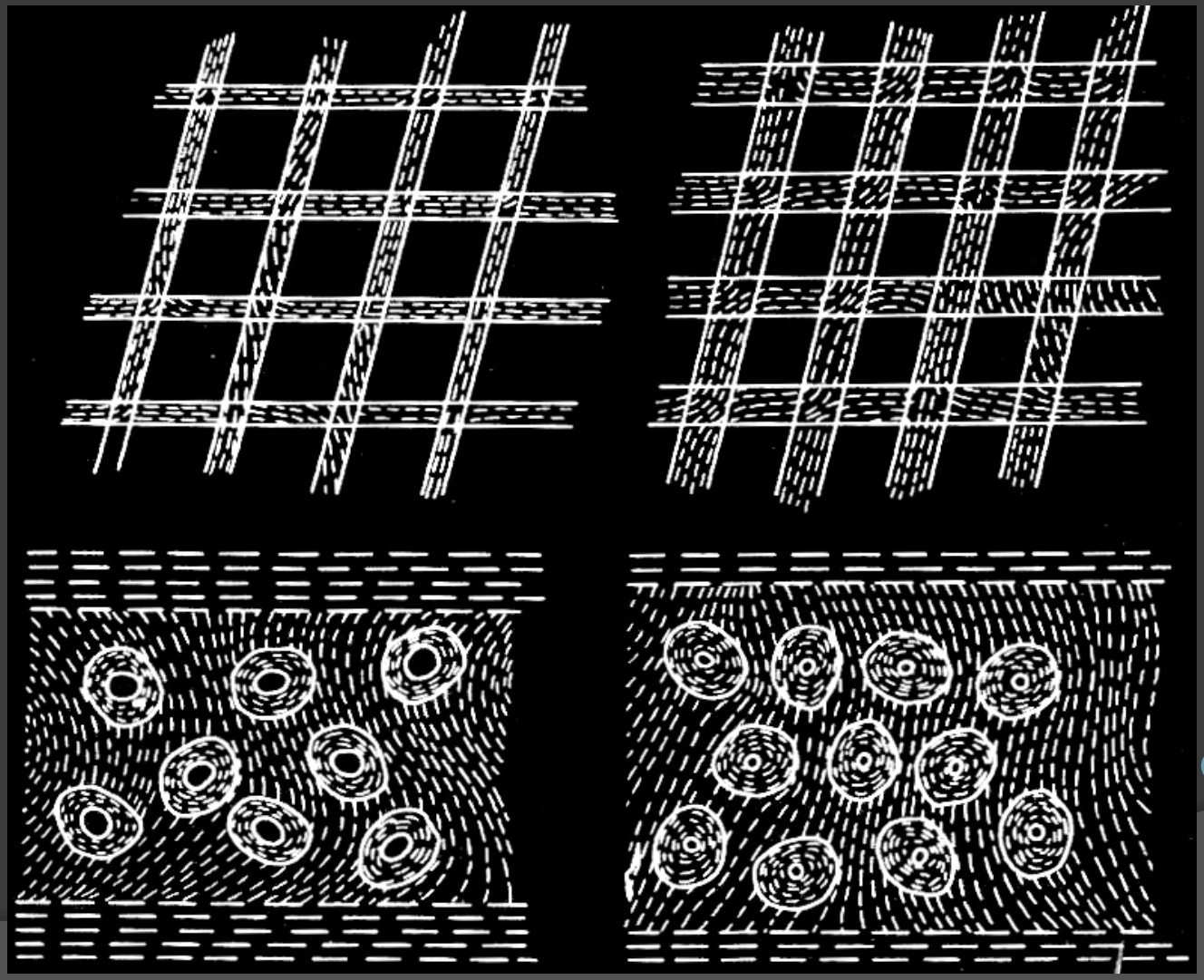
- Hypertrophic osteoporosis

Osteosclerosis /hyperostosis

- **Definition :**
  - Increase of amount of bone matrix in given volume of bone
- **X-ray appearance :**
  - Bone density increased
    - Cortex thicken – periosteal growing
    - Bone marrow cavity narrowing – endostosis growing and trabecular thickening
- **Etiology :**
  - Inflammation or granuloma (chronic)
  - Trauma & fracture
  - Tumor or tumor-like lesion

Osteosclerosis

Normal

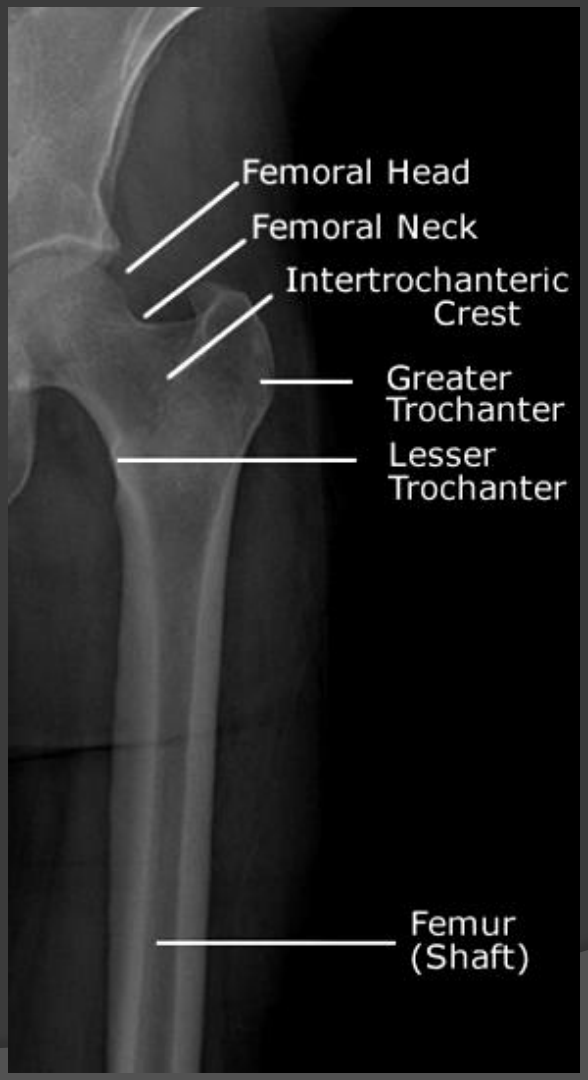


Spongiose bone

- Compact bone

X-ray of the leg. Osteosclerosis.

- Focal sclerosis



• Diffuse sclerosis

Osteosclerosis

- Chronic osteomyelitis
  :
  - Med-low part of the tibia
  - Cortex thickening
  - Bone marrow cavity narrowing and obliteraed

Bone destruction

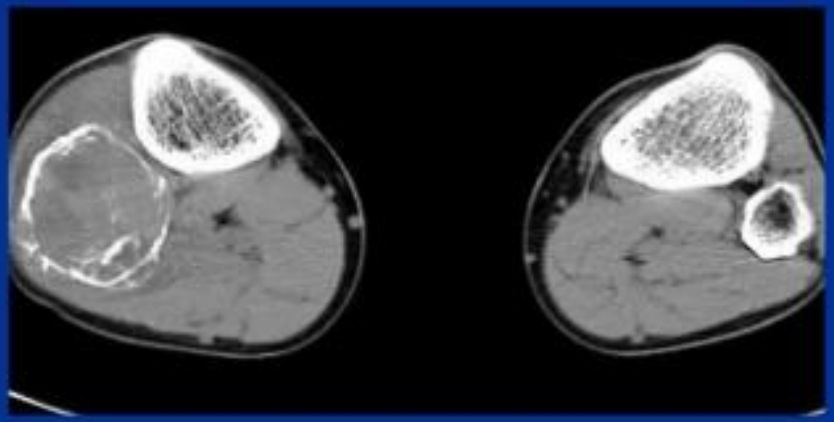
- **Definition :**
  - The pathologic tissue replaced the normal bone structure (cortex or spongiosa)
- **X-ray appearance :**
  - Bone density decreased, rarefaction of bone
  - The cortex erosion
- **Etiology :**
  - Inflammation or granuloma
  - Tumor or tumor-like lesion

Bone destruction

- Simple bone cyst :
  - Massive bone destruction / radiolucency area in proximal femur with well-defined margin, the cortex become thinning

Bone destruction

- Giant cell tumor
  - Eccentric expanding (cystic) translucency area in the proximal fibilar bone , with multi-locular appearance



Bone destruction

- Giant cell tumor
  - Eccentric expanding (cystic) translucency area in the distal radial bone

X-ray of the femur

- Osteodestruction in osteomyelitis

X-ray of the foot

- Osteodestruction in tuberculosis osteitis

X-ray of the leg

- Osteodestruction in osteogenic sarcoma

X-ray of the leg

- Osteodestruction in metastasis

OSTEO-ARTICULAR SYSTEM

X-ray of the arm

- Osteodestruction in solitary bony cyst

X-ray of the forearm

- Osteodestruction in giant cell tumor of the bone

X-ray of the leg

- Osteodestruction in giant cell tumor of the bone

X-ray of the foot fingers

- Osteolysis of the falangs

Bone necrosis

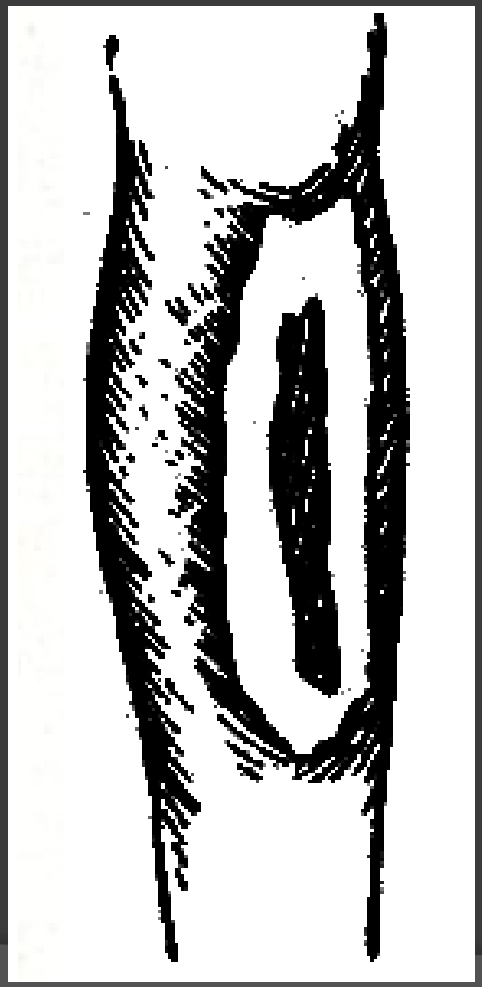
- **Definition :**
  - The death of bone tissue caused by gradual vascular impairment
  - ceasation of metabolism of local bone tissue
- **X-ray appearance :**
  - Sequestrum – fragment of dense/necrotic bone be separated , the X-ray density "high" (sequestrum is normal density , cause by the surrounding bone osteoporosis)
- **Etiology :**
  - Inflammation or granuloma (chronic)
  - Trauma & fracture

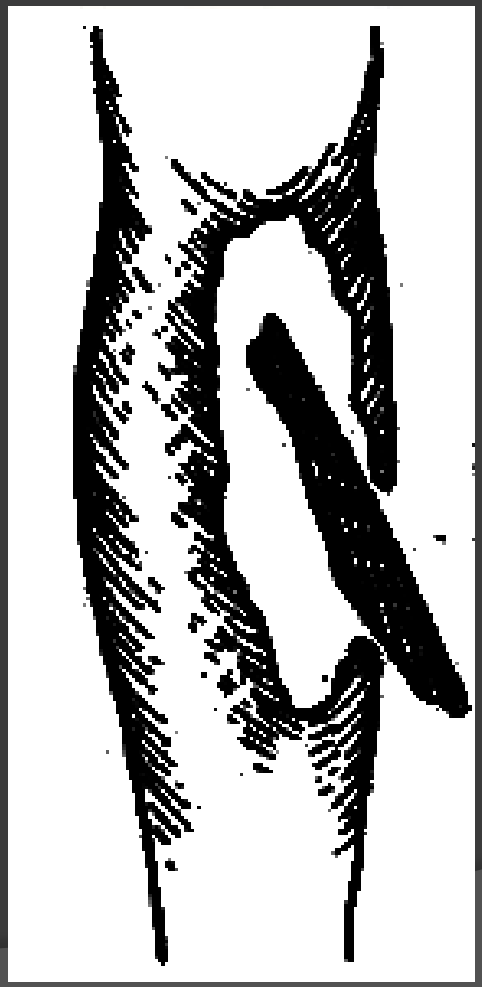
Bone necrosis

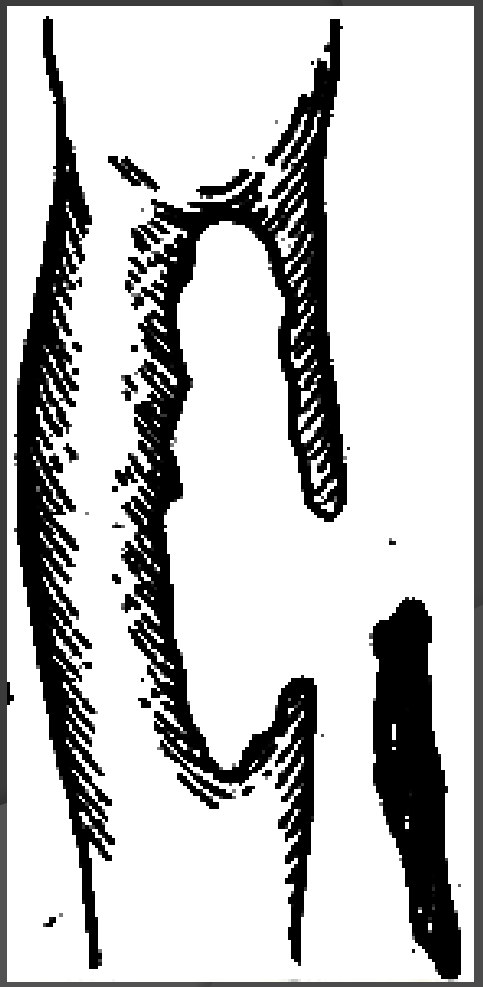
- Chronic osteomyelitis
  - Osteosclerosis of the bone between the areas of destruction
  - The separated "high" density fragments against the surrounding osteo-translucency zone
  - Sequestra – lost blood supply and then the calcium content remain intact

Localization of sequestrum

- Intraosseous (in cavity)
- Penetretion
- Extraosseous







X-ray of the knee

- Spongiose sequestrum

X-ray of the femur

- Intraosseous localization of the sequestrum

Changes in soft tissues

The options are many such as:

- Gas in the soft tissues - a sign of an open fracture or gas gangrene
- calcification of various nature
- Increase and decrease volume
- The presence of foreign bodies

Calcification of various nature

Gas in the soft tissues

Increase and decrease volume

The presence of foreign bodies

Periosteal reaction / periostosis

- Subacute osteomyelitis
  - Smoth lamellae Periosteal reaction

normal

Periosteal reaction / periostosis

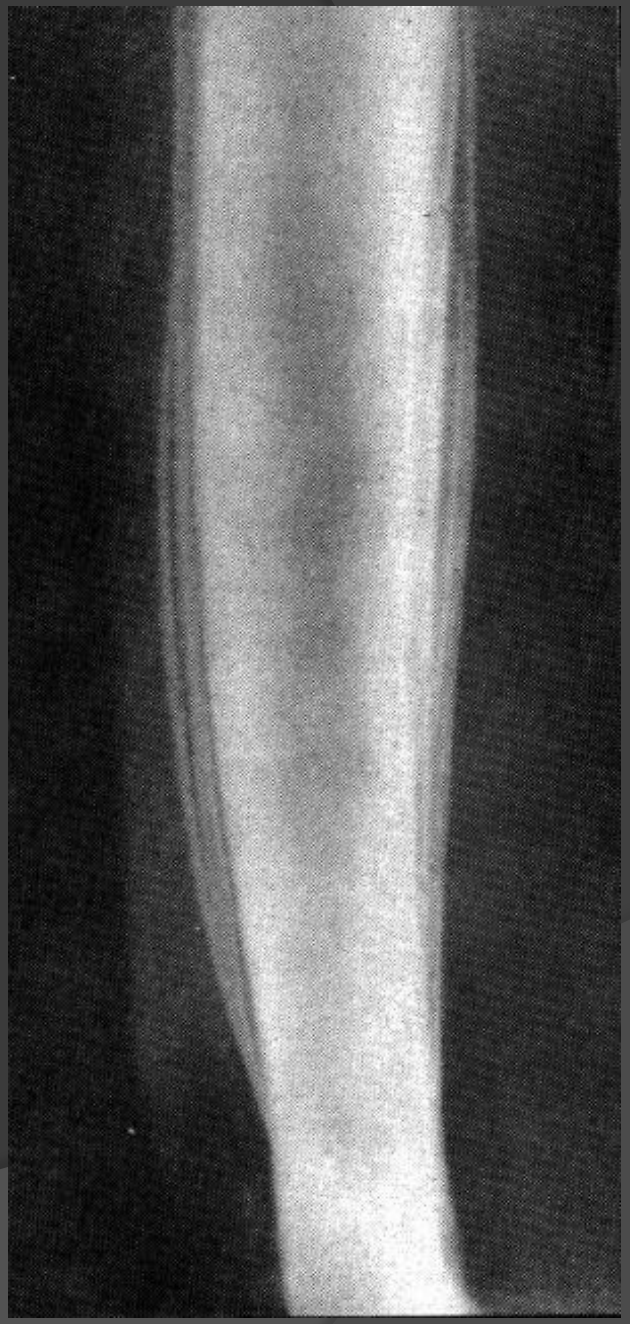
- Lacelike & spicules periosteal reaction

X-ray of the leg

- Linear periostosis

X-ray of the femur

- Stratified periostosis



X-ray of the femur

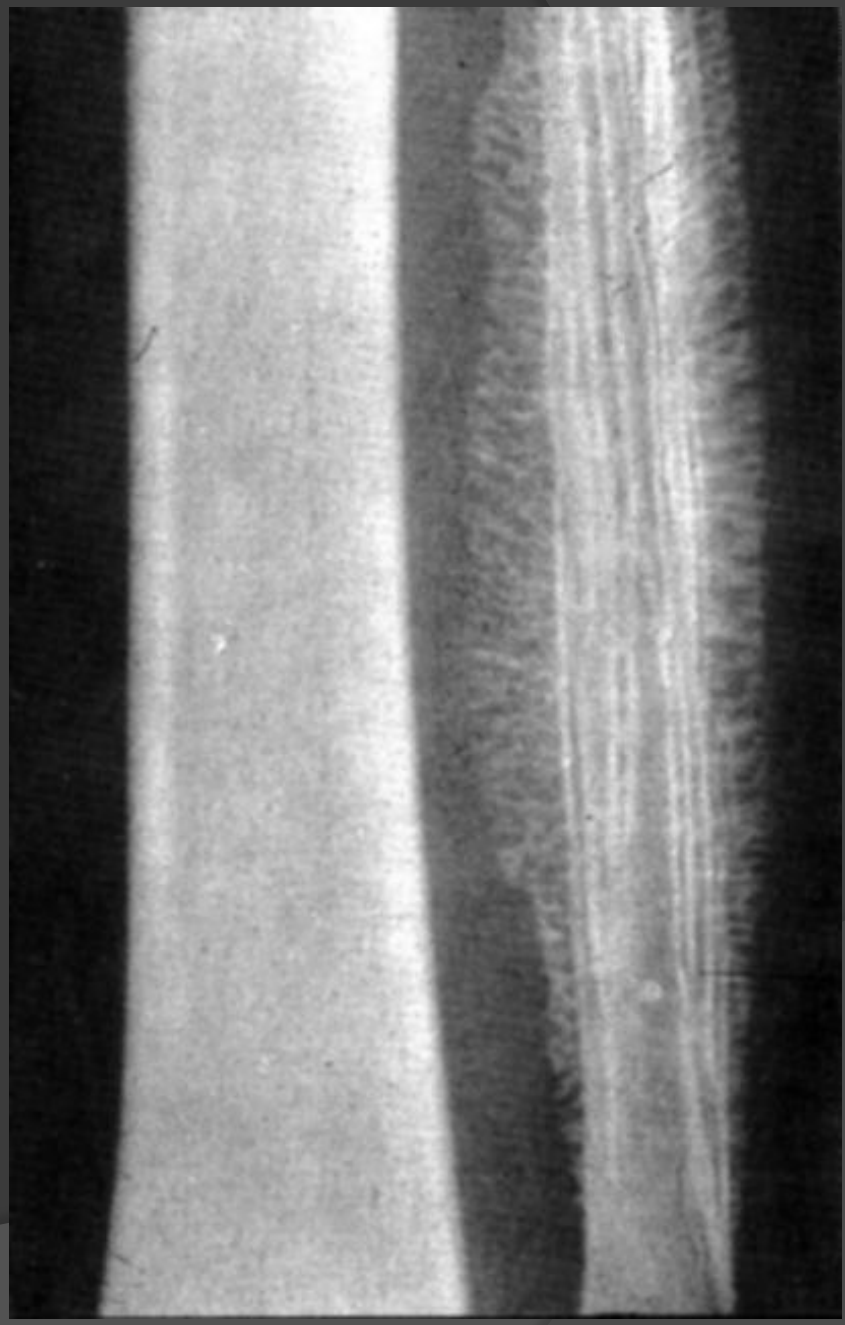
- Fringe-shaped periostosis

X-ray of the femur

- Ruche-shaped periostosis

X-ray of the leg

- Acicular periostosis



Articular changes

X-ray of the knee

Thinning of the radiological articular space

- **Uniform** • **Non-uniform**

1. Radiography of right wrist AP and lateral view
2. The position is correct. The image is with good and correct exposure. The pacient is an adult. In the radiography we determine radiological symptoms: first one is line of fracture in the distal part of radius. It is complete one. The direction of line of fracture is transversal. And the second radiological symptom seen is lateral displacement of bone fragments.
3. Conclusion: complete fracture of right radius.

1. Radiography of left hip joint AP view
2. The position is correct. The image is with good and correct exposure. The pacient is an adult. In the radiography we determine radiological symptoms: first one is line of fracture in the proximal part of femur, surgical colum region. It is complete one. The direction of line of fracture is oblic. And the second radiological symptom seen is longitudinal by sliding displacement of bone fragments.
3. Conclusion: surgical neck hip fracture.

1. Radiography of right forearm AP and lateral view
2. The position is correct. The image is with good and correct exposure. The pacient is an adult. In the radiography we determine radiological symptoms: first one is line of fracture in the middle part of ulna and radius. It is complete one. The direction of line of fracture is transversal. And the second radiological symptom seen is lateral displacement of bone fragments.
3. Conclusion: multiple fractures of right forearm.

1. Radiography of right wrist AP and lateral view
2. The position is correct. The image is with good and correct exposure. The pacient is a child. In the radiography we determine radiological symptoms: first one is line of fracture in the distal part of radius. It is incomplete without displacement of bone fragments.
3. Conclusion: green stick fracture of right radius.

1. Radiography of left humerus AP and lateral view
2. The position is correct. The image is with good and correct exposure. The pacient is an adult. In the radiography we determine radiological symptoms: bone inflation in the medium part, with distruction of bone, characteristic for Codman's triangle, with acicular reaction of periostium
3. Conclusion: left humerus malignant tumour

1. Radiography of hands AP view
2. The position is correct. The image is with good and correct exposure. The pacient is an adult. In the radiography we determine radiological symptoms: diffuse osteoporosis, with joint osteofitosis, decreased space in joints. Unique cyst in metacarpian bones.
3. Conclusion: rheumatoid arthiritis.