BENIGN BONE TUMOURS

CLASSIFICATION

1.BONE FORMING TUMOURS.

a] BENIGN
. osteoma
. osteoid osteoma
. Osteoblastoma

b]MALIGNANT.
. Osteosarcoma
. juxta cortical osteosarcoma
. periosteal osteosarcoma

2.CARTILAGE FORMING TUMOURS

a] BENIGN

. osteochondroma

. chondromyxoid fibroma

. chondroblastoma

b]MALIGNANT

. Chondrosarcoma

3.GAINT CELL TUMOUR

a] classical benign type (locally aggressive)

b] malignant GCT

4.MARROW TUMOURS

a] ewings sarcoma

b] myeloma

5.VASCULAR TUMOUR

A] benign

. haemanigoma

. lymphangioma

. glomus tumour

b] malignant

. angiosarcoma

6. CONNECTIVE TISSUE TUMOURS

A] benign

. desmoplastic fibroma

. lipoma

B] malignant

. fibro sarcoma

. Liposarcoma

7.OTHER TUMOURS.

a] chordoma

b] adamantinoma

c] neurofibroma

8.TUMOR LIKE LESIONS

a] solitary bone cyst

b] aneurysmal bone cyst

c] ganglion

d] non ossifying fibroma

e] fibrous dysplasia

f] eosinophilic granuloma

g] myositis ossificans

h] brown tumor of hyper parathyriodism.

Radiographic Features of the Various Tumors

- Benign:

well circumscribed, narrow zone of transition, no periosteal reaction, sclerotic border.

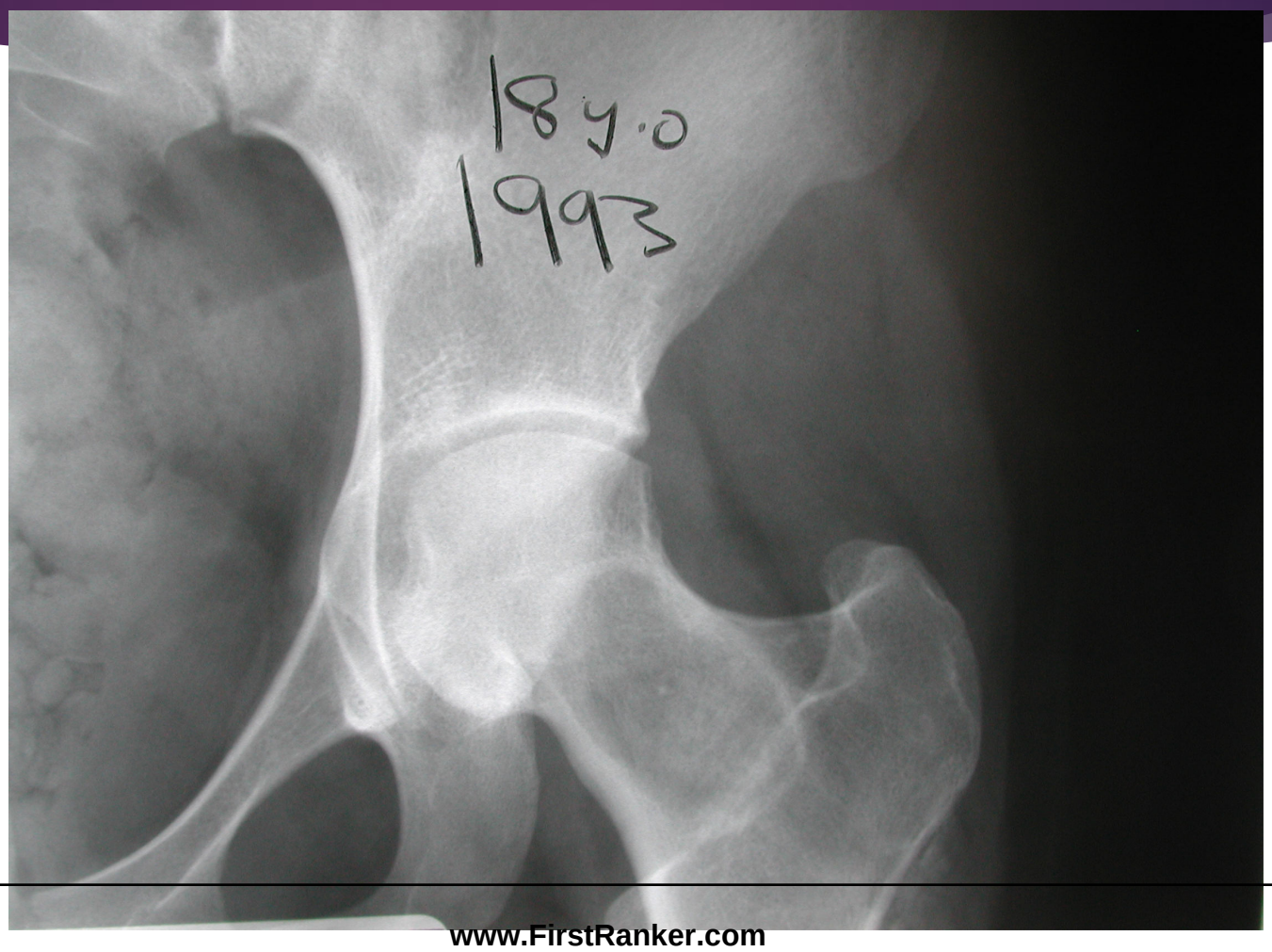
- Benign Aggressive:

expansion, thinning of cortex, usually lytic, +/- periosteal reaction, +/- narrow zone of transition.

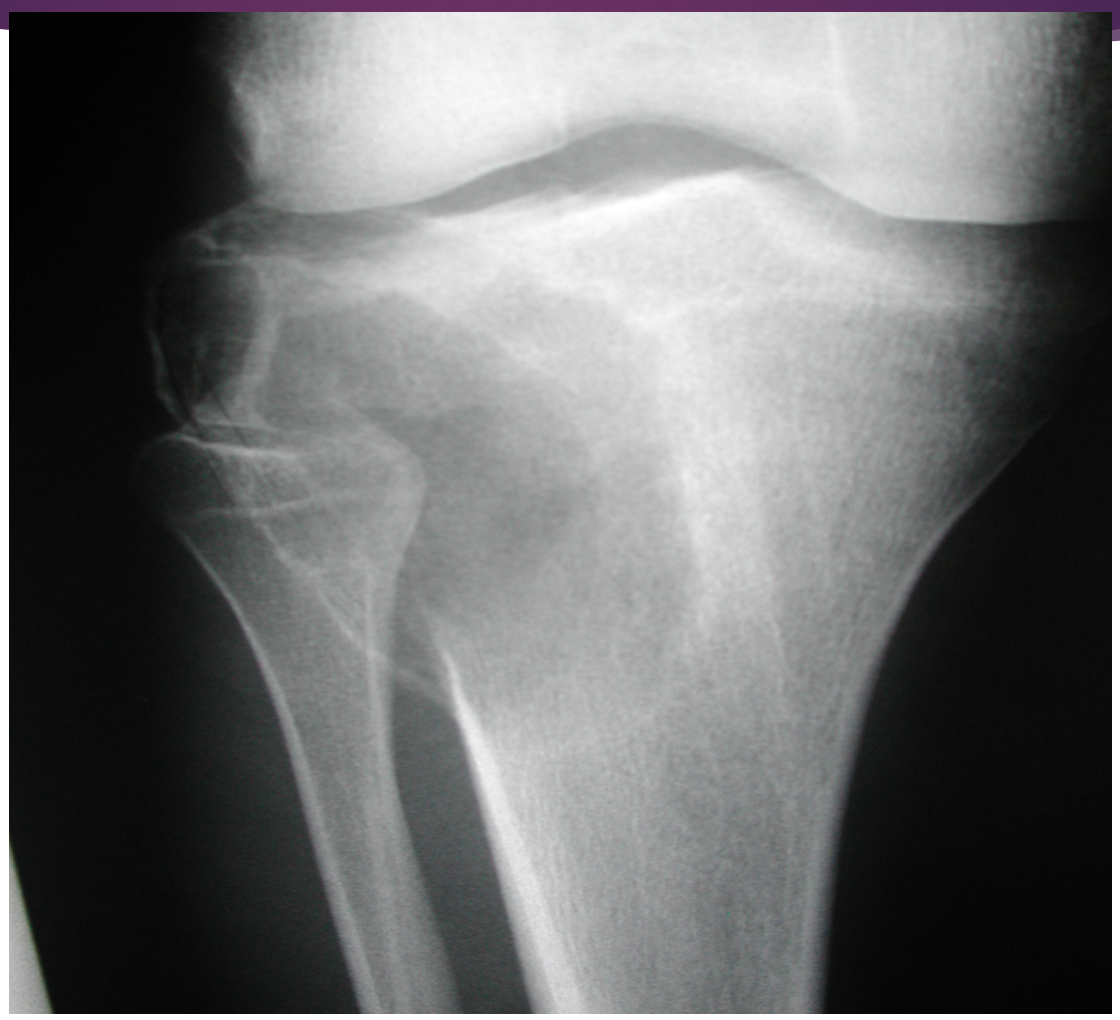
- Malignant:

++++periosteal reaction, large zone of transition, permeative, moth eaten.

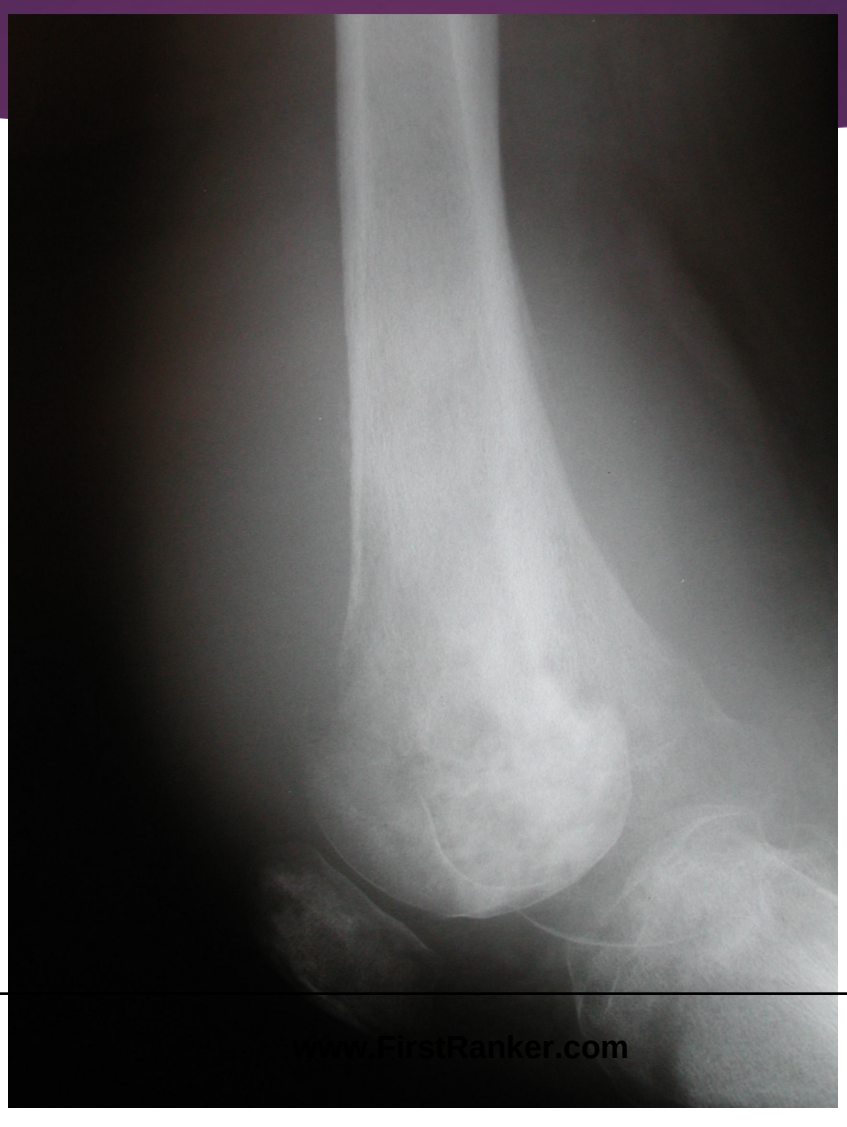
BENIGN TUMOUR



BENIGN AGGRESSIVE TUMOUR



MALIGNANT TUMOUR



Age of Tumors

- <20y - Osteogenic Sarcoma, Ewings.
- 20-40y - GCT, Chondrosarcoma, MFH, Lymphoma
- In 60 y - Mets, Myeloma, Chondrosarcoma, late Osteogenic sarcoma, MFH, Fibrosarcoma.

Sites of Tumors

- Diaphyseal: Ewings, Osteoid Osteoma, Mets, Adamantinoma, Fibrous Dysplasia
- Epiphyseal: Chondroblastoma, GCT,
- Metaphyseal: Osteosarcoma, bone cysts.

OSTEOID OSTEOMA

- This is benign osteoblastic tumor with a well demarcated **nidus of less than 1 cm** surrounded by a distinct reactive bone
- INCIDENCE: 2.6% of all primary bone tumors
- Age : 10-25 yrs
- Sex: M:F::2:1
- Site : long bones usually tibia and femur more commonly affected

- **Clinical feature**:

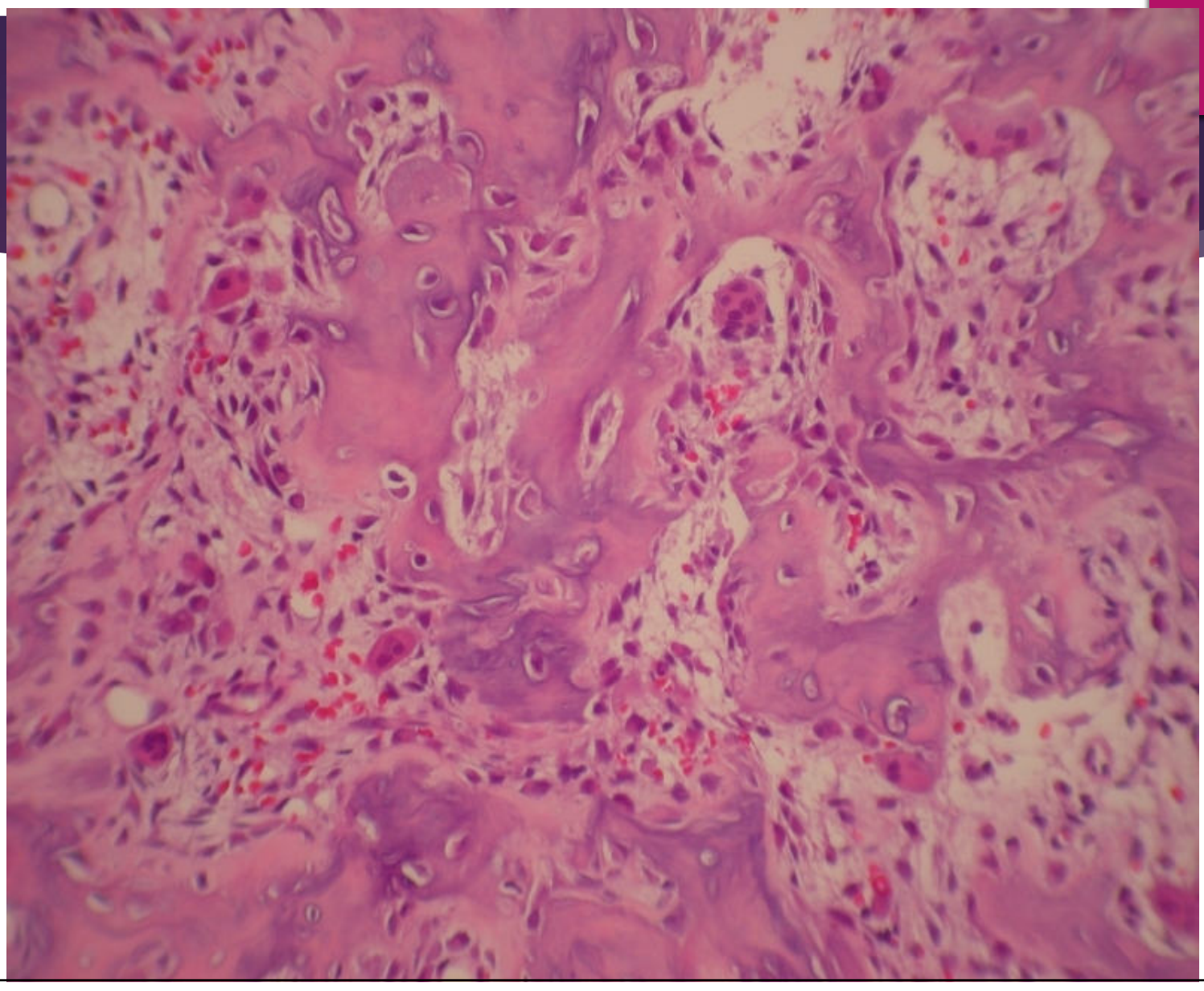
  .vague and intermittent **pain more at night**

  . pain relived by aspirin.

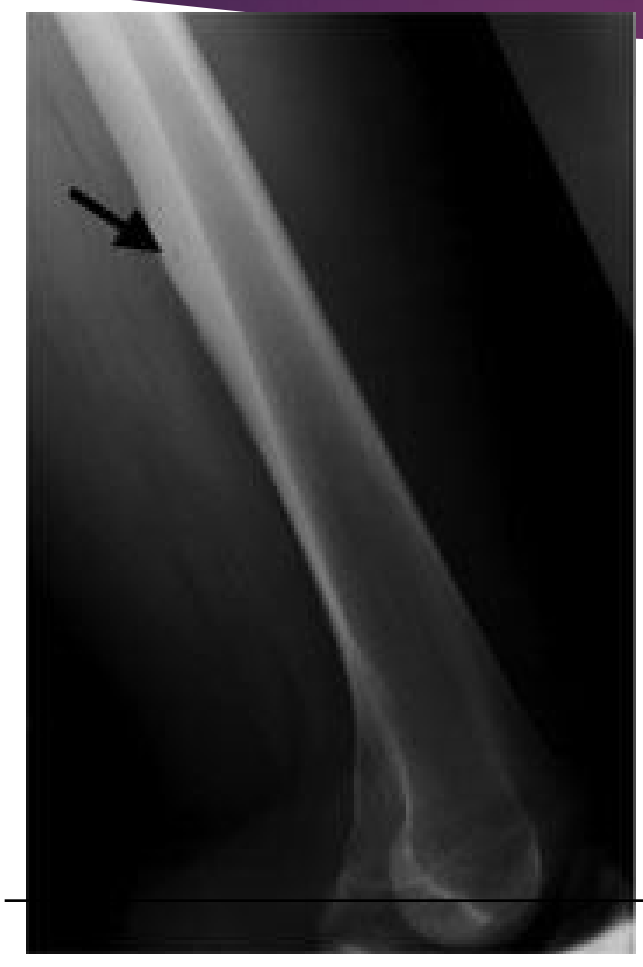
  . mild swelling , tenderness present

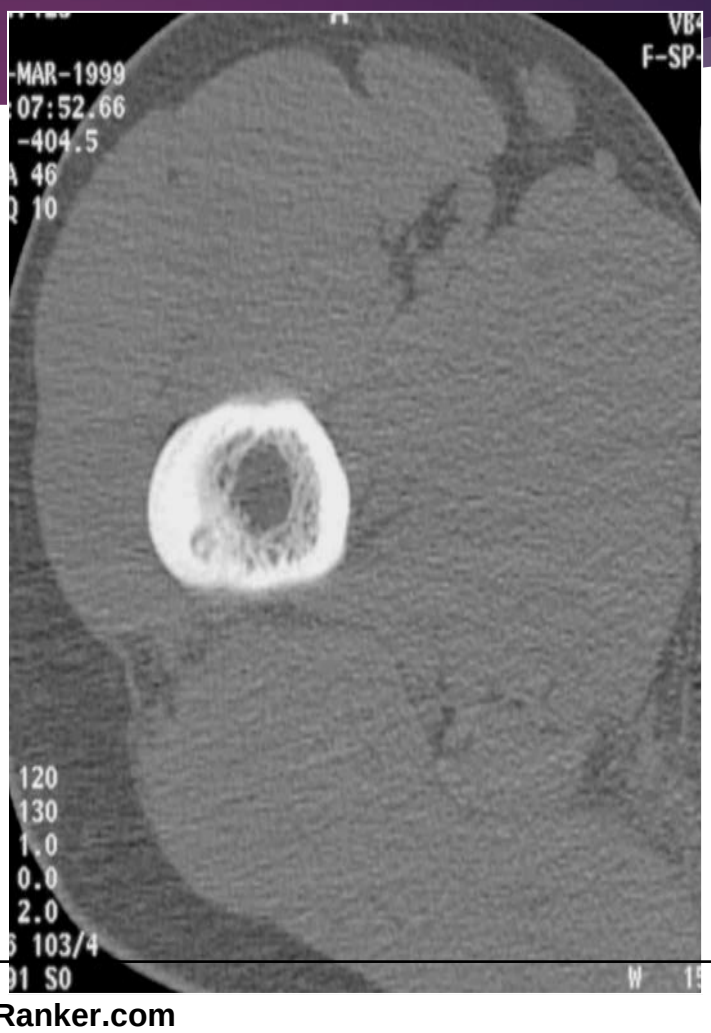
Osteoid osteoma

- Interlacing osteoid strands
- Vascularized fibrous stroma
- Prominent osteoblasts
- Osteoclasts



- X-ray : central lucency surrounding the nidus with or without dense calcified center, which is surrounded by reactive sclerosis
- Treatment : **wide** enblock resection with removal of surrounding sclerotic bone .





BENIGN OSTEOBLASTOMA

- A benign osteoblastoma is an uncommon **vascular osteoid and bone forming tumor** .
- It is very slow growing and characterized by absence of any reactive perifocal bone formation.
- INCIDENCE:0.8% of all primary tumors.
- AGE:10-20yrs.
- SITE: vertbra ,flat bones usually.

- Microscopy - A well circumscribed tumor when it is expanded it is delimited by a shell of cortical new bone. Dense sheets of osteoid and irregularly calcified new bone with intervening vascularized background of osteoblastic connective tissue stroma. Giant cells may be present.

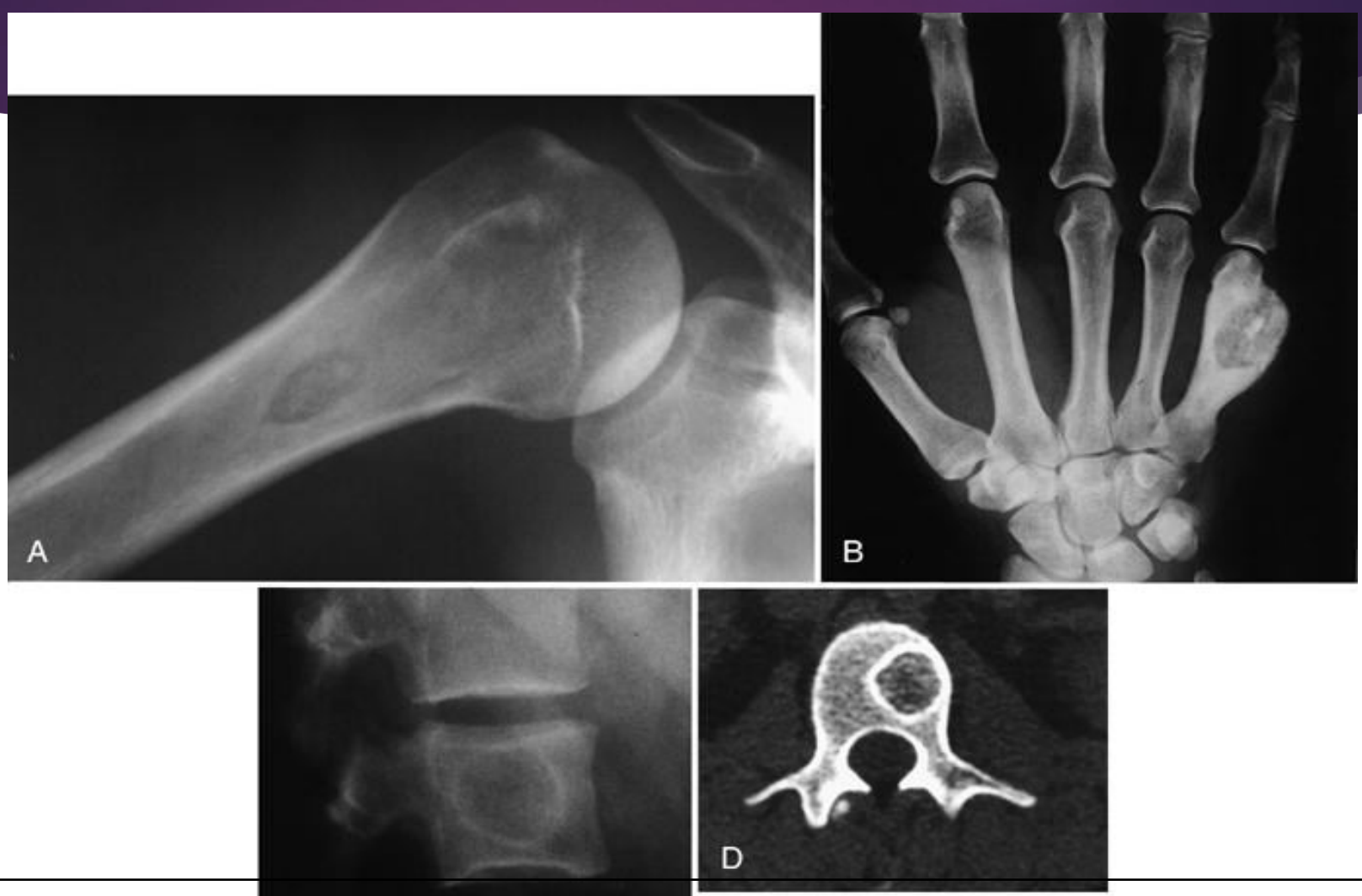
- Clinical Features: Pain, Swelling, Rarely As Fractures

- **X RAY** : Lesion is well circumscribed, radiolucent and expansile in fusiform fashion . Cortex is preserved with or without calcification.
- Malignant transformation has been reported.

- Treatment:

Small to moderate – Curretage and bone grafting

Recurrent - enbloc marginal excision.

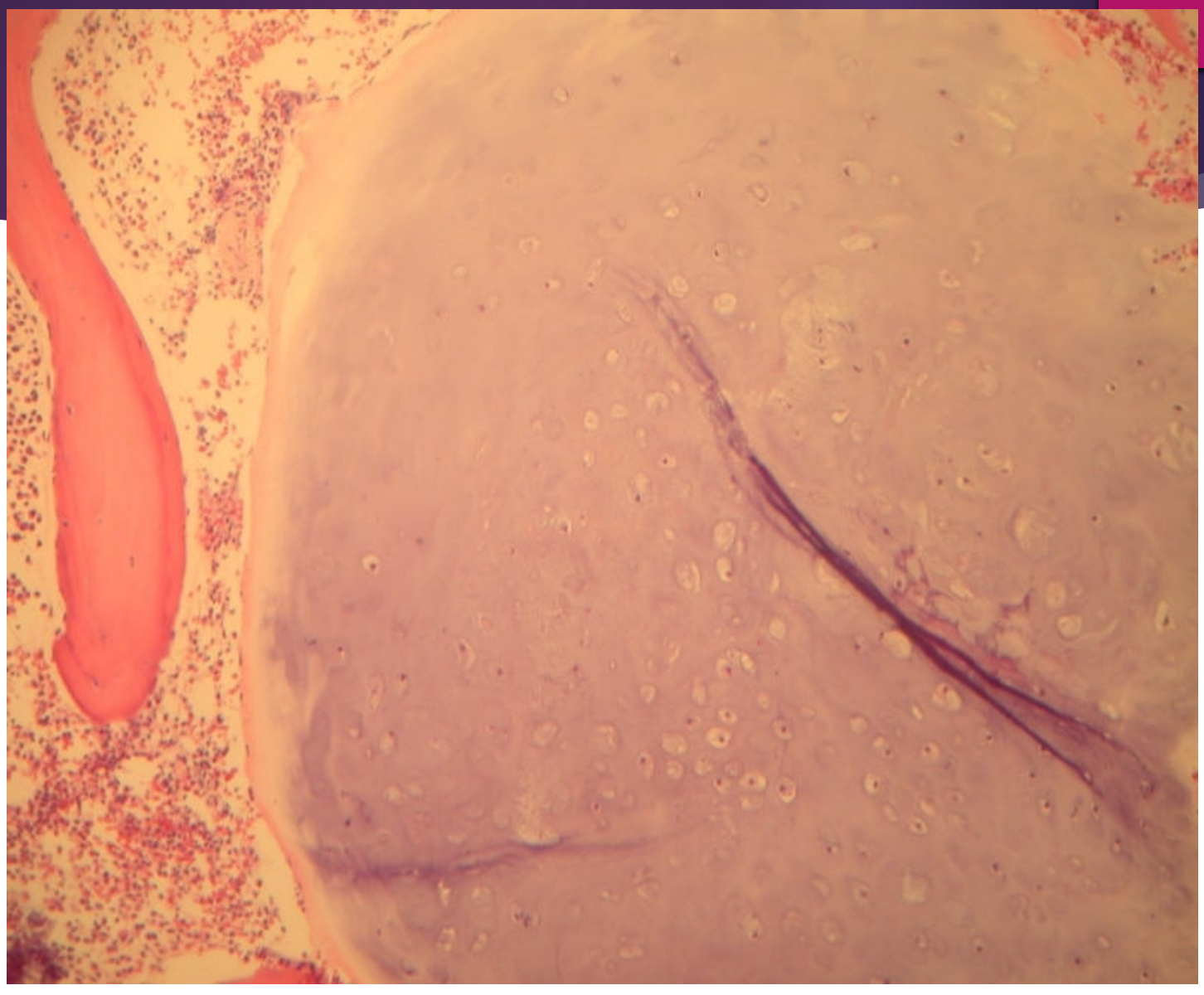


ENCHONDROMA

- This is a benign cartilaginous tumor centrally **located in phalynx.**
- INCIDENCE:3% of all bone tumors.
- AGE:10-50yrs.
- SITE: **metaphysis** is usually involved, it is common in phalanges of hand and feet.
- PATHOLOGY: tumor surrounded by fibrous capsule neoplastic tissue is composed of bluish white translucent cartilage. primitive mesenchymal cartilage is in periphery, while most mature is in center of tumor.

Enchondroma

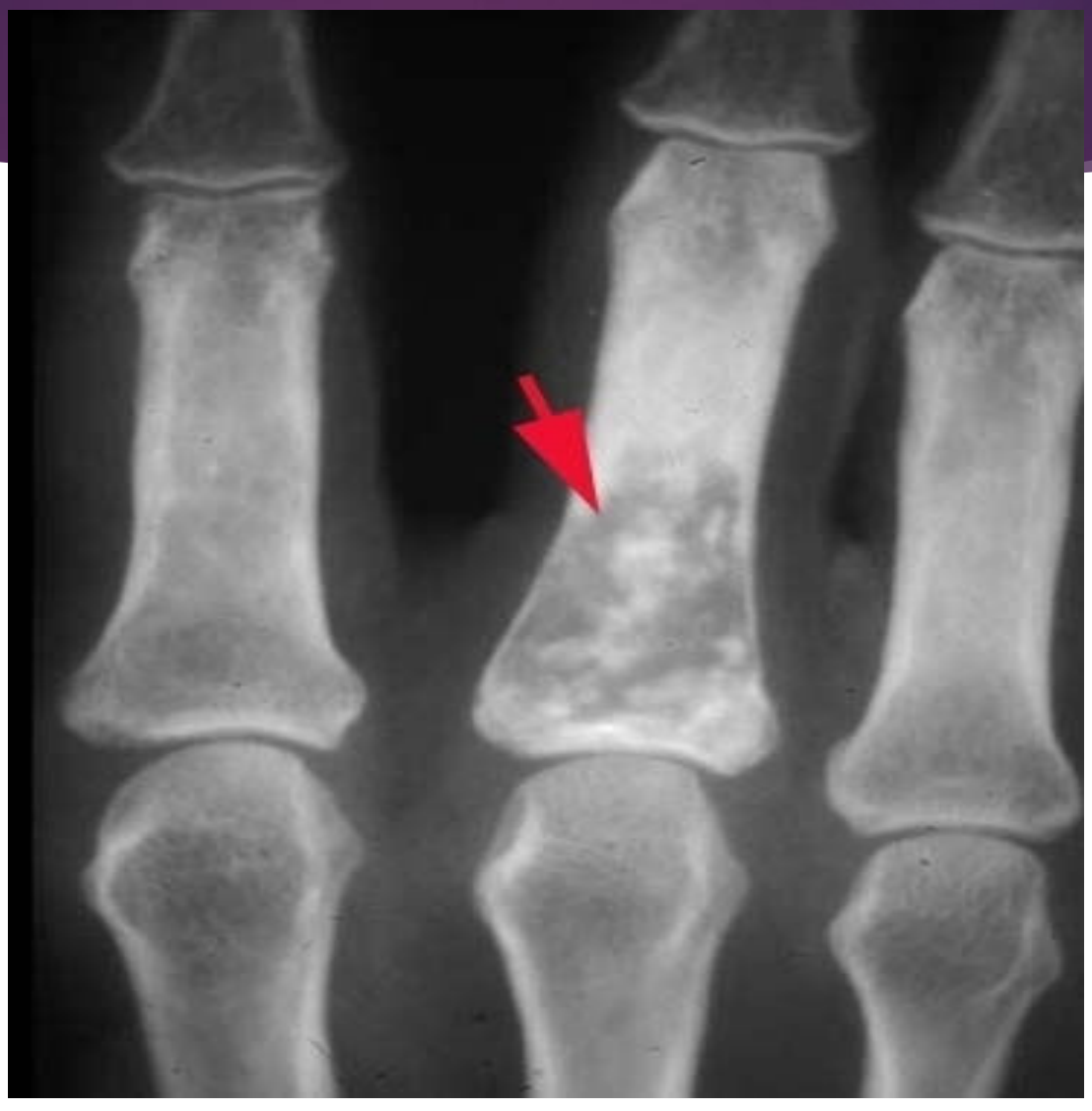
- Benign intramedullary neoplasm of hyaline cartilage
- Lobules of neoplastic cartilage
- Frequently rimmed by a band of new bone
- Normal appearing chondrocytes
- Hyaline chondroid matrix



- Signs and symptoms : incidentally diagnosed radio logically, pain and enlargement of phalanx.
- X- ray : tumor appears cystic (loculated or non – loculated, cortex- thin and expanded it may be perforated . No reactive bone formation.

circumscribed focus of popcorn like densities is characterstic of chondroma

- **Maffucci and olliers syndrome –** associated with multiple enchhondroma.



- Treatment :

small – curettage and bone grafting

recurrent – radical resection

Osteochondroma (exostosis)

- It is aberrant developmental anomalies formed of bone and cartilage that arise from the periphery of cartilaginous growth plate
- Most common benign bone tumor
- Incidence : 11%
- Age : common during growth period
- Sex : M : F :: 1.4 : 1

- Pathology : usually lateral out growth of cartilage have all histological feature of " epiphyseal plate" in their cartilaginous cap . **Grows until epiphysis fuses**

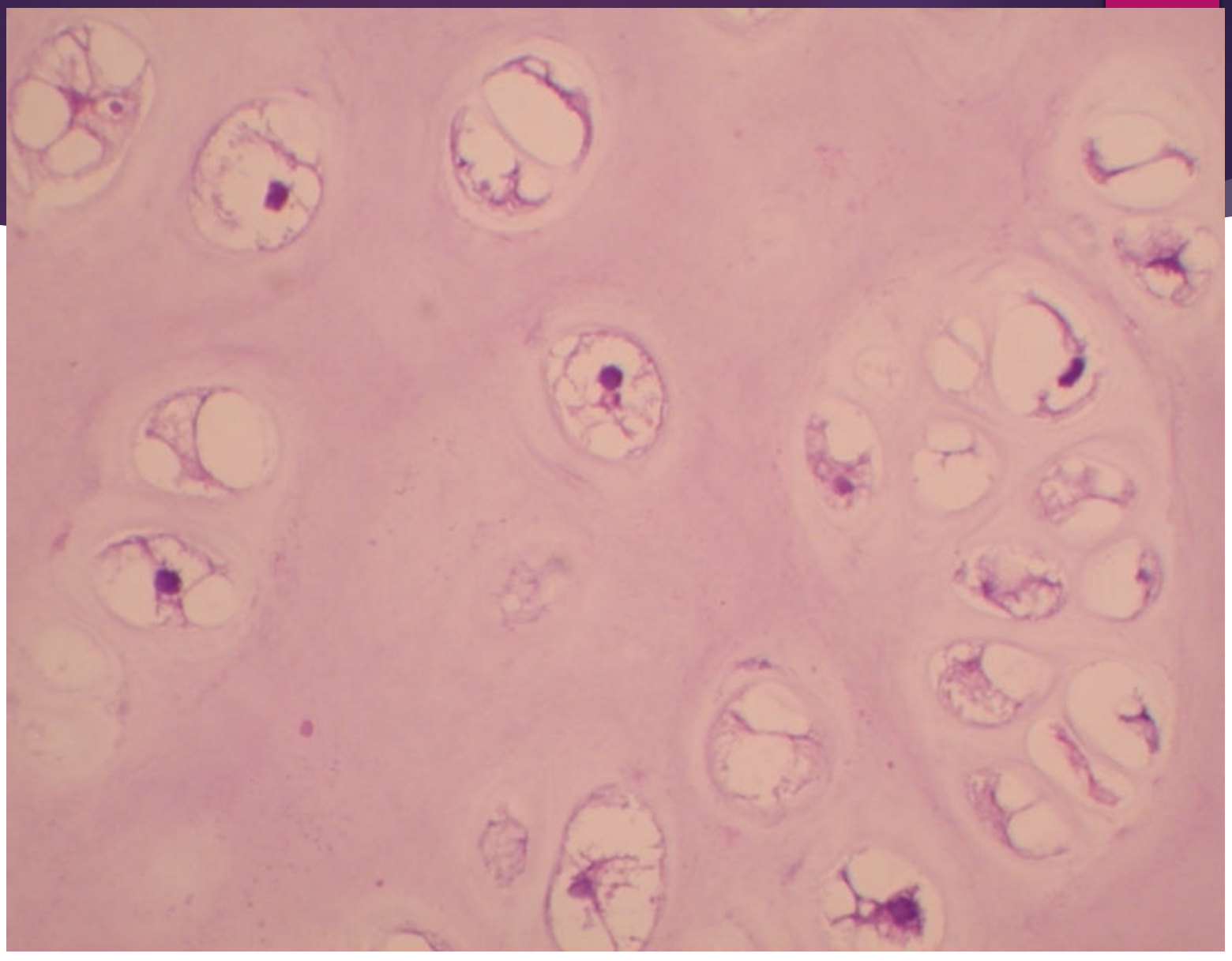
- Histology : deep layer of periosteum (cambium) retains ability to form catilage and bone. Tumors may be due to perverted activity of this layer

- Signs and symptoms : symptom less, pain and swelling can occur once bursitis or malignant changes occurs

  firm to hard, fixed, painless mass overlying bone .

Osteochondroma

- Outgrowth of medullary and cortical bone covered with a cartilage cap
- Cap usually < 0.5 cm. May be thicker in children
- Benign appearing cartilage



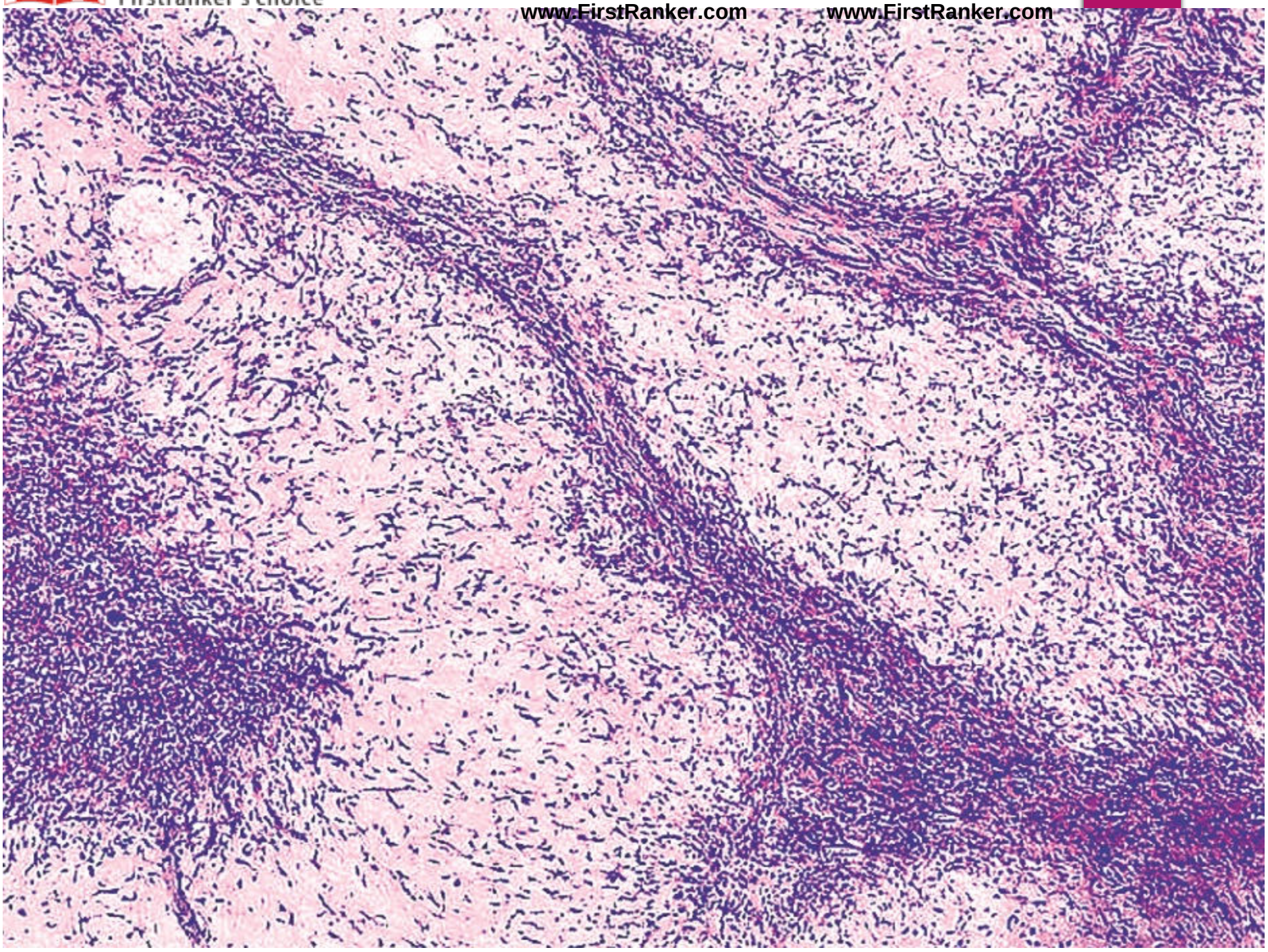
- X- ray :flow out from cortex of metaphyseal area no reaction of underlying bone .Cartilaginous cap and overlying bursa are radiolucent
- Malignant change occurs in 1-2%
- Treatment :
- Observation
- Surgery- removal of tumor with resection of extracapsular margins

CHONDROMYXOID FIBROMA

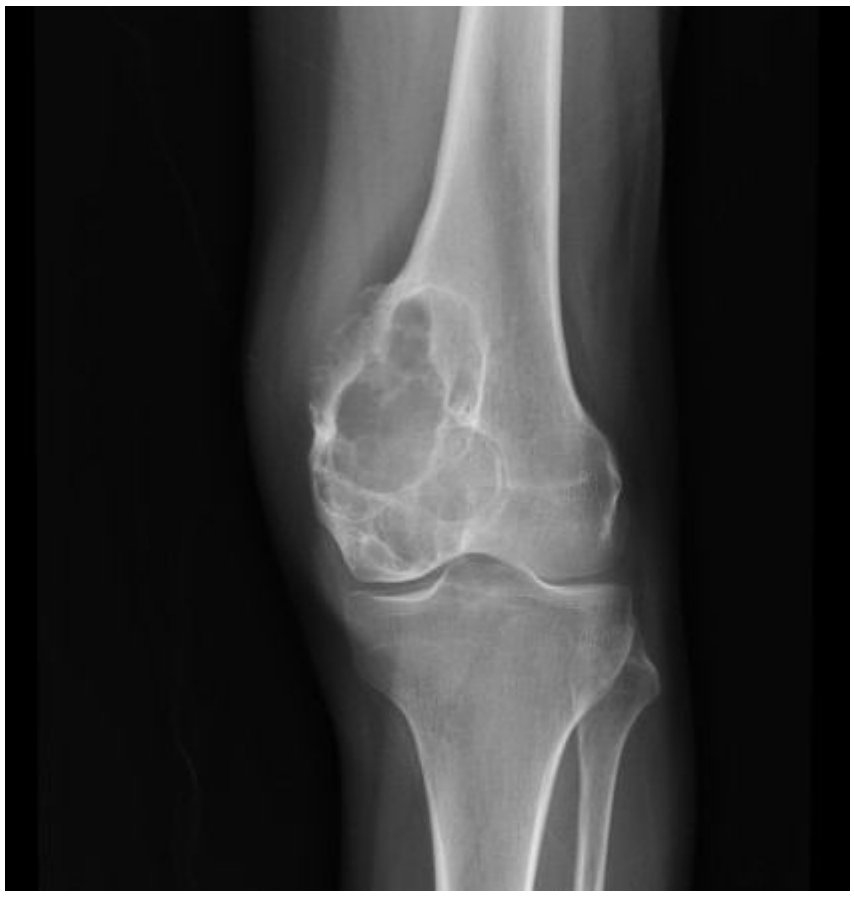
- Least common benign cartilaginous bone tumor
- Incidence : 0.4%
- Age : 10-30 yrs
- Site: upper end tibia ,lower end of femur , lower end fibula.
- Pathology : collagen fibers abundant in this tumor. Cellular population predominantly chondroid and myxoid in this case

Chondromyxoid Fibroma

- Nodular architecture
- Lobules of cartilage with myxoid features
- fibrous septa separating lobules
- Giant cells in septa



- C/F : mild pain ,swelling ,tender mass fixed to bone
- X-ray : translucent mass of variable size located eccentrically in the metaphysis , with in tumor faint trabecular pattern is present .
- Treatment : excision and bone grafting .



CHONDROBLASTOMA

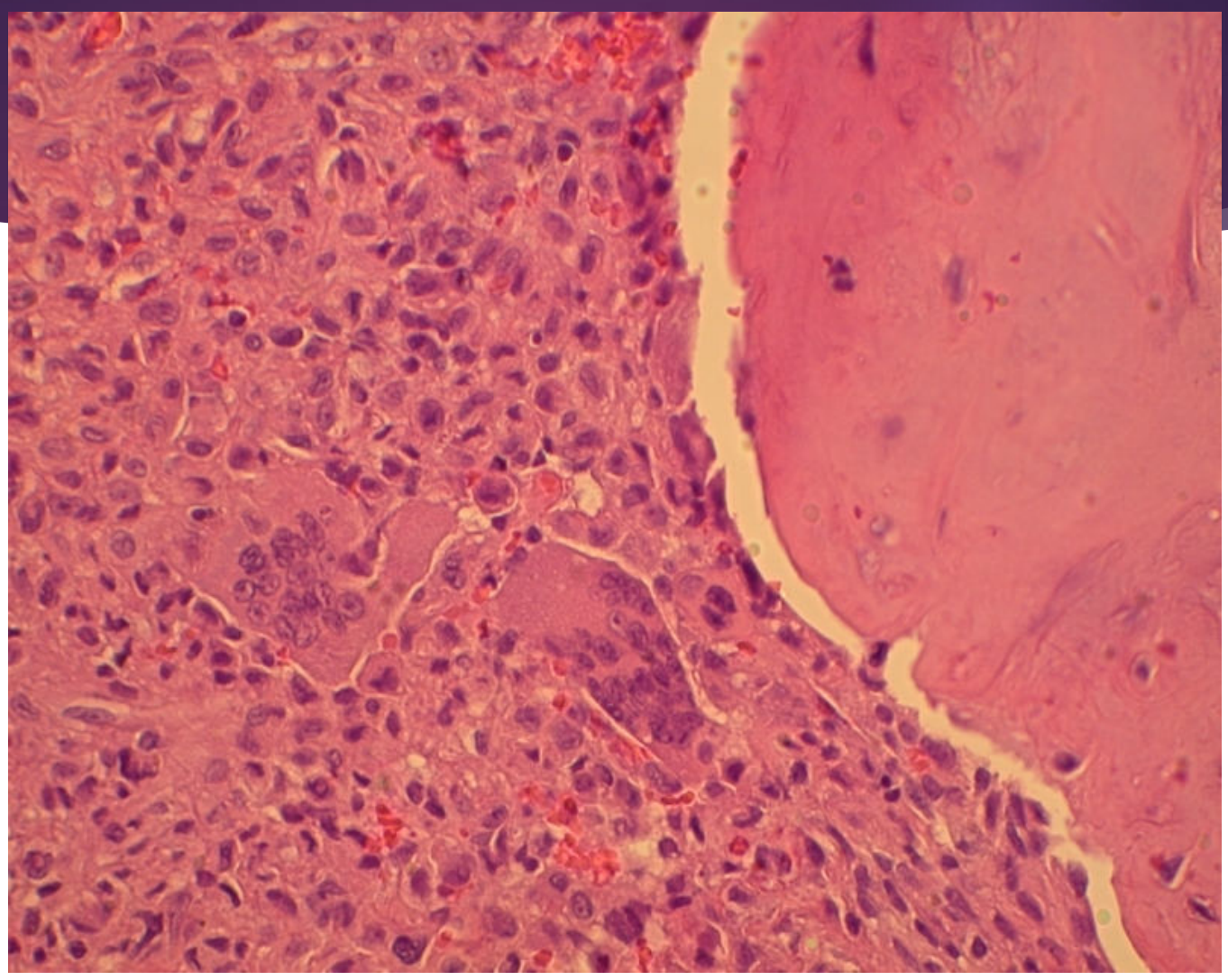
- Benign tumor arising in epiphysis consisting of polygonal chondroblasts, small foci chondroid tissue , osteoclast like giant cells and samll foci of calcification .

Its importance lies in to differentiate from GCT

- INCIDENCE : 1 %
- Age : 10 -15 yrs

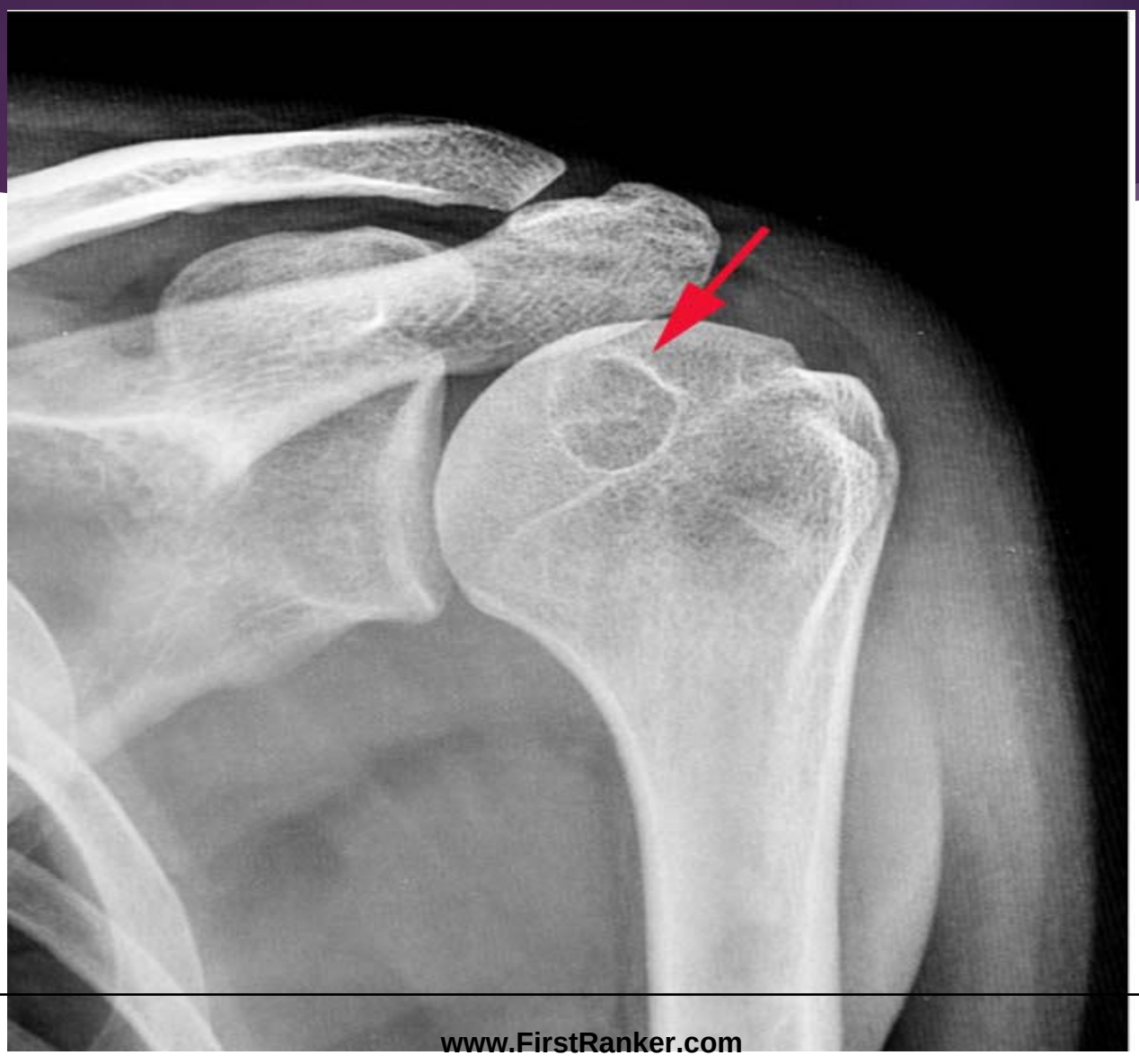
Chondroblastoma

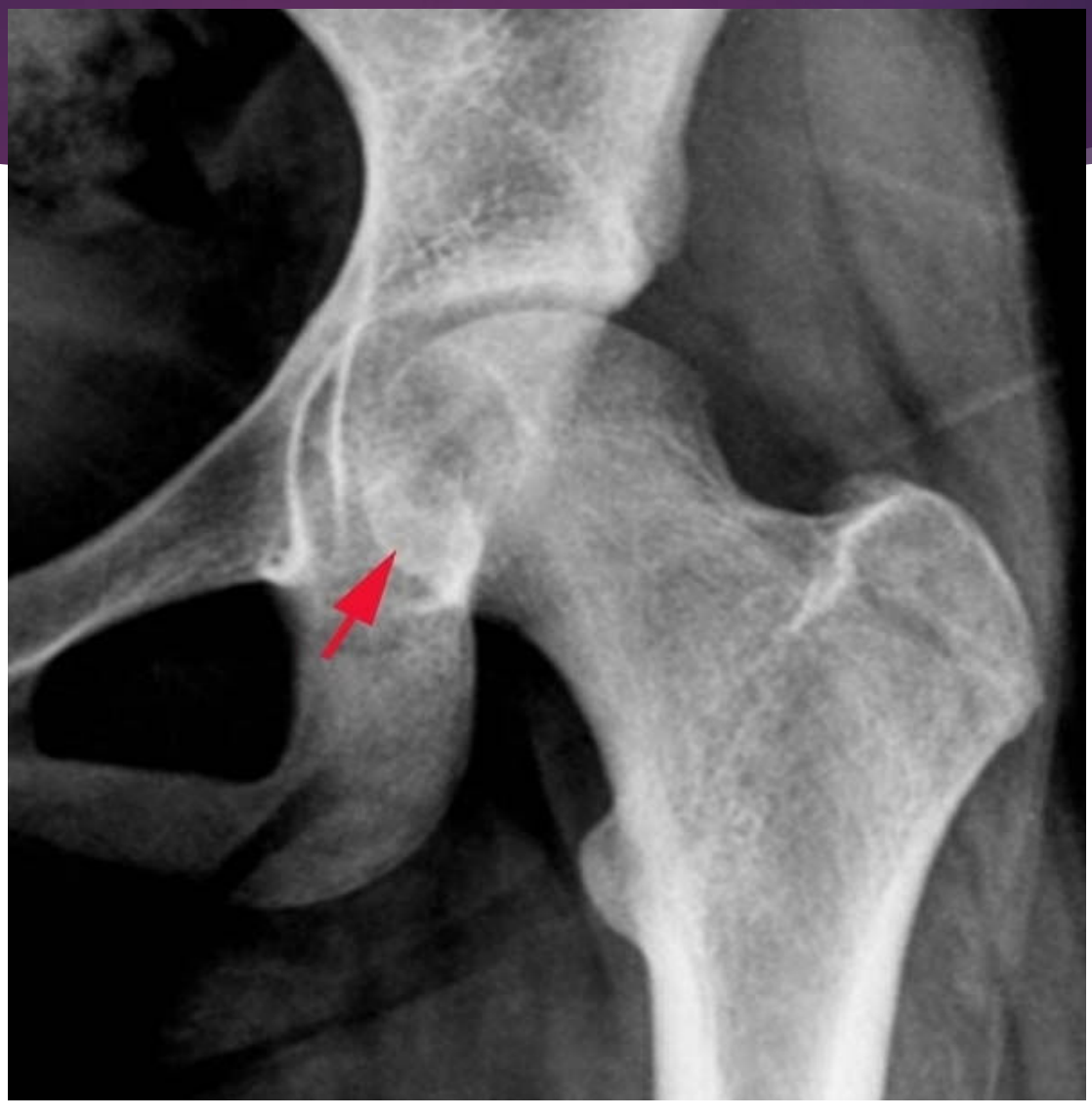
- Comprised of ovoid, round and spindle cells
- Nuclear clefts or grooves
- Osteoclast-like giant cells
- Hyaline cartilage seen focally
- Calcification around individual cells



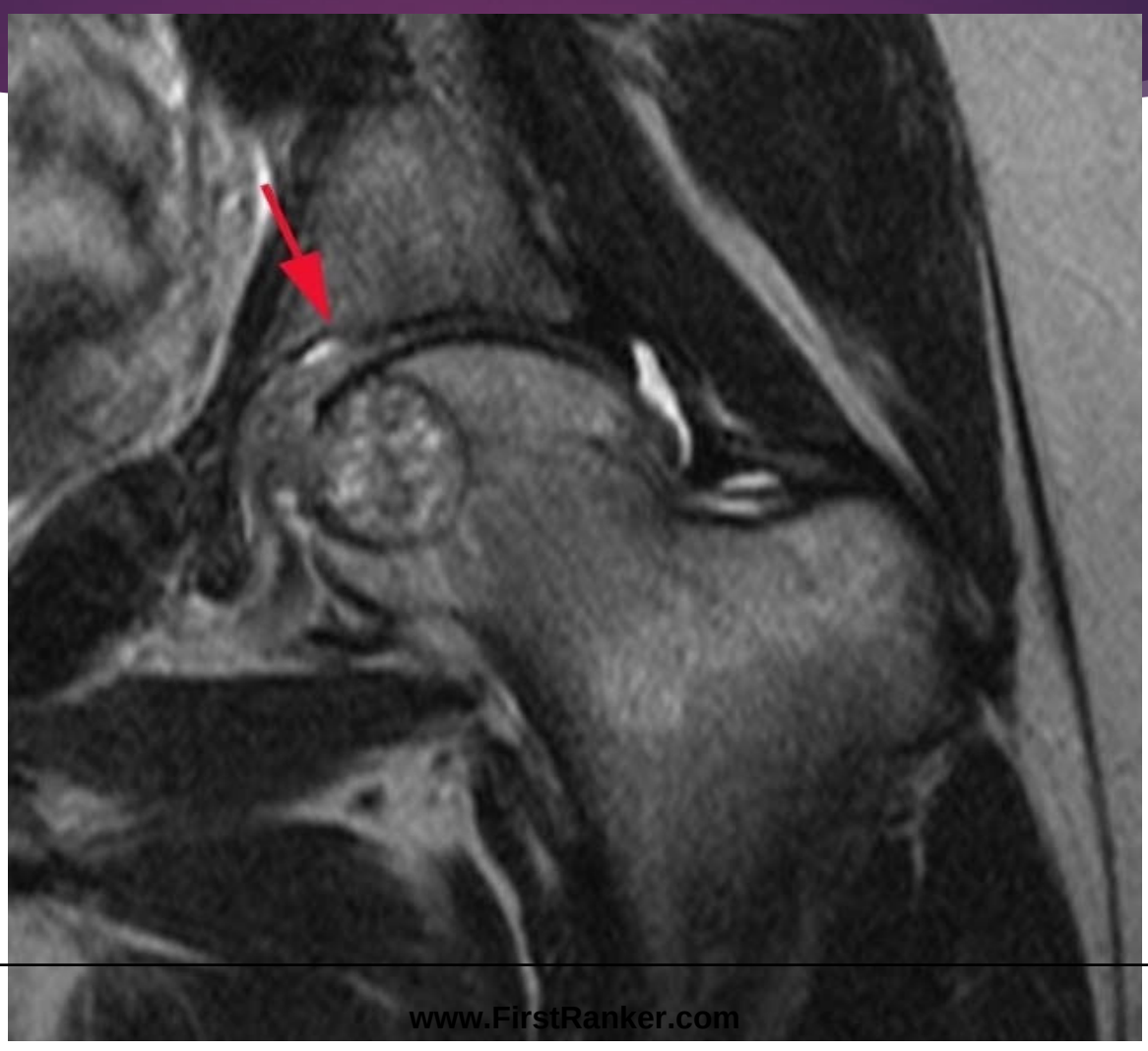
- Site :upper end humerus ,lower end femur, upper end tibia
- Clinical feature : pain ,swelling ,limitation of movememts
- X ray :lesion eccentric and involves less than one half of entire epiphysis .

  border of host bone sclerosis present, small puncture calcification present
- treatment :currettage and bone grafting .





On MRI



GIANT CELL TUMOR

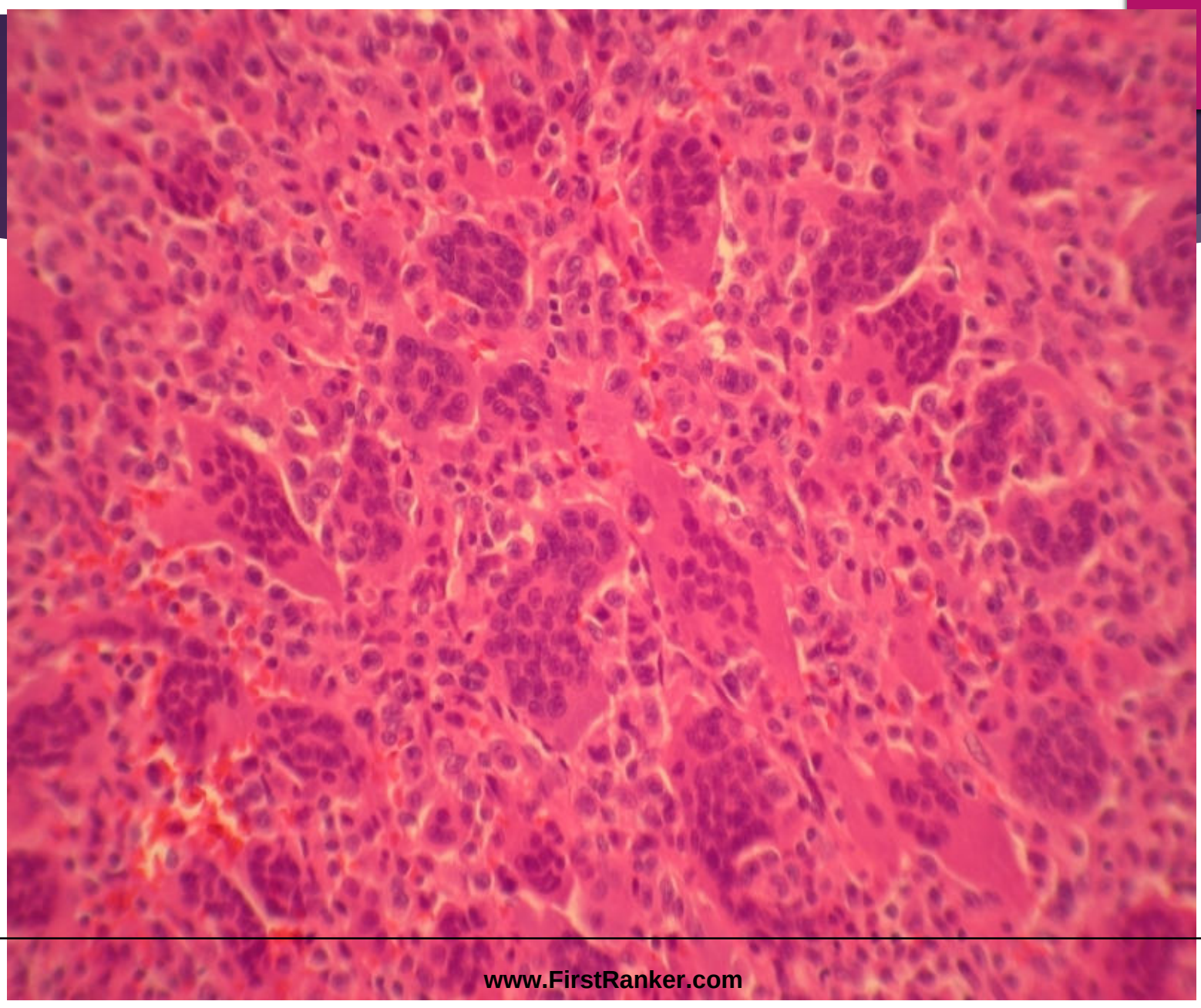
- It is an osteolytic lesion arising from epiphysis common in young adults .
- Incidence : 5 %
- Age : 20- 40 yrs (70 %cases)
- Sites : epiphyseal region of long bones , pelvis and sacrum.

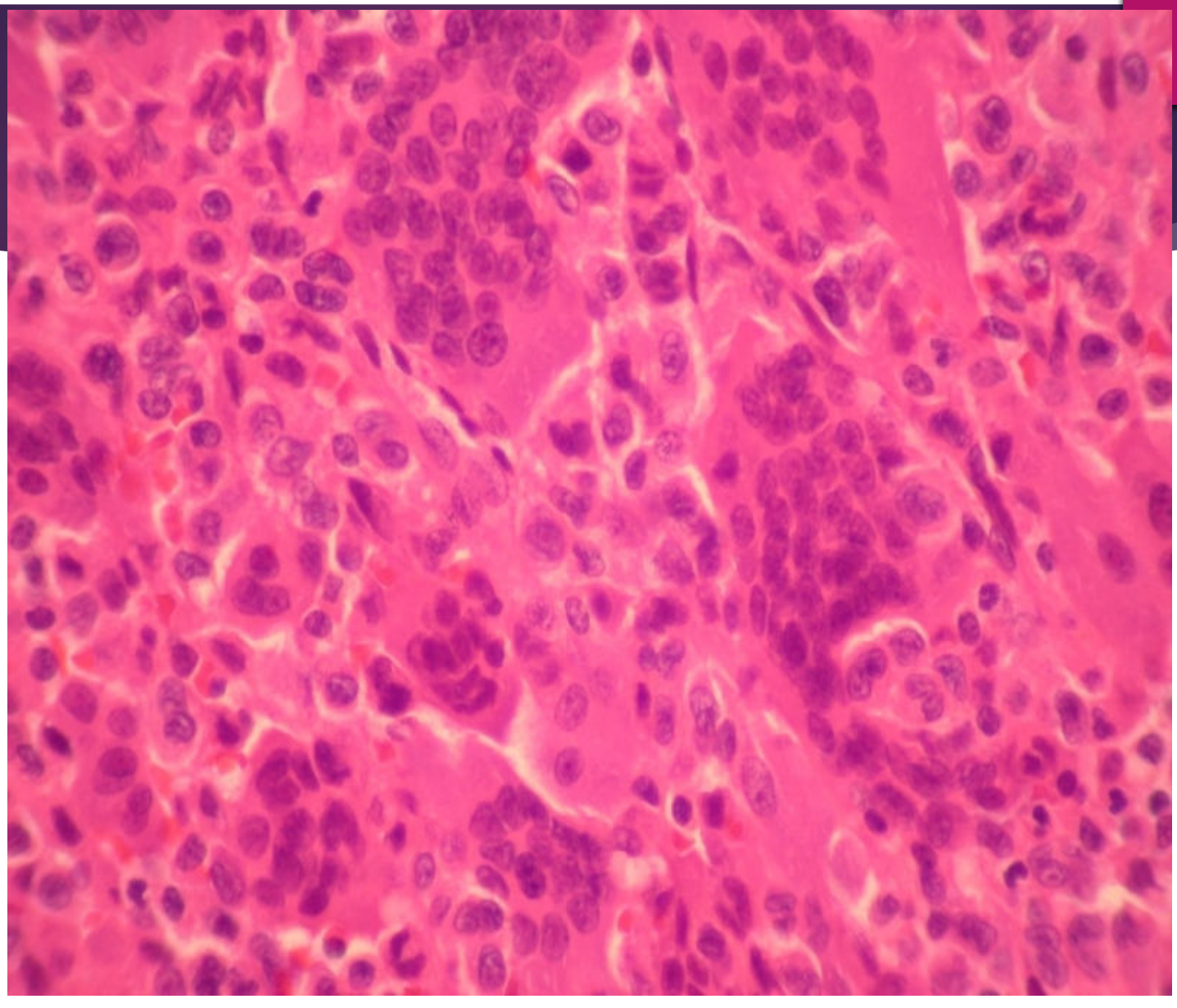
- Pathology : soft tumor very friable readily bleeding tissue contains cavitation and small cysts . Color of tumor varies from reddish to chocolate brown .
  Presence of abundant tumor giant cell and stromal hyperplasia is characteristic .
- C/F : chronic course , swelling , pain , pathological fracture .

egg cell crackling sensation is characteristic

Giant Cell Tumor

- Locally aggressive neoplasm
- Large numbers of uniformly distributed giant cells
- Background of plump mononuclear cells
- Differential diagnosis
  - Brown tumor, NOF,Fibrous histiocytoma, ABC, Osteosarcoma with prominent giant cells



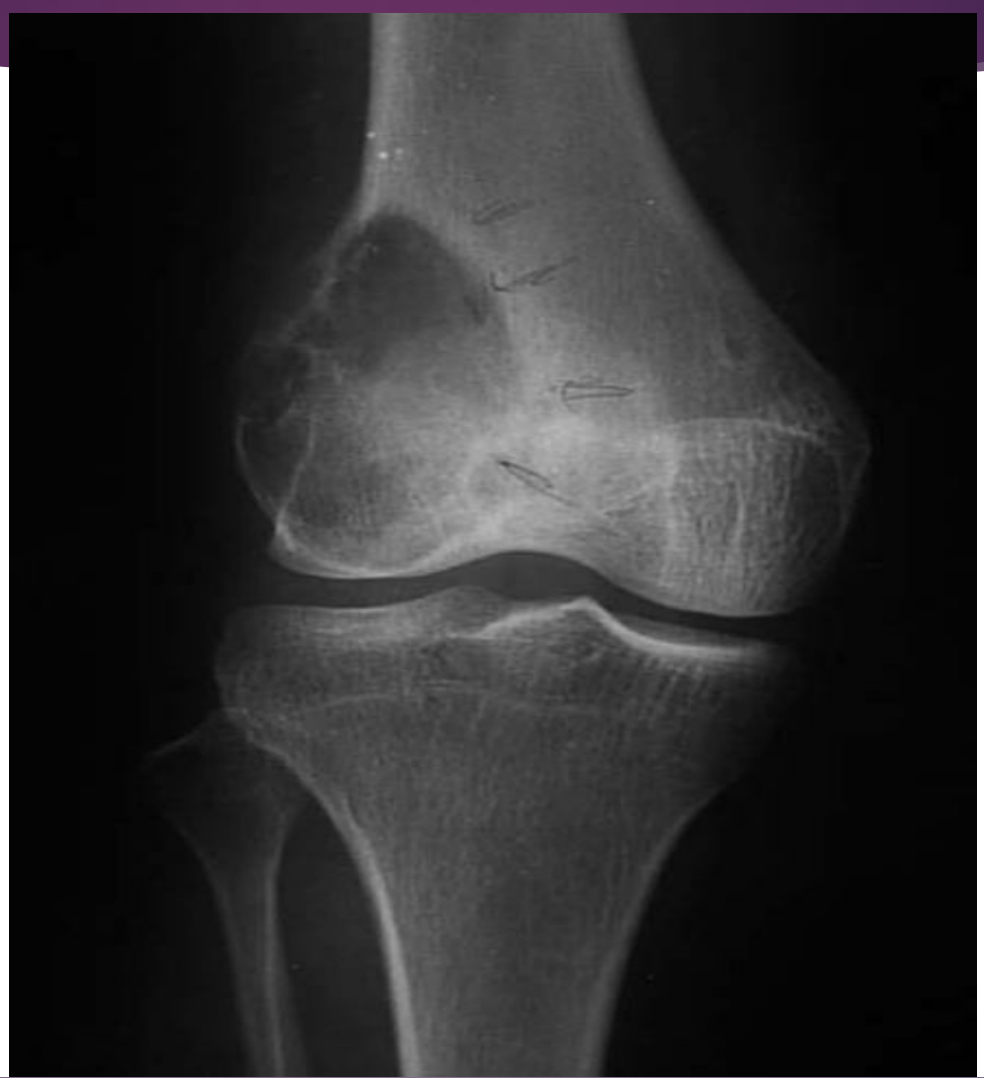


- X-ray : cortex is expanded and thin , osteolytic lesion ,no periosteal new bone formation .

Thin septa of bone traverse the interior and produce " soap bubble appearance"

- Treatment :

curettage and bone grafting – recurrence is 40 %



Treatment -

- Curettage and acrylic cementation
- Curettage and bone grafting
- Enblock excision for aggressive tumors

Benign Cystic lesions - Unicameral bone cyst

- Age : first 2 decades of life
- Sex preponderance : M > F [2:1]
- Location : long bones particularly metaphysis
- Types of UBC

1. Active cystic lesion - within 1cm of physis
2. Benign latent cysts – separated from epiphysis

Unicameral bone cyst (contd)

Pathophysiology

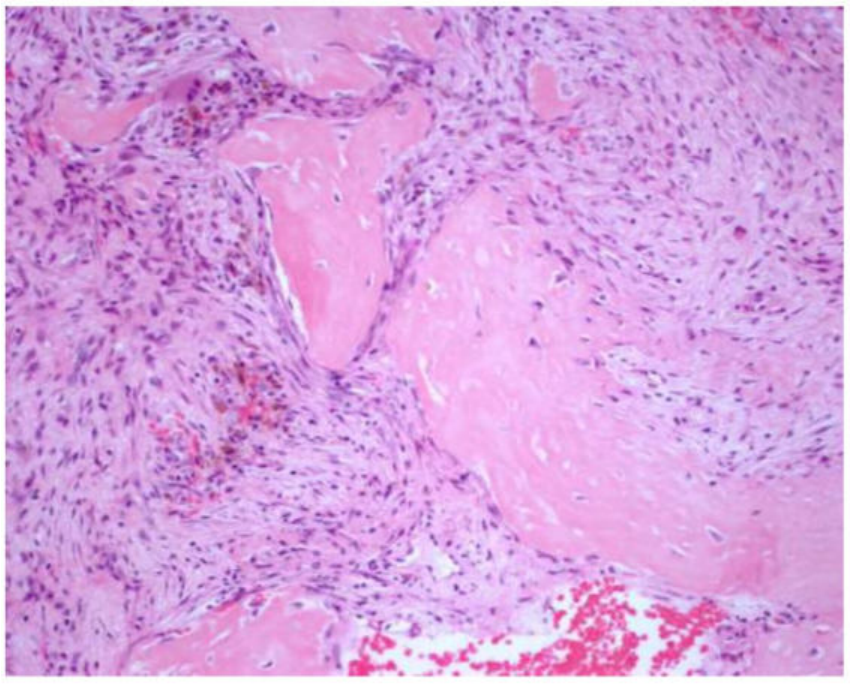
- Unclear
- Focal defect in metaphyseal remodeling
- Recent studies show increased activity of lysosomal enzymes in cyst fluid

Gerasimov AM et al(1991) Clin Orthop Relat Res.

Unicameral bone cyst (contd)

Pathology

- Grossly, bone shows fusiform expansion with thin cortex
- On microscopy, lined by fibrous membrane < 1mm thick, composed of fibroblast, mesenchymal cells and lymphocytes



Histology of unicameral bone cyst

Unicameral bone cyst (contd)

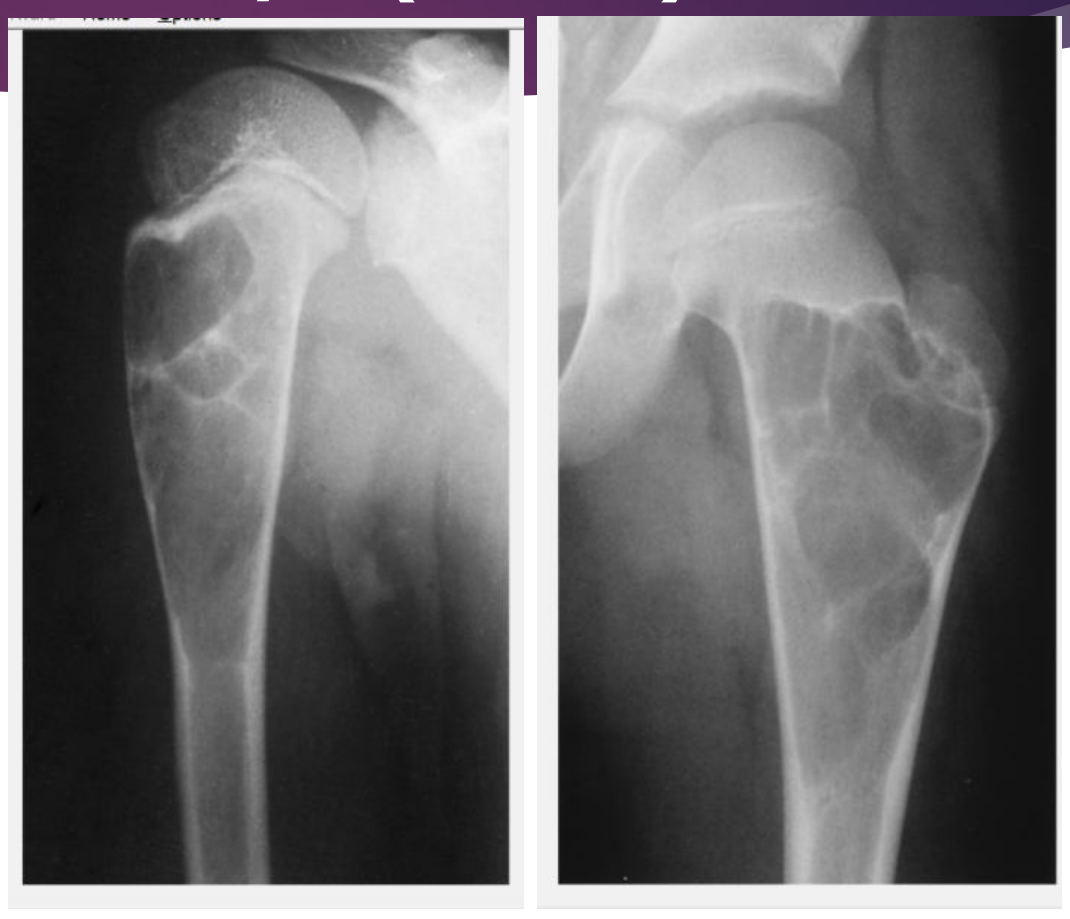
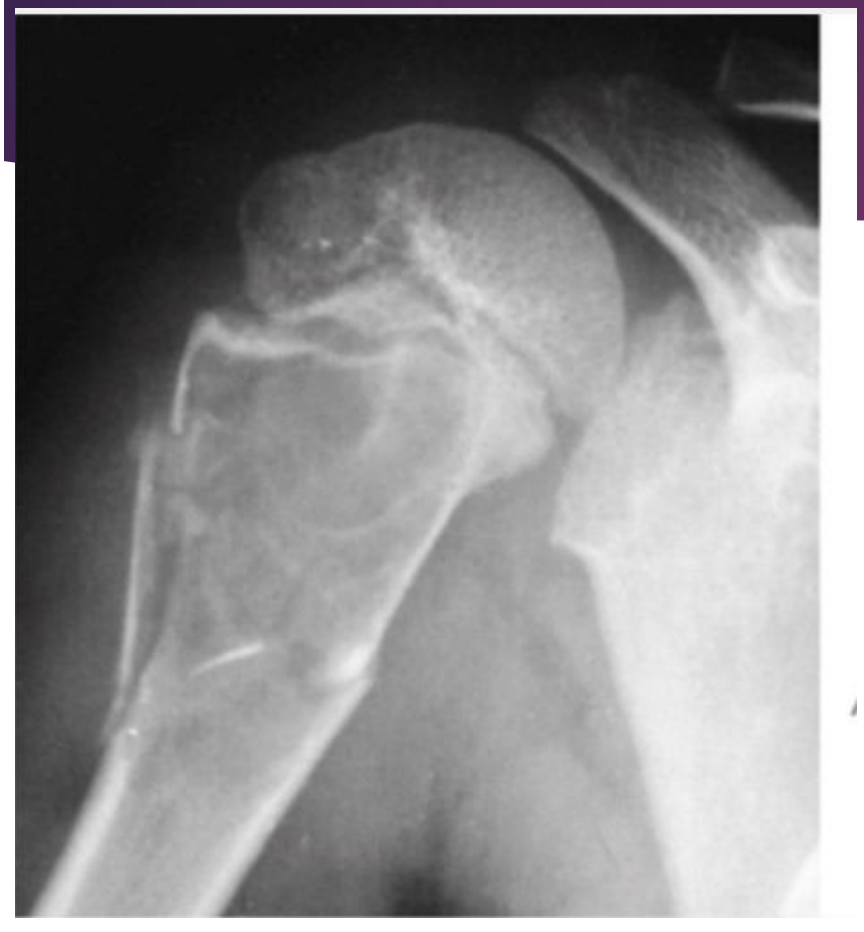


Fig1: simple bone cyst in proximal humerus in 6 yr old boy

Fig2: simple bone cyst in proximal femur in a 11 yr old girl

Source: Greenspan 4th ed ch 20



Simple bone cyst in proximal humerus with fallen leaf sign
Source: Greenspan 4th ed ch 20

Treatment modalities

Percutaneous:

- **Steroid injections-methylprednisolone acetate** (Scaglietti et al 1974 Clin Orthop Relat Res.)
- **Other fibrosing agents**
- **Trepenation** (Komiya et al 1993 Clin Orthop)
- **Autologous bone marrow injection**

Open procedure: sub-total resection with or without bone grafting

Aneurysmal bone cyst

- Age : usually in 1st to 3rd decade of life .
- Sex : slight female predominance.
- Location : any bone may be involved.

  Most common is proximal humerus

- Types :
- Primary : appears de novo following intraosseous A-V fistula.
- Secondary : results of cystic changes in GCT, osteoblastoma

Aneurysmal bone cyst (contd)

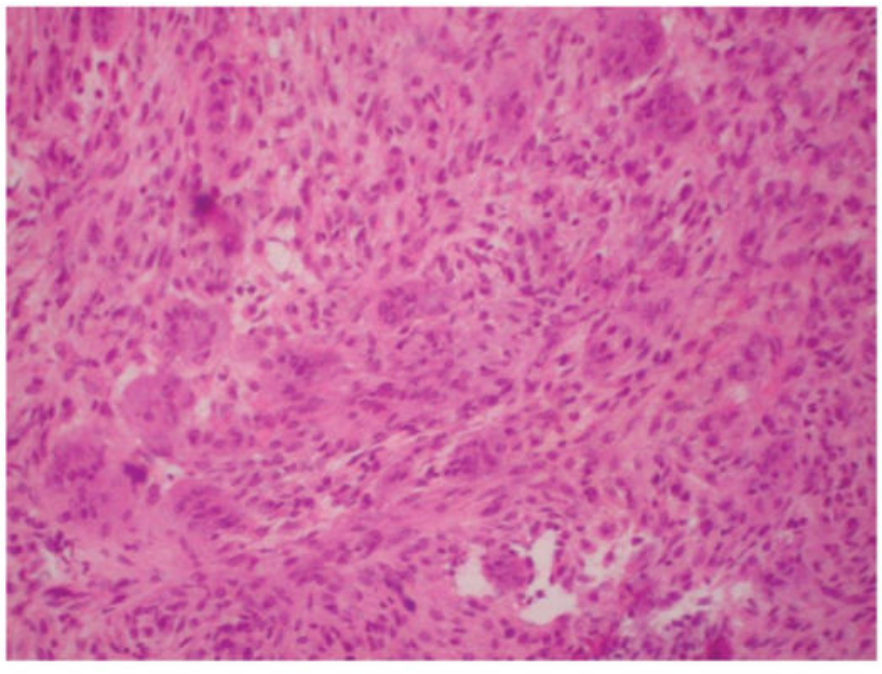
Pathophysiology:

- Unclear
- Local circulatory disturbance leading to increased venous pressure

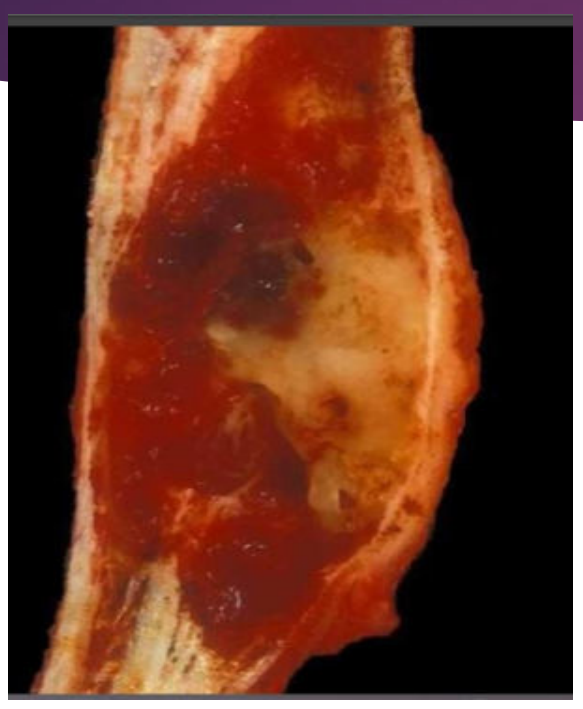
Aneurysmal bone cyst (cont.)

Pathology:

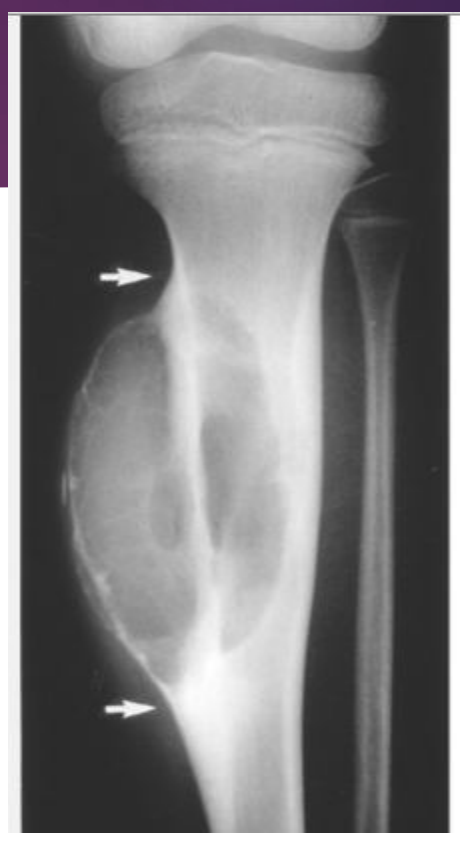
- **Grossly, cavitatory lesion with blood filled septate spaces**
- **On microscopy, cavernous spaces separated by cellular stroma – fibroblasts, histiocytes, giant cells**



Histologic appearance of aneurysmal bone cyst
Source: Campbell 13th ed page 913



Gross appearance of ABC
Source: pathpedia.com



Radiograph of tibia showing ABC
Source: Greenspan 4th ed ch 20

Aneurysmal bone cyst (contd.)

Other investigation:

- Bone scan : shows diffuse or peripheral tracer uptake with decreased uptake in centre.
- Ct scan : helpful in delineating the cyst
- MRI : shows multi loculated cavities & fluid level

Aneurysmal bone cyst (cont.)

Treatment :

- Curettage & bone grafting.
- Marginal resection is indicated in expendable bone
- Low dose radiation
- Other adjuvants- high speed burr, cement, phenol, argon beam coagulation, cryosurgery

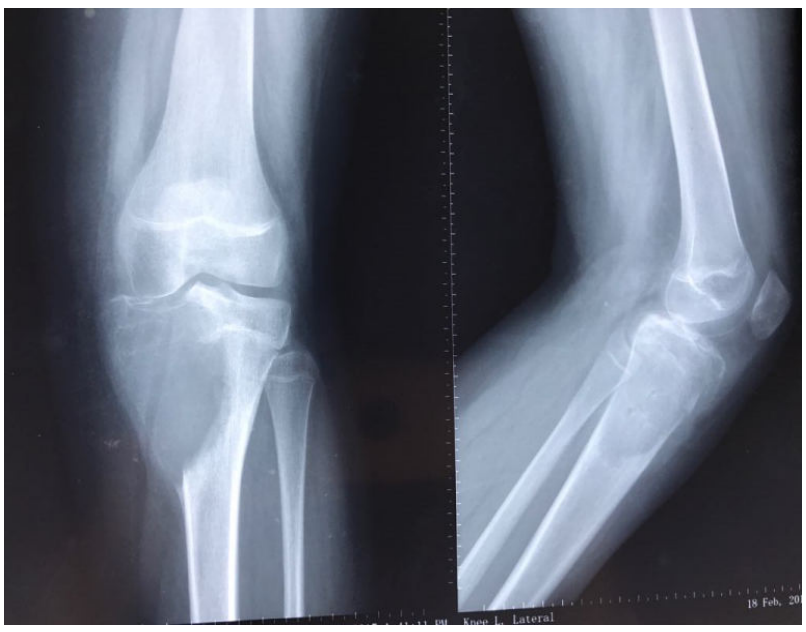
Aneurysmal bone cyst (contd)

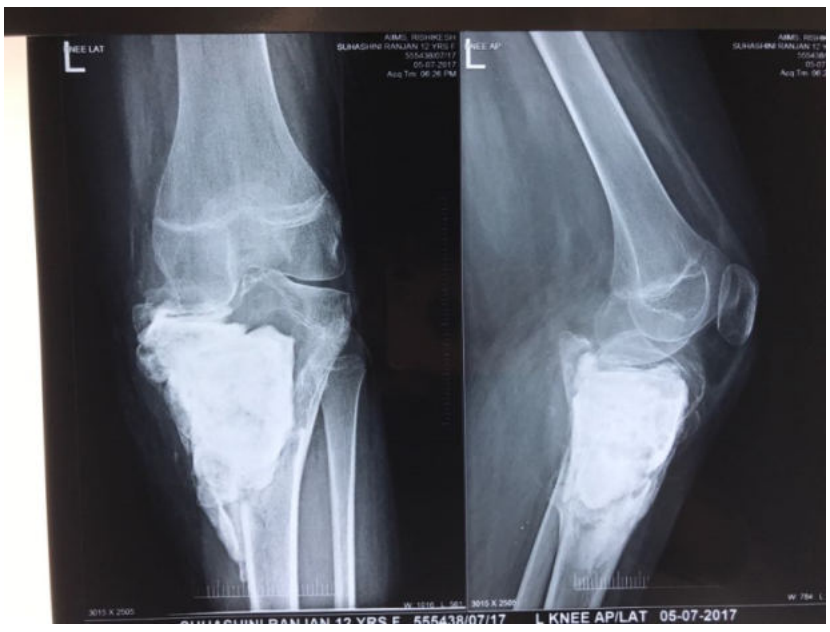
Alternative treatment:

- **Arterial embolization**
- **Sclerotherapy**
- **Curopsy** (Reddy et al Clin Orthop Relat Resp 2014)
- **Percutaneous doxycycline** (Fife et al J Lab clin Med 1997)
- **Denosumab**
- **Bisphosphonates**

Case 1:

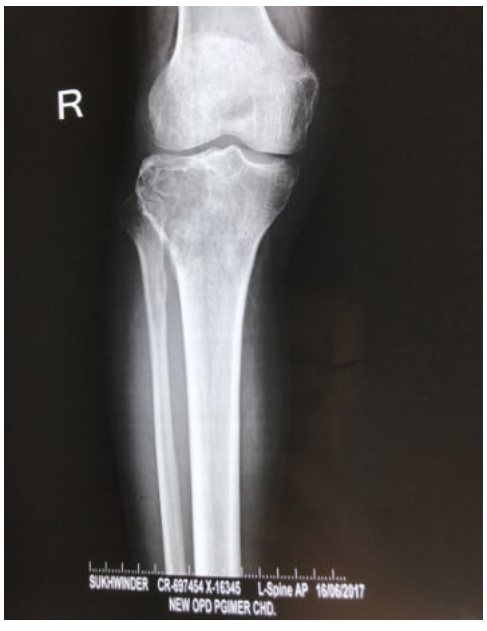
12 year old female presented with pain and swelling left knee for 3 months. Diagnosed as ABC and treated with curettage and bone cement.

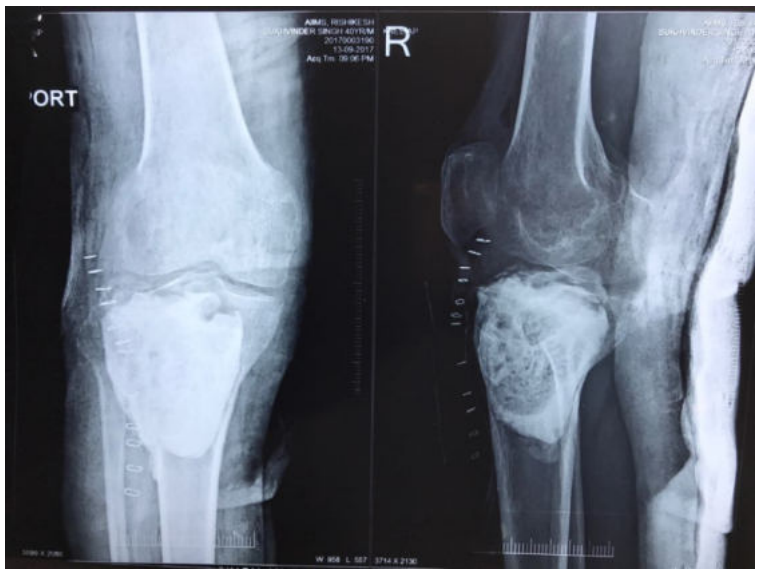




Case2:

40 year old male presented with complain of pain knee and swelling. First diagnosed as ABC treated with intra-lesional sclerosant.





FIBROUS DYSPLASIA

- Intrinsic defect of endo-chondral bone maturation results in incomplete or immature ossification , the absorbed bone is replaced by fibrous osseous tissue.
- Incidence : 0.8%
- Age : 3-15 yrs .
- Site : diaphysis or metaphysis of femur , tibia , fibula.

- Pathology : appearance of immature bone in a sea of fibrous connective tissue.

  immature dysplastic trabeculae are round, plump . Multinucleated giant cells +

- Clinical features : in wt. bearing bones marked deformity , pathological # +

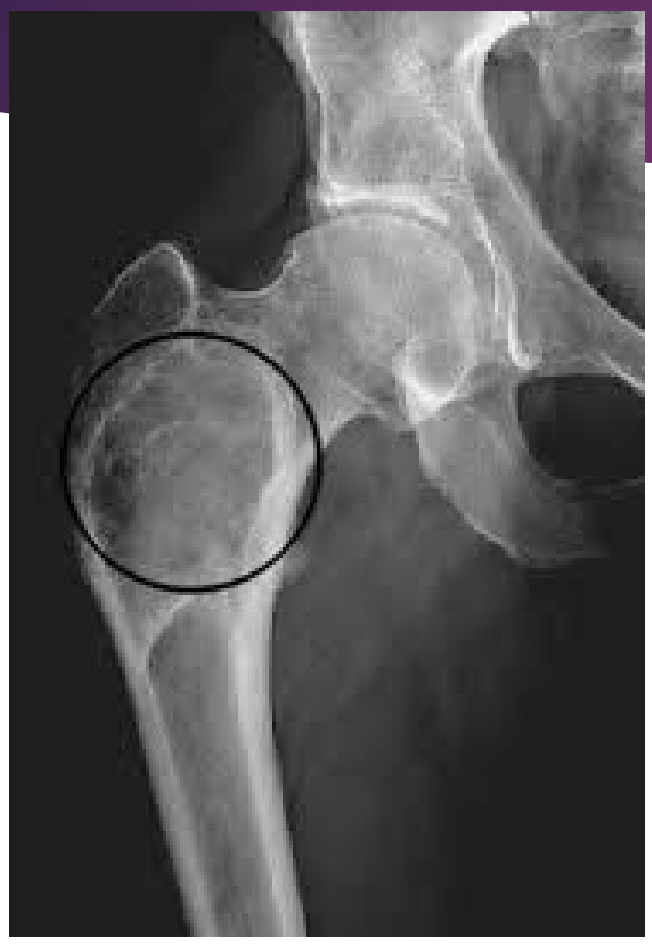
  " sheperd crook " deformity of proximal femur is commonest deformity (1-30 cms size).

  Albright syndrome – precocious puberty , fibrous dysplasia, brown skin patches.

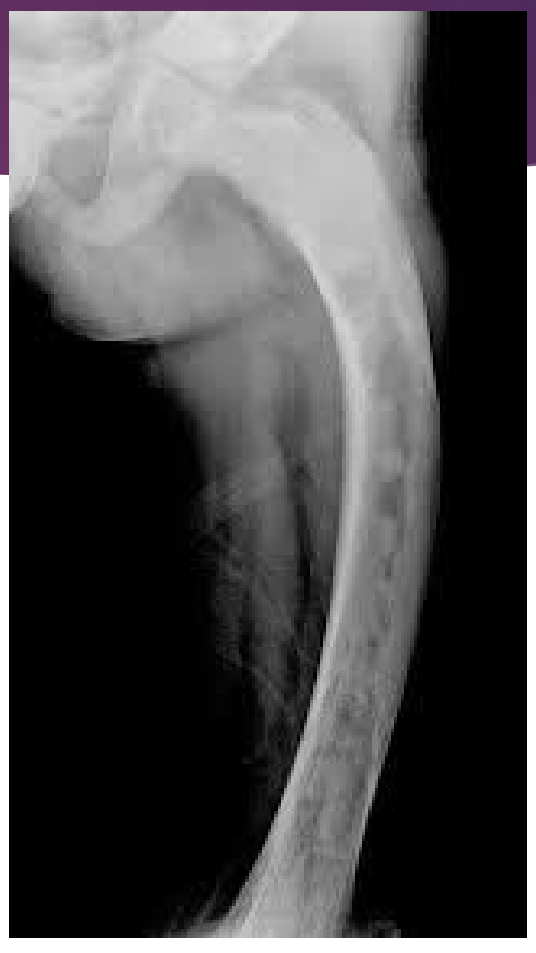
- X ray : cyst like lesion in diaphysis or metaphysis with endosteal scalloping with or without bone expansion.

  Uniform distribution of dysplastic trabeculae gives **ground glass appearance.**

- Treatment: Aim is to supplement dysplastic bone with bone cement and mechanical support by implants to produce strength to prevent deformity and fracture than to eradicate disease.



Ground glass appearance



Shepherd crook deformity

Conclusion

- **Benign cystic lesions can mimic aggressive and malignant lesions of bone and vice versa**
- **Despite multi-modal approach to diagnosis of bone lesions, HPE remains the standard method**
- **Standard treatment of benign cystic remains curettage/resection with bone graft despite advent of new treatment .**

Thank you

MCQ 1

Fallen leaf sign is a feature of

1. Giant cell tumor
2. Unicameral bone cyst
3. Fibrous dysplasia
4. enchondroma

MCQ 2

Egg crackling feature is diagnostic of

1. Giant cell tumor
2. Enchondroma
3. Fibrous dysplasia
4. Unicameral bone cyst

MCQ 3

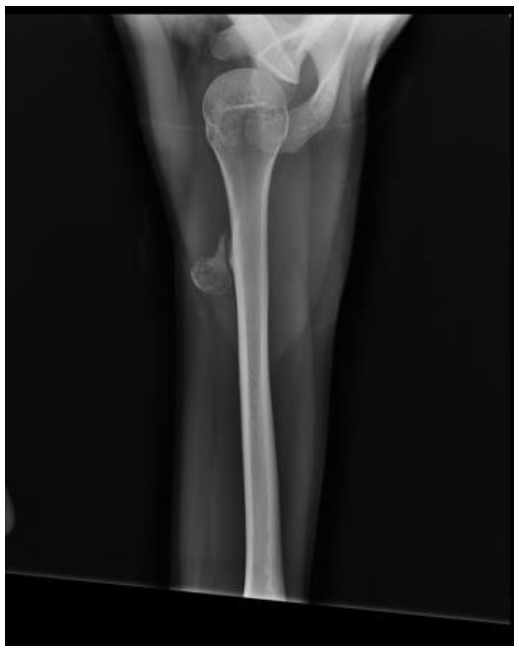
A 25 years old female presents to us with a swelling around knee. On histopathology there is abundance of giant cell in the backdrop of mononuclear cells. What is the most probable diagnosis

1. Fibrous dysplasia
2. Giant cell tumor
3. Aneurysmal bone cyst
4. Unicameral bone cyst

MCQ 4

Treatment of shown exostosis with no sign of deformity, neural or vascular compression and ceased growth is

1. Excision of tumor
2. Observation
3. Radical excision
4. Radiotherapy + chemotherapy



MCQ 5

A well demarcated bone forming tumor with well defined nidus on CT scan is diagnostic of

1. Osteoblastoma
2. Osteoid osteoma
3. Chondroblastoma
4. enchondroma