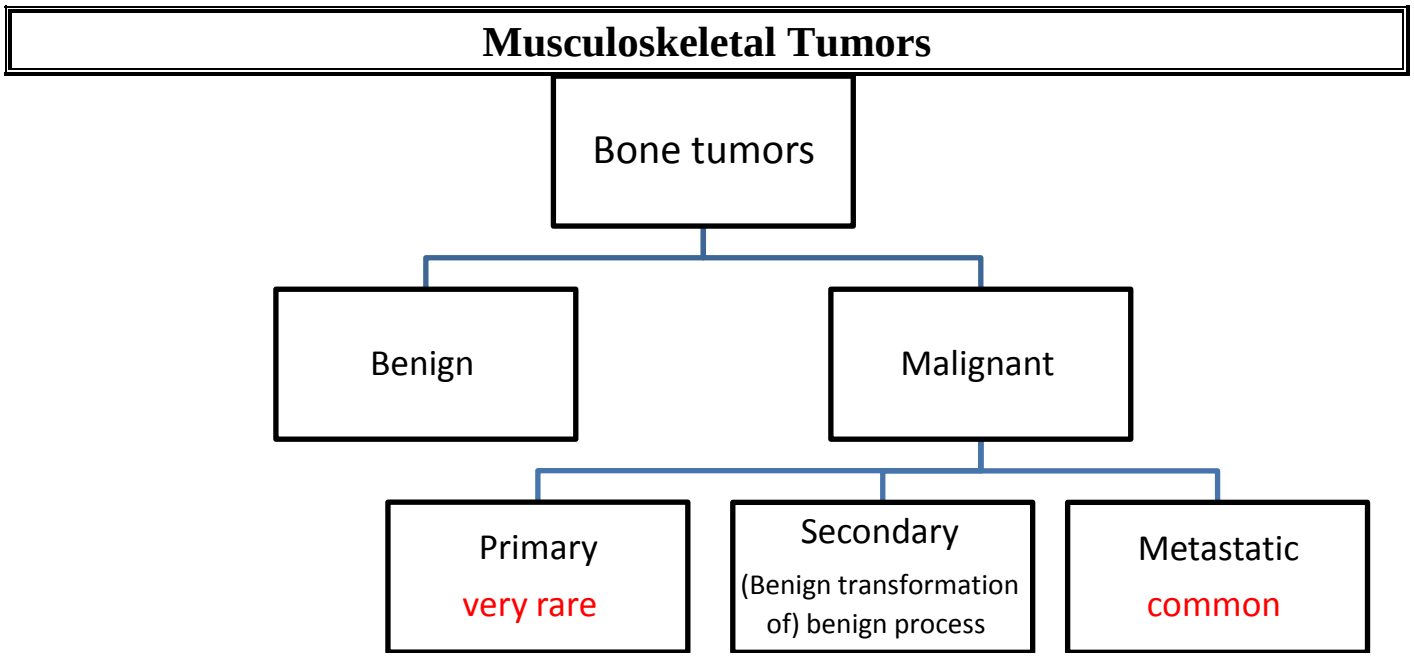
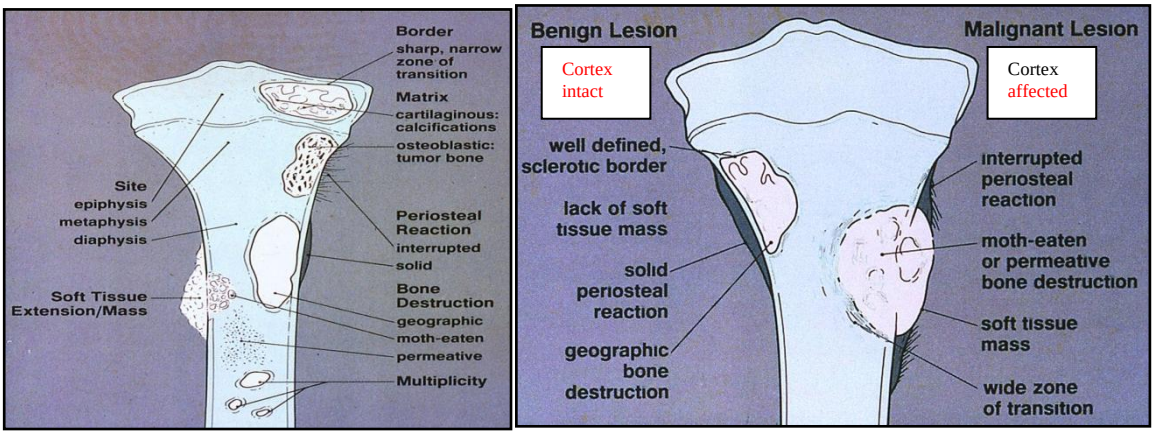


- Most common **bone Tumors** → BENIGN.
- Most common **benign** tumors → OSTEO CHONDROMA.
- Majority of **Malignant tumors** → METASTATIC of other tumors elsewhere in the body.
- Most common **primary malignant** tumors → M. MYELOMA THEN OSTEOSARCOMA.
- **Malignant Bone tumors** are called SARCOMA
- **Primary Malignant bone tumors** is minority
- **Benign bone tumors** do not invade the soft tissue nor do they affect the cortex
- Certain tumors have predilection for some bones (favorite places) it can recognized by X-ray. E.g.: **Ewing's sarcoma** most commonly in the DIAPHYSIS. **Giant cell tumors** are almost always found in a subarticular position, i.e. METAPHYSIC location.

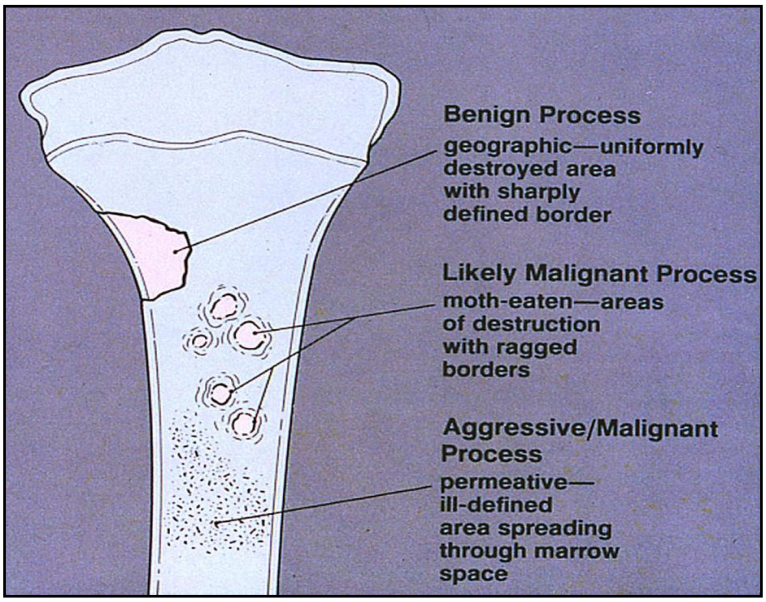
◈ Classification according to the cell origin:

Tissue of origin	Benign	Malignant
Bone (osteogenic)	Ostoidosteoma Osteoblastoma	Osteosarcoma (most common in epiphysis)
Cartilage (chondrogenic)	1- Enchodroma 2- Chondroblastoma	Chondrosarcoma
Bone & cartilage (both)	Osteochondroma	
Fibrous (fibrogenic)	Fibrous cortical defect	
Bone marrow (hematopoitic)	Gaint cell tumor	1- Multiple myeloma 2- Ewing's sarcoma (most common in diaphysis)
Unknown (lesion like tumor)	1- Simple cyst. 2- Aneurismal bone cyst (ABC).	
Metastasize		Metastasis

◈ How to describe bone tumors?



الصوره مهمه جدا – سؤال – الفرق



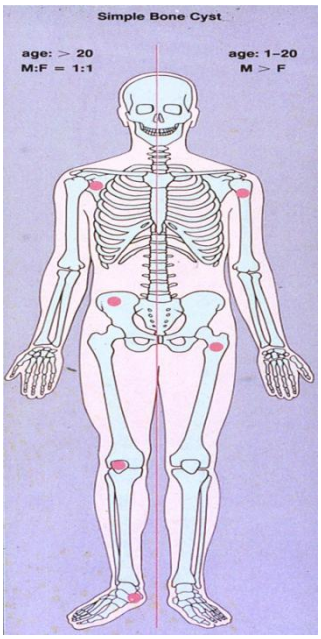
1- **Site:** Epiphysis, Diaphysis or Metaphysic whish most of the tumor arises from metaphysic.
2- **Centric** (away from the border) or eccentric (in the bone border).
3- **Border** of the tumor:
   a. Well define & sharp border → usually in benign tumors.
   b. Ill-defined →usually in malignant.
   c. Sclerotic margin: sign of benign tumors.
4- **Matrix** of the tumor :
   a. Sclerotic: it means forming bone .so on x-ray →opaque.
   b. Lytic: it means forming tissue other than bone (it may be cartilage, fibrous tissue or cyst) on X-ray →translucent.
   N.B.this calcification (lytic and sclerotic) helps in the differentiation b/w the tumors .i.e. you can't say from this calcification that this tumor is benign or malignant.
5- **Periosteal reaction** :
   -occur in some bone tumors:
      A. Characteristic periosteal reaction: mostly occur with malignant tumors (teeth like)
      B. Smooth periosteal reaction: with benign tumor.
6- **Geographic appearance** :
   Describe the tumor: e.g. oval shape, surface tumor, multiple tumor, etc.
7- **Soft tissue extension**: occurs mostly with malignant tumors or aggressive benign.

◈ Benign VS malignant: مهمه جدا

Description	Benign	Malignant
Border	**Well-defined**	**Ill –defined**
Periosteal reaction (PR)	**Smooth PR**	**Characteristic PR**
Matrix	**Lytic or sclerotic**	**Lytic & sclerotic**
Soft tissue extension	**No**	**Usually**
Geographic app.	**Uniform shape**	**Doesn't have specific shape**
Symptoms	**Usually swelling, proceed the pain**	**Usually the pain proceed the swelling**

Tumor like lesions

1) Simple bone cyst (unicameral cyst)



- The most common tumor like legion مهمه
- Usually in children age group up to 20 years old ,Male > Female
- After 20 Male=Female
- Not progressive

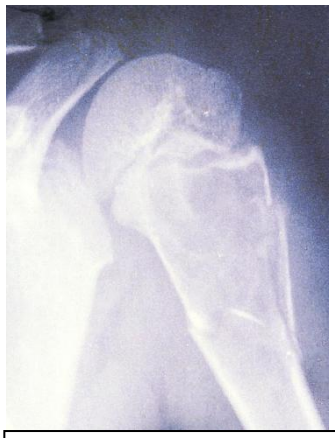
- **Sites**
  - Common in the end of long bones (e.g. proximal humerus).
  - Upper & lower femur
  - Pelvic (iliac crest)
  - Calcenum
  - Scapula
  - Patella

- **Presentation:**
  - The patient may present with pathological fracture → cause pain (after trauma , & cyst may correct after fracture)
  - **Usually its presentation is incidental**. (Most resolve within 2 yrs.)

- **Radiological feature** :
  - (x-ray is the main investigation in benign tumors)
    1. Metaphysic lytic lesion.
    2. Sclerotic margin, well define.

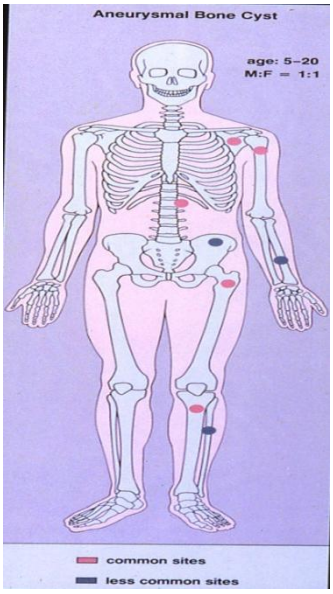
لا تظهر بشكل بالون وتكون محدوده ضمن حدود العظم

- **Treatment**
  - X-ray of pathological fracture in child age group
  - Nothing to do it except conservative treatment for the fracture ,& till the patient that you may have fracture in this area
  - The same fracture in older age with displacement & angulation
  - ORIF (Open Reduction and Internal Fixation) + Bone graft to fill the space



Show pathological fracture of child's humorus due to Cyst

2) Aneurysmal bone cyst (Agrrisive)



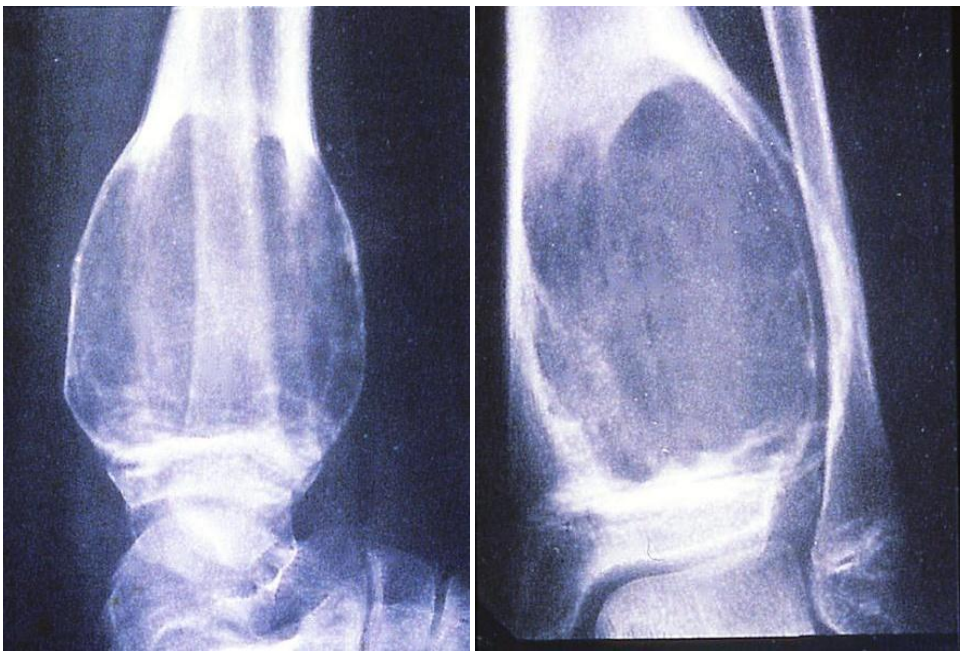
- Aggressive and balloon-like مهمه.
- Progressive tumor like legion.
- Arteriovenous formation.
- Recurrence rate is high. (because it is aggressive)
- Fusiform cyst.
- Aneurismal cysts have bloody content مهمه, while simple cysts have straw colored fluid.

- **Site (common site):**
  - Upper humerus.
  - Upper femur.
  - Spine (neural arch: lamina &pedicle) may give pressure effect.
  - Proximal tibia.
  - Scapula.

- **Presentation :**
  - The usual presentation is **swelling**.
  - Patient may present with pathological fracture → pain.

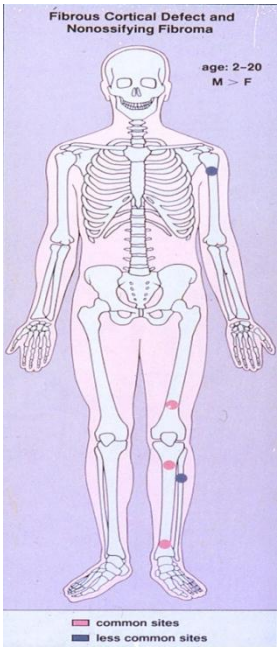
- **Radiological feature:**
  - X-ray shows different content inside aneurysmal cyst unlike simple cysts.
  - Metaphyseal lytic lesion.
  - Well- defined, sclerotic margin.
  - Expansile →thin cortex (like egg shell)

- **Treatment**
  - ORIF + BONE graft (from fibula as support BCZ lesion is very big)
  - Sequestration = divide it to small champers
  - Aspiration with alcohol ,phenol & steroid



Benign tumors

1) Fibrous Cortical Defect (Non Ossifying Fibroma)



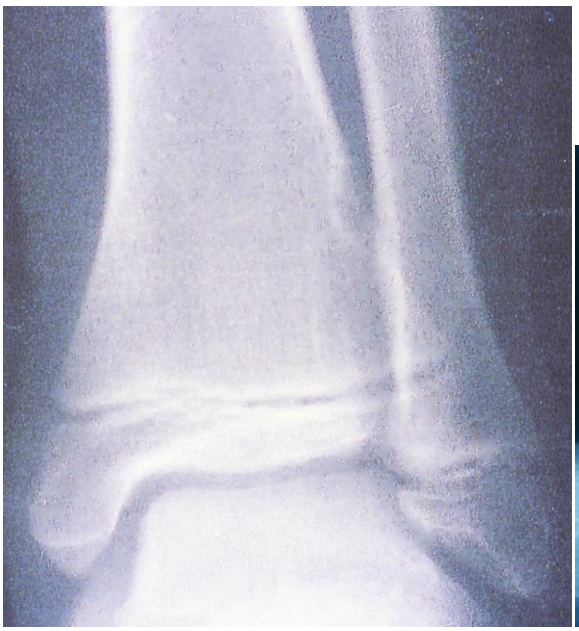
- **Benign** lesion since birth
- Not site for fracture.
- Never transfer to malignant.
- Ec-centric lesion.
- Usually accidental finding

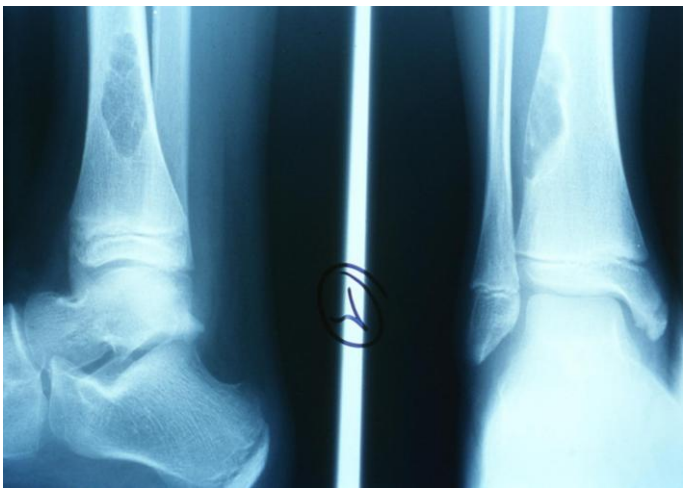
- **Site:**
  - Around knee: (lower femur, upper tibia).
  - Lower tibia.

- **Presentation :**
  - **Asymptomatic** (no pain, no swelling &no pathological fracture) →discovered incidentally.

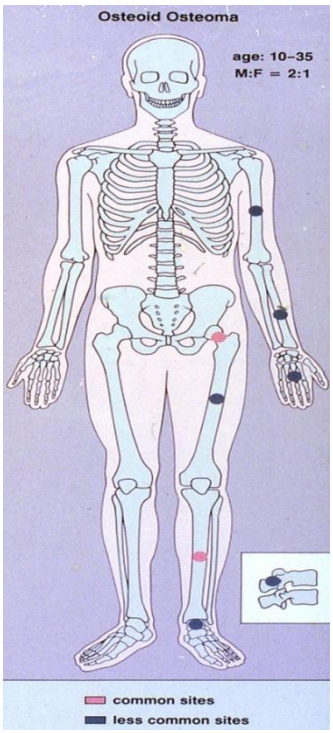
- **RADIOLOGICAL FEATURE :**
  - Metaphyseal lytic lesion (inside the cortex)☝
  - Well defined, sclerotic margin.

- **Treatment :**
  - Self-limited, healed by itself. مهمه
  - Reassurance is the Rx.
  - If pain-full → curettage +bone graft.

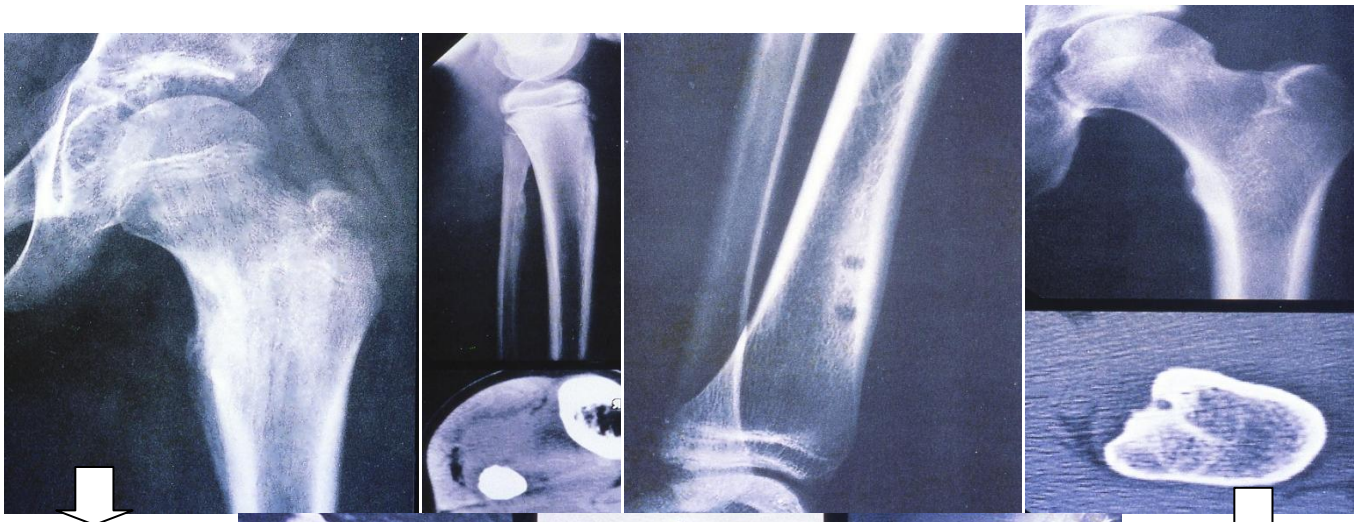




2) Osteoid Osteoma:



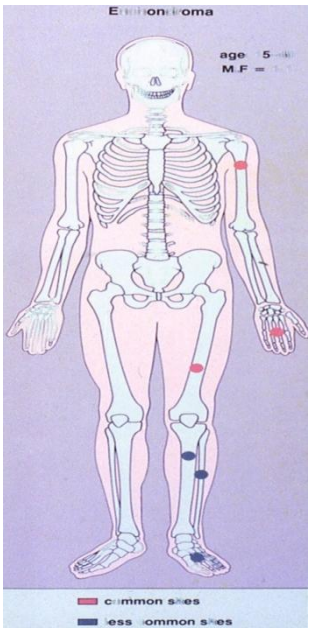
- Benign tumor which has different behavior → main presentation is pain. (in the Back – femur – tibia – the pain usually Not mechanical and it increase at sleep time → DDx of night pain : infection – tumor)
- Usually affects young patients 10-35 and more common in males.
- May arise in the cortex of long bones, or occasionally in the cancellous bone of the spine and less commonly talus
  - **Presentation**
    - Usually well localized pain that is **worse at night** and prevents patients from sleep.
    - Character of pain :
      1. Pain at the site of tumor.
      2. Aggravated by activity.
      3. Relived by aspirin & NSAID.
  - **Radiological features :**
    - Metaphyseal or diaphyseal lesion.
    - Lytic lesion inside patch of sclerotsis.
    - The lytic lesion called ((nidus)) , nidus is the part which surrounded by a reactive zone of dense sclerotic *new bone formation*, therefore in the treatment →we **remove nidus only**.
  - **Investigation:**
    1. X-ray→ a nidus surrounded by a **thick cortex** (sclerosis).
    2. CT scan (Best modality – MCQ) → show nidus
    3. Bone scan used sometimes.→↑uptake.
  - **Treatment**
    - NSAIDs for 3-6 weeks
    - If not relived A CT-guided needle can be inserted in to the nidus and the lesion ablated with radiofrequency coagulation (also called radiofrequency ablation).
    - If it easy to access > excise it &lable it then send it to histopathologist to make sure all the lesion was excised



Pt present with thigh pain ; the Xray show thick cortex (Abnormal)

CT show Nidus : which is the center of the inflammation

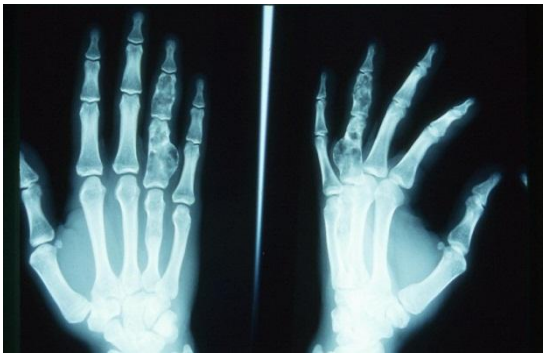
3) Endochondroma (Aggrisive)

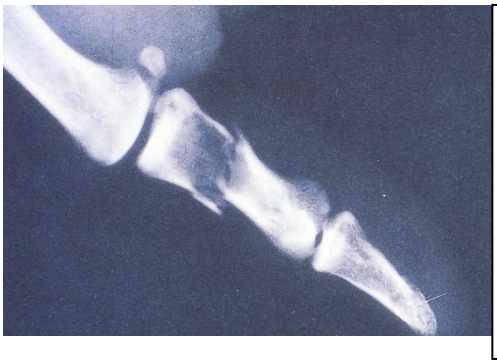


- 15-50 age group
- Tumor grows within the bone and expands it **(ballooning)**
- It composed of translucent hyaline cartilage and content inside is**chondroid**.
- The affected bone is expanded by the tumor and its cortex is thinned.
  - **Sites – MCQ**
    - **Mainly small bone (Digits) – MCQ** e.g. phalangese in hand & foot …etc.
    - Fairly common in Femur, humerus and less commonly tibia &fibula
  - **Presentation**
    - Usually found incidentally
    - Swelling.
    - **Pathological fracture** which may cause pain.
    - Affect one side e.g. one hand
  - **Radiological features**
    - Metaphyseal or diphyseal lytic lesion.
    - Well defined.
    - Sclerotic margin.
    - Multicentric
    - Location and contents is different than aneurismal bone cysts. X- RAY of enchondroma is more hyperdense due to the chondroid.

- **Treatment**
  - If it symptomatic (pain , become bulky) >> surgery (curettage + bone graft) and fixation – MCQ
    N.B. any pathological, you must take a biopsy.

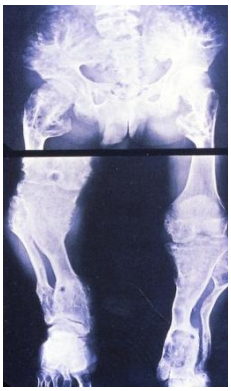
Show mass with bony contact

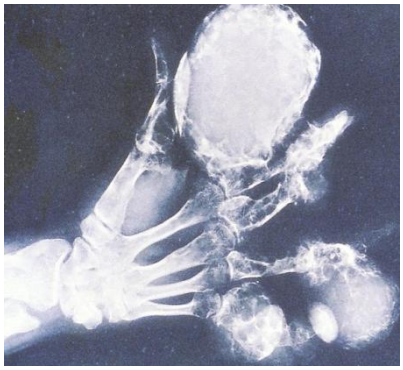


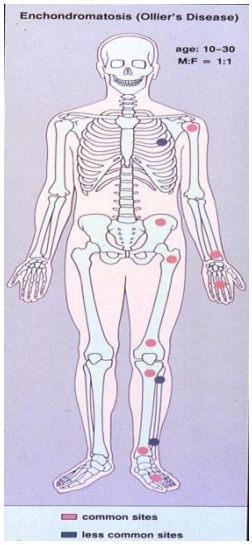


→Show pathological fracture → need curettage to heal the normal cast will not work

- **Endochondromatosis (premalignant lesion)**
  - Multiple enchondroma of the major long bones occur mainly in the rare condition called multiple enchonromatosis.
  - Benign ,affect both sides ,low grade destructive lesion
  - Usually starts in children, and carries a high risk of becoming a secondary tumor (malignant transformation). – MCQ
  - Treatment : Amputation to avoid transformation to malignant

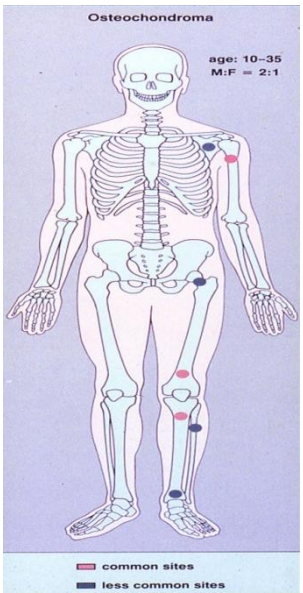






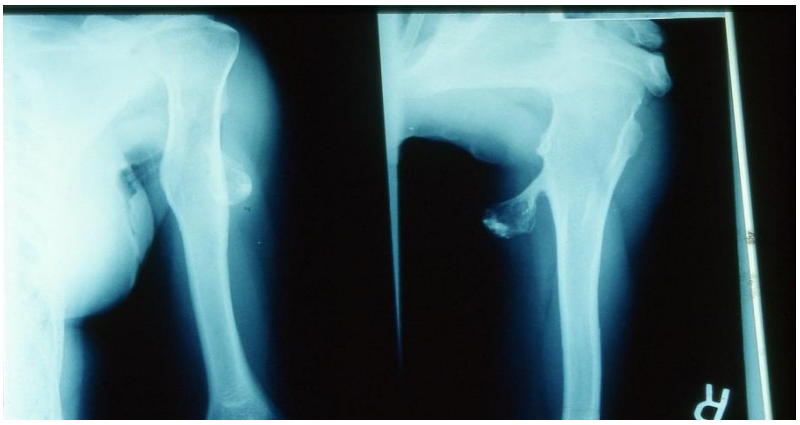
4) Osteo chondroma عظم مغطى بغضروف

- **Commonest benign tumor of bone**. (MCQ)
- The only surface tumor, (outside the bone) .therefore, we call it exostosis or pedunculated.
- It is acombination of both bone & cartilage.
- Usually in 10-20 age group and Male > Female.
- Painful in children due to growth plate compression and pressure effects on adjacent nerve or vascular structures.
  - **Sites**
    - The commonest are(around knee مهمه جدا) distal femur + proximal tibia
    - Scapula, neck of femur.
  - **Presentation:**
    a. Swelling : it can reach huge size .(keeps on growing)
    b. Symptom of complication :



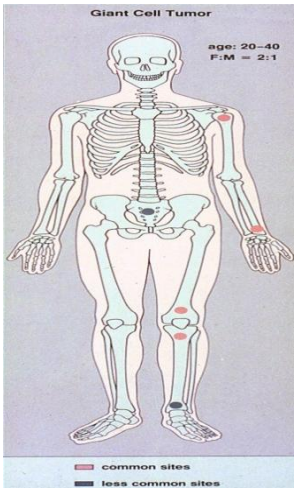
1- Pressure symptom:
   - Pseudo-aneurysm.→ artery.
   - Hypothesis or parasethesia →nerve.
   - Rendering the movement → tendon.
   - Restrict the movement of the movement nearby the joint☝ - MCQ
   - Adventitia bursea.
2- Fracture especially with pedunculated type.
3- If transfer to malignant

- **Radiological feature:**
  - Metaphyseal lesion.
  - Mushroom-like stalk of the bony tumor. (connected to the bone)
  - On x-ray the cartilaginous cap: which is the cartilaginous part of the tumor not seen (translucent).it is located around the bony part.
  - Direction of the tumor →away from the bone.
    - Start from the growth plate & in the direction of Ms. Tendon.
    - Stop growing when patient stop to growth usually at 18 yrs.
  - According to the shape of the neck of the tumor , we divide it into :
    1- Pedunculated type: has long & thin neck.
    2- Sessile type: has short & thick neck.
- **Treatment**
  - Usually we do nothing, just reassure the patient. – MCQ
  - Surgery (just excision , no need for bone graft b/c it is surface tumor) & the surgery is indicated in (MCQ) :
    a. When there is complication. (pressure symptoms)
    b. Cosmetic.
    c. If it grow fast مهمه



Sessile	Pedenculated

5) Giant cell tumor (Agrrisive)

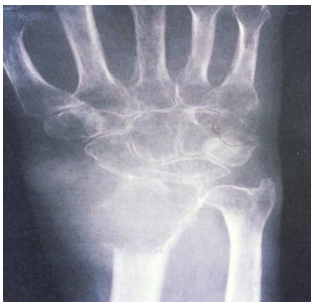


- F > M مهمه
- From bone marrow
- Occurs most commonly in young adults, 20-40 age groups.
- Benign aggressive tumor.
- It's only the benign bone tumors that can metastases to the lung. So it's important to get chest x-ray.
- Origin: osteoclast, therefore it is sometimes called **osteoclastoma**.
- Very destructive tumor
  -

- **Sites (Around the knee**
  - Most common distal epiphysis of radius
  - Less common are distal tibia ,sacrum
  - Very bad one in sacrum because it will affect nerve roots
- **Presentation**
  - Mostly patient present first with: pain, then swelling & later on pathological fracture.
  - Not clear
  - Osreopenia.
- **Radiological feature :**
  - Epiphyseal lytic lesion.
  - No new bone formation b/c this new bone will be eaten by the osteoclast.
  - Ill define margin.
  - Radiograph shows lucent regions, lytic destruction of the bone with expansion of the cortex, without a sclerotic rim.
  - Ill-defined borders when aggressive or pre-malignant
  - Usually looks like a bone cyst, definite diagnosis made by biopsy.
  - No marginal sclerosis.
  - Soft tissue extension.
- **Investigation :**
  - The assessment depends on :
    a. Soft tissue extension: by MRI.
    b. Joint extension: the articular cartilage is a very resistant against progression of the tumor from going to the joint.
    c. Bone extension: by CT scan.
    d. Further investigation :
      - Bone scan: for metastasis.
      - CBC: FOR ASSESMENT of general condition of patient.
      - Biopsy: for confirmation it doesn't convert to malignant tumor.

So, the tumor will not destruct the joint. But the surgeon during treatment will destruct the joint b/c he has to remove the entire region around the joint.

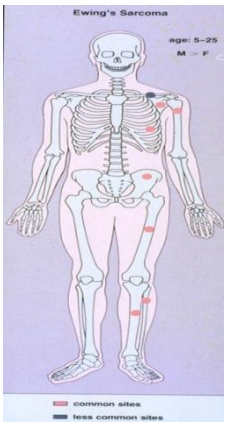
- **Treatment**
  - No place for conservative treatment.
  - In general we do : excision followed by either : (depend on the site of the tumor)
    1- Bone graft. + curettage (MCQ) اعرف هذا العلاج فقط كافي
    2- Prosthesis.
      a. If the tumor in non-weight bearing area (e.g. lower radius) → radical excision + bone graft + arthrodesis for nearby joint
      b. If the tumor in weight bearing area (e.g. lower femur) →excision + prosthesis (N.B. no bone graft here).



- **Radiotherapy &chemotherapy are indicated in :**
  1- Frank malignancy.
  2- Recurrence of the tumor.
  - Recurrence rate is 50% ,it will be more aggressive with metastasis

Malignant tumors

1- Ewing's sarcoma



- Origin: from the **endothelial lining of the bone marrow canal**.
- Most of the Ewing's sarcoma is miss-diagnosed firstly as acute osteomyelitis. (Mimic the OA) because of systemic symptoms and elevated ESR.
- Young age group 5-25 (MCQ)
- Pulmonary metastasis can occur.
  - **Sites:**
    - It is the only bone tumor which takes it origin **from diaphysis** → so; we will find a diaphyseal lesion.
    - The diaphyses of the femur are the most common sites, followed by the tibia and the humerus.
  - **Presentation :**

    Very characteristic:
    1- Febrile patient.
    2- High WBC's.
    3- Local Pain & redness
    4- Ulceration of skin.
    5- swelling

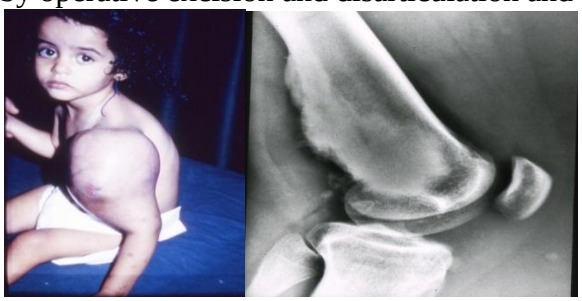
    } like the presentation of infection☝ (MCQ)

    + Scapula, less commonly clavicle.
  - **Radiological feature:**

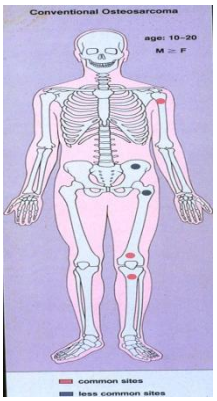
    X-ray: peal onion reaction.

    --- You think it is AOM→YOU do aspiration for drainage of pus →there will be no pus &you will find tumor tissue →biopsy →Ewing's sarcoma.
    - So, it is a diaphyseal lytic lesion (not sclerotic).
    - Ill- defined.
    - Sometimes →soft tissue extension.
    - N.B: you can't differ it from osteosarcoma unless you do biopsy.
  - **Investigation :**
    - Definite diagnosis made by MRI and biopsy.
  - **Management (Suspect it early)**
    - In history usually asymptomatic unless it cause pressure in vital structures or in late stage
    - Blood investigations , ESR
    - Radiology (X-ray ,bone scan ,CT,MRI)
    - Biopsy –same surgeon who will do surgery should take the biopsy- To avoid contamination then spreading the tumor
  - **Treatment**
    - It is sensitive to chemotherapy
    - So start with chemotherapy –to decrease the tumor in size so it will be easy to excise it & to control metastasis (microcell) everywhere in the body as in bacteremia.
    - Tumor treated by operative excision and disarticulation and You may need amputation

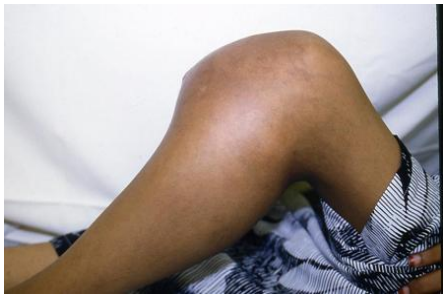
Ewing Sarcoma



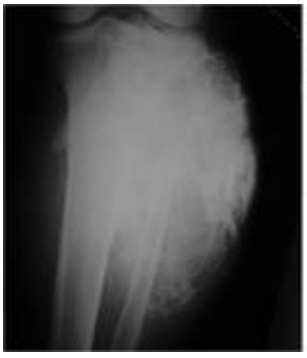
2- Osteo sarcoma

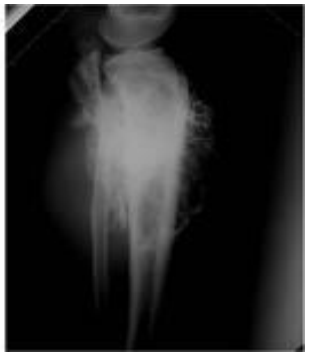


- Most common primary malignant tumor .{ remember the most common malignant tumor is metastatic }
- More common than Ewing's sarcoma
- 10- 25 year old and Male > Female – Middle Age – MCQ
  - **Sites**
    - Arises from primitive bone-forming cells
    - Around the knee.
    - Common in the lower femur, upper tibia, and upper humerus.
    - Less commonly clavicle
  - **Presentation :**
    - Patient present firstly with pain, then swelling, lastly pathological fracture (typical presentation of malignant tumor). Overlying skin is warm due to high vascularity.
    - May present as cachectic (in lated& advanced case).



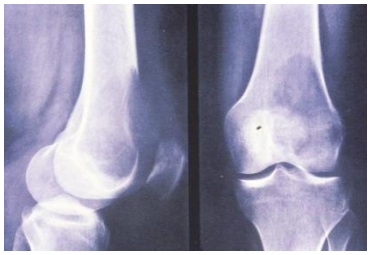
  - **Radiological presentation**
  -
  -



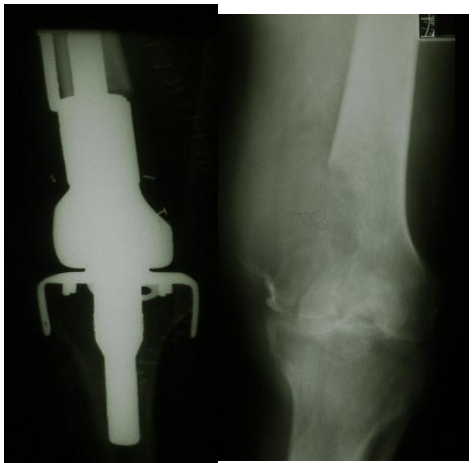


Show sunrise Appearance

  -
    - Very dense
    - Irregular medullary and cortical destruction of the metaphysis.
    - Sun rise periosteal reaction (surrounded by low dense) – MCQ
    - Could be lytic or sclerotic."mixed"
    - Ill defines no sclerotic margin.
    - Metaphyseal lesion.
    - Definite diagnosis made by biopsy



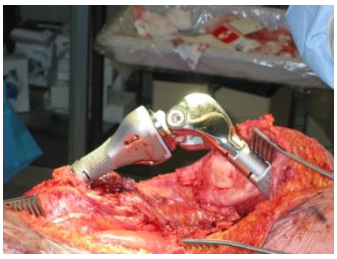
  - **Investigation :**
    1- CT scan = bone extension.
    2- MRI = soft tissue extension.
    3- Bone scan = metastasis.
    4- Searching for metastasis



  - **Treatment**
    - Surgical intervention :
      1- **Limb salvage procedure**: which is radical excision of the affected bone & the affected compartements (e.g. flexor compartement

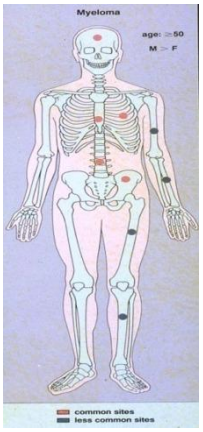
of thigh , adductor compartment of the thigh … etc)around the bone + followed by reconstruction (reconstruction may be :prosthesis (MCQ) , bone graft , or bone cement) + lastly we do radiotherapy &chemotherapy .

2- **Amputation** : is indicated:
   a. The whole compartment around the bone is involved (e.g. the flexor, adductor & extensor compartment of the thigh). If there the Vessels involved you can do bypass graft
   b. Pathological fracture.
3- in all stages: chemotherapy → surgery → chemotherapy
4- survival rate is 80 %



N.B. CHEMOTHERAPY TO AT LEAST ↓ED SIZE OF THE MASS. مهمه

3- Multiple myeloma (Primary tumor)

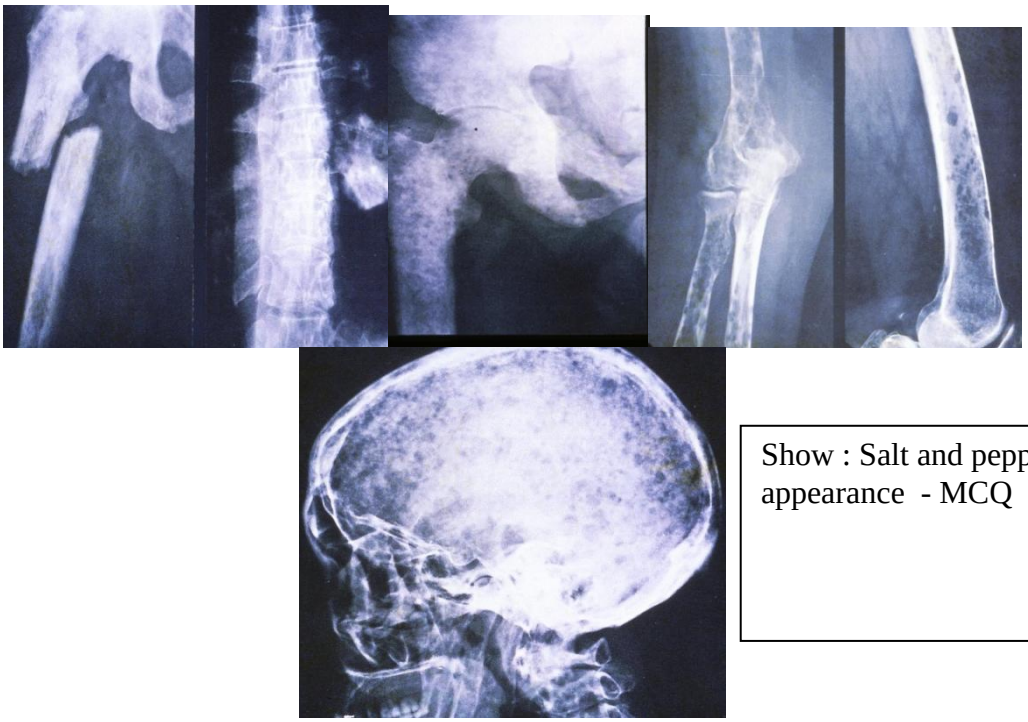


- Arise from plasma cells in the bone marrow. Plasma cells are responsible for antibodies production (gamma globulins).
- The most common primary malignant tumor.
- Arises from the plasma cells of the bone marrow
- Tumor of bone marrow, occurring in older adults > 50 and predominantly Males.
- **Bence Jones proteins test** found in 24-hour urine collection. – MCQ
- Disseminates too many parts of the skeleton through the blood stream, thus usually multiple.

- **Site:**
  - Central bones (axial skeleton): skull, ribs, pelvic girdle. & spine.
  - It may be solitary, multiple (commonest) or generalized osteoporosis (mylometosis: multiple myeloma + only generalized osteoporosis).
- **Presentation :**
  - Pt ill (decreased immunity)
  - Sclerotic (no more elasticity) so more prone to fractures
  - In skull there will be pepper (lytic) &salt (sclerotic)... {if sclerotic →un flexible →easy to fracture) mottled appearance).
  - P.t came with bone ach (backache) + osteopenia.
  - More common in periphery than center
  - The only one definitive to diagnose it, is Bone marrow aspiration."Biopsy".
- **Treatment**
  - Bone marrow transplant
    - Success rate is 30%
    - Cost million $
  - Radiotherapy.
  - Chemotherapy.

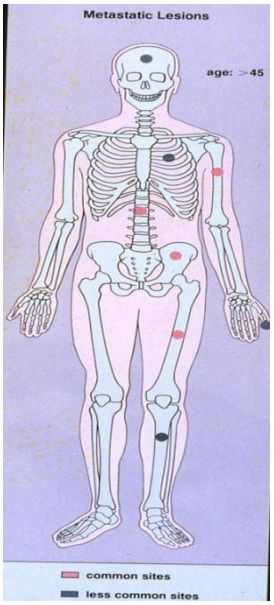
  } all 3 done by oncologist.

  - The rule of orthopedic surgeon is only when you have pathological fracture →do internal fixation.



Show : Salt and pepper appearance - MCQ

4- Metastatic lesions



- Tumor outside the bone. The most common tumors are: prostate (Male) , thyroid, breast (Female) , lung and kidney. – MCQ
- More than 45 in age, F>M.
- More common than primary tumors in later adult life.
- Affect SAME SITE which affected by multiple myloma.
- Take biopsy to know where is the primary
- If there is fracture do curettage first then fixation.

■ **Presentation :**

- Patient present & primary tumor is known & the patient is treating from it.
- May present with secondary metastasis. So, we have to search for the primary and try to treat it.
- Usually metastasis occurs in the highly vascular bones e.g. vertebral body, ribs, pelvis, upper end of femur, and humerus.

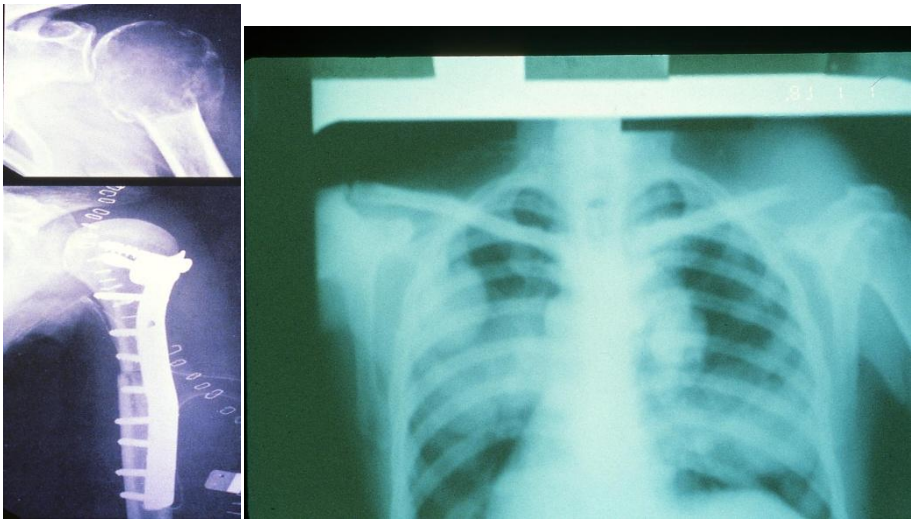
■ **Radiological feature :**

- It may be solitary or multiple (common) or just osteoporosis (called carcinomatosis).
- It differs from multiple myeloma because it may present with lytic or sclerotic lesion while the M.M only present with lytic lesion.
- If the primary tumor is from the **prostate** →the lesion will be **sclerotic**.
- If the primary tumor is from the **breast** → the lesion will be **lytic**.

■ **Investigation :**

- Same as Multiple myeloma
- X-ray shows decreased bone density (bone eaten away) with thinning of the cortex. Resembles bone cysts but the age group directs the diagnosis.
- Metastasis usually of the lung → sarcoma
- CT- scan of the chest performed for definite diagnosis.

- **TREATMENT :**
  - 1st treat the primary tumor then treat the bone
  - If fractures present treat them
  - It usually palliative treatment



Some IMP Notes From 427

All bone tumors all metaphyseal except:

1- Osteoid osteoma: metaphyseal + diaphyseal.
2- Enchondroma: metaphyseal + diaphysis.
3- Chondroblastoma + giant cell tumor: epiphysis.
4- Ewing's sarcoma: diaphyseal tumor.

Most of the tumor occurring in children or growing age (>25) except:

1- Osteoid osteoma: 10-35.
2- Osteoblatoma: 10-35.
3- Osteochondroma: 10-35.
4- Enchondroma: 15-40.
5- Giant cell tumor: 20-40.
6- Multible myeloma & metastasis: old age >50.

Most of the tumor occurs more common in male except:

- Giant cell tumor: F>M.
- MUTIPLE myeloma +metastasis: f >m
- Simple bone cyst +ABC+ enchondroma: F=M.

Benign tumor that may transfer to malignant:

1- Osteoblastoma.
2- Osteochondroma.
3- Giant cell tumor.
4- Chondromatosis.

- Metastatic tumor more common than primary tumor.
- Most common primary benign tumor: osteochondroma.
- Most common primary malignant tumor: multiple myeloma then osteosarcoma.

Important tumors (study them very well)

1- Simple cyst.
2- Know the difference between osteblastoma& osteoid osteoma.
3- Enchondroma&condroblastoma : على الطاير
4- Osteosarcoma: أهم شي
5- Ewing sarcoma: pay attention to its presentation.
6- Multiple myeloma: pay attention about it investigation.

- praxia. √