Giant Cell Tumor

- Locally aggressive, rarely metastasizing tumor of neoplastic mononuclear stromal cells with macrophages and osteoclast-like giant cells
- Malignant giant cell tumor of bone (GCTB) (< 10% of cases)
  - Primary malignant GCTB: malignant nodule within benign GCTB
  - Secondary malignant GCTB: secondary to treatment of initially benign GCTB
    - » Almost all cases are related to radiation therapy
    - » Recurrent disease may be isolated to soft tissues and show calcification
- Also known as osteoclastomas or benign fibrous histiocytomas but those terms are no longer recommended

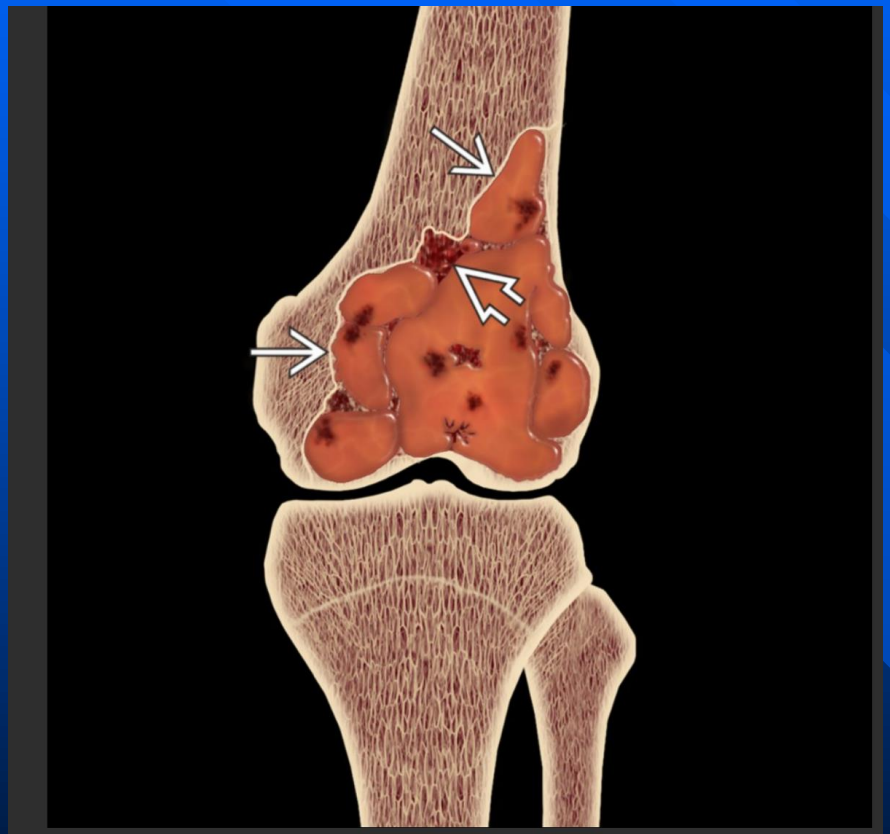
Clinical issues

- Peak incidence at age 20-50 (80%)
- High recurrence rate with marginal resection (curettage): 15-50%
- Denosumab therapy in unresectable cases or as neoadjuvant therapy
- Absence of early mineralization following therapy should lead to concern for misdiagnosis of primary malignant GCTB or other malignancy
- Rarely seen in skeletally immature patients
  - Distribution and behavior same as in adults

Imaging

- Originates in metaphysis, extends into epiphysis, often to subarticular end of bone
  - Distal femur > proximal tibia > distal radius
  - Axial skeleton: sacrum > other vertebrae
  - Vertebral body > > posterior elements
- Radiographic appearance usually unique
  - Combination of location, narrow transition zone, and nonsclerotic margin suggestive of GCTB
  - Completely lytic lesion in majority of cases
  - ± cortex breakthrough/soft tissue mass (33-50%)
- T1 MR: low to intermediate signal intensity (SI), inhomogeneous
- T2/STIR MR: inhomogeneous high SI with areas of
- ↓ SI within lesion (63%), including hemosiderin rim
- Aneurysmal bone cyst-like changes (14%)
- Nuclear Medicine Findings
  - Bone scan: typical donut appearance (↑ uptake peripherally with central photopenia)
  - FDG PET: ↑ uptake
  - Can be used to monitor response to therapy in unresectable cases

Extension to the subchondral bone (in 84-99% within 1 cm of the articular surface)



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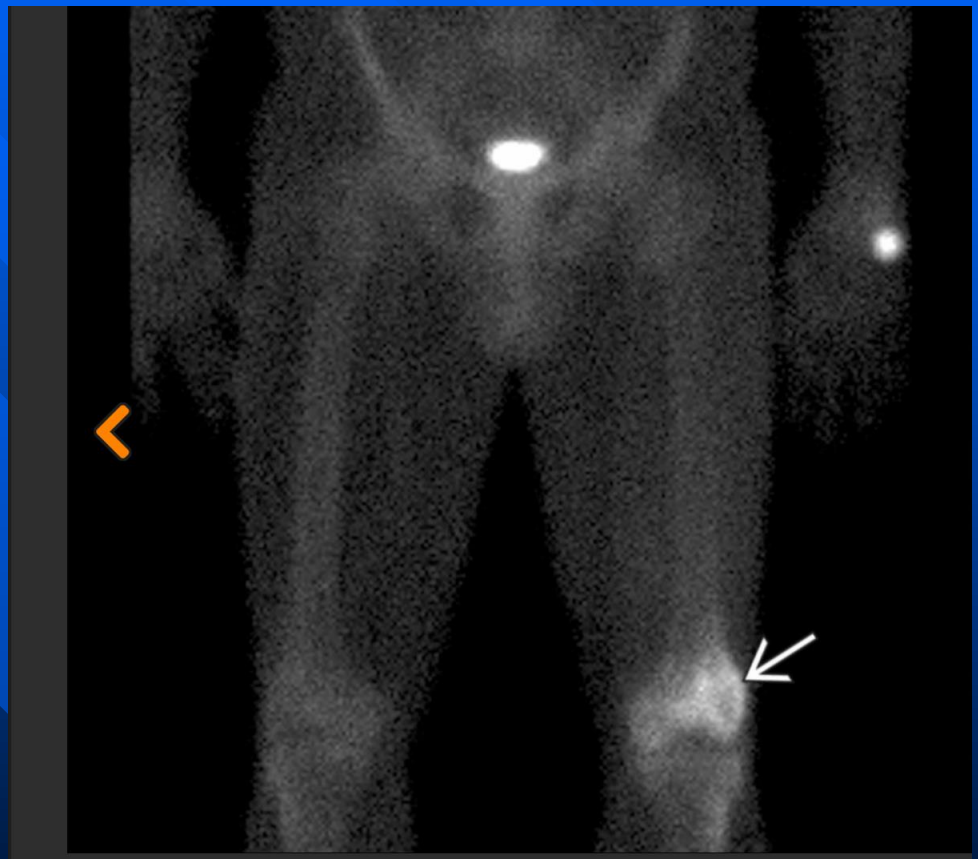
Graphic depicts transected specimen of a giant cell tumor of bone (GCTB). Note that the lesion is sharply demarcated from normal bone →, but the margin is very thin and typically nonsclerotic. Hemorrhagic regions can be present ⇨.



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Anterior bone scan in the same patient shows the characteristic donut sign of GCTB →: peripheral increased uptake with central photopenia.

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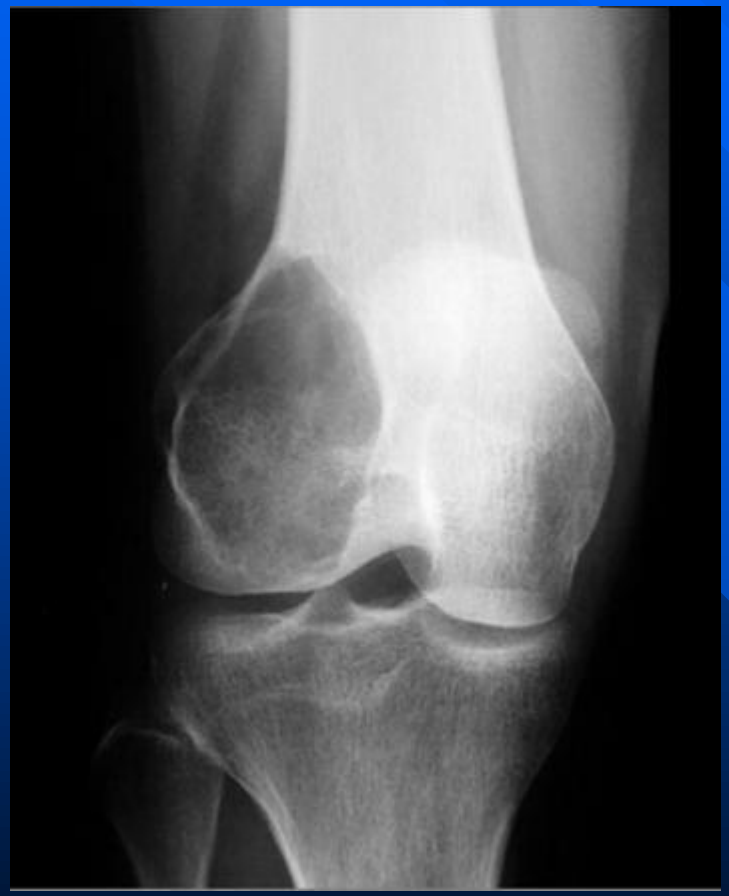

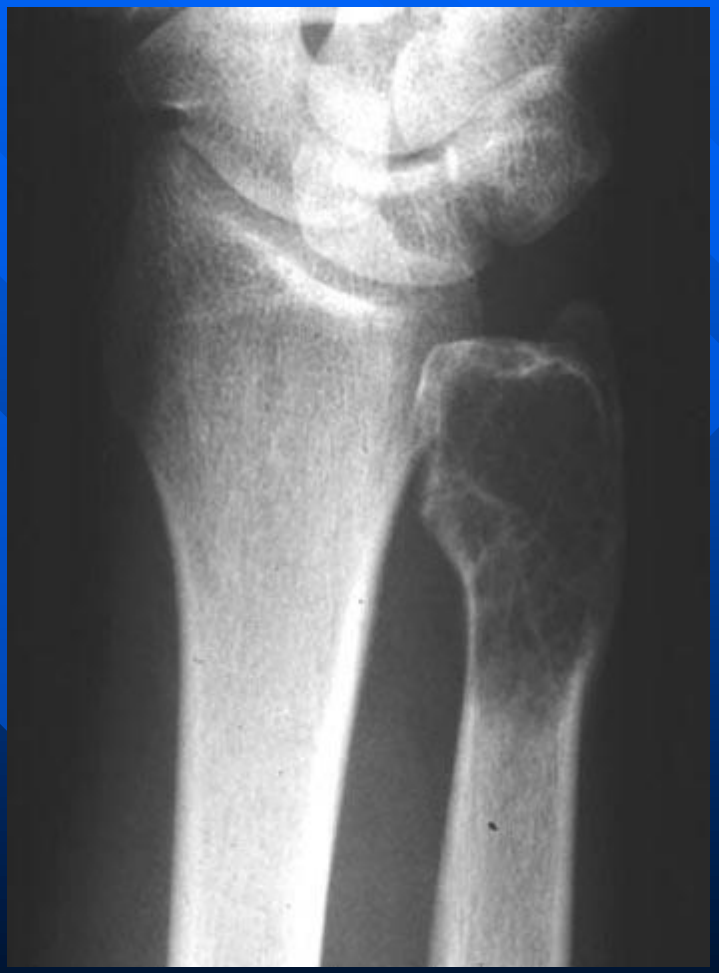

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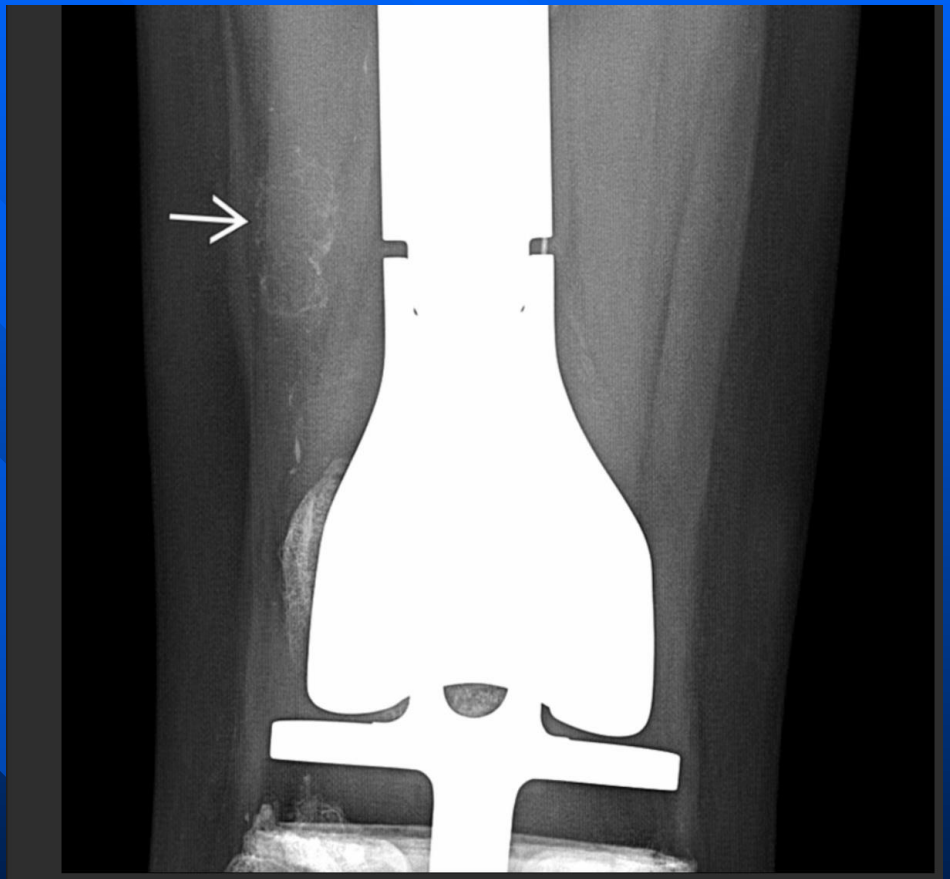
Oblique radiograph of the middle finger shows a destructive GCTB with soft tissue extension → and a pathologic fracture ⇒. When GCTB occurs in small bones, it can be associated with significant expansion or destruction, as is seen in this case.



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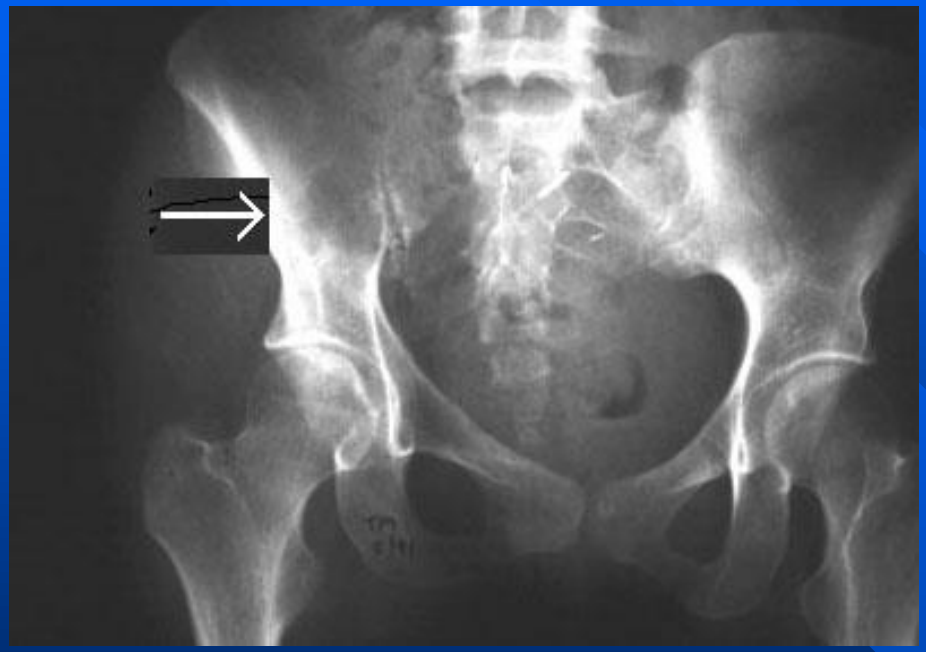
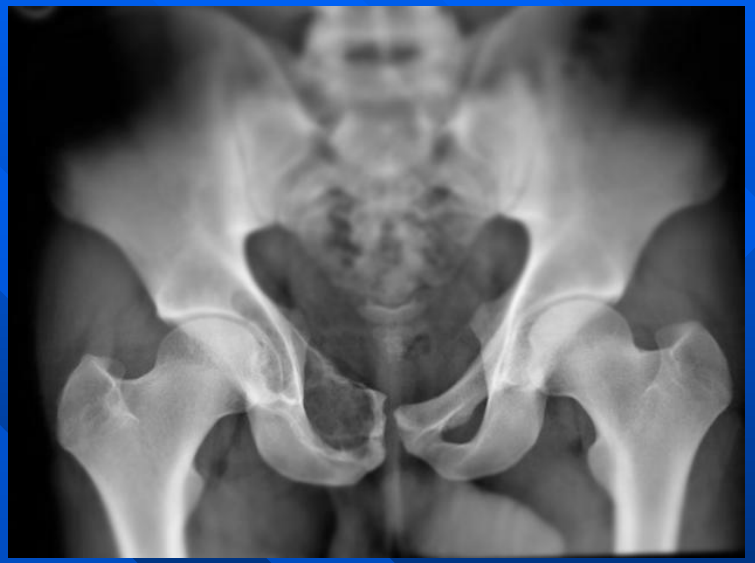
AP radiograph in the same patient 1 year later shows a peripherally calcified lesion → in the lateral soft tissues, representing soft tissue recurrence of GCTB.

Giant Cell Tumor





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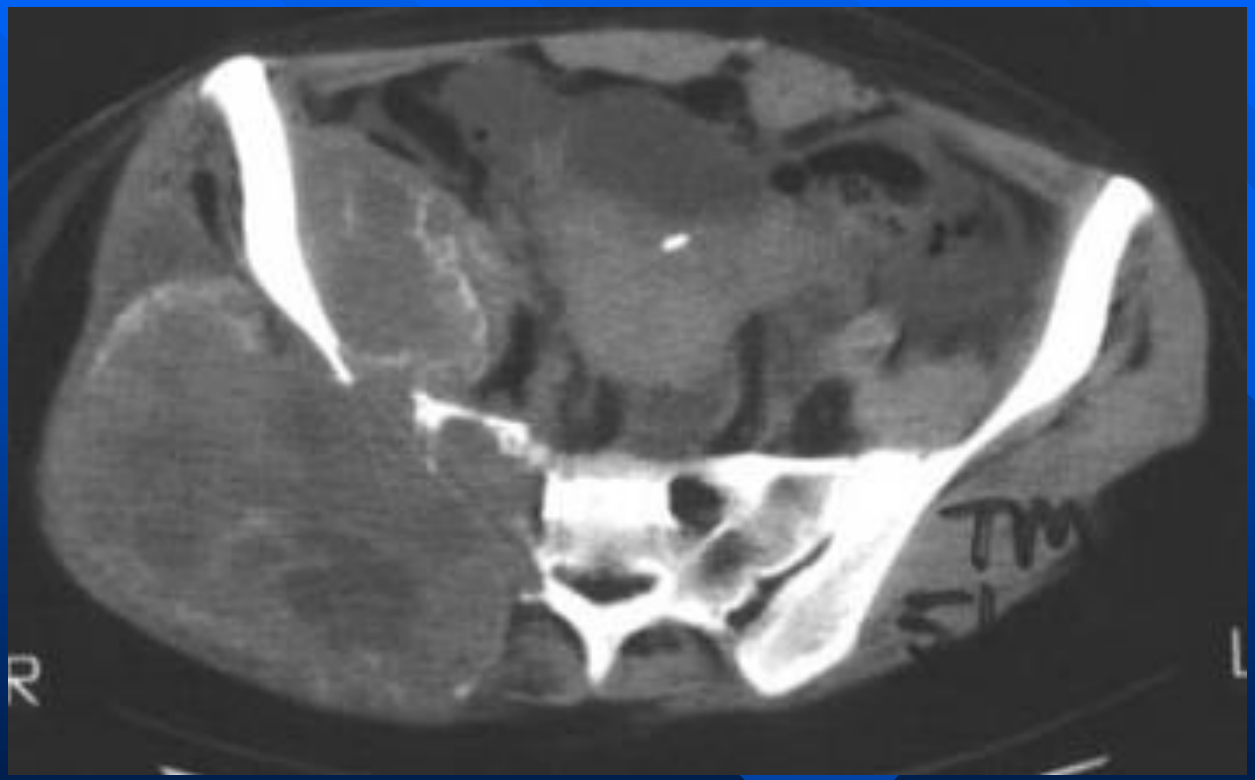

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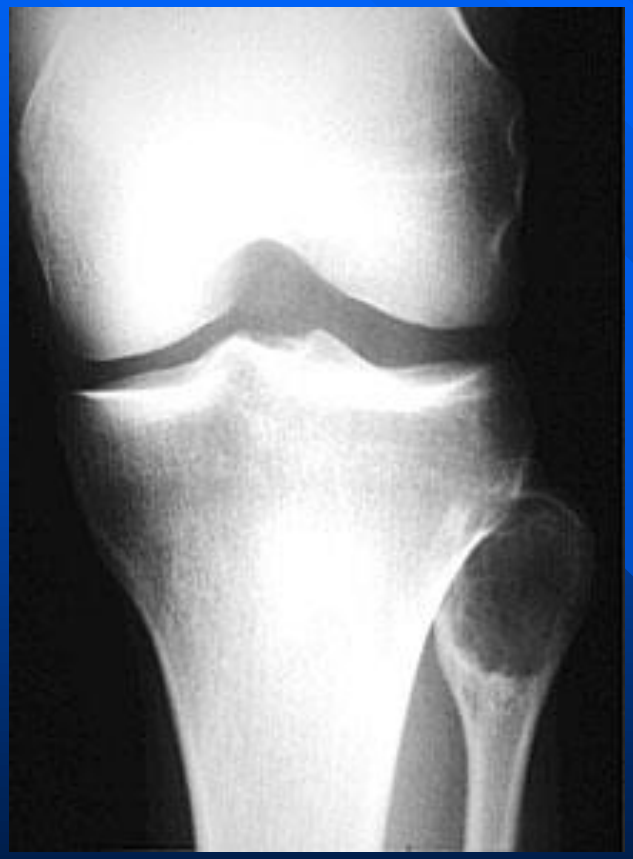

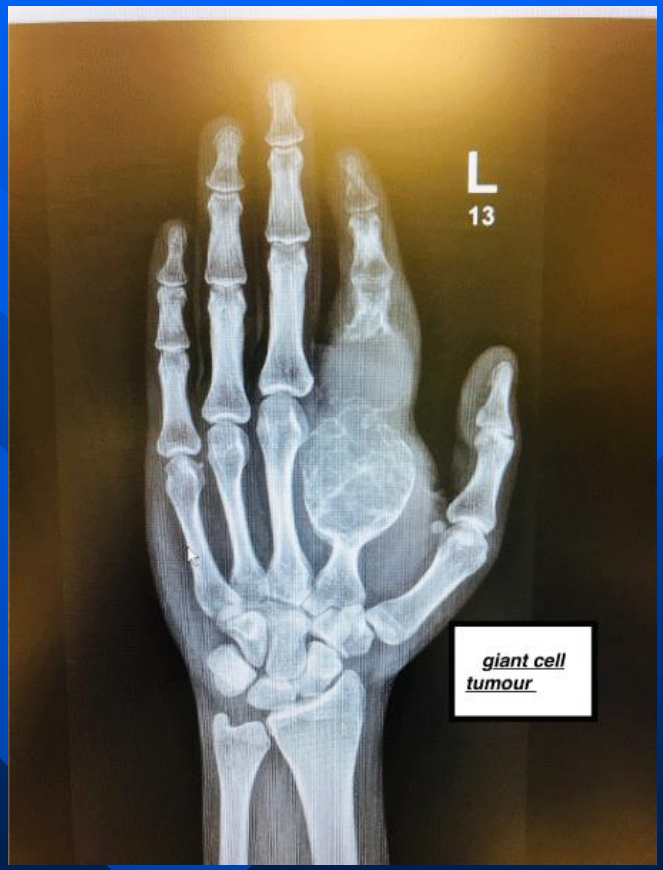

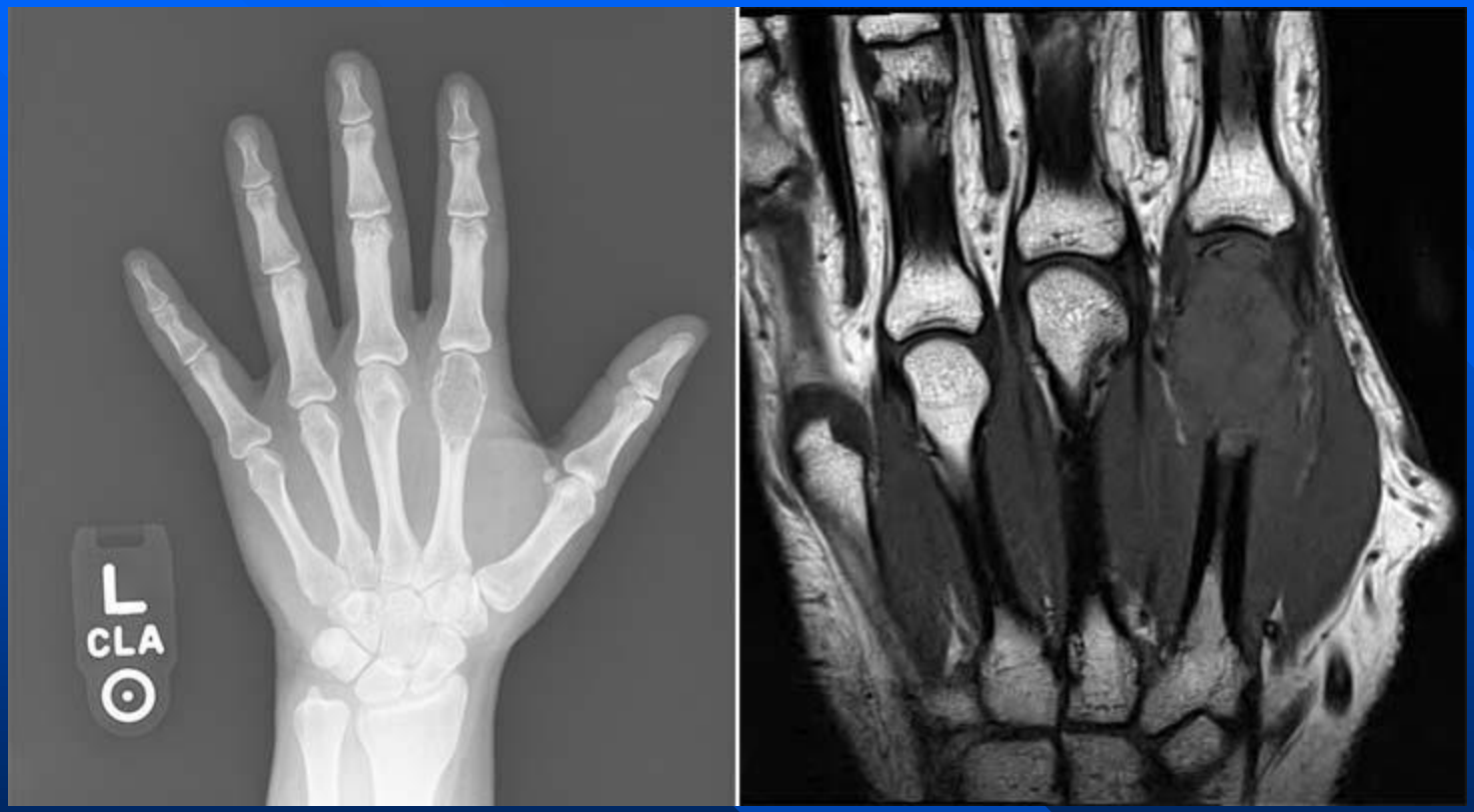
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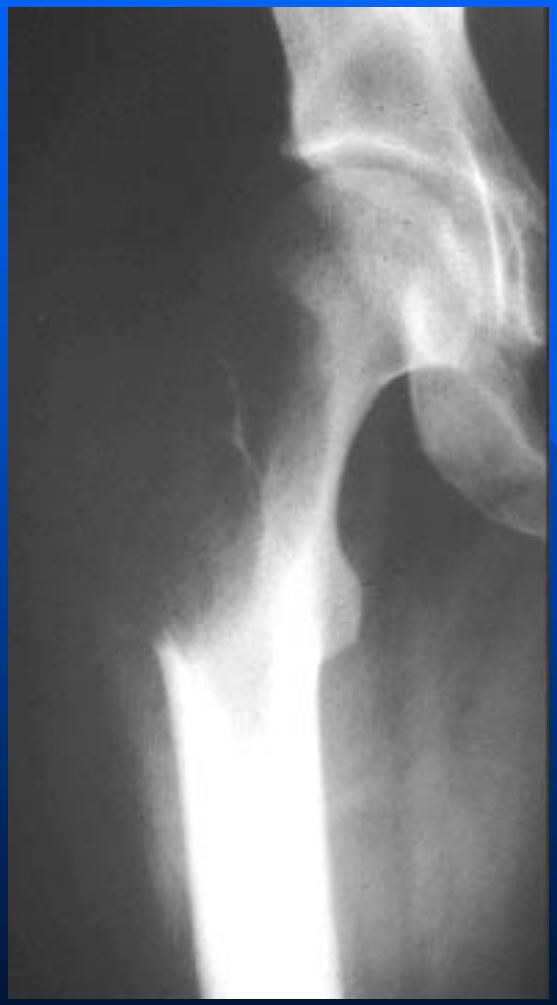

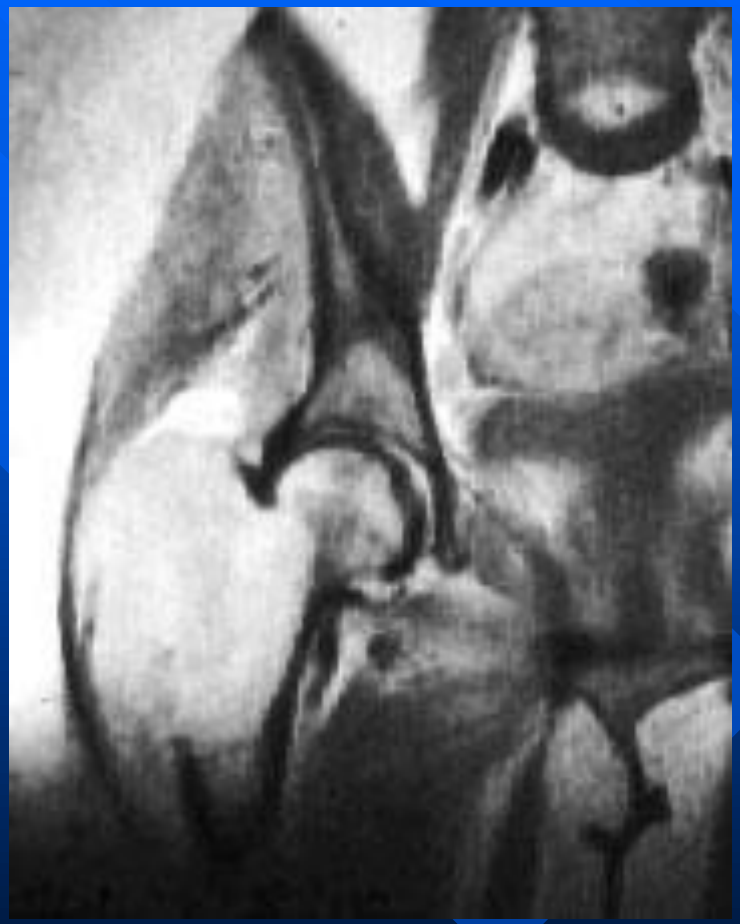

Coronal T1-weighted MR

DDX: chondroblastoma, giant cell tumor, aneurysmal bone cysts, or infection