Tikrit University
College of Medicine
Department of Radiology

Bone Tumors

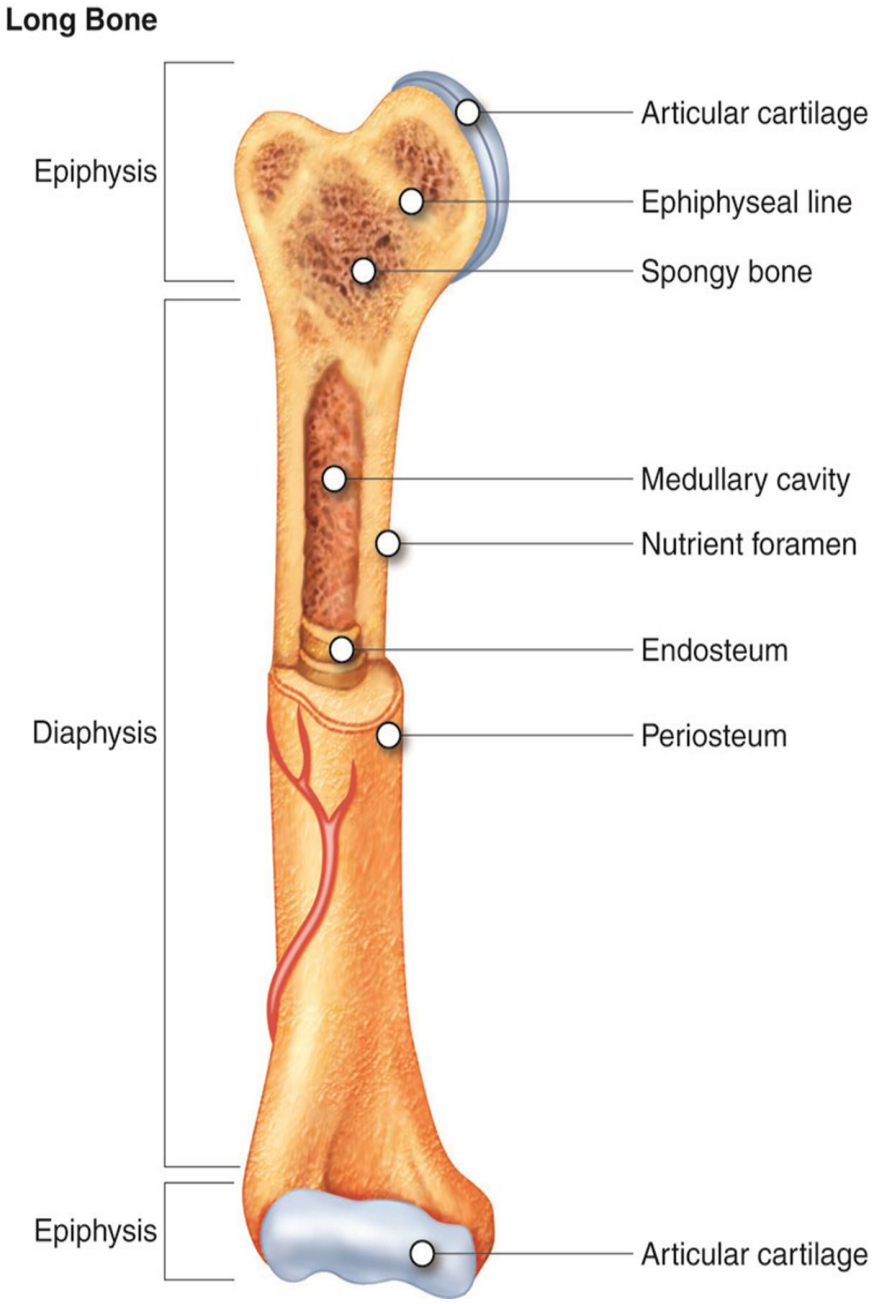
MSK Series

Terminology

- Diaphysis - shaft
- Metaphysis
- Epiphysis
- Epiphyseal plate (Growth plate) (Physis).

- Periosteum.
- Cortex.
- Endosteum.
- Medullary cavity.

- Articular.
- Subarticular.



How to approach the lesion to reach the diagnosis ?

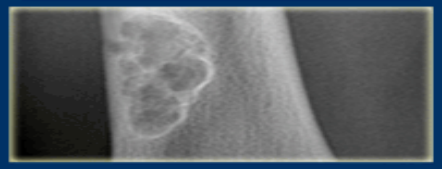
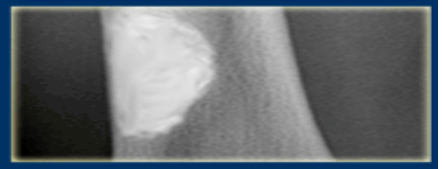
CLINICAL

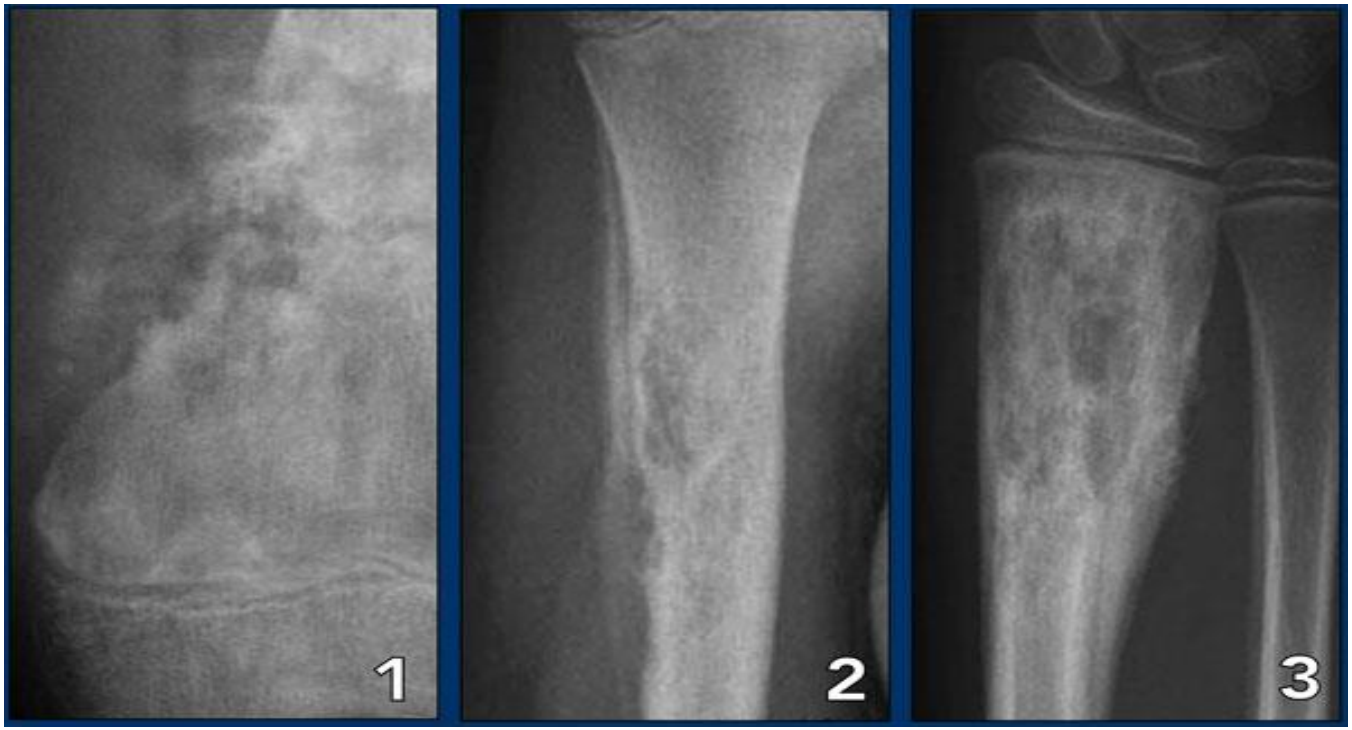
- Age
- Sex
- Clinical history

RADIOLOGICAL

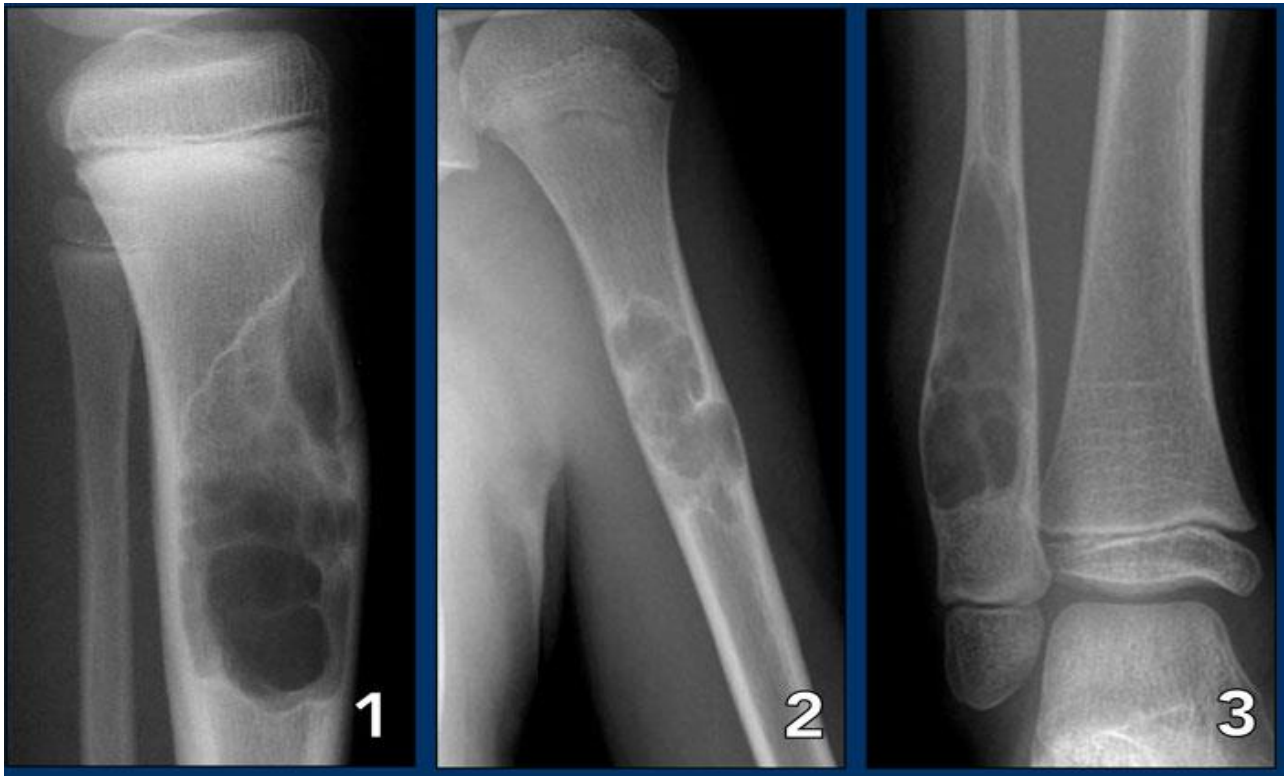
- Site: diaphysis, metaphysis or epiphysis?
- Site: cortical or medullary?

- Matrix of the lesion (lytic/sclerotic)
- Behavior of the lesion (destructive or not?)
- Transitional zone(wide? Narrow?)
- Soft tissue component?

Age	Well-defined	ill-defined	Sclerotic
			
0 - 10	EG SBC	EG - Ewing Osteosarcoma Leukemia	Osteosarcoma
10 - 20	NOF, Osteoblast Fibr dysplasia EG SBC ABC Chondroblast CMF	Ewing EG Osteosarcoma	Osteosarcoma Fibr dysplasia EG Osteoid osteo Osteoblastoma
20 - 40	Giant CT Enchondroma Chondrosarcoma (low grade) HPT - Brown tumor Osteblastoma	Giant CT	Enchondroma Osteoma Bone island Parosteal Osteosar Healed lesions: - NOF, EG - SBC, ABC - Chondroblast
40+	Metastases Myeloma Geode	Metastases Myeloma Chondrosarcoma (high grade)	Metastases Bone island
All ages	Infection	Infection	Infection



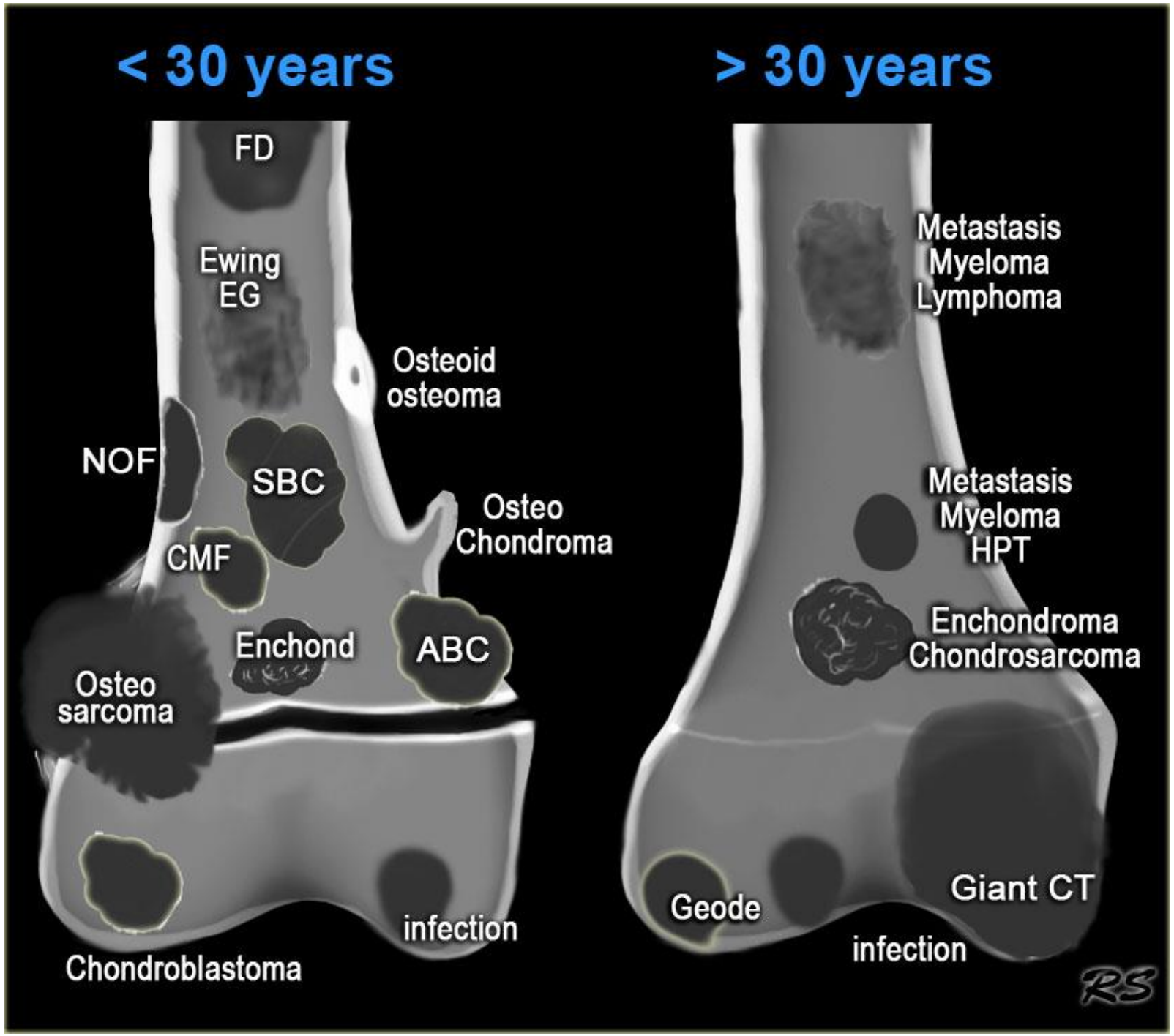
Wide zone of transition indicates malignancy or infection or eosinophilic granuloma

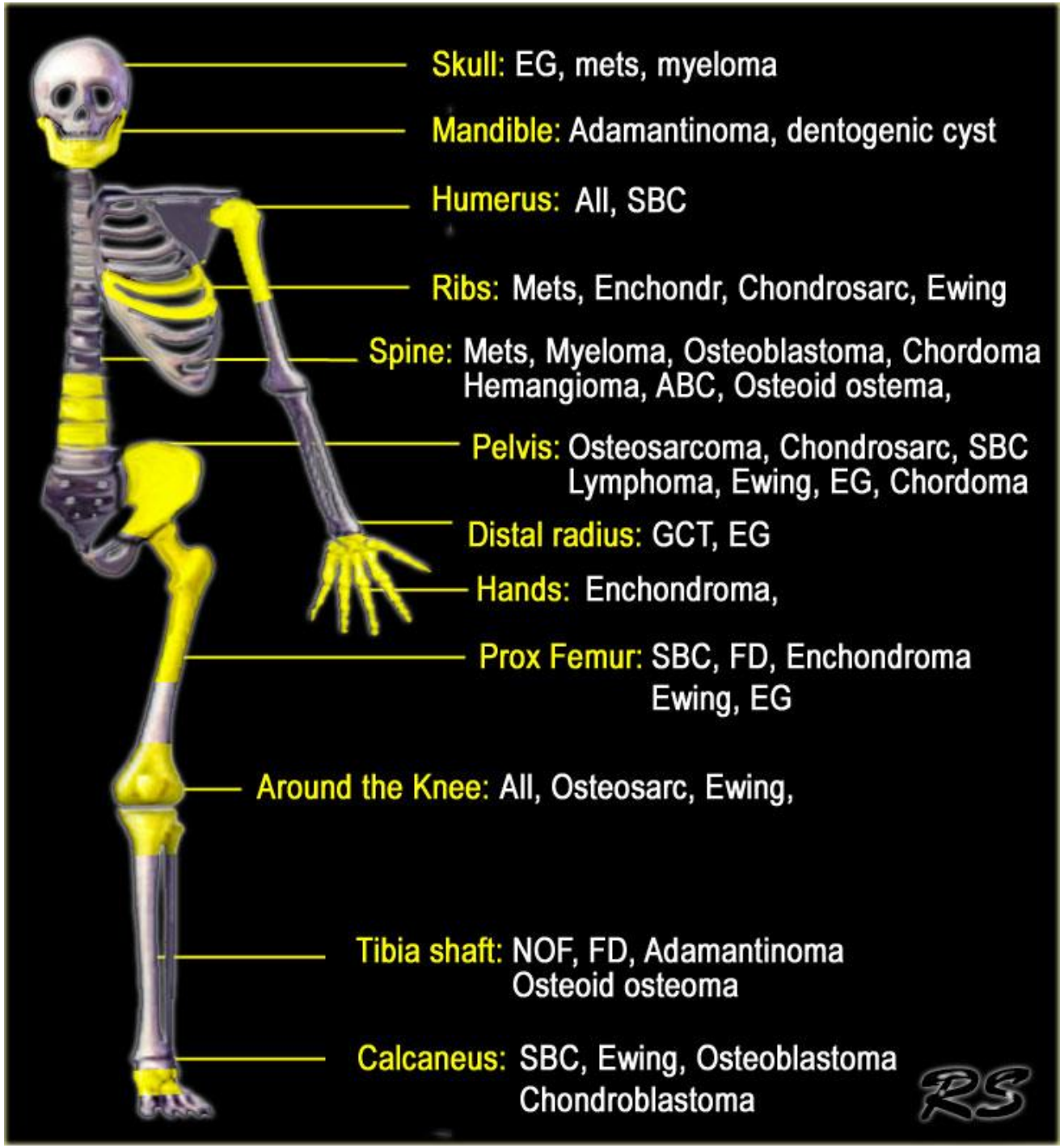


Narrow zone of transition: NOF, SBC and ABC (Non-ossifying fibroma, Solitary bone cyst, Aneurysmal bone cyst

)

Age & Site


< 30 years
> 30 years
FD
Ewing
EG
Osteoid
osteoma
NOF
SBC
Osteo
Chondroma
CMF
Enchond
ABC
Osteo
sarcoma
infection
Chondroblastoma
Metastasis
Myeloma
Lymphoma
Metastasis
Myeloma
HPT
Enchondroma
Chondrosarcoma
Geode
Giant CT
infection
RS


Skull: EG, mets, myeloma
Mandible: Adamantinoma, dentogenic cyst
Humerus: All, SBC
Ribs: Mets, Enchondr, Chondrosarc, Ewing
Spine: Mets, Myeloma, Osteoblastoma, Chordoma
Hemangioma, ABC, Osteoid ostema,
Pelvis: Osteosarcoma, Chondrosarc, SBC
Lymphoma, Ewing, EG, Chordoma
Distal radius: GCT, EG
Hands: Enchondroma,
Prox Femur: SBC, FD, Enchondroma
Ewing, EG
Around the Knee: All, Osteosarc, Ewing,
Tibia shaft: NOF, FD, Adamantinoma
Osteoid osteoma
Calcaneus: SBC, Ewing, Osteoblastoma
Chondroblastoma
RS

Radiological modalities in bone lesions

- Plain X-Ray – very very helpful.
- CT.
- MRI.
- Bone scintigraphy (Static & Dynamic).
- US – limited use.
- Intervention (Diagnostic & Therapeutic).

Benign vs. Malignant bone lesion

Features	Benign	Malignent
Marrow infiltration	No	Yes
Cortical destruction	No or Geographic	Moth-eaten or Permeative
Periosteal reaction	No or Solid	Lamellated – onion peel Sunburst Codman's triangle
Soft tissue component	No	yes

Common signs of malignant bone tumors

- Extensive bizarre shaped periosteal reaction.
- Bone destruction (cortical destruction).
- Soft tissue mass.
- Calcific matrix within the soft tissue mass.
  - Pathological fracture (complication) & can be seen in benign also.
- ***DD: infections.***

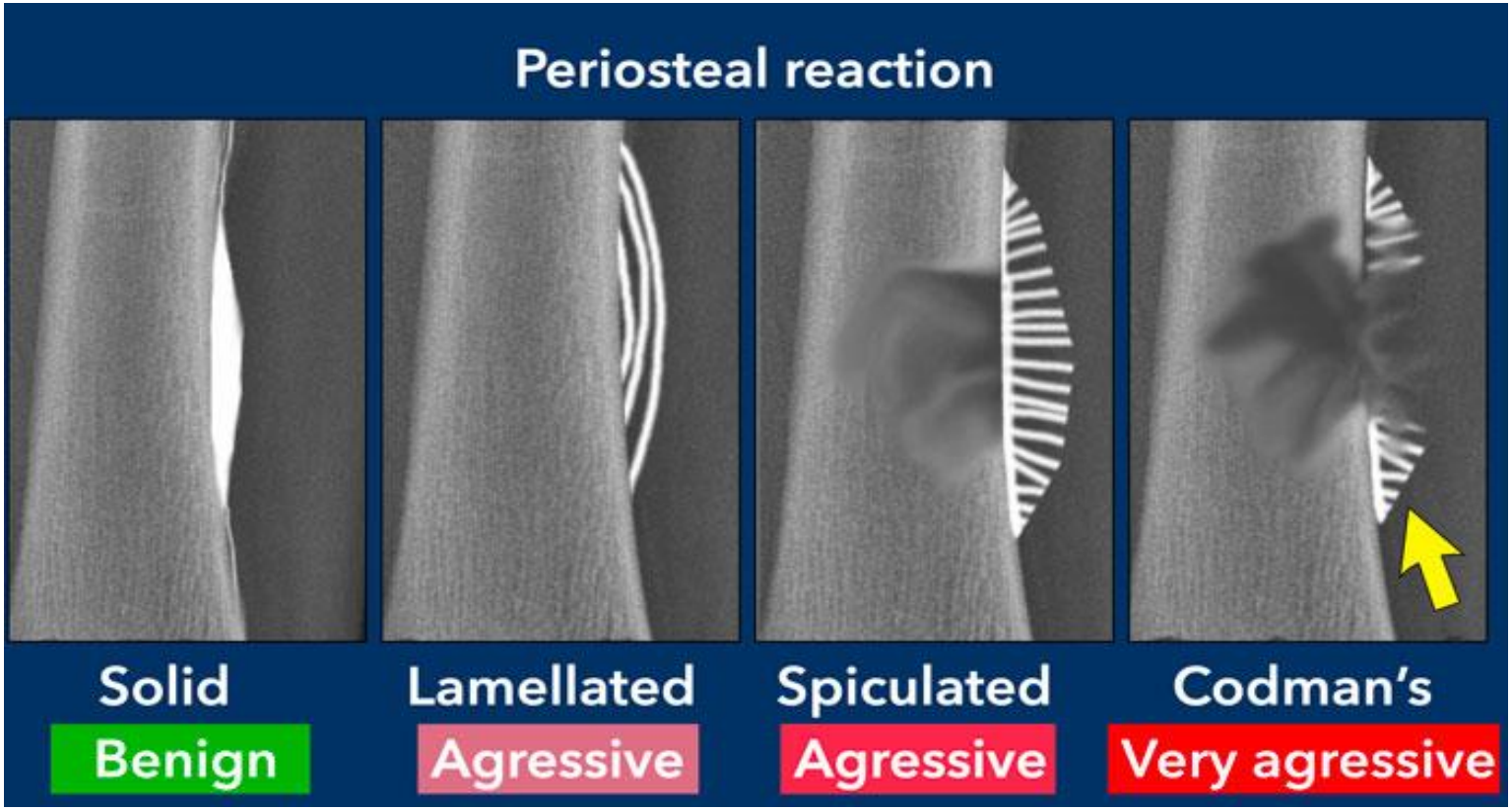
Types of bone tumors

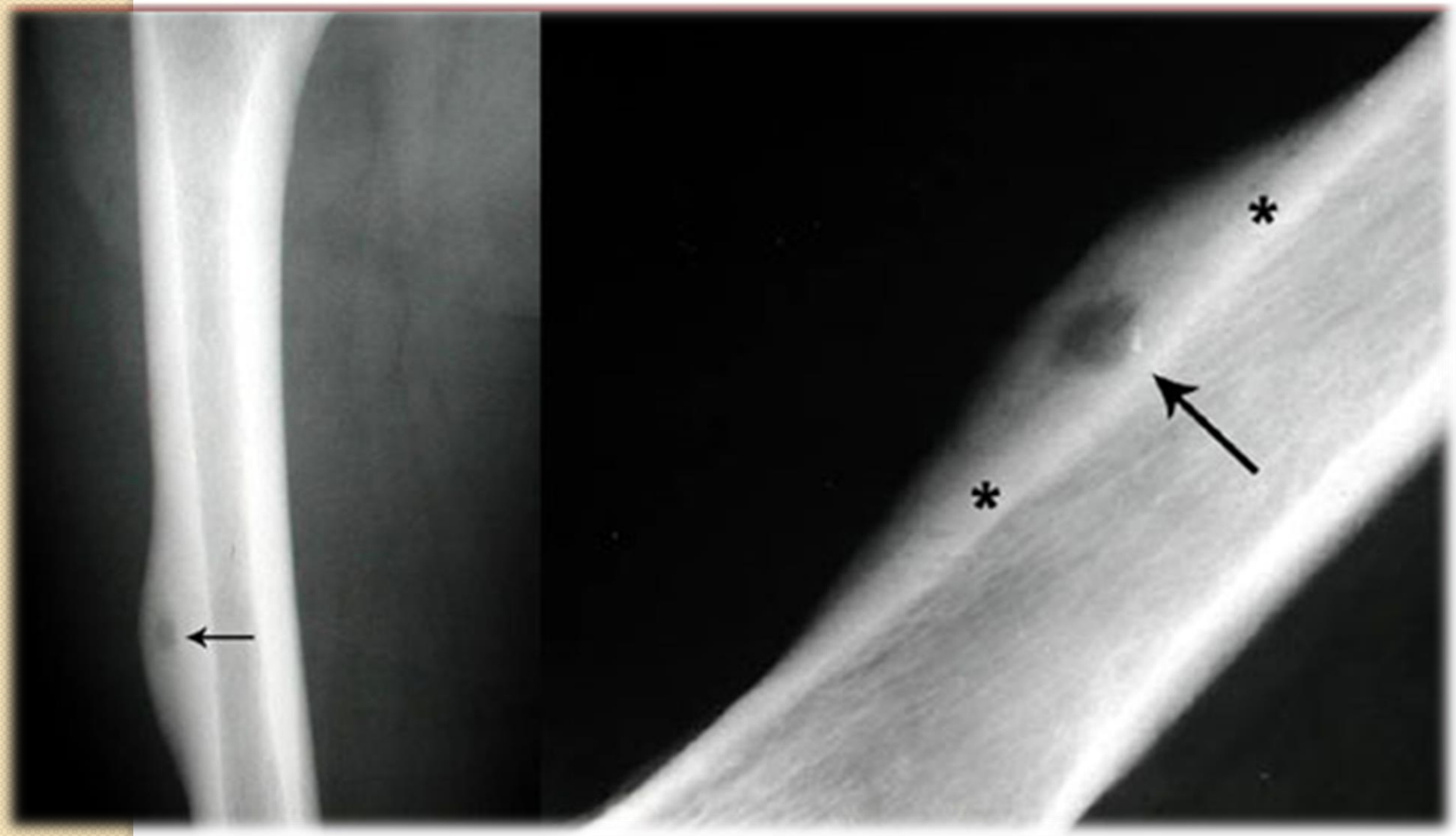
- Benign (osteoid osteoma- Enchondroma..)
- Malignant (osteosarcoma- fibrosarcoma..)
- Benign locally aggressive (osteoclastoma- bone cysts).

FACTS

- Benign bone tumors are much more common than malignant bone tumors.
- The most common malignant bone tumors are secondaries (mets).
- Most bone tumors induce variable degrees of periosteal reaction.

Types of periosteal reaction





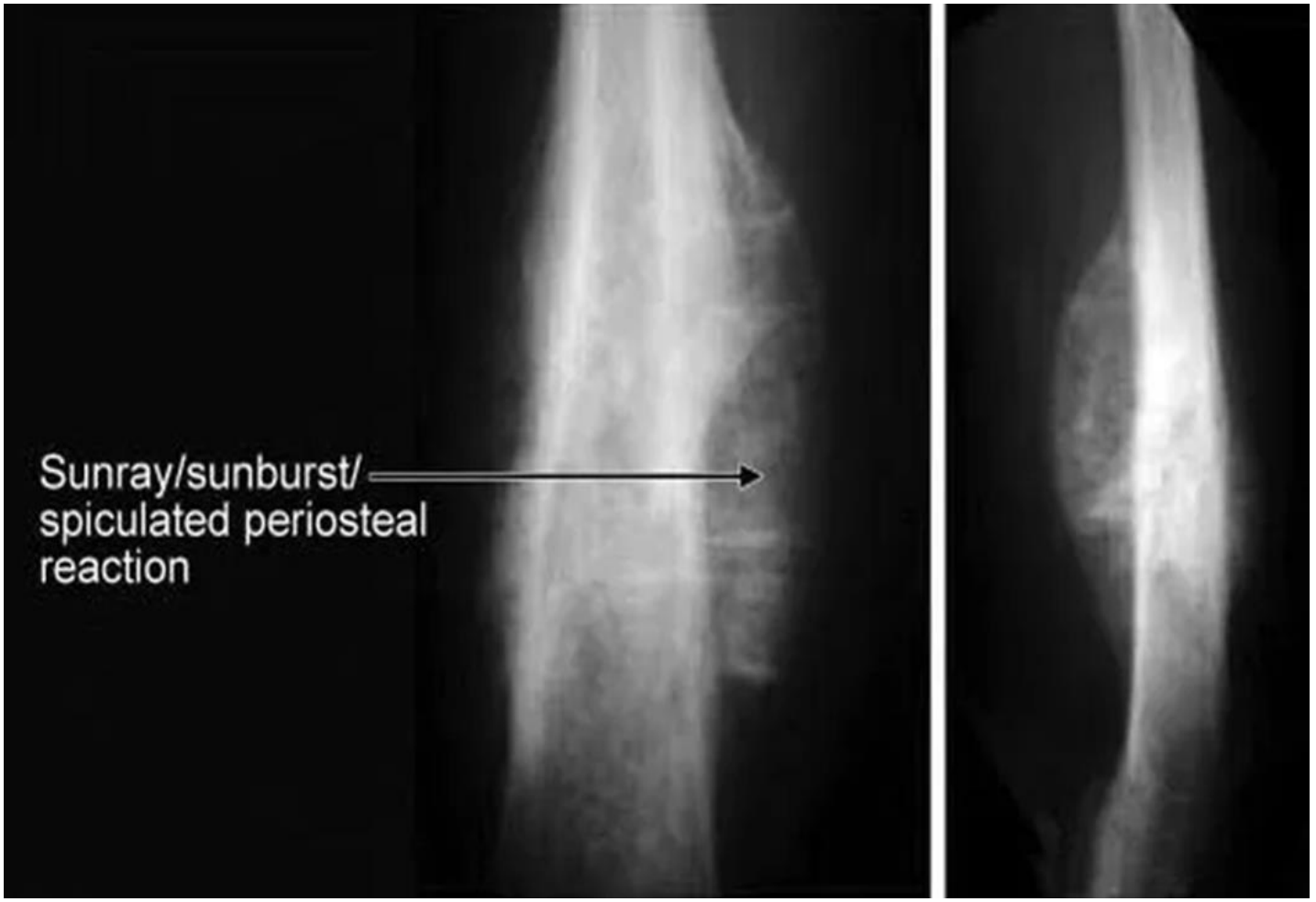
Solid periosteal reaction

Dx:

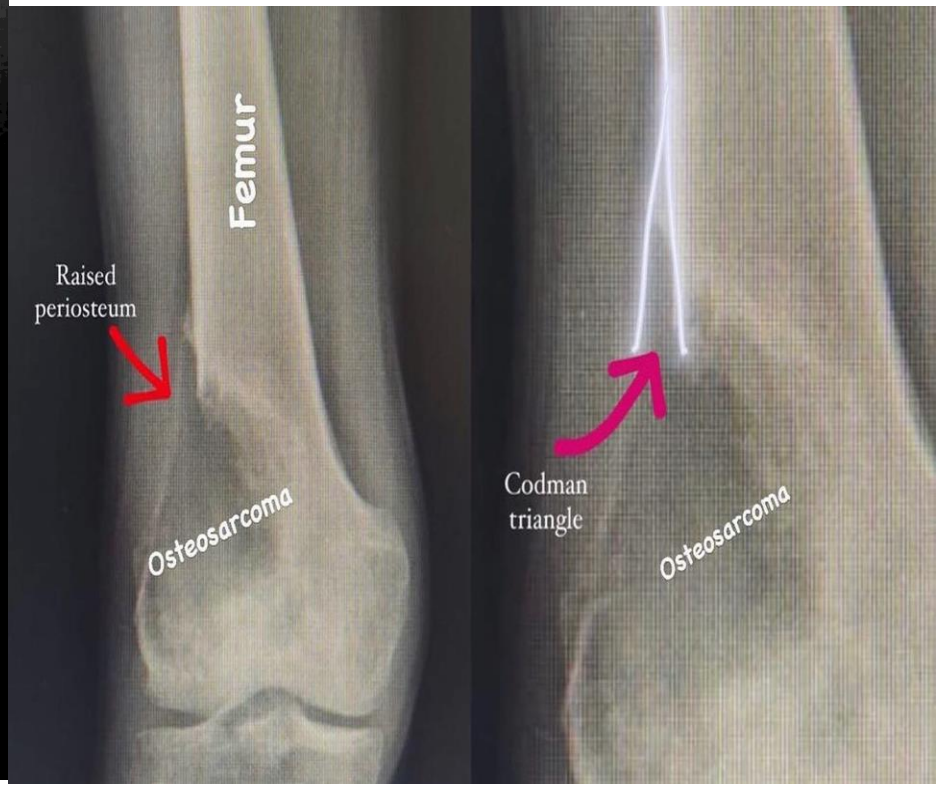
Osteoid osteoma

Onionskin periosteal reaction

Frontal radiograph shows localized laminated periosteal reaction (arrow) along lateral cortex of distal femur



Sunburst periosteal reaction



Frontal radiograph of distal femur shows edge of periosteum (thin arrow) lifted off cortex (arrowhead) at site of sclerotic metastasis from prostate cancer(thick arrow)

Codman triangle

Patterns of Bone Destruction

- Geographic
- Moth-eaten
- Permeative

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- Geographic
- Moth-eaten
- Permeative

Non-ossifying fibroma

Geographic Bone Destruction

- Destructive lesion with sharply defined border
- Implies a less-aggressive, more slow-growing, benign process
- Narrow transition zone

Geographic Lesions
Examples

- Non-ossifying fibroma
- Chondromyxoid fibroma
- Eosinophilic granuloma

Patterns of Bone Destruction

- Geographic
- **Moth-eaten**
- Permeative

Multiple Myeloma

Moth-eaten

Moth-eaten Appearance

- Areas of destruction with ragged borders
- Implies more rapid growth
  - Probably a malignancy

Moth-eaten Appearance
Examples

- Myeloma
- Metastases
- Lymphoma
- Ewing's sarcoma

Patterns of Bone Destruction

- Geographic
- Moth-eaten
- Permeative

Leukemia

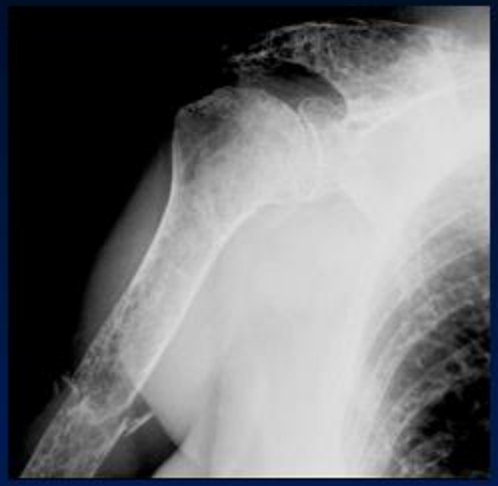
Permeative Pattern

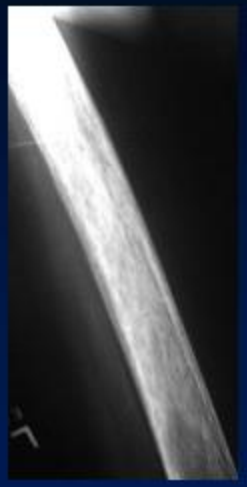
- Ill-defined lesion with multiple “worm-holes”
- Spreads through marrow space
- Wide transition zone
- Implies an aggressive malignancy
  - Round-cell lesions

Permeative Pattern
Round cell lesions

- Lymphoma, leukemia
- Ewing's Sarcoma
- Myeloma
- Osteomyelitis
- Neuroblastoma

Patterns of Destruction





Geographic

Moth-eaten

Permeative

Less malignant

More malignant

USE THE FOLLOWING APPROACH TO DESCRIBE THE LESION

A well define / ill define

Expansile / non expansile

Osteolytic / Sclerotic

Lesion is seen at the

Epiphysis / metaphysis / diaphysis

Of the RT/LT (bone name)

Associated with

- Type of periosteal reaction. → NEW
- Pattern of cortical bone destruction/thinning. → NEW
- Large / small Soft tissue component / internal septation or not.

- A well define
- Osteolytic
- Expansile lesion is seen at the
- Proximal Meta-diaphysis
- Of the RT fibula
- Associated with internal septation and cortical thinning.
- **No cortical destruction**
- **No extra osseous soft tissue component**

Dx:

Simple Bone cyst.

DDx:

Aneurysmal Bone cyst

MRI study

- Infiltrative
- Marrow based
- Diaphysis

Dx:

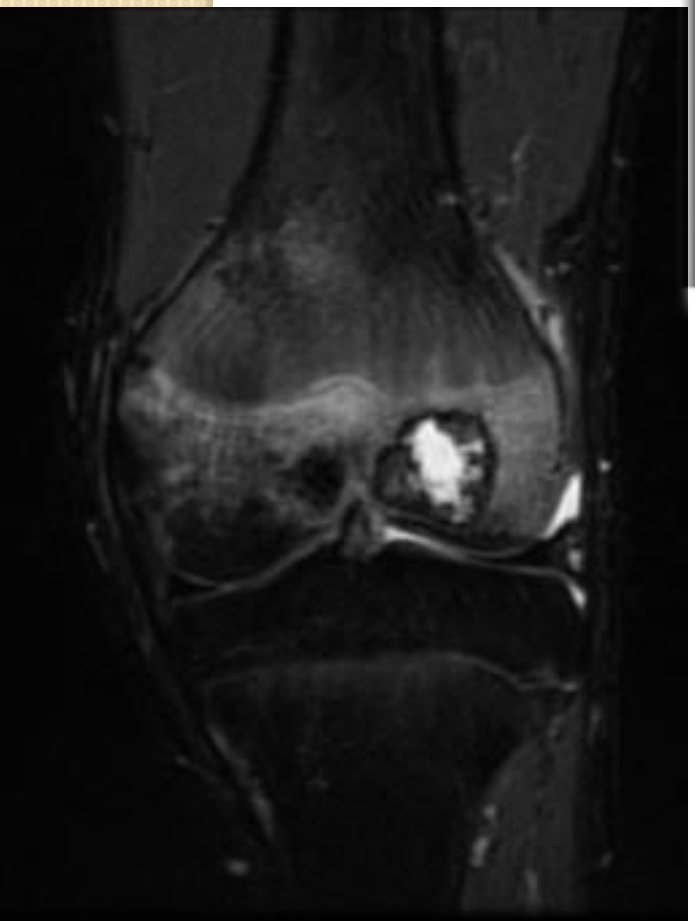
- Ewing Sarcoma

Describe

Dx: GCT (Osteoclastoma)

Describe

Dx:
Chondroblastoma



Describe