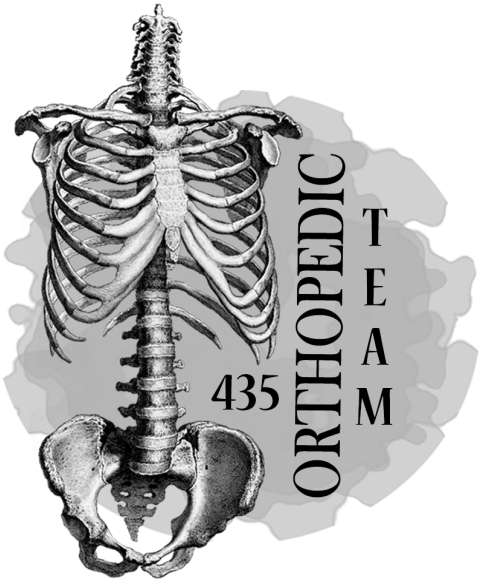

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Bone Tumors

Objectives:

★ **Doctor said this lecture should be enough for exam purposes.**

★ **Summary**

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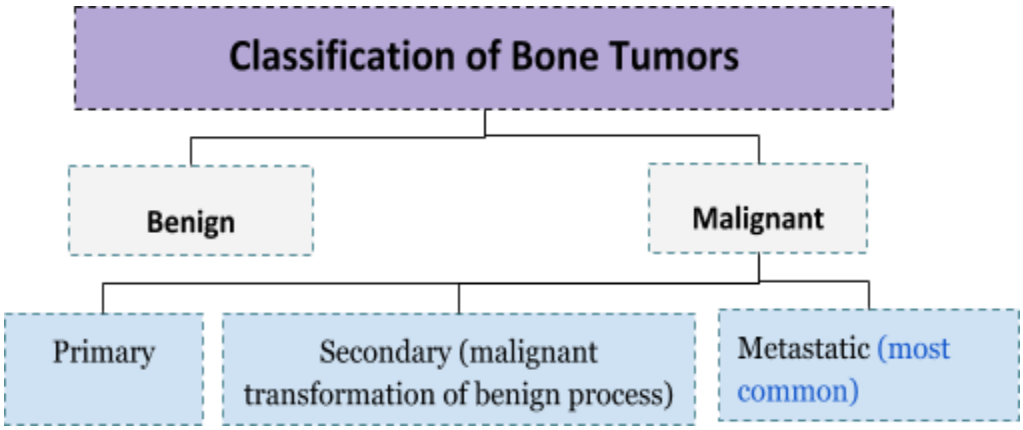
Edited By: Bedoor Julaidan
Revised by: Dalal Alhuzaimi
References: 435 Lectures And Notes, Toronto notes, 433 Team, Apley's

Bone Tumors



Most are classified according to the normal cell of origin and apparent pattern of differentiation:

Histologic Type	Benign	Malignant
Hematopoietic (40%)		**Myeloma**
		Malignant lymphoma
Chondrogenic (22%) "cell of origin: cartilage"	**Osteochondroma**	**Chondrosarcoma**
	Chondroma	**Dedifferentiated chondrosarcoma**
	Chondroblastoma	**Mesenchymal chondrosarcoma**
	Chondromyxoid fibroma	
Osteogenic (19%) "cell of origin: bone"	**Osteoid osteoma**	**Osteosarcoma**
	Osteoblastoma	
Unknown origin (10%) classified as benign or malignant based on cell pathology, but cell of origin is unknown	**Giant cell tumor**	**Ewing tumor**
		Giant cell tumor
		Adamantinoma
Histiocytic origin	Fibrous histiocytoma	Malignant fibrous histiocytoma
Fibrogenic	Metaphyseal fibrous defect (fibroma)	Desmoplastic fibroma
		Fibrosarcoma
Notochordal		Chordoma
Vascular	Hemangioma	Hemangioendothelioma
		Hemangiopericytoma
Lipogenic	Lipoma	Liposarcoma
Neurogenic	Neurilemmoma	

The diagnosis of tumors is made by History, physical examination & investigations.

History:

- Age, sex. why is age important? a bone lesion in a child (e.g. 7 y.o.) is most likely **primary**, either benign or malignant, while a tumor in an elderly (e.g. 70 y.o.) is most likely **metastatic**. [1] (EXTREMES of AGE)
- Present with:
  - Pain, especially severe progressive **night pain** in one limb that wakes patient up.
    - Although night pain can be associated with benign conditions like muscular or growing pain.
    - The pain could be caused by the tumor itself or the **pathological fracture**.
    - **No history of trauma.**
    - **Rest pain**, does not respond to analgesia.
  - **Local associated symptoms**: Swelling/lump, ulceration, deformity.
  - Distal nerve **compression symptoms** (paresthesia or numbness).
  - **constitutional symptoms** (Weight loss, fever, night sweat, loss of appetite). not the primary presentation, as they present late (metastasis)
- Family history of bone tumor.
- DDX of any tumor is INFECTION.

7 years old boy came with leg pain at night for 2 months, no history of trauma, he's unable to walk, he lost some weight. **Examination**: swollen knee with limited ROM. **X-ray** shows aggressive lesion with sunburst periosteal reaction in the distal femur. you did **MRI**, it's most likely osteosarcoma, **chest x-ray** shows no lesions, bone scan shows only distal femur lesion. what will you do next? **biopsy**.
do not forget systematic review it could be a metastatic cancer (for example patient has bleeding per rectum from colon cancer)

Physical Examination:

- General examination (cachectic), Lymphadenopathy.
- If there is a lump: 2Ts = tenderness, temperature, 3Ss = Site, size & shape, consistency, surface, margins, Overlying skin, mobility, discharge, Reducibility, Pulsatility & transillumination
- if the tumor is near a joint there may be effusion and/or limitation of movement.

Investigations:

Lab:	Imaging:	Biopsy:
• **CBC** (infection or anemia), **ESR**. • Hematological investigations Leukemia, lymphoma, and multiple myeloma in elderly (some consider MM bone tumor and some consider it hematological)	**1. local staging:** • **X-ray** (Plain film of the whole bone with 2 views). most important, 90% of tumors can be suspected or diagnosed on x-ray. • **MRI**. Assessment of surrounding soft tissues, tumor extension, neurovascular structures, and medullary/marrow involvement. • **CT** (bony bone tumors) **2. systemic:** • **Chest CT with contrast** (lung metastasis is the first in children) • **Bone scan** (lesion of same tumor or metastatic from bone to bone which is a characteristic for **osteosarcoma**)	• biopsy should be done by who will do the definitive surgery, ideally orthopedic oncologist or interventional radiologist who works with the orthopedic oncologist. • care must be taken to take biopsy directly through the compartment involved to avoid contaminating other compartments. • Biopsy is sent for **pathology** and **microbiology** "biopsy every infection and culture every tumor" e.g. TB

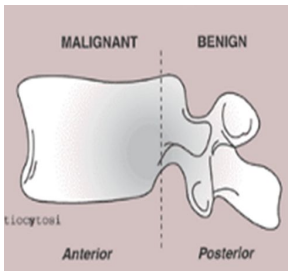
[1] <1 yr of age: metastatic neuroblastoma
1-20 yr of age: Ewing's sarcoma in tubular bones
10-30 yr of age: osteosarcoma and Ewing's tumour in flat bones
>40 yr of age: metastases, multiple myeloma, and chondrosarcoma

X-Ray Reading describing a lesion should include the following (VERY IMPORTANT):

1- **Number:** is the lesion solitary or are there multiple lesions?[2]

2- **Site:** what bone is involved & where is the lesion in the bone?

- Epiphysis, Metaphysis or Diaphysis; most tumors arise from the metaphysis.
- Centric (in the middle of the bone) or eccentric (in the bone border).
- This may help in diagnosis as some tumors are exclusively in the diaphysis or metaphysis, some are central, some eccentric. No need to know this in details.
- Distribution of various lesions in a **vertebra**:
  - **Malignant** lesions are seen predominantly in its **anterior** part (body). "most likely"
    exceptions: hemangioma, langerhans cells, fibrous dysplasia.
  - **Benign** lesions predominate in its **posterior** elements.



3- **Types of bone destruction (morphology: most important):**

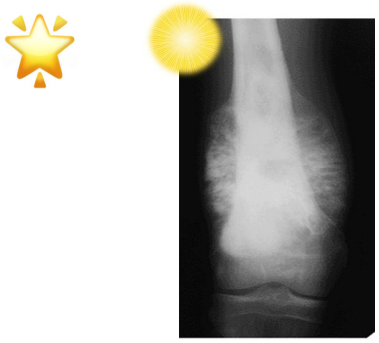
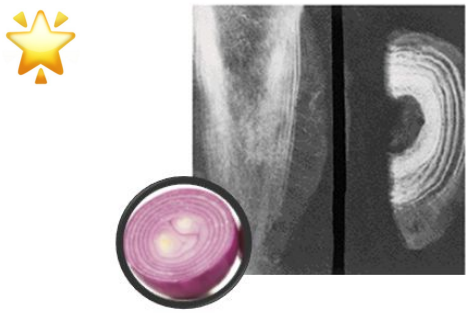
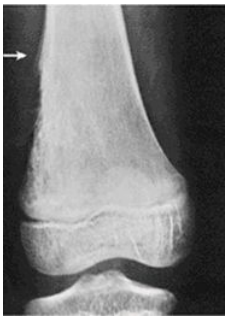
- **Geographic** (Organised uniformly destroyed area with sharply defined border)**: benign**.
- **Mouth eaten** (areas of destruction with ragged/disorganised border): likely **malignant**.
- **Permeative "همجية"** (ill defined areas spreading through **bone marrow)**: **aggressive/malignant** process.

4- **Border of the tumor or zone of transition:**

- **Well defined & sharp borders** (either sharp *sclerotic* or sharp *lytic*), **narrow zone of transition**→ benign tumors (grow slowly > encapsulate by bone)
- **Ill-defined borders**, **wide zone of transition** → malignant tumors (fast, the bone didn't have the time to encapsulate it) .

5- **Periosteal reaction:**

- **Uninterrupted periosteal reaction** usually indicates a benign process (Solid clear buttress).
- **Interrupted / large** (teeth like) reaction indicates a malignant or aggressive nonmalignant process:

sunburst pattern[3] **in osteosarcoma**	**lamellated or onion-skin type in ewing sarcoma**	**Codman triangle (arrow) in ewing sarcoma & osteosarcoma**
		

6- **Matrix of the tumor:**

- **Sclerotic:** it means **bone forming** (osseous). so on x-ray → opaque/white.
- **Lytic:** it means forming tissue other than bone **"fluid"** (it may be cartilage, fibrous tissue, or cystic). on X-ray → translucent/ black (e.g. popcorn calcification = chondroid)

N.B. this classification (lytic and sclerotic) helps in the differentiation between tumors. But **doesn't indicate benign or malignant nature**. However, a lytic lesion may appear to have ill-defined border (fools you as malignant) while in fact it has sharp lytic borders (benign).

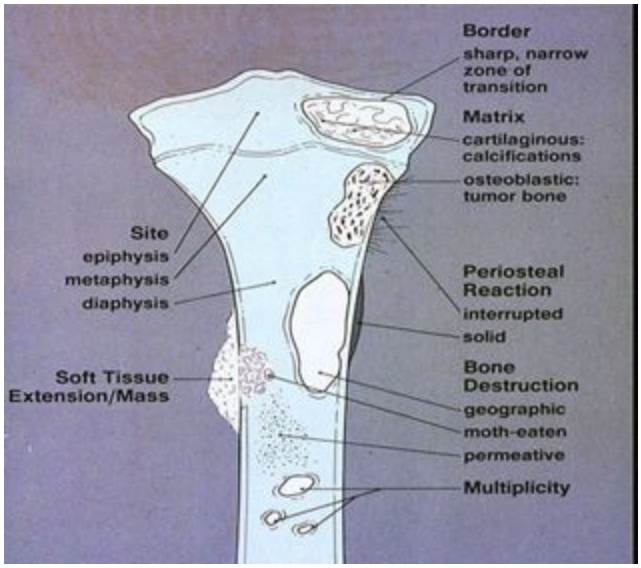
---

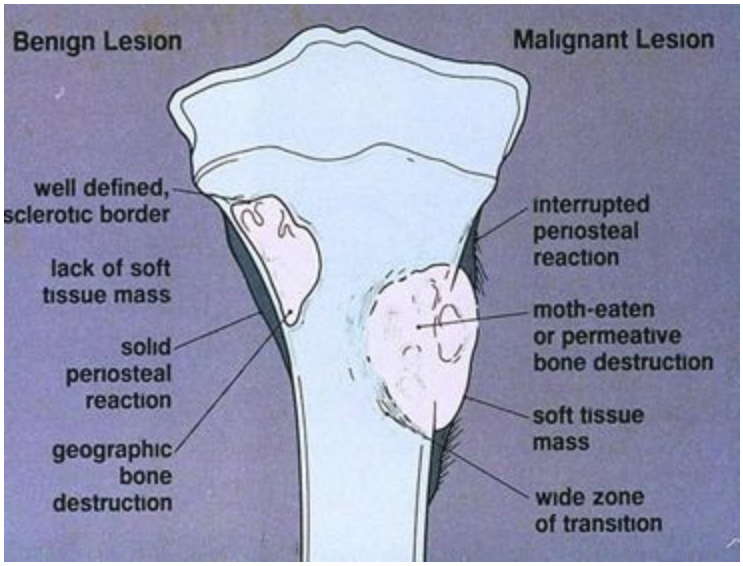
[2] Multiplicity: metastases, myeloma, lymphoma, fibrous dysplasia, enchondromatosis

[3] when the periosteum does not have enough time to lay down a new layer and instead the Sharpey's fibres stretch perpendicular to the periosteum

7- Soft tissue extension (swelling/shadow): mostly with malignant tumors (MRI is ideally used)

All you need to know is to recognize bone lesions in x-ray and classify them as benign or malignant.





1. Benign Tumors

1) Simple bone cyst (unicameral cyst):

Usually seen in young patients (age group up to 20 years old, Male > Female). This is a solitary, usually unilocular cystic bone cavity lined by a fibrous membrane and filled with serous or serosanguinous fluid.

Presentation:
Most commonly as **incidental finding** (asymptomatic) or **pathological fracture**.

Sites:

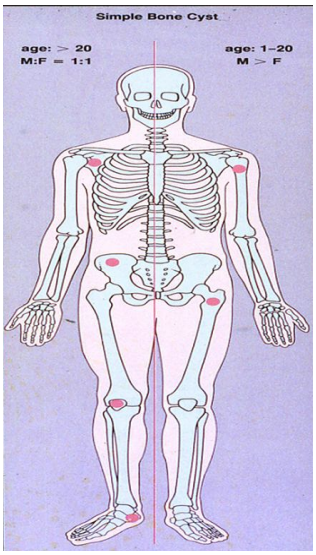
- Pelvis, Calcaneus, Scapula, around the knee.
- Proximal part of long bones (e.g. proximal humerus, femur or tibia).

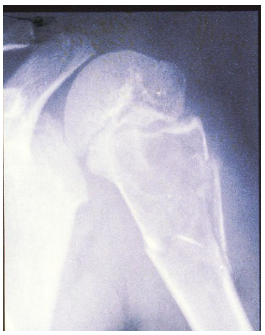
Radiological features:

1. **Metaphysic lytic** lesion expanding and thinning the cortices
2. Well defined sharp border.
3. No periosteal reaction.
4. Soft tissue swelling caused by hematoma (due to fracture) but **Not** a true soft tissue swelling.
5. Bone septa are often present, giving the impression of a multiloculated cyst.
6. When fracture occurs, a small fragment may be seen within the cavity, the classic 'fallen leaf' sign.

Treatment:

- Treatment is often **supportive**. lesions will regress following skeletal maturity.
- Curettage and bone grafting may be required in areas at risk of fracture
- **Fracture:** correction of fracture will heal the cyst.[4] Spontaneous resolution following fracture.





[4] Pathological fracture in young age group: cast the fracture & patient education regarding recurrence of fracture in this area. The same fracture in older age with displacement & angulation: ORIF + Bone graft.

2) Aneurysmal bone cyst (ABC):

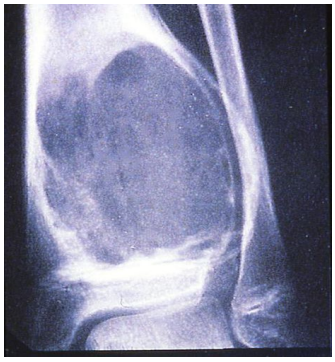
Benign, expansile lesions of bone composed of blood-filled cystic spaces.[5]
Although called "aneurysmal" it has nothing to do with blood vessels.
it called aneurysmal because of its shape

Sites:

- Around joints: Upper humerus, Upper femur, Proximal tibia.
- Spine (neural arch: lamina & pedicle) may give pressure effect.
- Flat bones: Scapula and pelvis.

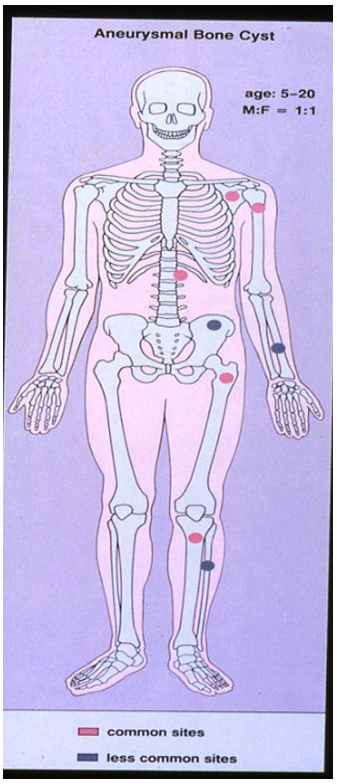
Presentation:

- Asymptomatic.
- Pain and swelling, or pathological fracture



Radiological feature:

1. Large "balloon-like" lesion
2. Metaphyseal lytic lesion.
3. Well- defined & sclerotic margin.
4. Expansile →thin cortex (like egg shell).
5. No periosteal reaction.
6. No Soft tissue swelling

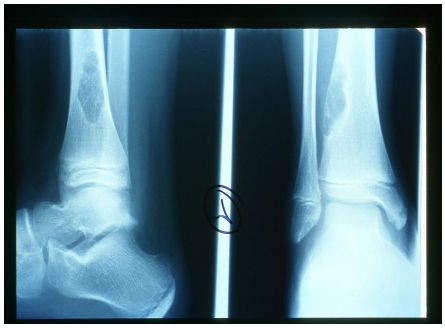


Treatment:

- It may **resolve spontaneously** following trauma, either fracture or biopsy. [6]
- Curettage of the lesion at the time of biopsy ('curopsy'), debriding the cystic cavity wall, is often effective though recurrence can occur (20%).

3) Fibrous Cortical Defect and Non-Ossifying Fibroma:

The commonest benign lesion of bone. Never transfer to malignant.
In children.



Sites:

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

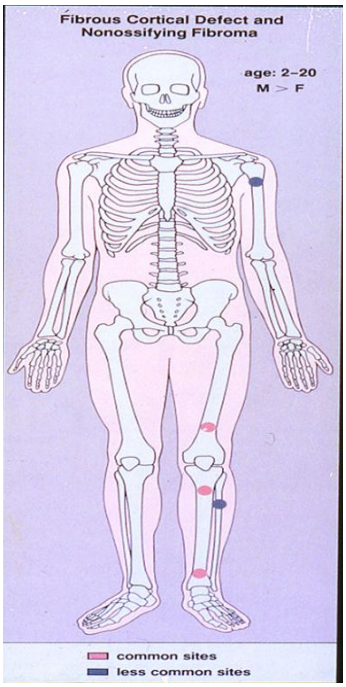
Presentation: Asymptomatic

Radiological features:

- Metaphyseal Mixed lesion (cystic + sclerotic components)[7]
- lesion that appears to be 'central' is actually **adjacent to or within the cortex**, hence the alternative name 'fibrous cortical defect'.
- Benign features: No periosteal reaction, No Soft tissue swelling, Well-defined, sclerotic margin.

Treatment:

- Self-limited. Reassurance.
- If large or fractured → curettage + bone graft.



[5] Fusiform cyst and Arteriovenous formation. Aneurysmal cysts have bloody content, while simple cysts have Orange colored fluid (Looks like Straw/sun top juice).
[6] Fracture: ORIF + BONE graft (from fibula as support because lesion is very big). Sequestration = divide it to small champers. Aspiration with alcohol, phenol & steroid.
[7] Although it looks cystic on X-rays, it is a solid lesion consisting of unremarkable fibrous tissue with a few scattered giant cells.

4) Osteoid osteoma: a very common tumor

Site:

- May arise in the cortex of **long bones**, or occasionally in the cancellous bone of the **spine** and less commonly talus.

Presentation:

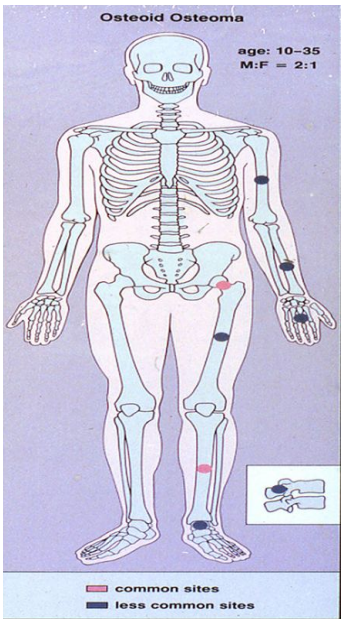
- Main presentation is **pain**.
  - well localized pain (in the back or groin area)
  - worse at night and prevents patient from sleep.
  - Responds well to NSAIDs, leading to complete resolution.
- Painful scoliosis if affecting the spine. while idiopathic scoliosis is painless

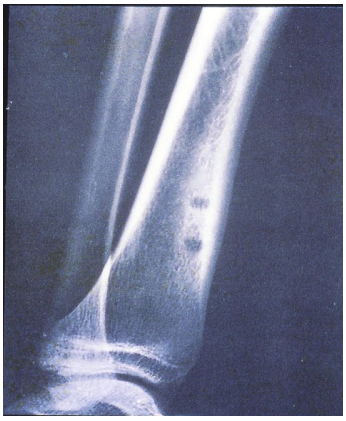
Radiological features:

- Lytic lesion (central nidus), surrounded by a reactive zone of dense sclerotic new bone formation.
- **CT scan** → nidus (modality of choice in the diagnosis)
- Bone scan used sometimes → ↑ uptake.

Treatment:

- Without treatment, the lesion will slowly increase but **over time will regress** and usually burns out over a variable number of years
- **NSAIDs challange "aspirin challenge"** for 3-6 weeks
- CT-guided needle can be inserted in to the nidus and the lesion is ablated with radiofrequency. **you have to kill the nidus**, if you scrape the sclerotic lesions alone it won't resolve because it's bone forming. you have to use a heated probe to burn the nidus (interventional radiologist).
- If it easy to access > excise it, label it then send it to histopathology.





5) Enchondroma:

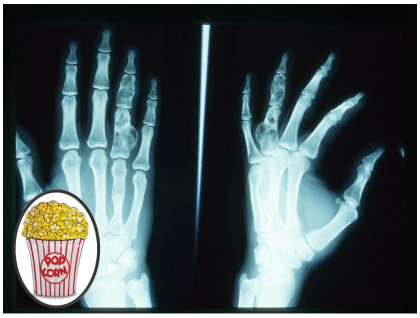
Middle aged patients around 40 (15-50 age group).
It composed of translucent hyaline cartilage (chondroid).

Sites:

- Mainly small bone e.g. phalanges in hand & foot ...etc. Any benign tumor in the phalanges is enchondroma unless proven otherwise.

Presentation:

- Asymptomatic: Usually found **incidentally**.
- Rings may become tight due to the swelling.
- **Pathological fracture** which may cause pain, affect one side and prolonged healing.

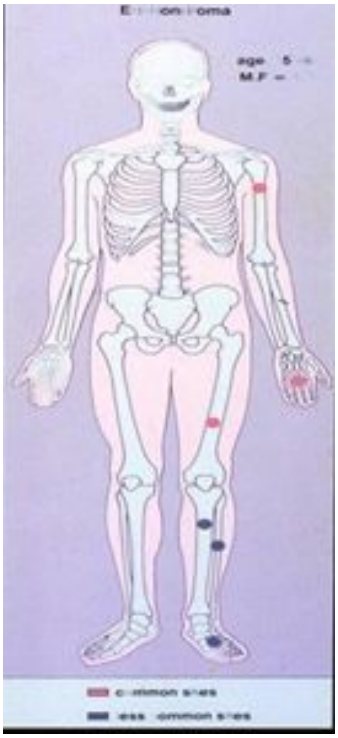


Radiological features:

- Popcorn matrix is characteristic for cartilaginous content.
- Benign features. (although large)
- The affected bone is expanded by the tumor (ballooning) and its cortex is thinned.[8]

Treatment:

- **If symptomatic** (pain, bulky, fracture) > curettage + bone graft +\- fixation.



6) Multiple Enchondromatosis (ollier's disease):

The disease is non-hereditary and sporadic. **Autosomal recessive[9].**
Benign, affects both sides, Usually seen in children. Rare.
The difference between single enchondroma and multiple enchondromatosis is the High risk of malignant transformation (10-15% transforms into **chondrosarcoma**).

Presentation:

- Not painful
- Very disabling deformity → restricts movement.

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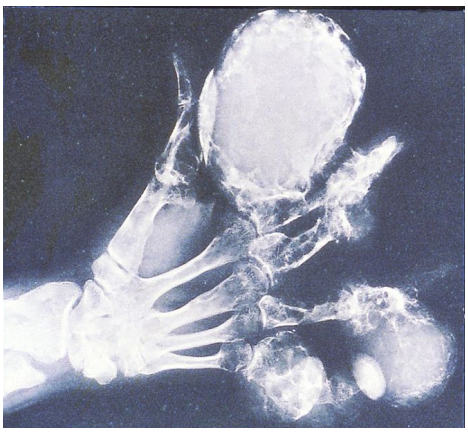
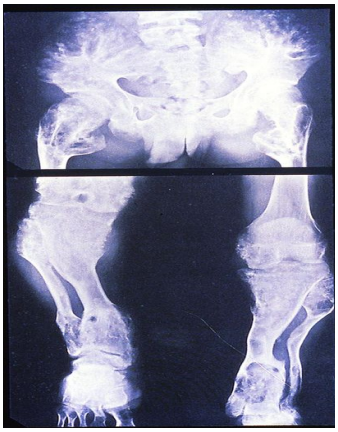
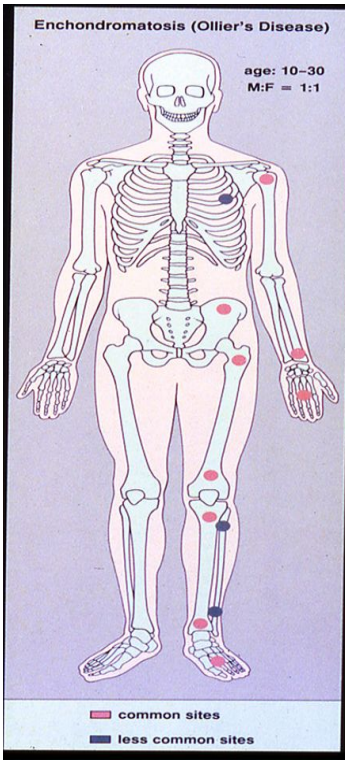




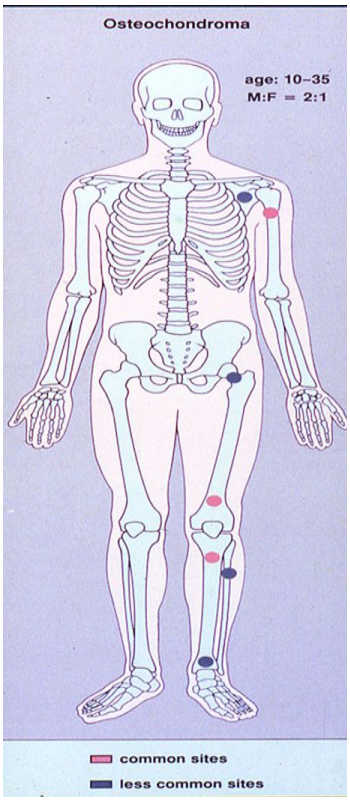


[8] **Location and contents is different from aneurysmal bone cysts**. Enchondroma usually in digits, different from aneurysmal which occurs in long bones. Ground substance here contains fibrous tissue unlike aneurysmal which appears like glass. **X- RAY of enchondroma is more hyperdense due to the chondroid**.

[9] Enchondromatosis encompasses several different subtypes of which Ollier disease and Maffucci syndrome are most common. Most subtypes are non-hereditary, while some are autosomal dominant or recessive

7) Osteochondroma (exostosis) :

The **only** surface tumor (outside the bone)
It is a combination of both bone & cartilage.
Starts from the **growth plate** and Stops growing when patient stops to grow usually at 18 yrs.



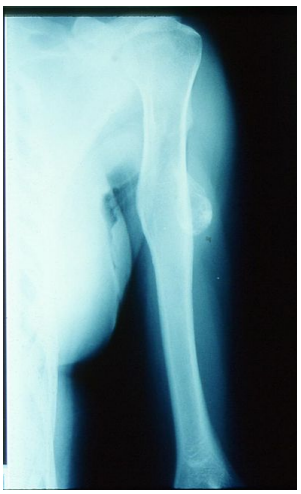
Sites:

- The commonest are around the knee (distal femur & proximal tibia)
- proximal humerus, Scapula and neck of femur.

Presentation:

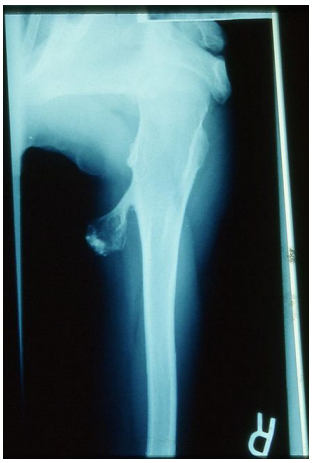
- Painless progressive Swelling. Patients usually present for cosmetic purposes.
- Painful in children due to growth plate compression and pressure effects on adjacent nerve or vascular structures.
- Symptoms of complications:
  1.Pressure symptom:
  - Pseudoaneurysm → artery.
  - Hypoesthesia or paresthesia → nerve.
  - Rendering the movement → tendon.
  - Restrict the movement of the nearby joint
  - formation of an overlying bursa due to friction.

  2.Fracture especially with pedunculated type If it transfers to malignant.



Radiological features:

1. Exostosis[10] (fungated). Mushroom-like stalk of the bony tumor (connected to the bone).
2. Benign features.
3. Metaphyseal lesion.
4. MRI: cartilaginous cap.
5. According to the shape of the neck of the tumor, we divide it into:
   a. **Pedunculated type:** long & thin neck. Directed away from the bone.
   b. **Sessile type:** has short & thick neck.



Treatment:

- Usually nothing is needed, **reassure the patient.**
- Surgery (just **excision**, no need for bone graft b/c it is a surface tumor)

The surgery is indicated if there is:

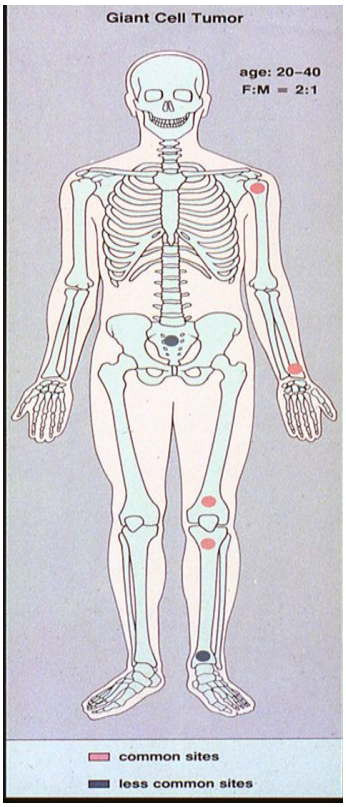
1. Presence of any complication (compression on nerves, vessels, or tendons).
   - Most common site for excision of Osteochondroma is the knee, because of the effect on ligaments and compression on vessels.
2. Transformation to malignancy "chondrosarcoma" (1%). Identified by:
   - Sudden increase in pain.
   - Sudden increase in size.
   - if cartilaginous cap exceeds 2 cm on X-Ray.

[10] is the formation of new bone on the surface of a bone

8) Giant cell tumor (GCT):

Benign but very aggressive tumor (more aggressive than some malignant tumors yet classified as benign based on cell pathology: NO DNA alteration).

- It can metastasize to the lung. So, it's important to get chest x-ray
- **Origin**: osteoclast, therefore it is **osteoclastoma**. Very destructive tumor.
- **DDx:** bone cyst, aneurysmal cyst.
- GCTs can occasionally be seen in conjunction with Paget's disease of bone and can arise in association with focal dermal hypoplasia (Goltz syndrome).
- Malignant transformation can occur in GCTs though this is rare (<1%)



Sites:

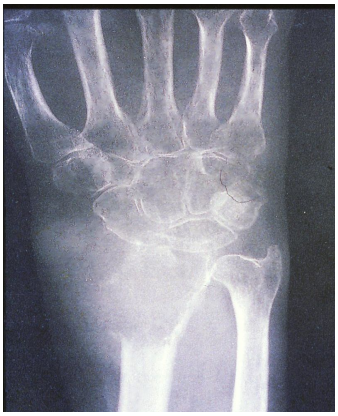
- Most common: **distal radius.**
- Less common are distal tibia & sacrum.
- Very bad in the sacrum because it will affect nerve roots.

Presentations:

Mostly patients present first with: **pain**, then swelling & later with pathological fracture.

Radiological features:

1. Aggressive features:
    a. **Permeative** destruction.
    b. Ill-defined borders
    c. Huge soft tissue component.
2. No new bone formation b/c the osteoclast will eat this new bone (little or no periosteal reaction).
3. Radiograph shows lucent regions, lytic destruction of the bone with expansion of the cortex, without a sclerotic rim.



Investigations:

- Soft tissue extension: by **MRI**.
- Joint extension: the articular cartilage is a very resistant against progression of the tumor from going to the joint.
- Bone extension: by **CT scan.**
- **Bone scan**: for metastasis.
- **CBC**: to assess the general condition of the patient.
- **Biopsy**: to confirm that it does not transform into malignant tumor.

Treatment:

- **No place for conservative treatment.**
- Excision followed by either bone graft or prosthesis depending on the site of the tumor:
    - If the tumor is in non-weight bearing area (e.g. lower radius): radical excision, bone graft and arthrodesis for nearby joint.
    - If the tumor is in weight bearing area (e.g. lower femur): excision and **prosthesis** (N.B. no bone graft here).
- Patient must be followed up every 3 months in the first year, every six months in the second year and once in a year after that.

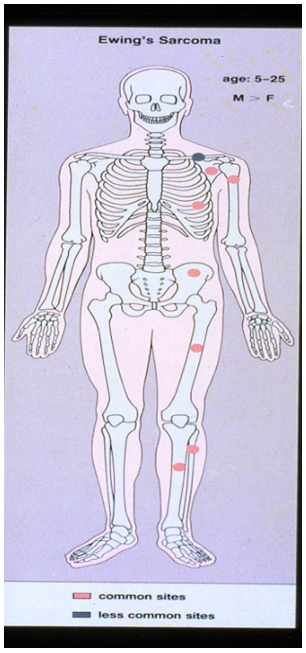
Management of benign bone tumors:

- Latent benign lesions may not require any treatment unless symptomatic.
- Active benign lesions usually require intervention to halt the active process and allow healing. This can range from **limited biopsy and curettage** to **detailed curettage and bone grafting**.

2. Malignant Tumors

1) Ewing's sarcoma:

One of the **most common** tumors in children.
Origin: Unknown

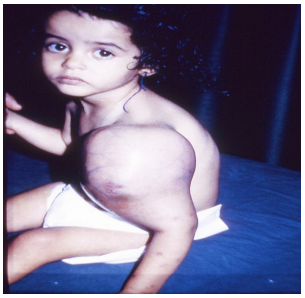


Sites:

- Around the growth plate → femur (most common), tibia, and humerus.
- It is the only bone tumor which takes it origin from **diaphysis**

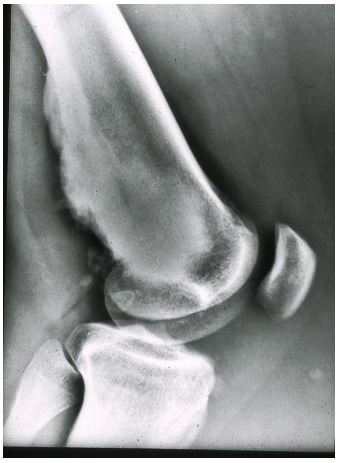
Presentations:

- Pain
- Huge swelling
- Most of the Ewing's sarcoma is misdiagnosed as acute osteomyelitis. because of systemic symptoms and elevated ESR and elevated CRP: Febrile patient, High WBC's, Local Pain & redness, Ulceration of skin, Swelling.
- Pulmonary metastasis can occur.



Radiological features:

- Sclerotic lesion.
- Onion-skin periosteal reaction.
- Ill defined borders.
- **Very significant soft tissue component** *characteristic of Ewing sarcoma*

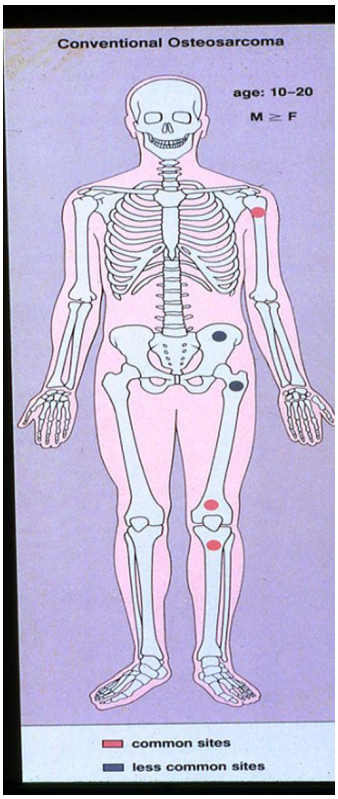


Investigations: MRI and biopsy make definitive diagnosis

- 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.
    - You think it might be osteomyelitis: You do aspiration for drainage of pus > there will be no pus and you will find tumor tissue >You do biopsy > Ewing's sarcoma.
    - N.B. you can't differentiate it from **osteosarcoma** unless in biopsy.

Treatment: Chemo and surgery
Start with chemotherapy to decrease the tumor in size so it will be easy to excise it and control metastasis (microcell) everywhere in the body. Tumor treated by operative excision and disarticulation, and you may need amputation.

2) Osteosarcoma:



- **More common than Ewing's sarcoma.**
- Arises from primitive bone-forming cells (growth plate).

Types:

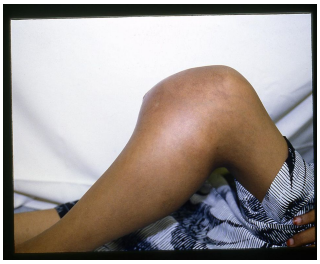
1. primary (no need to know types of primary sarcoma)
2. secondary (malignant transformation of benign process):
    a. paget's disease > paget's sarcoma
    b. post radiation sarcoma
3. metastatic from breast, lungs or **other bones**.

Sites:

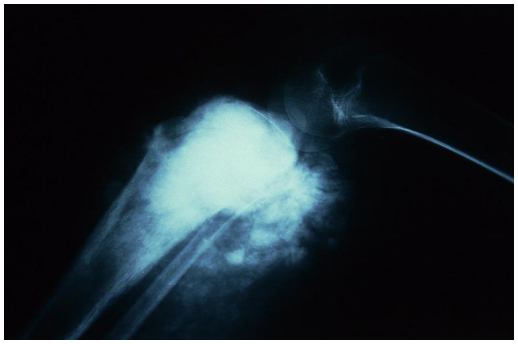
- Around the growth plate > Around the shoulder, knee.

Presentation:

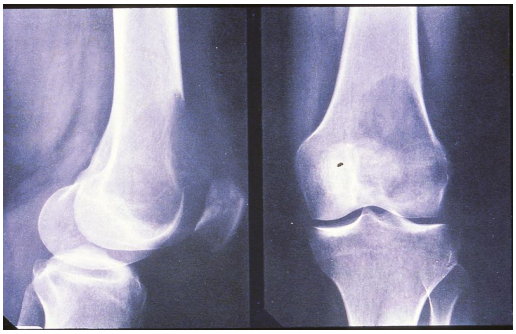
- Pain, swelling (but not as huge as Ewing's), pathological fracture (typical presentation of malignant tumor).
- Overlying skin is warm due to high vascularity.
- The patient may look cachectic (in late and advanced cases).



Radiological features:[11]

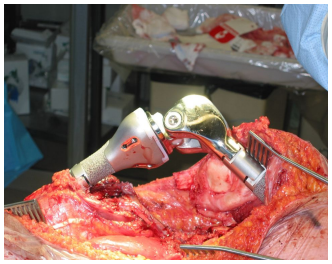


- sclerotic.
- Sunburst periosteal reaction.
- Ill defined borders.
- Soft tissue swelling.



- **lytic** (20-25% bone destruction).
- No periosteal reaction (because it has been eaten).
- Significant Soft tissue swelling.

This is called periosteal osteosarcoma (not very common)



Investigations:

- **CT scan** = bone extension, lung metastasis.
- **MRI** = soft tissue extension, neurovascular bundle involvement
- **Bone scan** = metastasis to other bones *characteristic feature*.
- Fever, elevated alkaline phosphatase (ALP) and lactate dehydrogenase (LDH)
- Definite diagnosis made by biopsy.

Treatment:

it's multidisciplinary and the case discussed at tumor board meeting.

Neoadjuvant chemotherapy[12] (4-6 weeks) > rest after chemo (2 weeks) > surgery > Adjuvant chemotherapy[13].

[11] Irregular medullary and cortical destruction of the metaphysis, unlike Ewing which is seen in the diaphysis.

[12] Chemotherapy helps in: 1. killing micro metastasis. 2. Shrinking the mass.

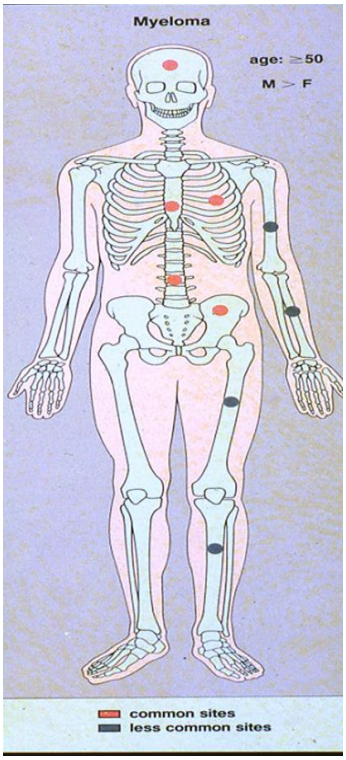
[13] After surgery, if necrosis >90% continue the same (chemotherapy agent). If necrosis <90% we must add a new Adjuvant chemotherapy.

Surgical interventions:

1. **Limb <u>salvage</u> procedure (limb sparing):** which is radical excision of the affected bone & the affected compartment around the bone (e.g. flexor compartment of thigh) + followed by reconstruction (prosthesis, bone graft, or bone cement). can be done only if the tumor isn't invading the neurovascular bundle and the tumor can be excised with safe margins.
2. **Amputation (<u>unsalvageable</u> limb):** If there is extension to the neurovascular on MRI, we can't excise the tumor with safe margins, and thus limb is amputated. Also indicated when the whole compartments around the bone is involved, (e.g. the flexor, adductor & extensor compartments of the thigh).

3) Multiple myeloma

- Arise from plasma cells in the bone marrow.
- <u>**The most common primary malignant tumor.**</u> in elderly > 50
- some consider it a bone tumor and some consider it hematological



Sites:

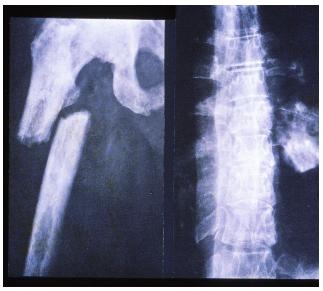
- Multiple lesions, most common in the spine or femur
- Central bones (axial skeleton): skull, ribs, pelvic girdle. & spine.

Presentation:

- Pain, spinal cord compression, Osteoporosis, Pathological fractures.
- Medical complications include anaemia, hypercalcaemia, hyperviscosity, immunosuppression and renal dysfunction.
- CRAB: **C = Calcium** (elevated), **R = Renal failure**, **A = Anemia**, **B = Bone lesions** (bone pain)

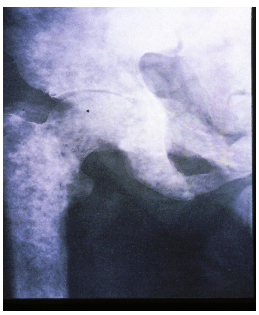
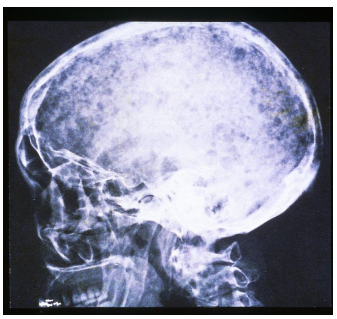
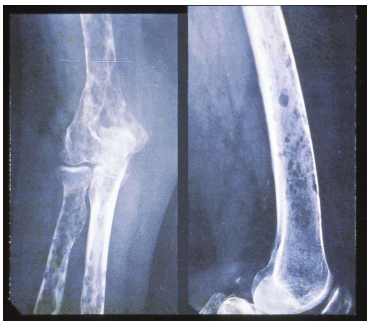
Diagnosis:

- **Radiological features:** Multiple Lytic or sclerotic lesions.
- In skull, there will be pepper (lytic) & salt (sclerotic) appearance (pepper-pot). you have to do skull x-ray
- Bence jones proteins test found in 24h urine collection (highly suggestive).
- **only definitive diagnosis is bone marrow aspiration.**



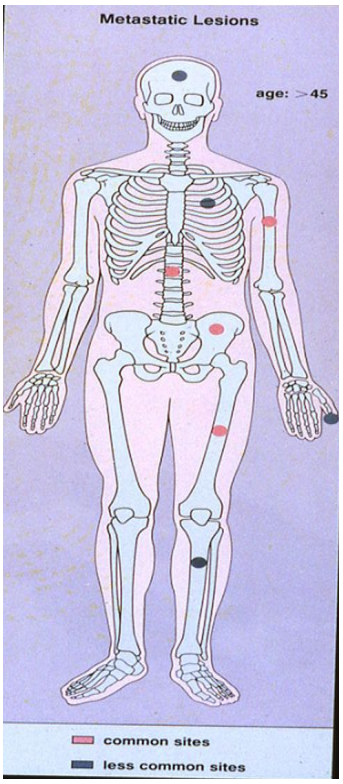
Treatment: (mainly medical)

- Radiotherapy, Chemotherapy.
- Bone marrow transplant: Success rate is 30% and it Costs millions
- The rule of orthopedic surgeon is only when you have pathological fracture, do internal fixation.

4) Metastasis

- More common than primary tumors in later adult life (age > 35).
- The most common tumors are: thyroid, lung, breast, colorectal, and prostate kidney. you need to take thorough history (e.g. breast lump, melena) and physical examination (thyroid, breast, per-rectal etc.)
- Affects same sites which are affected by multiple myeloma. Usually metastasis occurs in the **highly vascular bones** e.g. vertebral body, ribs, pelvis, upper end of femur, and humerus.



Presentation:

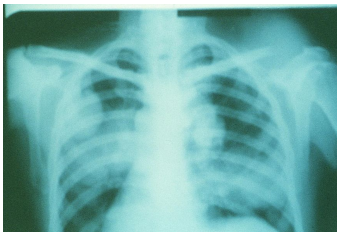
- Patient may present with known primary tumor.
- May present with secondary metastasis. So, we must identify the primary site and treat it.

Radiological features:

- It may be solitary or **multiple** (common) or just osteoporosis (carcinomatosis).
- 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.

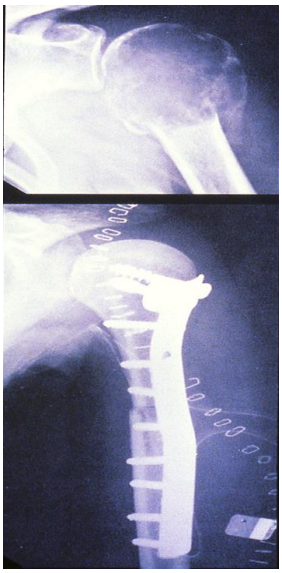
Investigations:

- X-ray shows lytic lesions (bone eaten away) with thinning of the cortex. Resembles bone cysts but the **age group** directs the diagnosis.
- CT- scan of the chest.
- Take biopsy to know where is the primary



Treatment:

- **Palliative chemo (not surgical)**
- no need for excision with safe margin, just treat the symptoms & prevent pathological fracture
- Surgery indications:
  - severe pain
  - mechanical instability: pain in the spine when they stand
  - neurological symptoms (spinal cord compression)
  - prophylactic (preventive fixation): in weight bearing bones with involvement of >60% of cortex
  - fixate the fracture. (after curettage)



Characteristics of Malignant Bone Lesions:

- Poor delineation of lesion – wide zone of transition
- Loss of overlying cortex/bony destruction
- Periosteal reaction
- Soft tissue mass

Summary						
Bone tumor	nature	age	site	Presentation	X-ray	treatment
1) Simple bone cyst (unicameral cyst):	benign	young < 20	Flat bones: pelvis, scapula Or around joints	Incidental (asymptomatic) Or pathological fracture.	1-Lytic 2-benign features: (well-defined borders, no periosteal reaction) 3-soft tissue swelling (hematoma)	Reassurance (supportive, **If symptomatic** > curettage + bone graft
2) Aneurysmal bone cyst:					1-benign features 2-"**ballon like**"	
3) Fibrous Cortical Defect (Non-Ossifying Fibroma):			around knee		1-benign features 2-Mixed (cystic + sclerotic)	
4) Osteoid osteoma:		10 - 35	cortex of long bones (less commonly spine)	**1-PAIN** 2-painful scoliosis if in spine	Lytic lesion with central nidus within sclerotic bone. (nidus: ↑ uptake in bone scan)	NSAIDs (challenge test for Dx) + burn the of nidus
5) Enchondroma: (Any benign tumor in the phalanges is enchondroma unless proven otherwise)		Around 40	**phalanges**	Asymptomatic or pathological fracture.	1-benign features (may be large) 2-Popcorn matrix (cartilaginous).	No need for treatment, **If symptomatic** > curettage + bone graft / prosthesis
6) Ollier's disease: Multiple Enchondromatosis (AR):	benign, with High risk of malignant transformation (10-15%)	10-30 (AR > children)		Very disabling deformity (not painful)	multiple aggressive lesions	
7) Osteochondroma:	Benign (combination of bone and cartilage)	10-35	around the joints	Painless, progressive swelling	1-benign features 2-Exostosis (fungated)	
8) Giant cell tumor (GCT):	benign but very aggressive	20-40	around the joints (most common site: distal radius)	1-Pain 2-swelling 3-pathological fracture	1-Lytic 2-Aggressive features: Permeative destruction, ill-defined borders, huge soft tissue involved	**Limb salvage:** Excision + bone graft or prosthesis
9) Ewing's sarcoma: (very huge swelling)	malignant	5-25	Around growth plate > long bones (mostly femur)		1-Sclerotic 2-onion-skin periosteal reaction. 3-malignant features	chemo & surgery (limb salvage or amputation)
10) Osteosarcoma:[14]		5-20	Around the growth plate		1-Sclerotic (mostly) or lytic 2-aggressive features **3-sunburst reaction**	

[14] primary, secondary (paget's sarcoma, post radiation sarcoma), or metastatic from breast or **other bones**.

11) Multiple myeloma		> 50	spine or femur	pain, osteoporosis, renal failure pathological #	1-Multiple lytic or sclerotic 2-pepper pot skull	chemo
12) Metastasis:		late adulthood >30 Y.O			1-multiple lytic lesions (except if from prostate) 2-malignant features	

MCQs

Who performs the tumor biopsy?

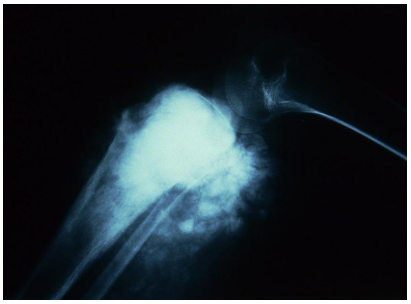
A. Orthopedic surgeon
B. Radiologist
C. Ortho oncology surgeon

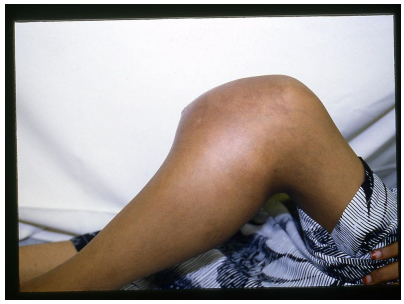
26 years old female came to the clinic with swelling in her right knee. She was diagnosed with giant cell tumor. Which of the following is the management?

A. Radiotherapy.
B. Curettage and bone grafting.
C. Resection of the tumor.
D. Resection of the tumor and adjacent joint.

2-17 year old with swelling and pain at the right knee for the last 6 months, lost 7 kg, no history of trauma or infection, blood work done and was normal besides high alkaline phosphatase, x-ray was done and is shown below.
What is the confirmatory diagnosis test?

A-MRI of knee
B-CT of knee
C-Bone scan with gallium
D-Biopsy





Answers: 1) C 2) B 3) D