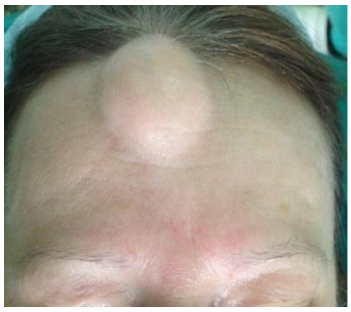
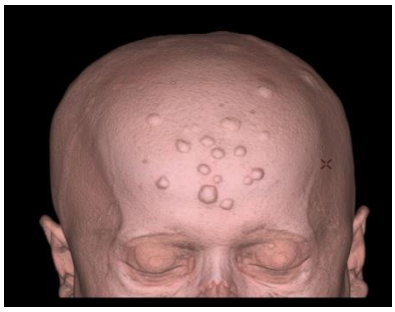
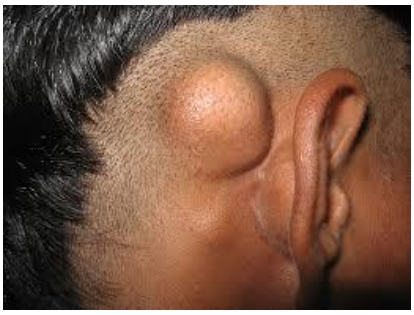
Bone Tumours

Osteoma

I. Compact osteoma (Ivory osteoma).

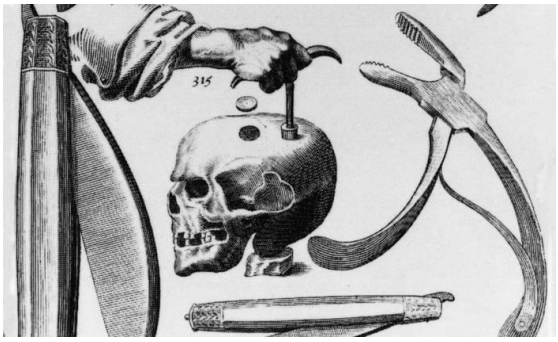
* **Pathology:**
  - **Origin** : Osteoblast.
  - **Site:** Bones develops from membranes especially the skull.
  - **Gross picture:** Usually single but may be multiple , rounded, sessile hard & well-defined.
  - Never turn malignant.

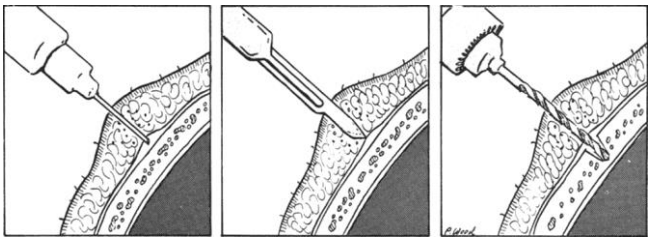




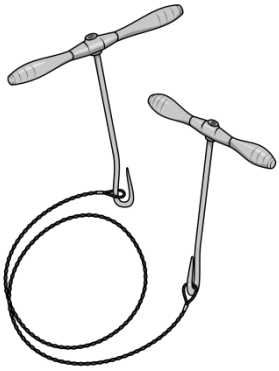
* **Clinical picture** : According to site:
  - Outer table → cosmetic
  - Inner table →increase intracranial pressur .
  - Orbit → proptosis .
  - Auditory meatus → deafness.
* **Treatment:**

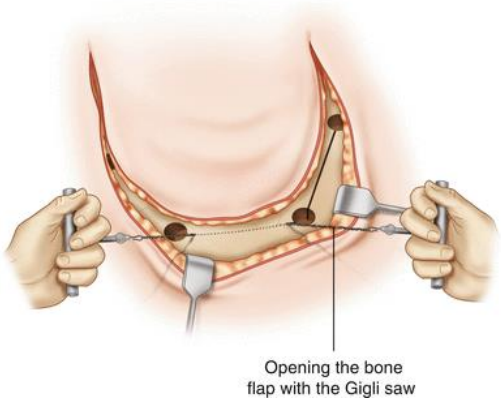
1- Small: Excision in a trephine hole.

1- Large: Excision of a piece of skull bone carrying the tumour by multiple burr holes and Gigli saw.







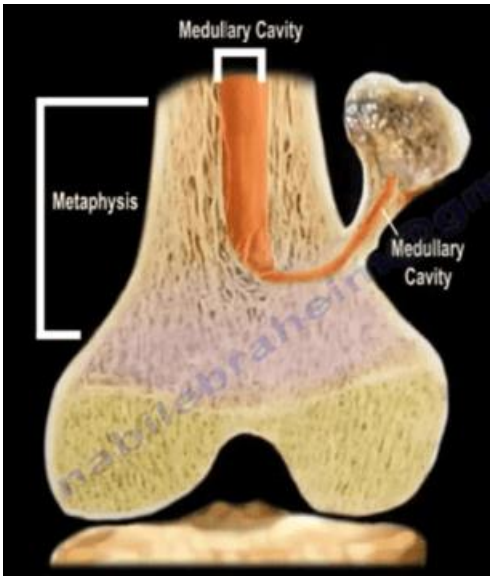


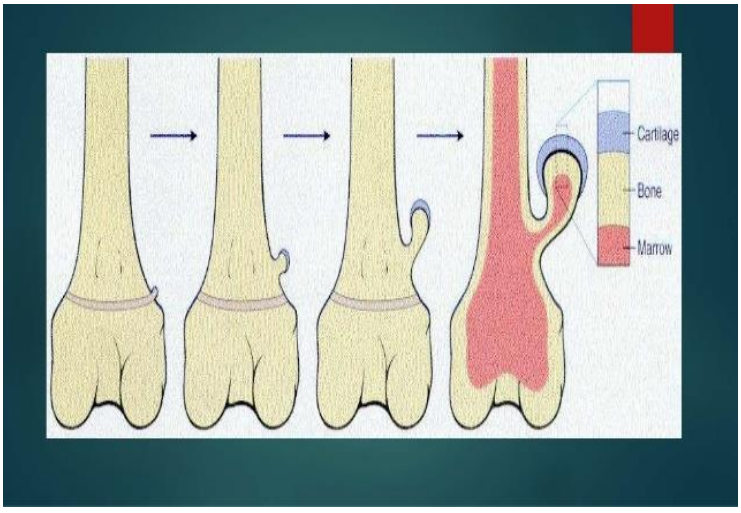
II. Osteochondroma

1- Single osteochondroma:

* **Incidence & Pathology:**
  - It is the **commonest** benign bone tumour **.**
  - It is **autosomal dominant** disease .
  - Usually starts in **teen agers .**
  - **Site:** Usually affect the **metaphyses** especially around the **knee** and upper humerus .

- **Origin:**
  - ♣ **Chondroblast**.
  - ♣ Possibly arise from a part of **epiphyseal cartilage** that **herniates** through the cortex under the periosteum
  - ♣ Recently it is considered as a **skeletal hamartoma** in which parts of the epiphyseal cartilage are detached and lie in the metaphysis.
- **Gross picture:**
  - ♣ It arises from the **surface** of the bone and continues with the **medullary cavity** .
  - ♣ Smooth, sessile or usually pedunculated swelling of spongy bone covered by a cap of cartilage ,which form the bony mass by endochondral ossification , but at the age of epiphyseal fusion, it ossifies and the swelling stop to grow.
  - ♣ The cap of cartilage has the same histological structure as that of the epiphyseal cartilage .
  - ♣ A bursa may be present overlying the cartilaginous cap .
  - ♣ It grows oblique away from the epiphyseal cartilage.





* **Complications** :

1- It may turn malignant in 1% of cases → **chondrosarcoma** → the swelling becomes painful, rapidly growing & recurrent after excision.

2- **Compression** of neurovascular bundle or tendons

3- **Block** of movements of near by joint.

4- Adventitious **bursa and bursitis**.

5- **Fracture** of the pedicle

* **Clinical pictures :**

1- Characteristic **incidence** .

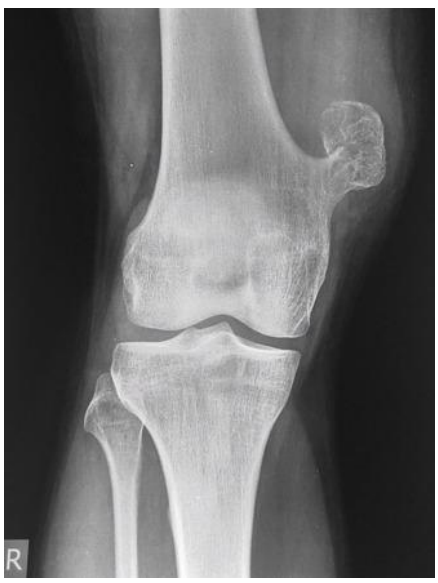
2- Usually **symptomless** .

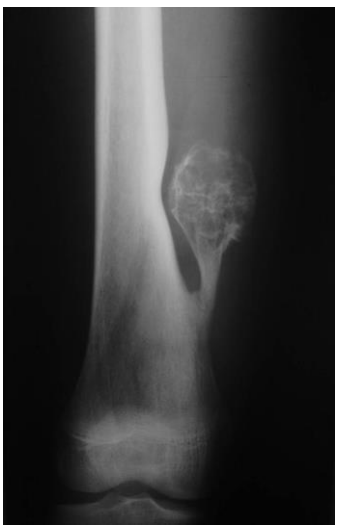
3- Painless **swelling** metaphyseal swelling in th characteristic site . Pain usually occur due to complications.

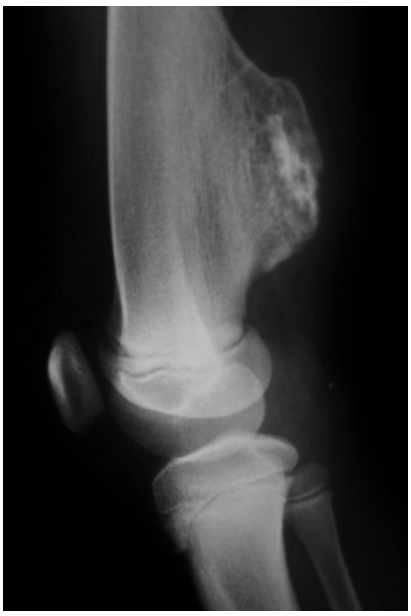
4- Manifestations of **complications** .

* **Investigations :**

- **Plain x ray :** Sessile or pedunculated well-defined metaphyseal bony swelling on the bone surface .
- MRI shows the cartilaginous cap.







- **Treatment:**
  - Observation for symptomless tumour.
  - If complications or symptoms occur: Excision of the tumour from its base after the age of epiphyseal fusion .
  - Wide surgical excision if malignant transformation occurs.

2) Multiple exostosis :

- **Definition :** A **heridetary autosomal dominant** disease , more in **males** , characterised by the following clinical features :

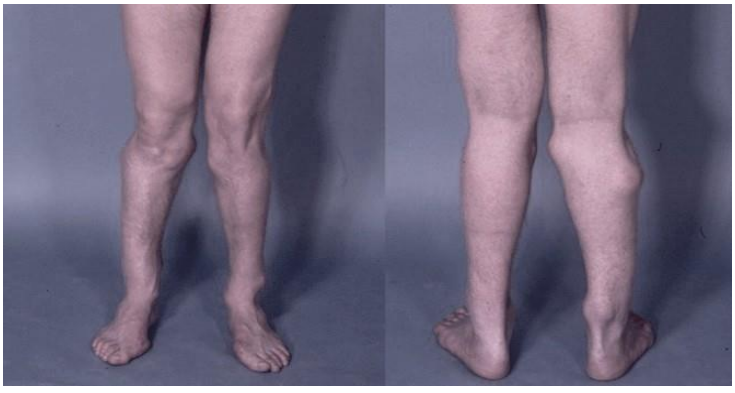
1- **Multiple** osteochondromata .

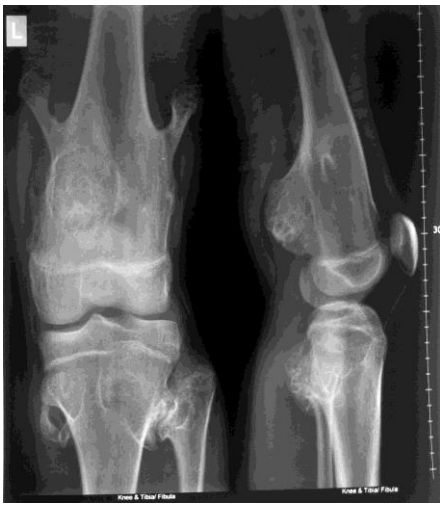
2- **Broadening of metaphysis** of long bones with many sessile tumours.

3- Skeletal **deformity** (usually in thigh , leg and forearm).

4-**Short stature** (short femur and tibia).

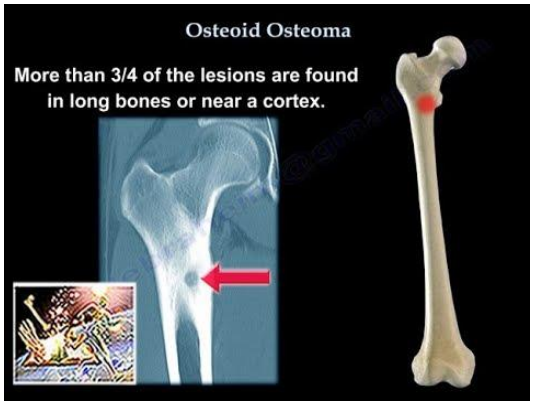
5- Malignant transformation to **chondrosarcoma** in 10% of cases .Malignancy is suspected if there is recent rapid increase in size and appearance of pain .

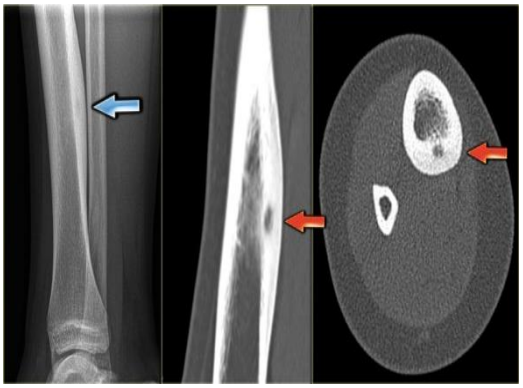




- **Investigations** : Plain x ray and MRI
- **Treatment:** Excision of complicated tumours only.

III. Osteoid osteoma





- It is a **rare , benign bone forming neoplasm .**
- **Incidence :** More in males below 20 years .
- **Pathology :**
  - **Site:**
    - ♣ In one side of the cortex of diaphysis of long bone
    - ♣ The commonest site below lesser trochanter .
    - ♣ Femur & tibia are the commonest site .
  - It has a small nidus of neoplastic tissues surrounded by reactive mature bone formation .
- **Clinical picture :**
  - It is a painful condition worsen by night and relieved by NSAID .
- **D.D :** Brodie's abscess and osteosrcoma **.**

* **Investigations :**

1- Plain x ray show rounded or oval lytic well demarcated nidus in one side of cortex surrounded by sclerotic area .

2- CT scan & MRI .

* **Treatment :**

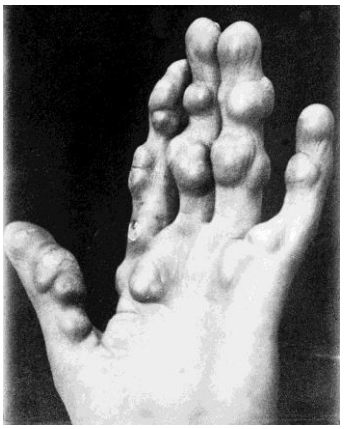
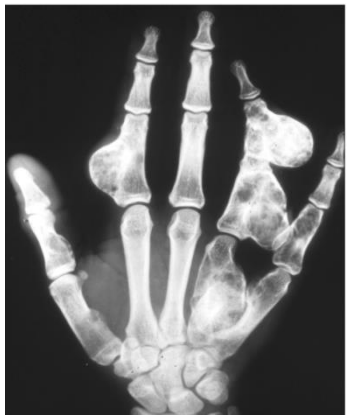
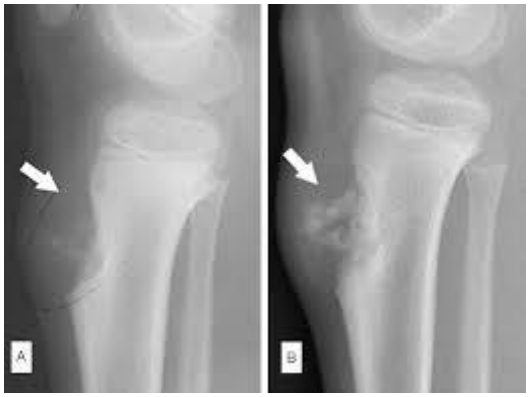
I) Conservative :

- It is the main treatment as the lesion usually becomes asymptomatic and spontaneously heals .
- **Method :** Observation & anti-infilammatory medications .

II) CT guided radiofrequency ablation if conservative treatment fails.

CHONDROMA

* Chondroma is a benign tumor arising from the chondroblasts characterized by cartilage formation .
* **Incidence :** A relatively common tumor and the commonest tumor of hand & feet .
* **Pathology :**
  - Typically the tumor involves the short long bones of the hand & feet or the metabphysis of long bones (especially femur & tibia).
  - It may be situated centrally in the medulla causing bone expansion **(enchondromo) ,**or eccentrically situated appear on the surface **(ecchondromo).**
  - It may occur as a single or multiple tumours.

* **Complications :** Pathological fracture and malignant transformation into chondrosarcoma may occur.
* **Clinical picture :**

1- Enchondroma in long bones usually seen as incidental finding in plain x-ray finding or it may present by complications.

2- Ecchondroma uaually appears as firm well defined slowly growing swelling .

* **Investigations :**
  - Plain x-ray shows well defined radiotranslucent lesion with bone expansion and areas of calcification.
  - No infilteration of surrounding structures .
  - The cortex is intact or endosteal scalloping affecting less than 2/3 of cortical thickness .
* **Treatment:**
  - No symptoms → no treatment and follow up by x-ray .
  - Presence of smptoms or complications →Curettage and bone graft.

* N.B :
  - **Olier's disease :**
    - It is multiple enchondromatosis , present from birth, due to error in endochondral ossification .
    - The patients have short bowed limb with high incidence of malignancy .
  - **Maffucci syndrome** :
    - It is multiple enchondromatosis & hemangiomas .
    - The patients have high risk of angiosrcoma .

Malignant Bone Tumours

(General)

- **Staging: TNM classification**
- **Complications :**

1- Spread :

a- Direct : Longitudinal through the medulla and transversely to cortex then to the surrounding structures .

b-Lymphatic : rarely, to the regional lymph nodes , **only common in Ewing's sarcoma .**

c- Mainly blood spread to the lungs or other bones .

2- Pathological fracture in advanced tumors .

3- Anaemia , cachexia and death.

- **Clinical picture :**

1. Characteristic **incidence** (Mention)
2. **Swelling** , **pain** (as usual) & **tenderness**
3. Manifestations of **complications**.
4. Sympathetic **effusion** in the near by joint.

- **Investigations:**

1. **Plain X-ray** is the first investigation.
2. **C.T scan & MRI :** are best investigations for accurate staging of the tumor
3. Radioactive isotopic **bone scan.**
4. **Open biopsy** during operation while a tourniquet is applied. The edge is the ideal part.
5. **Angiography** show irregular vascularity of the tumor .
6. Investigations to detect **metastases** (mention)

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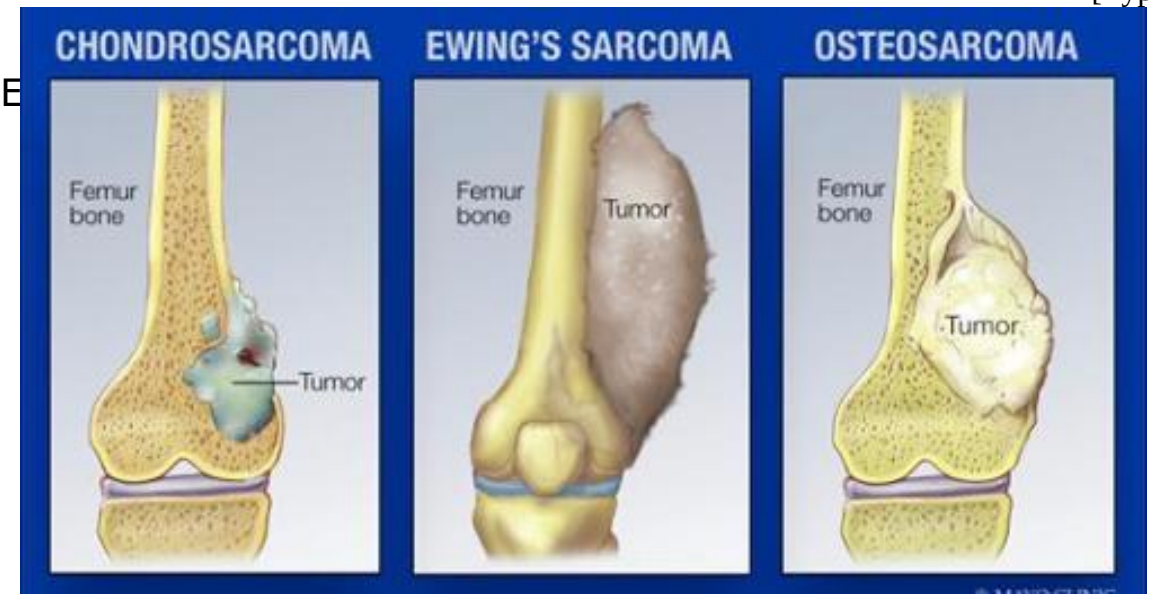


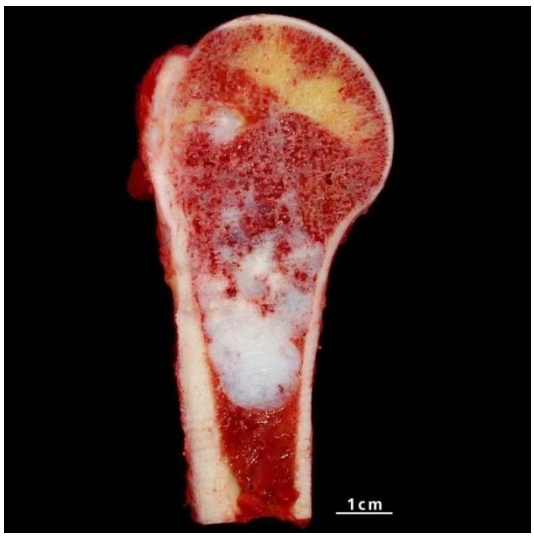
Chondrosarcoma

* It is a malignant tumor arising from the chondroblasts .
* **Incidence :** It is the 3rd. common primary malignant bone tumor (after multiple myeloma & osteosarcoma) and usually occur between 40-60 year
* **Pathology :**
  - **Site : Usually pelvis , scapula** or less commonly in the **epiphysis** of femur , tibia and upper humerus .
  - Whitish irregular ill-defined tissue infilterate the surrounding structures .
  - The tumor may be **de novo or on top of** chondroma or osteochondrma .
* **Complications :**
  - **Pathological fracture .**
  - **Spread :**

    1- **Direct :** to the surrounding structures .

    2- **Blood spread** is late to the lung .

    3- Lymphatic spread is very rare .



* **Clinical picture :**

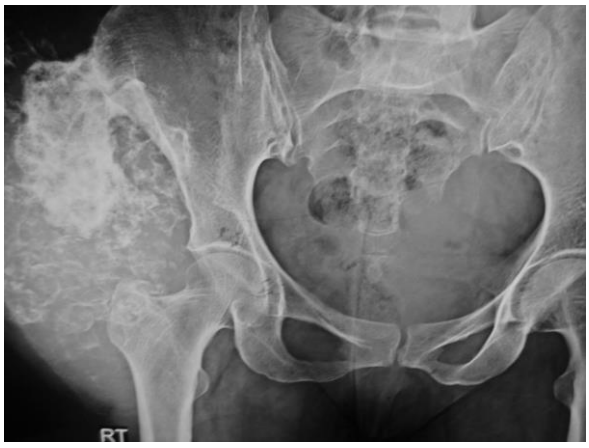
- There may be **history** of chondroma or osteochondroma .
- Large rapidly growing, painful , hard **,**fixed **swelling** in the characteristic site .

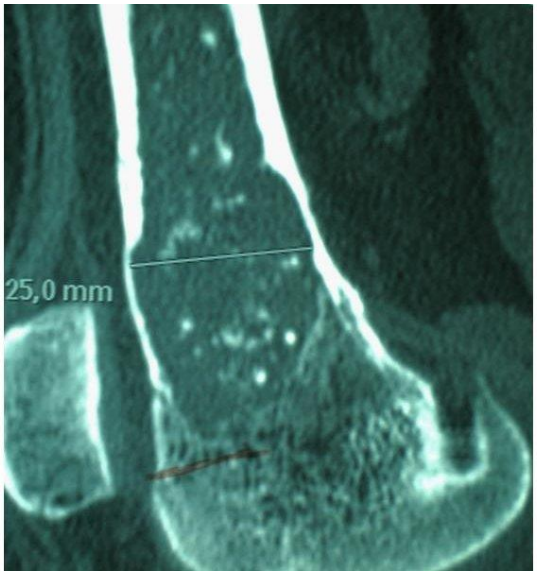
* **Investigations : (As all malignant bone tumors) +**

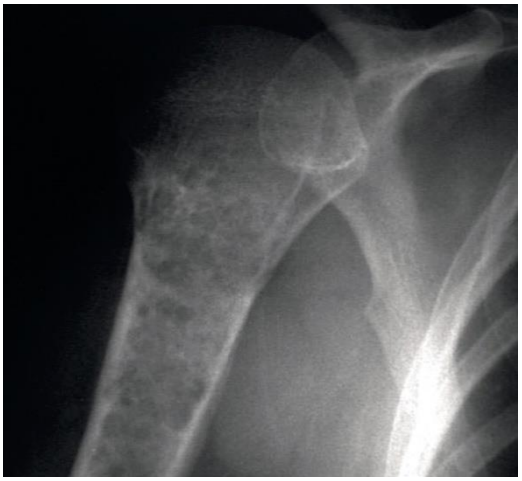
1- Plain x-ray :

- Chondrosarcoma appear as a **lytic** lesion with **intra-lesional calcification** (rings , arcs & popcorn calcification = fluffy cotton appearance).
- **Endosteal scalloping** affecting more than 2/3 of cortical thickness .

Intra-lesional calcification







Endosteal scalloping

* **Treatment :**

- The tumor is resistant to chemotherapy and radiotherapy .

- The usual treatment is similar to osteosarcoma .

	Osteoclastoma (Giant cell tumour)	**Osteosarcoma (Osteogenic Sarcoma)**
*** Incidence** ♣ **Age :** ♣ **Sex :**	♣ A common 1ry. bone tumor which may be benign, locally malignant or frankly malignant. ♣ 20 - 40 years (after epiphyseal union). ♣ More in males .	♣ The 2nd common 1ry malignant bone tumour after multiple myeloma. ♣ Usually 10-20 years or above 50 years if on top of Paget's disease ♣ More in males .
***Predisposing factors :**	♣ Trauma (usually call the attension of the patient to the already present disease).	♣ Trauma, osteoclastoma, irradiation & Paget's disease.
⁎ **Pathology:** ♣ **Origin** ♣ **Site :**	♣ Uncertain. ♣ Eccentric in epiphyses of long bones especially around knee, upper part of humerus, lower part of radius & mandible.	♣ Osteoblasts (bone forming cells). ♣ The **rule of 80**: 80% of osteosarcoma in teen ages, 80% in the lower limb, 80% around the knee, 80% in the lower end of femur & 80% metaphyseal.
♣ **Gross picture**	♣ The tumour causing bone expansion & finally thinning of the cortex → egg shell crackling sensation. ♣ The tumour is separated from the medulla by an operculum or medullary plug. ♣ Usually does not invade the articular cartilage or adjacent	♣ The tumour **destrory & invades** the medulla & cortex → fusiform swelling. ♣ Thus the tumour is formed of 2 parts: 1- **Intramedullary part** 2-**Subperiosteal part**: It raises the periosteum → stretch of subperiosteal

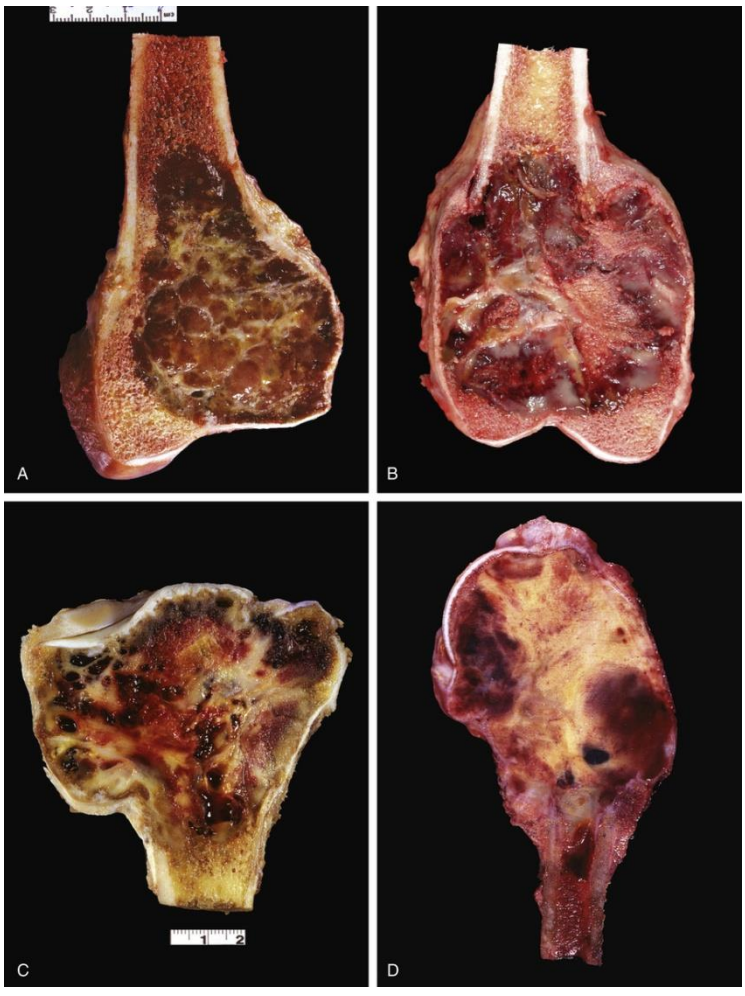
	joint .	vessels→ reactive new bone formation in 2 sites: **a. Codman's triangle**: at the angle between raised periosteum & shaft. **b.** Along the **subperiosteal vessels** → sun ray appearance. ♣ It **respects** the articular & epiphyseal cartilage → rare & late invasion of the joint or epiphysis .
♣ **Cut section:**	♣ A localized soft, friable well-defined growth with no bone of cartilage . ♣ Fibrous or bone trabeculae dividing the tumour in compartments variable in size ♣ The cut surface has a redish brown fleshy appearance with areas of hemorrhage & degeneration.	♣ Irregular , ill-efined,vascular, fleshy or grayish white mass infiltrating the surrounding structures with wide areas of hemorrhage, necrosis & degeneration.
♣ **Microscopic picture:**	♣ The tumour composed of 2 elements : ♣ **Mononuclear** small spindle shaped **neoplastic** cells. ♣ Large number of **reactive multinucleated giant cells** similar to osteoclasts . ♣ Well formed **blood vessels** which are not invaded by any cells.	♣ **Pleomorphic cells** (spindle, round, polyhydral & giant cells). ♣ **Pleomorphic stroma** show osteoid tissue, fibrous, cartilagenous, myxomatous or osseous tissues. ♣ Numerous thin walled malformed **blood vessels** which are invaded by malignant cells.

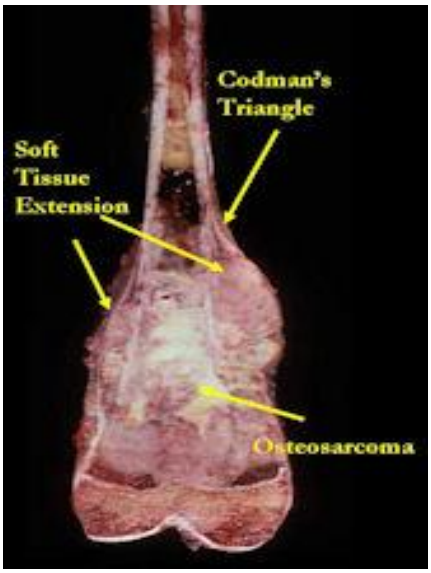
♣ **Pathological Types:**	♣ It is a tumor present with different grades of aggression , from totally benign to frankly malignant . ♣ Agression depends on the percentage of the spindle cells showing atypical morphology and mitotic figures. ♣ 1ry. malignant giant cell tumor behaves like osteosarcoma with abundant giant cells . It gives metastases in 5% of cases . ♣ 2nd. malignant giant cell tumor follows recurrence after surgery or radiotherapy .	1.**Intra-medullary** type 2. **Intra-cortical** type 3. **Juxta-cortical** types(on the surface of the bone) which may be : ♣ **Parosteal** type : arises from the outer layer of periosteum . ♣ **Periosteal** type : arises from the inner layer of periosteum . 4-**Telangectatic** type 5-**Secondary** osteosarcoma on top of Paget's disease or after radiotherapy . 6.**Osteolytic** type. 7. **Osteosclerotic** type.
Radiosensitivity:	♣ Sensitive	♣ Insensitive
⁎ **Complications**		
1. Spread:	♣ Direct spread only in low grade type but may spread to lungs in malignant type .	♣ **Direct** spread (to the surrounding), ♣ **Blood** spread (early & mainly to lungs) ♣ Very rarely **lymphatic** spread.
2.Pathological fracture :	♣ Occurs in advanced cases.	♣ Very rare as severe pain prevents the patient to use the limb & he is **bed ridden**.
3.Malignancy	♣ May turn to 1ry or 2nd malignant giant cell tumor	
4.Anaemia , cachexia & death:	♣ Not occur .	♣ Very common

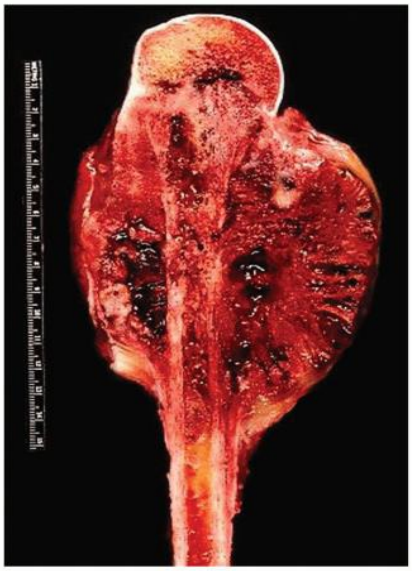
5. Recurrence after incomplete excision		
*** C/P:** **1. Swelling:**	♣ **Main & earliest** presentation ♣ It occurs **before pain**. ♣ The swelling is well defined, slowly growing, in the **epiphysis** of long bone. ♣ Early it is **hard** in consistency but later on it has an **eggshell** crackling sensation.	♣It is not the earliest syptom. ♣It occurs after pain ♣The swelling is tender, fusiform, ill-defined, rapidly growing, metaphyseal ♣Hard or heterogenous. ♣The skin is warm & shows dilated veins. ♣If the tumour is highly vascular → pulsation, thrill & bruit.
2. Pain:	♣ It is a **late** symptom.(Mention its features)	♣ Is the **main & earliest** symptom and it occurs months before the swelling . ♣ Pain is severe, sawing, increased by night → prevent sleep.
3. Near by joint	♣ May show sympathetic **effusion**	
4. Picture of complications	♣Pathological fracture or recurrence after incomplete excision.	♣ In advanced cases, there are low grade fever, anaemia, cachexia & features of lung **metastasis**.
*** Investigations:** **1- Plain X-ray:**	♣ Characteristic site & age. ♣ **Osteolytic** lesion. ♣ Bone expansion without soft tissue shadow outside the bone. ♣ **Soap bubble** appearance ♣ **Medullary plug** (abscent in malignant transformation)	♣ Characteristic site & age. ♣ **Osteolytic osteosclerotic** lesion. ♣ Bone destruction & new bone formation → **sun ray appearance & Codman's triangle.**

		♣ Eroded cortex (**bone ghost**) ♣ Large soft tissue shadow outside the cortex .
2. Other investigations (as before in any bone tumour).		
*** D.D.:**	♣ Hyperparathyroidism ♣ Aneurysmal bone cyst ♣ Osteosarcoma	♣ Osteoclastoma ♣ Other malignant bone tumours ♣ Metastases ♣ Chronic non-specific osteomgelitis.
*** Treatment:**	**A) Surgical : (main treatment)** **I) Unimportant bone** (e.g. upper fibula or lower ulna) → excision with wide safety margin. **II) Important bone:** **a.Early small low grade tumour:** ▪ **Aggressive curettage** with adjuvant (phenol or cryotherapy) to decrease local recurrence . ▪ The **defect** is closed by bone graft or sement . ▪ **Disadvantage** :High incidence of recurrence . **b.Wide excision with** safety margin **& reconstruction** by prothesis or arthrodesis . ▪ **Indications :** ➢ Large or aggressive tumour ➢ Extension to subchondral bone or soft tissues .	**I) Early cases:** (No lung metasuses) **a. Pre-operative** (neo-adjuvant) chemotherapy . **b. Surgery :**Local control of the tumour by one of the followings: **1) Limb salvage surgery :** ♣ **Method:** Wide local resection with replacement of the defect by prosthesis. ♣ **Indication :** If the tumor can be removed with adequate safety margin and the resulting limb has satisfactory function . **2)Amputation :** Proximal to the joint above the tumor . ♣ **Indication :** reverse of number 1 **c.Post-operative adjuvant chemotherapy** **II) Advanced cases:** (With

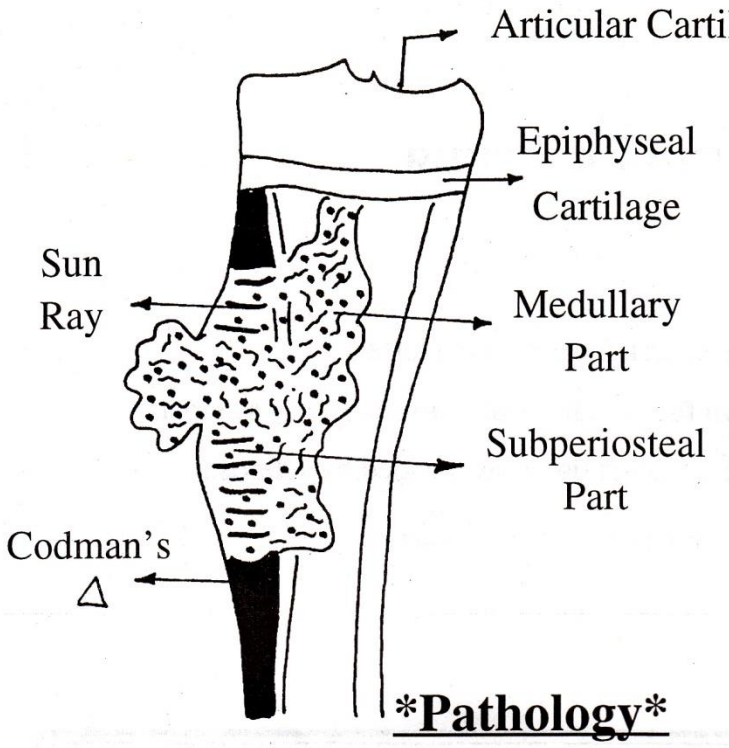
	➢ Recurrence **c. Amputation :** ▪ **Indications :**Recurrence with evidence of malignancy **A) Radiotherapy :** (inferior to surgery) **,**for inaccessable tumors e.g. vertebrae **.** **B) Medical treatment:** **a.Bisphosphonates + vit. D** inhibit bone resorbtion & encourage new bone formation **b.Denosumab** is a human monoclonal antibody for unresectable tumor + indications of wide excision	lung metastases): 1. Palliative **amputation.** 2. Palliative **radiotherapy & chemotherapy,** 3. Solitary lung metastasis is treated by **lobectomy.**

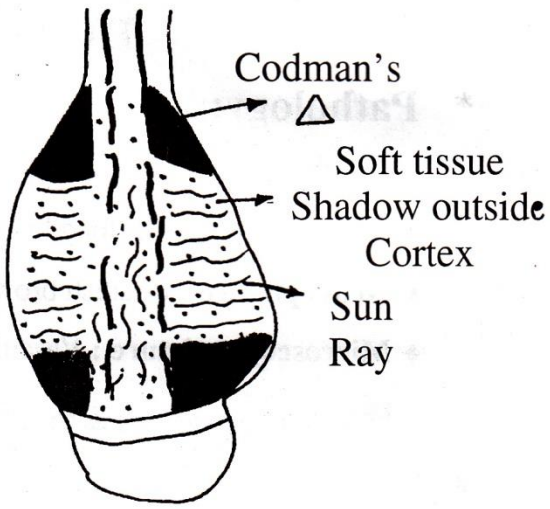




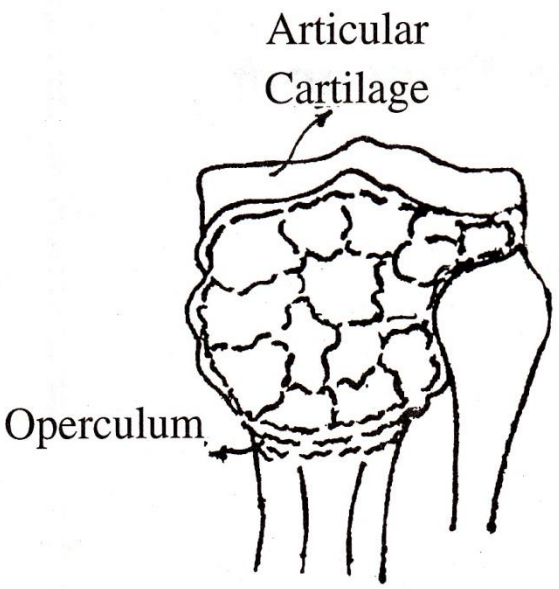


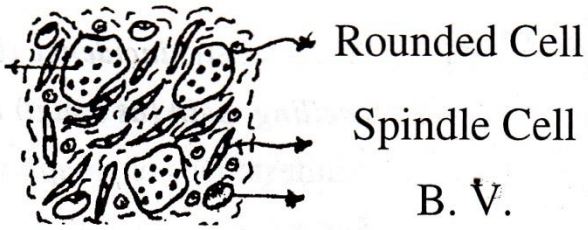
* Osteosarcoma *





Pathology *** X Ray ***

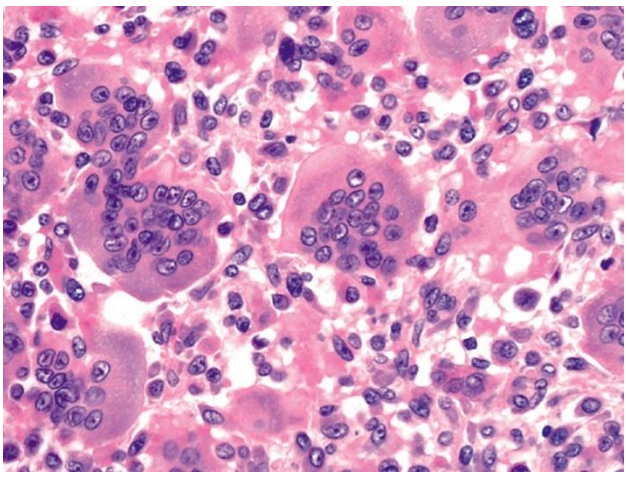


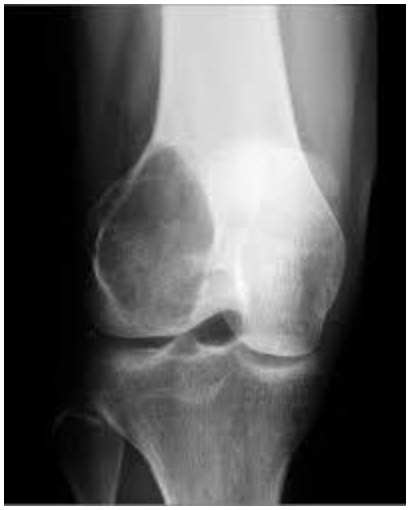


* Osteoclastoma *

Microscopic picture of

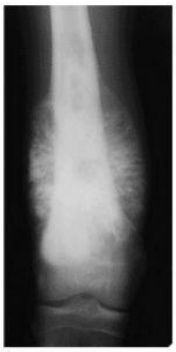
Giant cell tumor



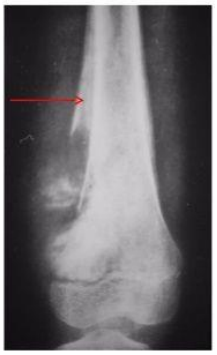


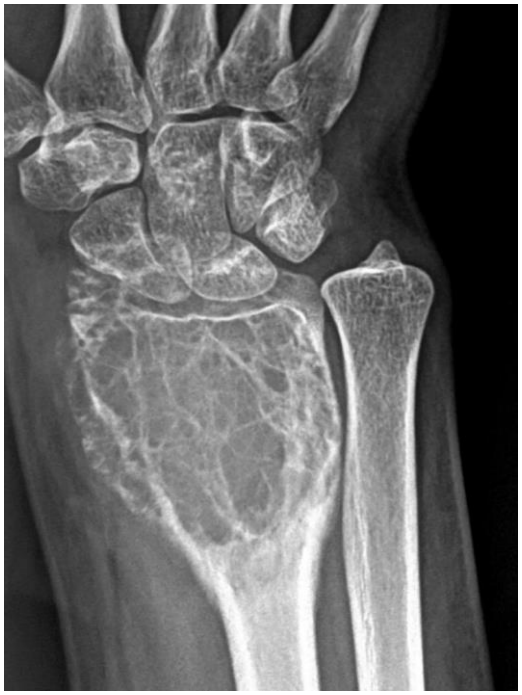
Periosteal Reaction

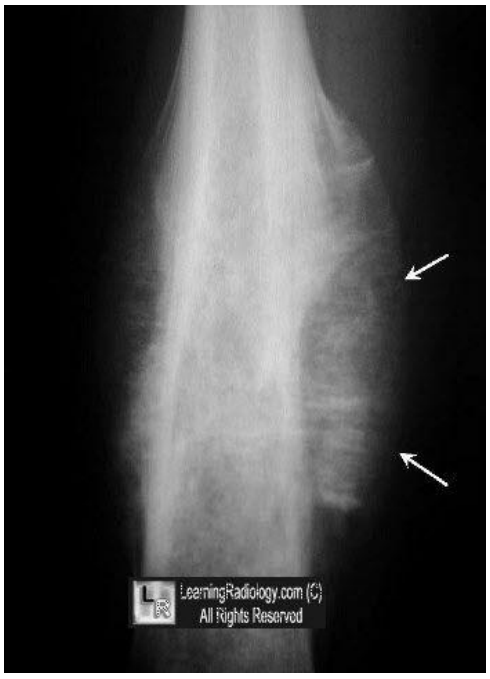
Sun Burst appearance

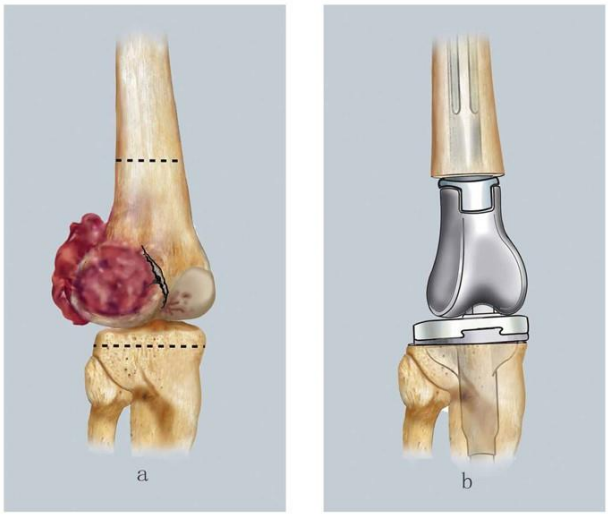


Codman's Triangle

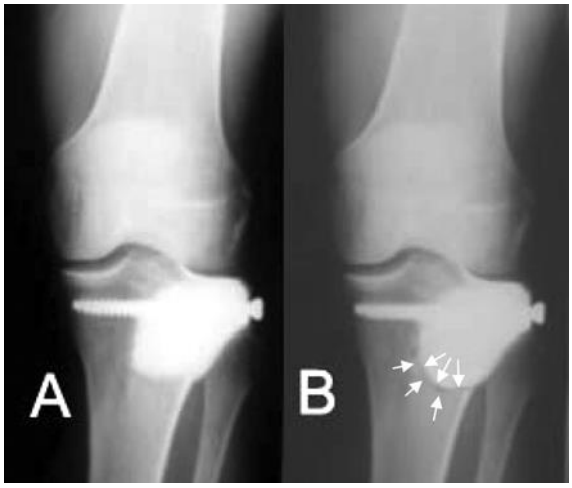







a
b

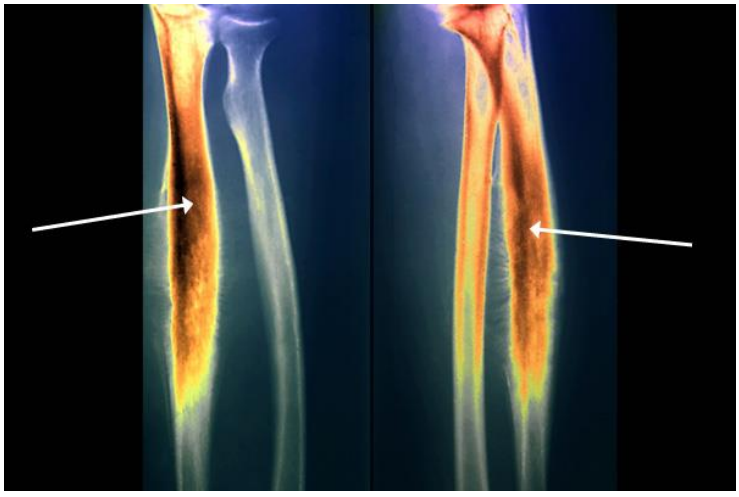

a
b
c

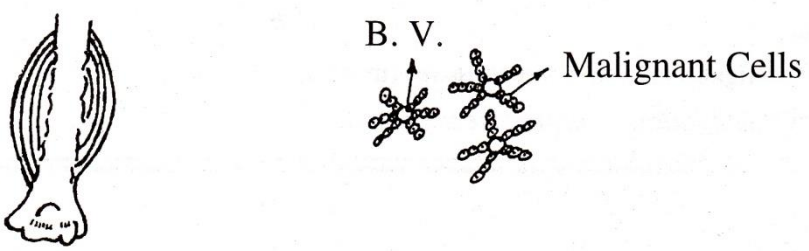

A
B


TEAM
USA

Ewing's Sarcoma

* **Incidence: Rare ,** more in males ,10-20 years.
* **Pathology:**
  - **Origin :** from the vascular endothelium of bone marrow.
  - **Site:** In the center of the diaphysis of a long bone especially tibia, fibula, femur.
  - **Gross picture:** The tumour arises in the medulla as a greyish white mass which spread longitudinally and transversely → raising the periosteum → subperiosteal new bone formation in successive layers.
  - **Cut section:** Ill-defined greyish white mass with areas of haemorrhage and necrosis.
  - **Microscopic picture:** Small rounded cells arranged in rosette around the blood vessels.





*** Ewing's Sarcoma ***

* **Complications: (As any malignant bone tumor) +**
  - Lymphatic (common) →regional L.Ns.
* **Clinical picture:**

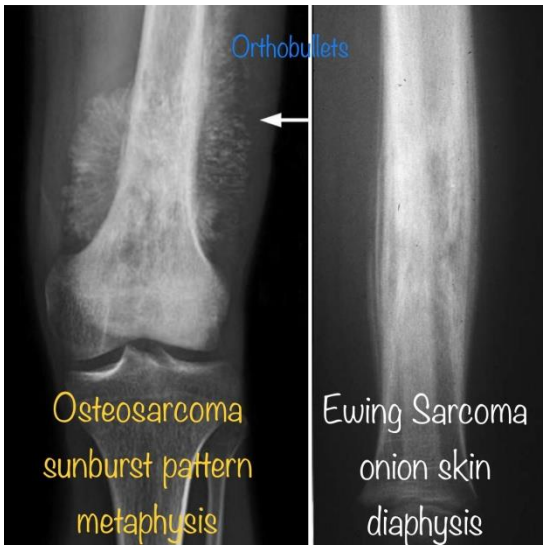
  1- Fever , headache , anorexia and malaise

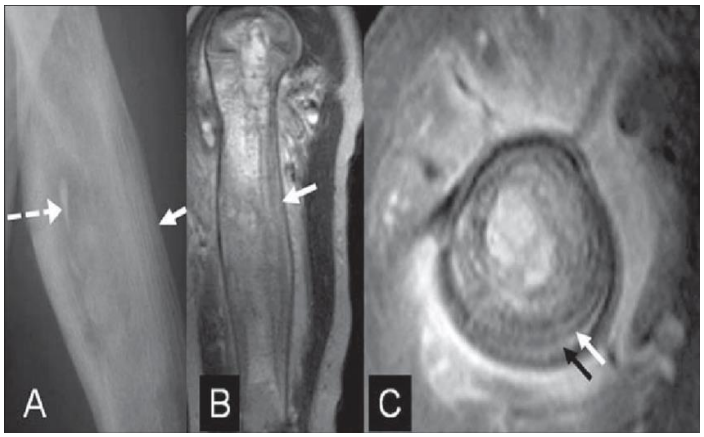
  2- Pain and tenderness.

  3- Swelling: Fusiform, ill-defined, diaphyseal, soft, the overlying skin is warm and shows dilated veins.
* **Investigations:** (As any malignant bone tumour)+

  1- Pain X-ray: Diaphyseal bone destruction + Onion peel appearance is diagnostic .

  2- Leucocytosis & high ESR.





* **D.D.:** Acute osteomyelitis, reticulum cell sarcoma & secondaries from neuroblastoma.
* **Treatment:** Complete surgical resection + radiotherapy & chemotherapy.