BENIGN LYTIC BONE LESIONS

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Contents

Introduction & Definition

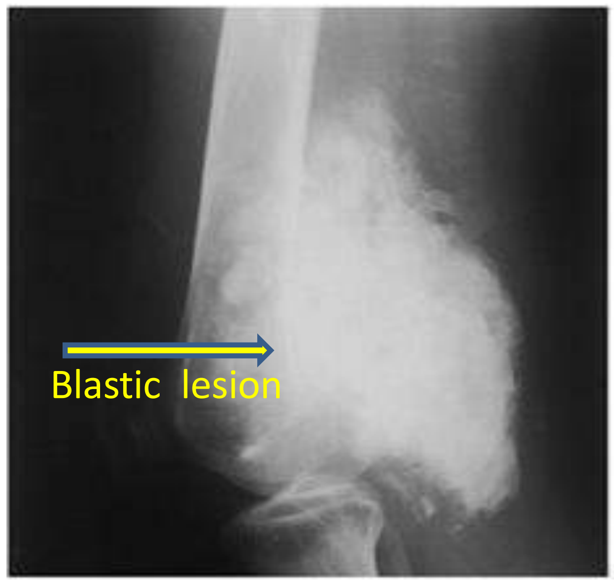
- **Lytic/ lucent bone lesion** refers to
  - A destruction of an area of bone due to a dzz process such as neoplasm or infection
- Benign or malignant
- Usually encountered as incidental finding on radiographs
- Reasonable diagnostic work-up can be prescribed

Biermann Js. Common benign lesions of bone in children and adolescents. J Pediatr Orthop. 2002;22(2):268-273

Radiological types of bone lesions

Lytic/lucent

Blastic lesion
(eg: osteosarcoma, Prostate Mets)



Mixed (Eg: Breast Mets)

Evaluation

- Complete Hx & Thorough P/E
- Labs & Imaging
- Biopsy

Approach to lytic bone lesions

- Age of patient
- Location/ Pattern of distribution of tumor
- Imaging
- Tumor grade/ staging
- Histology/ biopsy
- Treatment

Schajowicz F. Tumours and tumour like lesions of bone. New York: Springer. 1994.

Imaging evaluation of bone tumor

- **Staging studies**
  - Plain Radiograph
  - CT scan, Chest CT
  - MRI
  - Bone Scan

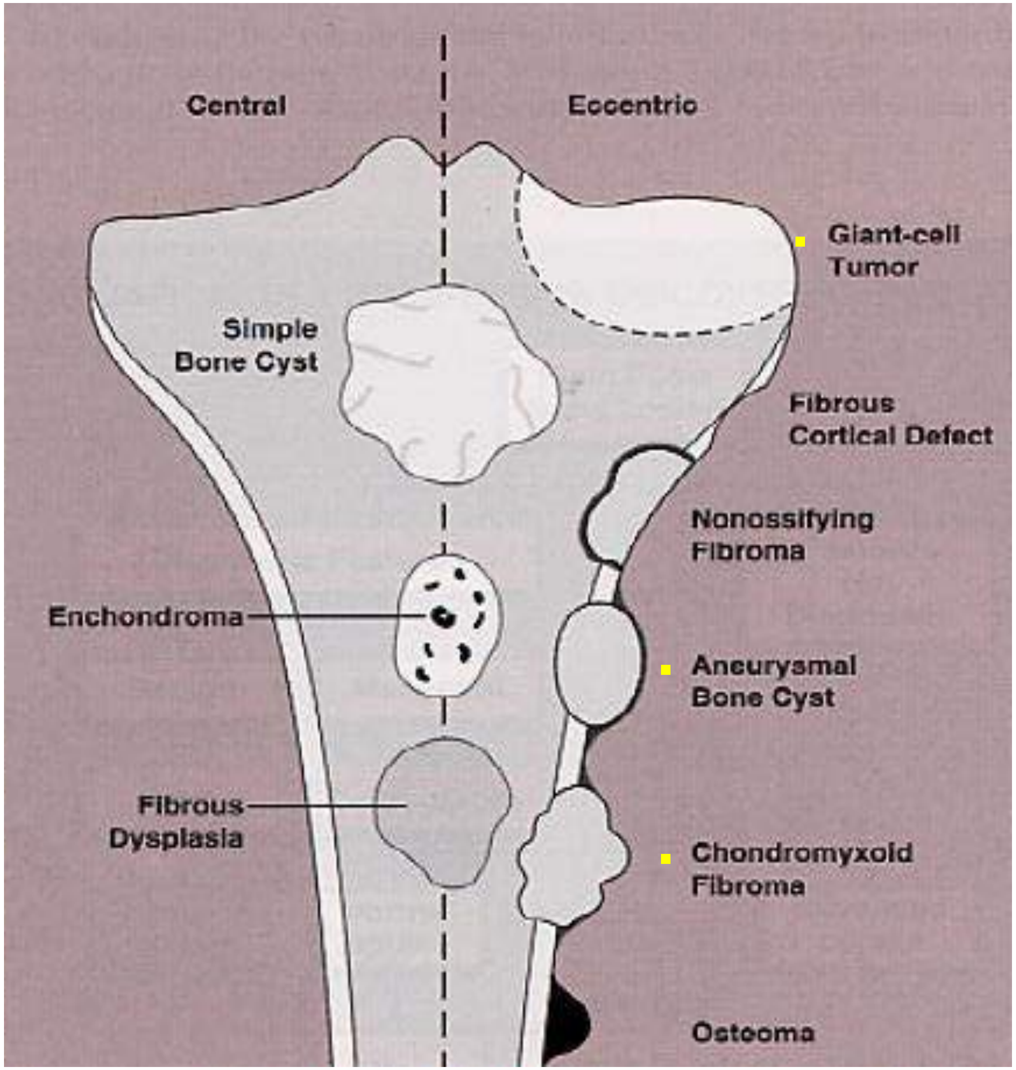
Radiographic evaluation

- Bone involved and position in the bone
- Pattern of bone destruction
  - Geographic, Permeative, Moth Eaten
- Presence of visible tumor matrix (Calcification)
- Internal trabeculations
- Cortical erosion, penetration, cortical expansion
- Periosteal reaction(Continuous or interupted)

Miller TT. Bone tumors and tumor-like conditions: Analysis with conventional radiography. Radiology.2008;246:662-674

Position in the bone

- Central
- Eccentric
- Cortical
- Juxtacortical (Periosteal/Parosteal)
- Soft tissue location



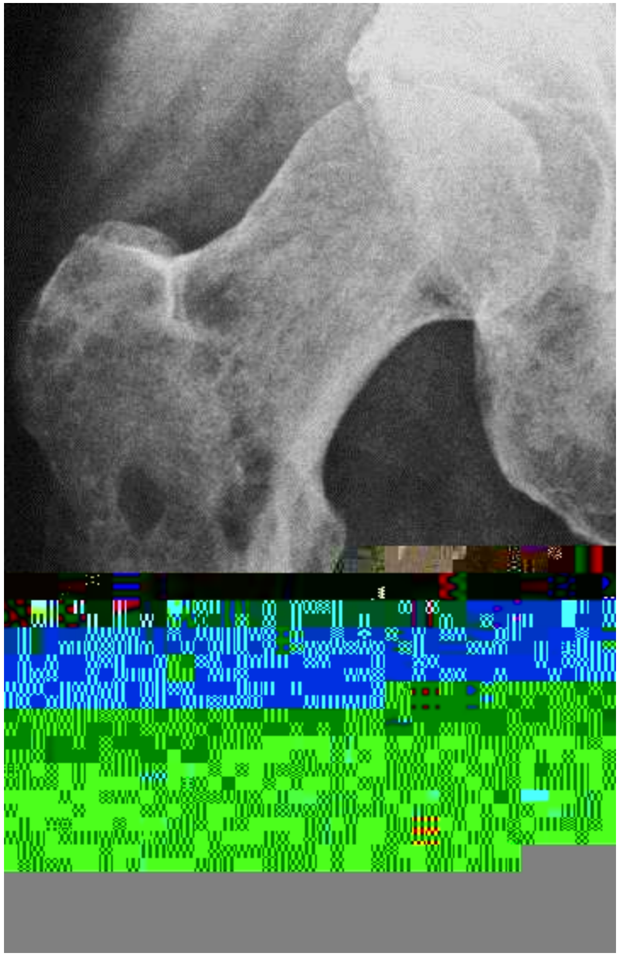
Geographic bone destruction

- Least aggressive pattern
- Slow growing lesion
- Clearly demarcated lesion
- Narrow zone of transition between tumor and normal Bone
- May have sclerotic margin
- Usually benign

Miller TT. Bone tumors and tumor-like conditions: Analysis with conventional radiography. Radiology.2008;246:662-674

Moth-eaten bone destruction

- More aggressive bone destruction
- Less well defined margins
- Wide zone of transition
- Multiple punched out holes(2-5mm)
- Malignant bone tumors, Osteomyelitis, E.G

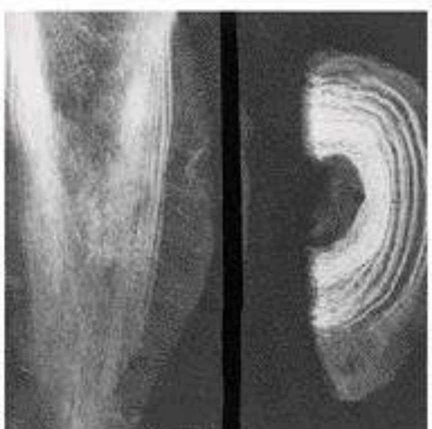


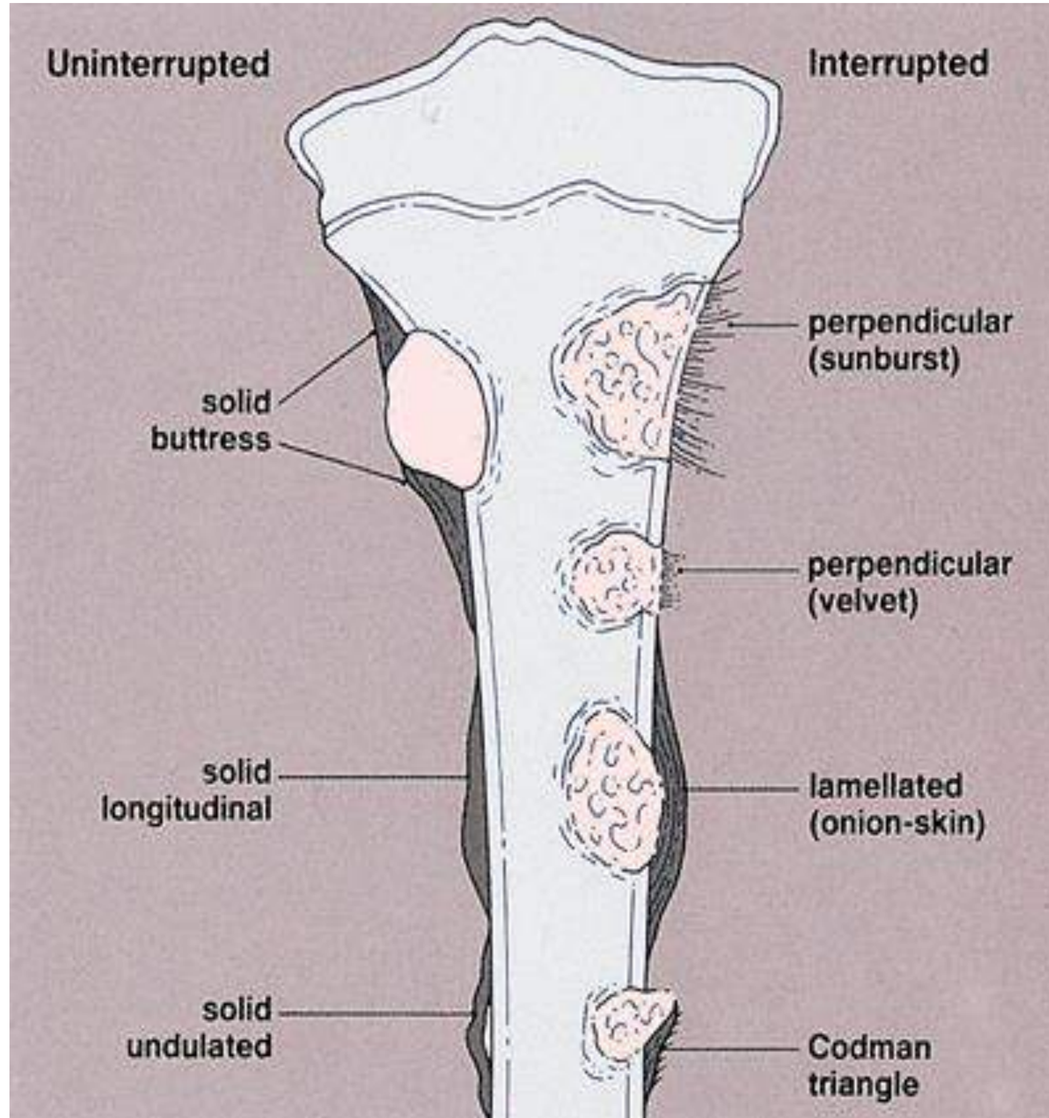
Types of periosteal reactions

sunburst pattern - osteosarcoma

Onion-skin type
Eg: E.sarcoma

Codman triangle





Further work-up

- MRI
- Whole-body nuclear medicine bone scan $\rightarrow$ for staging
- Biopsy (needle or open)

Benign tumors staging- Enneking

- **Stage-1 (Latent stage)**
  - Remains static or heals spontaneously Eg: NOF
  - No growth
  - Well defined margins
  - Thick reactive bone
  - Not expanding cortex

- **Stage-2 (Active)**
  - ✓Progressive growth but limited by natural barriers Eg: SBC
  - ✓Intracapsular
  - ✓Well defined margins
  - ✓Thin rim of reactive bone
  - ✓Cortical expansion with thinning

- **Stage -3 (Aggressive)**
  - ✓Progressive growth not limited by natural barriers eg: GCT
  - ✓Extracapsular
  - ✓Break through reactive bone/cortex

Enneking WF et al. A system for surgical staging of musculoskeletal tumor .Clin Orthop 1980:106:120

Differential diagnoses of osteolytic lesions

- **F**: Fibrous displasia or fibrous cortical defect
- **E**: Enchondroma
- **G**: Giant cell tumour
- **N**: Non-ossifying fibroma
- **O**: Osteoblastoma, Osteoid osteoma
- **M**: Metastasis/ myeloma
- **A**: Aneurysimal bone cyst
- **S**: Simple(Unicameral) bone cyst
- **H**: Hyperparathyroidism(Brown tumour)
- **I**: Infection(osteomyelitis)
- **C**: Chondoblastoma/chondromyxoid fibroma

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Osteoid Osteoma

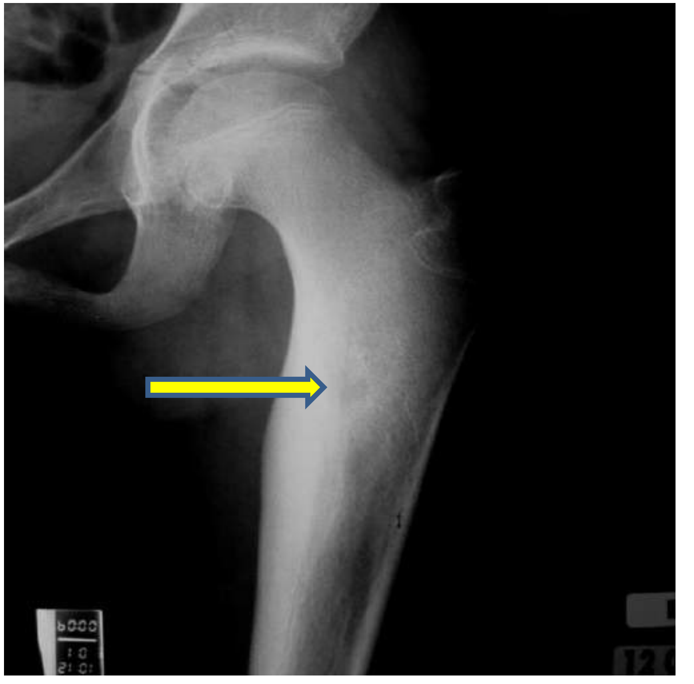
- A small, discrete and painful benign bone lesion
- Consists of a central nidus that represents neoplastic tissue
- The nidus is ≤ 2cm , surrounded by reactive bone
- 10% of benign bone tumors, 3% of all bone tumors
- 75%-80% of patients < 25 y.o, 3:1 M:F ratio
- Lower limbs mostly affected (>50%)
- Spine~ 10-15%, Hand ~ 5-10%, Foot < 5%

Torriani M et al. percutaneous radiofrequency treatment of osteoid osteoma. Pediatr Radiol,2002.

Osteoid Osteoma – S&S

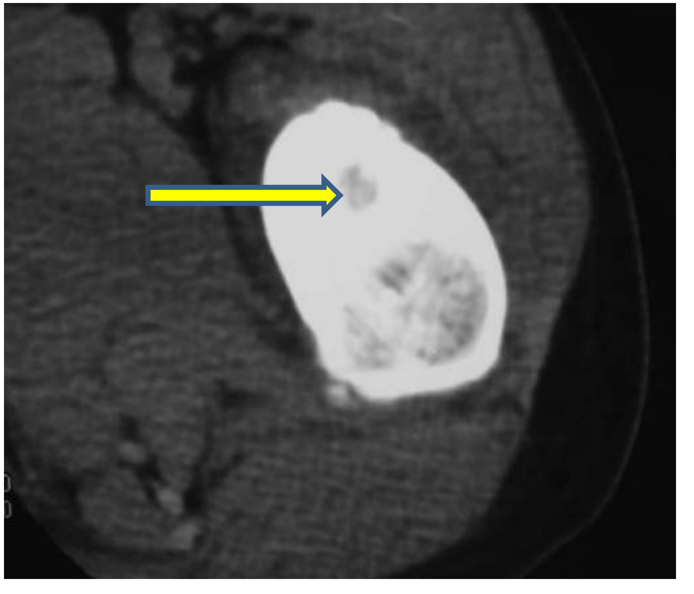
- Progressive pain of affected bone
  - Worst at night, relieved by NSAID
- Proximity to a joint
  - Effusion, contracture, limp an/or muscle atrophy
- Vertebral lesions may cause a scoliosis

Osteoid Osteoma- Radiographs



Plain X-Rays:

- Lucent nidus
  - Less than 2cm
  - Surrounded by a zone of sclerosis



CT Scan:

- Well defined nidus with a smooth peripheral margin

Osteoid Osteoma-ttt

- Nonoperative
  - NSAID- 50% can be treated with NSAIDs alone
- Operative
  - CT guided percutaneous radiofrequency ablation (RFA)
    - 90% successful/minimal risk
- Open surgical resection with curettage
- Recurrence rate ~ 10-15%

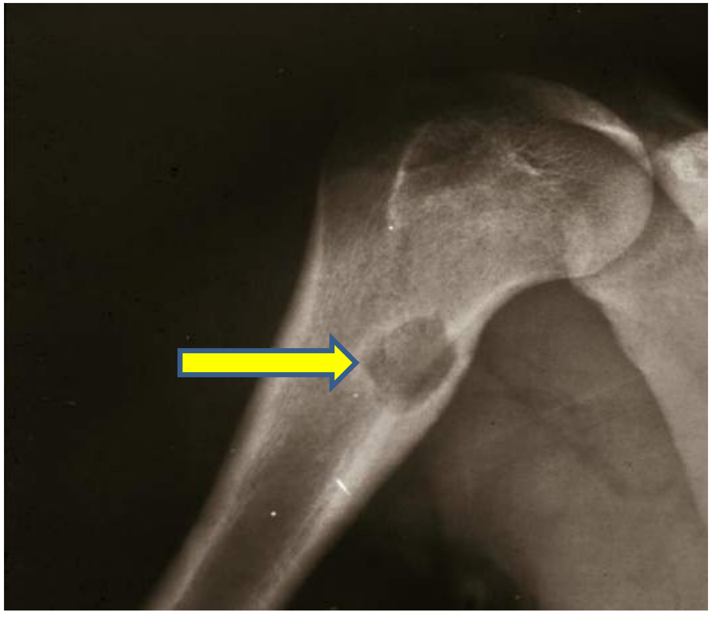
Rosenthal DI et al. percutaneous radiofrequency coagulation of osteoid osteoma compared With operative treatment. Bone Joint Surg Am.1998;80(6):815-821.

Osteoblastoma

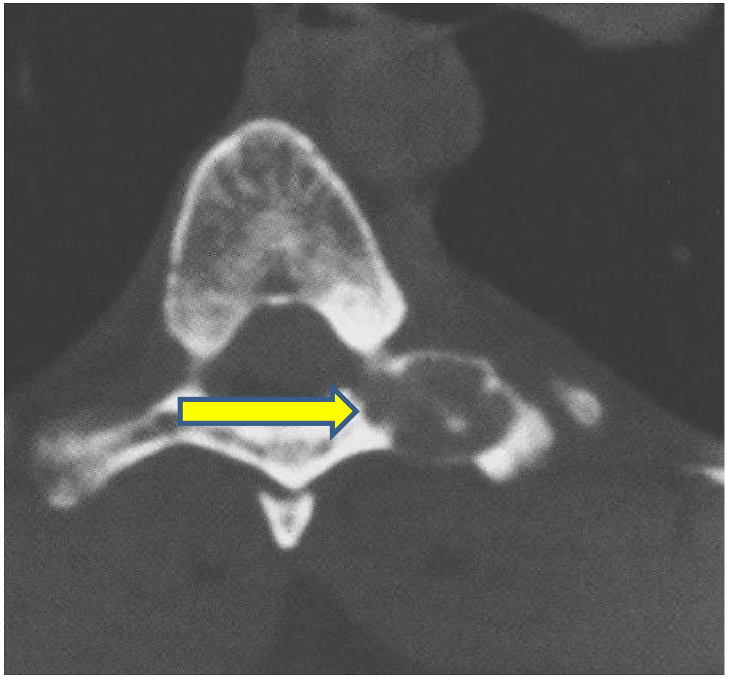
- Benign osteogenic neoplasm with aggressive growth pattern
- Histologically similar to osteoid osteoma but is a larger size and grows progressively
- 1% of benign bone tumors, M: F ratio 2:1
- Age: 80% of pts are between 10 and 30 y.o
- Sites: Spine (40%),Long Bones (30%)
- Pain not be relieved by NSAIDs
- Spinal lesions→ scoliosis and neurological manifestation

Ropper AE et al. primary vertebral tumors: a review of epidemiologic,histological and imaging findings; 2011

Osteoblastoma-Radiographs



- ✓ Geographic pattern of bone destruction
- ✓Eccentric
- ✓Sclerotic Margin
- ✓No clear mineralization on X-ray



- ➢ Geographic lesion
- ➢Posterior elements of spine
- ➢Bone is expanded- “Egg Shell” appearance
- ➢Mineralization present in lesion

Unicameral bone cyst(UCB)

- Arises in <30 y age group
- Begins within growth plate
- Extends into diaphysis
- Centrally located within a long bone
- Asymptomatic, until path fx
- X-ray : **Fallen-leaf or Fallen-fragment sign**

UCB path #→ fallen fragment sign

Kadhim M. Treatment of unicameral bone cyst: systematic review and metaanalysis;J Child Orthop.2014

UCBC- Treatment

- Path fxs - Immobilize
- Drainage
- Steroid injection

Steroid injection in the cyst

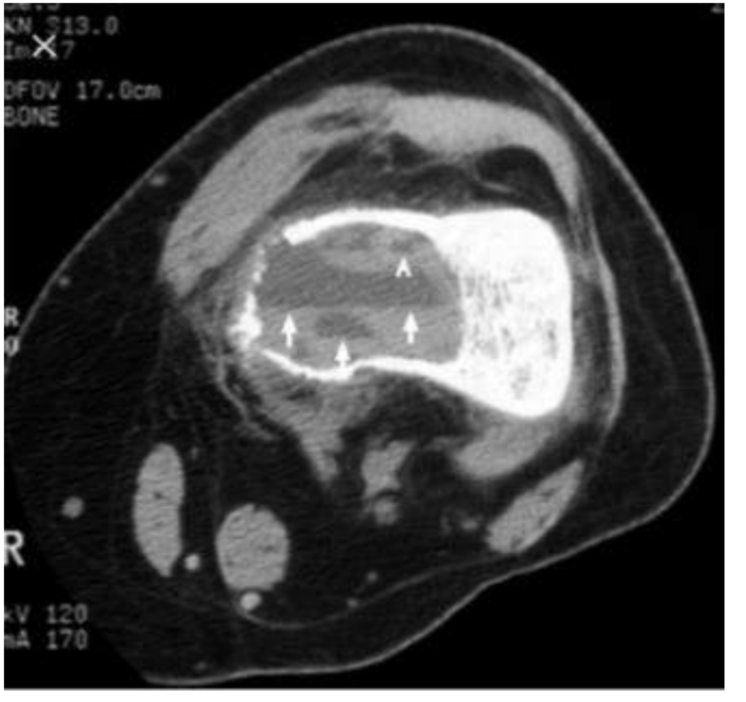
Aneurysmal bone cyst- ABC

- Expansile , blood filled cystic cavity
- **Etiology:**
  - Primary ABC (65-99%): Unknown, t(16;17)
  - Secondary ABC (1-35%): associated with other tumors(GCT,NOF ...)
- **C/F**
  - 5-20 yrs, 60% in females
  - Pain
  - site: femur and tibia(80%), T and L- spine

Cottalorda J et al. Modern concepts of primary aneurismal bone cyst. Arch orthop trauma surg. 2007;127(2):105-114

ABC

- **CT**: “blood filled sponge‟, fluid levels
- **MRI**: Multiple cysts: Fluid – fluid levels
- **Histology:**
  - Multiple blood filled sinusoid, cavernous spaces
  - Solid , numerous multinucleated giant cells
- **Rx:** Surgical curettage
- Recurrence rate is high up to 30%



ABC femur with fluid-fluid level

Cottalorda J et al. Modern concepts of primary aneurismal bone cyst. Arch orthop trauma surg. 2007;127(2):105-114

Enchondroma

- Benign indolent intra-medullary hyaline cartilage neoplasm
- **AGE:** Most common between 2nd & 4th decades
- Asymptomatic but commonly fractures
- Well-defined with narrow zone of transition
- **SITES:** Phalanges /metacarpals, followed by femur, humerus and ribs
- **RADIOGRAPHS**
  - well circumscribed distinct area of rarefaction, expands the cortex

Shimizu K et al. Enchondroma of the distal phalanx of the hand. J Bone Joint Surg Am 1997

Enchondroma…

Types

- Solitary Enchondroma
- Multiple Enchondromatosis
  - Ollier's Disease
  - Maffucci Syndrome: multiple Enchondromas and soft tissue hemangiomas

Treatment

- Asymptomatic lesions - follow-up with serial radiographs
- Symptomatic – Biopsy to r/o any malignancy
- Curettage and bone grafting
- Pathologic fxs are allowed to heal with closed ttt, curettage is then required after fx healing

Haase SC. Treatment of pathologic fractures. Hand clin 2013;29:579-84

Giant cell tumor: GCT

- Incidence: 5% of biopsied primary bone tumors
- Adults epiphysis-metaphysis of long bone
- Radiographs
  - Lytic lesion in E/M extending into subchondral bone
  - Thinning of cortex
  - Honey comb appearance
  - Soap bubble appearance

Soap bubbles

GCT- Campanacci Grading

- **Grade I:** Tumour associated with well defined margins and thin rim of mature bone
- **Grade II:** Tumour is well defined but has no radiopaque rim
- **Grade III:** Tumour has indistinct borders

Grade I

Grade II

Grade III

GCT- ttt

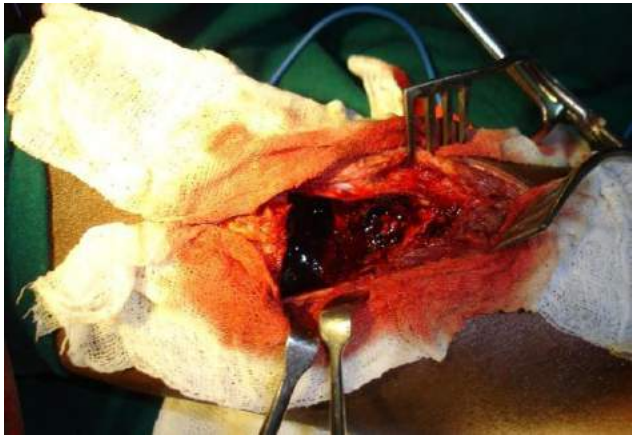
Operative

- Extended curettage and reconstruction
  - Adjuvants to destroy tumor cell (Phenol, liquid nitrogen)
  - Bone grating (autograft, allograft), PMMA
- Enbloc resection: Endoprosthesis, Arthrodesis
- Amputation
  - Significant cortical break through
- Follow-up is essential for at least 5 y
  - Check for lung mets especially in recurrent cases

Jewell et al. Giant cell tumor of bone with a solitary pulmonary metastasis. A case report. J Bone Joint Am.1964 Jun;46:848-852

GCT- ttt

Curettage

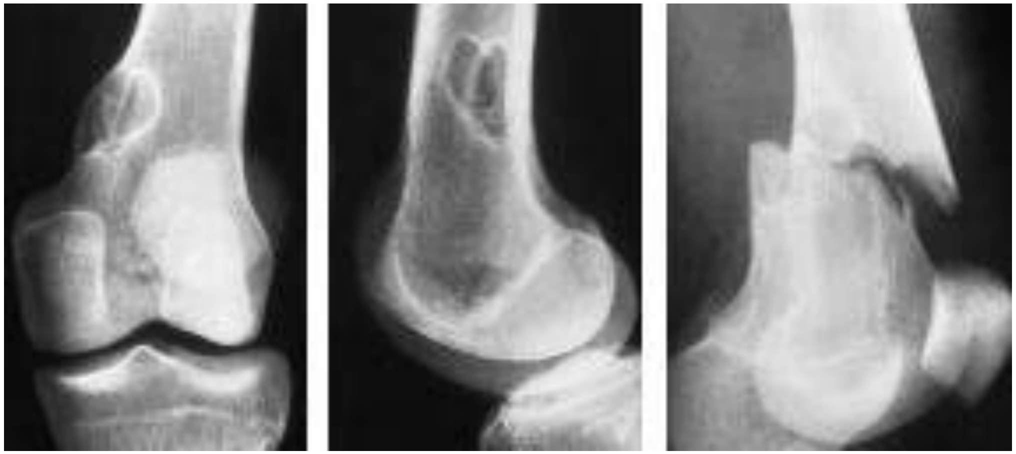


Adjuvant Therapy

Enbloc resection & Endoprosthesis

Fibrous lesions

Nonossifying fibroma



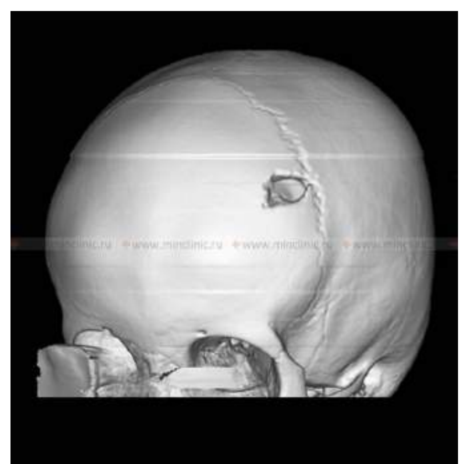
Fibrous dysplasia

Shepherd's crook appearance

Polyostotic Fibrous dyspalsia

Eosinophilic granuloma

- One of langerhan’s cell histiocytosis presentations
- Presents in children and young adults
- Great mimicker- appears similar to many lesions
- Radiologically manifests as "punched-out" lytic lesions
- Often seen in the skull, ribs
- Will cause vertebra plana in the spine, usually thoracic
- RX- self limiting lesion




Eosinophilic granuloma …

- Hand -Schuller-christian dzz (HSC)
  - Form of langerhan's cell histiocytosis
  - Chronic, disseminated form with bone and visceral lesion
  - RX- extended curettage , steroid injection , chemotherapy
- Letterer-Siwe dzz (LSD)
  - Fatal form that occurs in young children

Lieberman PH et al. A reappraisal of eosinophilic granuloma of bone, hand-Schuler-christian syndrome and letterer-siwe syndrome, medicine 1969 Sept;48(5):375-400

Principles of mgt of lytic bone lesions

- Benign asymptomatic tumors
  - If certain observe
  - If in doubt biopsy
- Benign symptomatic or enlarging tumors
  - Biopsy
  - Excision/ curettage
- Suspected malignant tumors
  - If primary admit for work-up
  - Staging
  - Choices: Limb sparing surgery, adjuvant therapy or amputation

Schajowicz F. Tumours and tumour like lesions of bone. New York: Springer. 1994.

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