Hyperparathyroidism

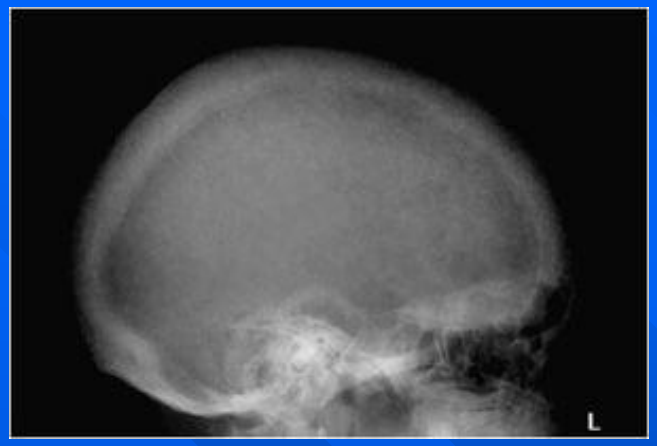
- Pathology
  - 1° hyperparathyroidism (HPTH): parathyroid adenoma (75-85%)
  - 2° HPTH: chronic kidney disease most common
- Diagnostic Checklist
  - Resorption along radial aspect of middle phalanx of index finger considered pathognomonic
  - Florid bone findings of HPTH are rare with advanced medical care
- General Features
  - Best diagnostic clue
    - » Bone resorption is diagnostic feature
      - Subperiosteal resorption along radial aspect of middle phalanges of index and middle fingers pathognomonic
  - Location
    - » Resorption may be subperiosteal, endosteal, subchondral, subtendinous, subligamentous, intracortical, along trabeculae

Imaging

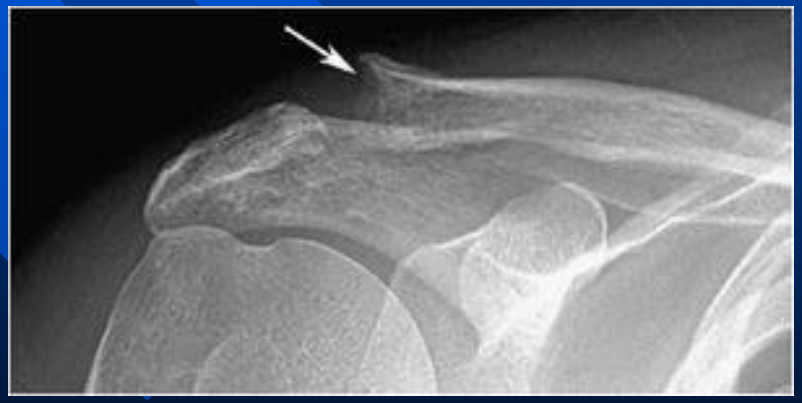
- Resorption is essential radiographic feature
  - Subperiosteal, endosteal, subchondral, intracortical, subtendinous, subligamentous, along trabeculae
- Physis resorption, especially along metaphyseal aspect, creates widening and irregularity
- Generalized osteopenia due to osteoporosis
- Metastatic soft tissue calcification, chondrocalcinosis
- Brown tumor: expansile, nonaggressive lytic lesion with geographic nonsclerotic margins
  - Mixed signal intensity on MR: depends on degree of fibrous tissue, cyst formation, and hemorrhage
- Salt and pepper (pepper pot) skull
- Weakened tendons and ligaments, may rupture or cause joint laxity
- Bowing deformities resulting from bone softening
- Fragility fractures
- Tc-99m sestamibi scan and US for diagnosis and localization of parathyroid adenomas

Radiographic Finding	Primary Hyperparathyroidism	Secondary Hyperparathyroidism
Osteosclerosis	0	+++
Brown tumors	+++	++
Chondrocalcinosis	++	0
Metastatic calcification	+	+++
Subperiosteal resorption	+	++

+++ more common, + less common.



“Rugger jersey” spine



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AP radiograph in the same patient shows subperiosteal resorption along the proximal, medial tibia →, a characteristic location, and calcification of medium-sized arteries ↷.

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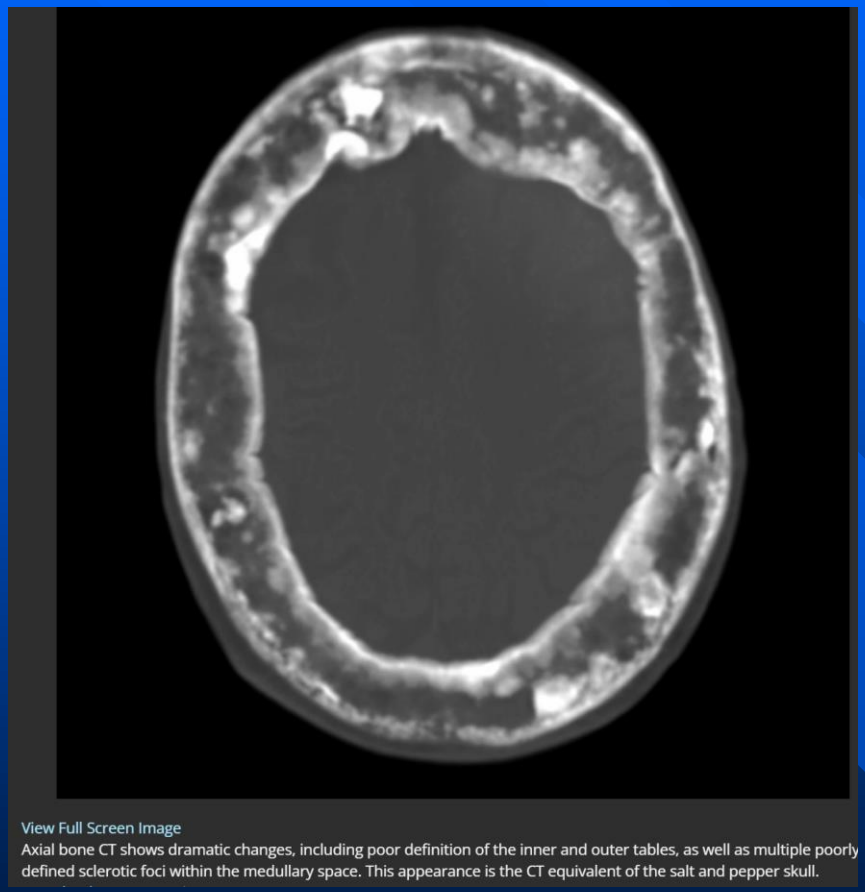
Axial bone NECT depicts the SI joint changes of HPTH → with subchondral resorption primarily of the iliac side of the joints. The transplanted kidney in the right lower quadrant is a strong clue to the etiology of these changes ⇨: HPTH 2° to chronic kidney disease (CKD) can mimic erosive disease.



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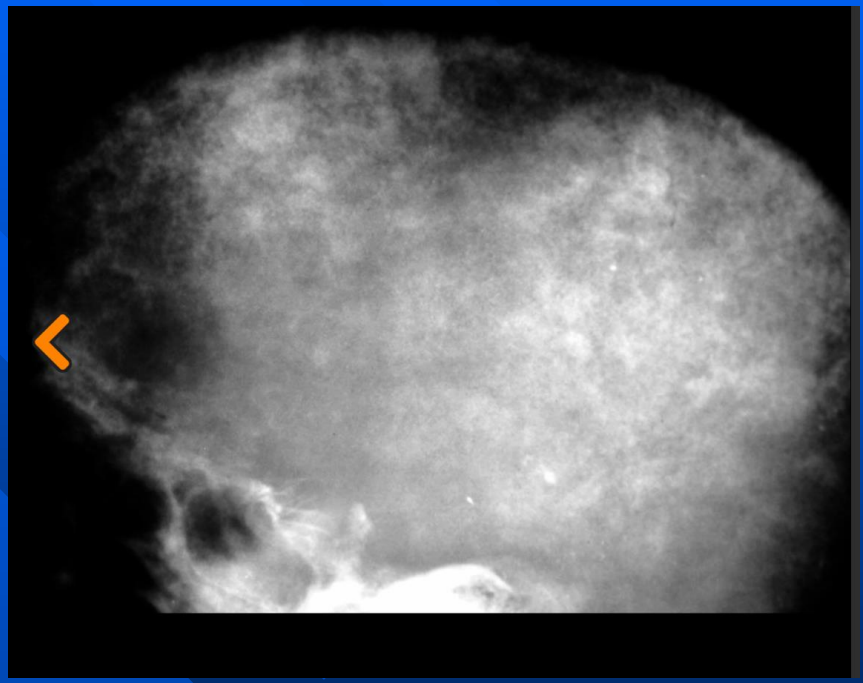
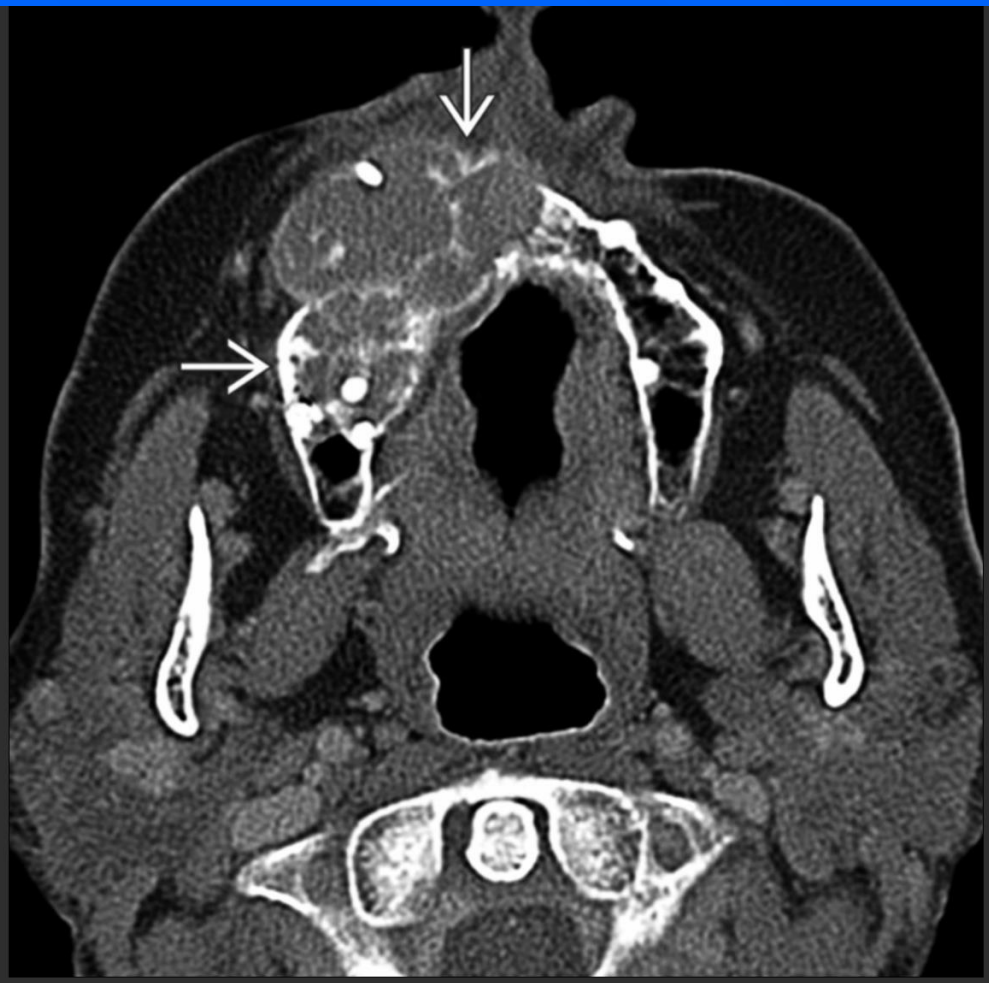
Axial bone CT shows dramatic changes, including poor definition of the inner and outer tables, as well as multiple poorly defined sclerotic foci within the medullary space. This appearance is the CT equivalent of the salt and pepper skull.



Brown tumor

- Lytic lesion, geographic nonsclerotic margins, may be expansile; no cortex destruction, periosteal reaction, soft tissue mass or matrix
- Greater incidence in 1° HPTH (3%) than 2° (1.5%)
- Overall, more commonly due to 2° HPTH (greater prevalence of 2° HPTH relative to 1°)
- Mandible, clavicle, ribs, pelvis, femur
- Solitary or multiple
- Long bone: metaphyseal; may extend into epiphysis or originate in diaphysis
- Term "brown" tumor comes from color imparted by hemorrhage



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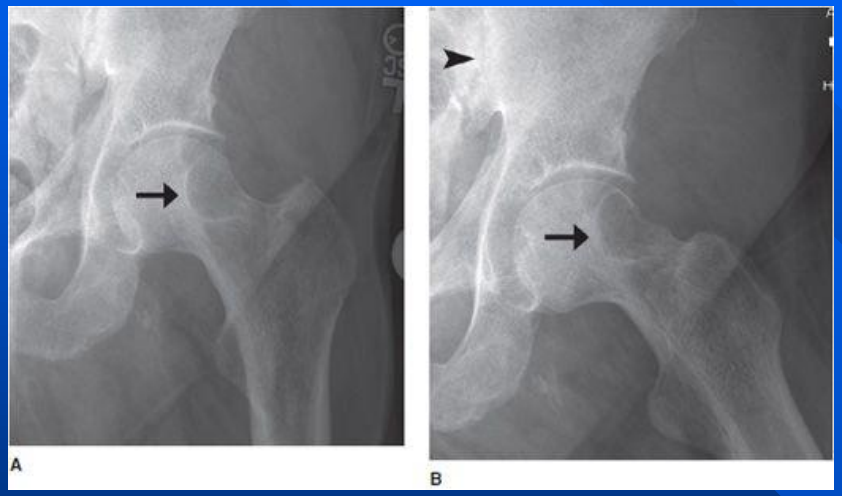
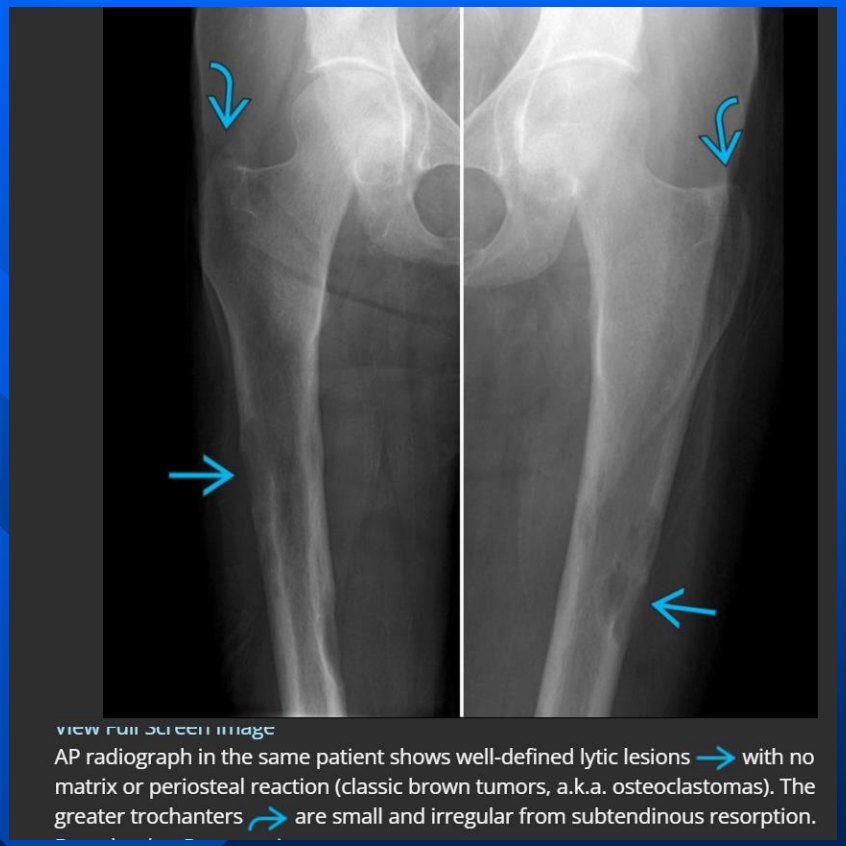
Axial bone CT reveals a multiloculated lesion arising from the mandible →. The mandible and maxilla are common sites of brown tumor, in addition to the ribs, clavicle, pelvis, and femur.

Brown Tumor



Brown Tumor

Hyperparathyroidism. Axial CT image of the pelvis shows a lytic lesion in the right iliac bone consistent with a brown tumor (arrowhead). Note the subchondral resorption about the sacroiliac joints (arrow).



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AP radiograph in the same patient shows well-defined lytic lesions → with no matrix or periosteal reaction (classic brown tumors, a.k.a. osteoclastomas). The greater trochanters ↗ are small and irregular from subtendinous resorption.

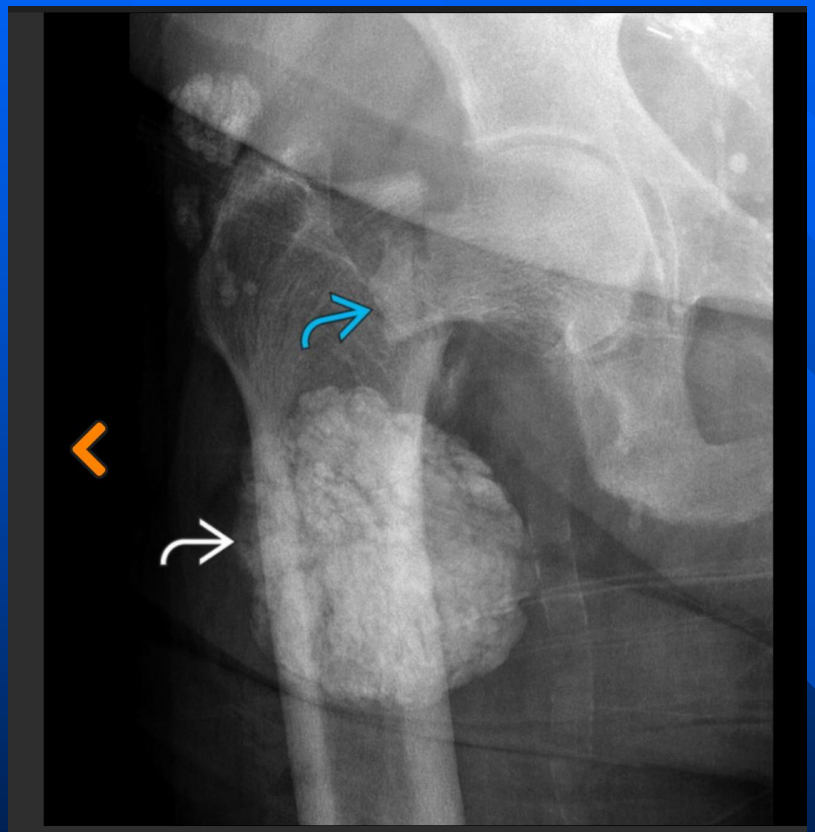
Soft Tissues

- Metastatic soft tissue calcification
  - More common in 2° HPTH
  - Large collections in periarticular sites: hip, shoulder
  - Subcutaneous deposits in digits
- Weakened tendons and ligaments, may rupture or cause joint laxity

Metastatic calcification

- Refers to a type of soft tissue calcification caused by elevated serum calcium salts.
- Etiology
  - chemotherapy
  - chronic renal failure
  - milk-alkali syndrome
  - multiple myeloma
  - osteolysis from malignant metastasis
  - primary and secondary hyperparathyroidism
  - sarcoidosis
  - vitamin D intoxication

Metastatic calcification



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AP radiograph in primary HPTH shows vascular calcification, metastatic calcification, and a combination of osteopenia and thickened trabeculae. The fragile femur has fractured.

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PA radiograph shows globular soft tissue calcification. This is metastatic calcification of HPTH.

Metastatic calcification

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PA radiograph shows amorphous calcifications adjacent to several metacarpophalangeal joints →; these metastatic calcific deposits associated with HPTH often occur in periarticular locations.