Giant Cell Tumor

- Locally aggressive neoplasm composed of osteoclast-like giant cells.
- Most likely causes of solitary sacral mass in adult patient are GCT, chordoma, and plasmacytoma
- Malignant GCT are rare, difficult to distinguish from typical GCT
  - Zone of transition usually less well defined
- Sacral GCT may be occult on radiographs; have low threshold for CT in patients with atypical sacral pain
- Patients treated with radiation must be followed with MR because of risk of recurrence, sarcomatous degeneration

Giant Cell Tumor

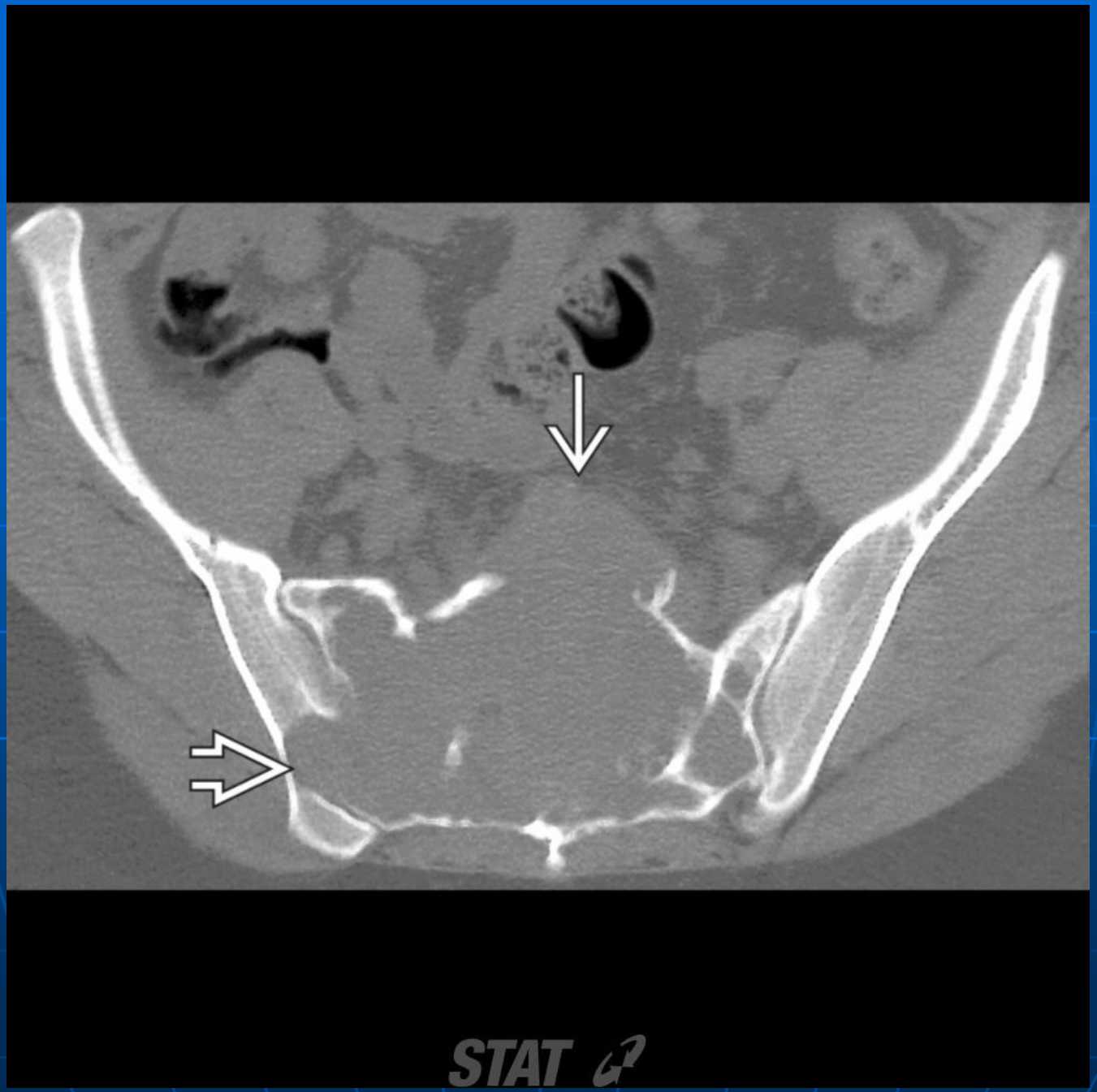
- Demographics
- Age
  - 80% in 3rd to 5th decade of life
  - In spine, peak incidence in 2nd and 3rd decades
  - Rare before skeletal maturity
- Gender
  - F:M = 2.5:1 in spine
    - More marked female preponderance than in appendicular skeleton

Location

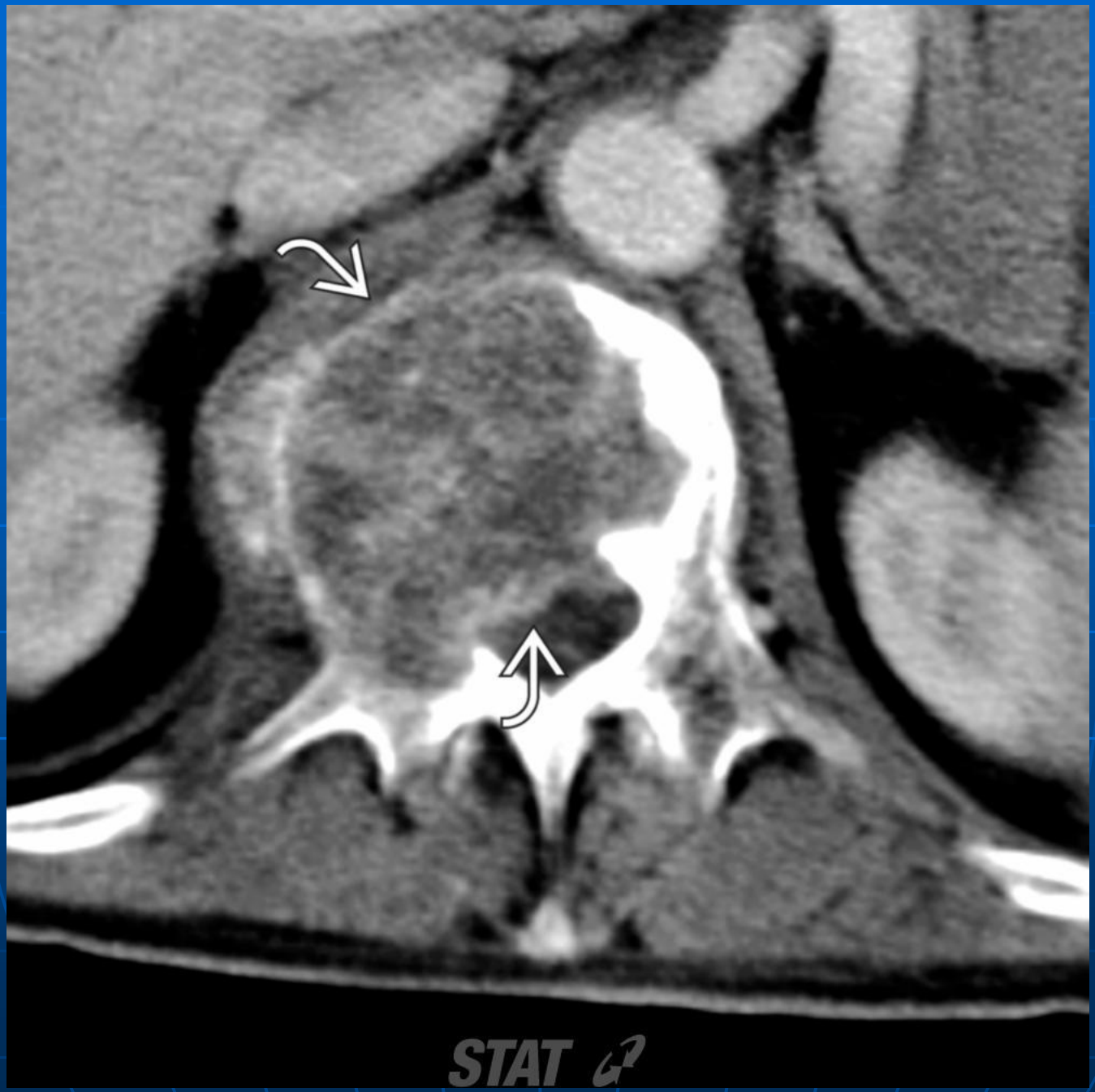
- Sacrum (60%); predominantly in lower sacral elements
- Sphenooccipital/nasal (25%)
  - 33% are of chondroid chordoma variety
- Cervical spine (10%)
- Thoracolumbar spine (5%)
- Usually midline in origin

Imaging

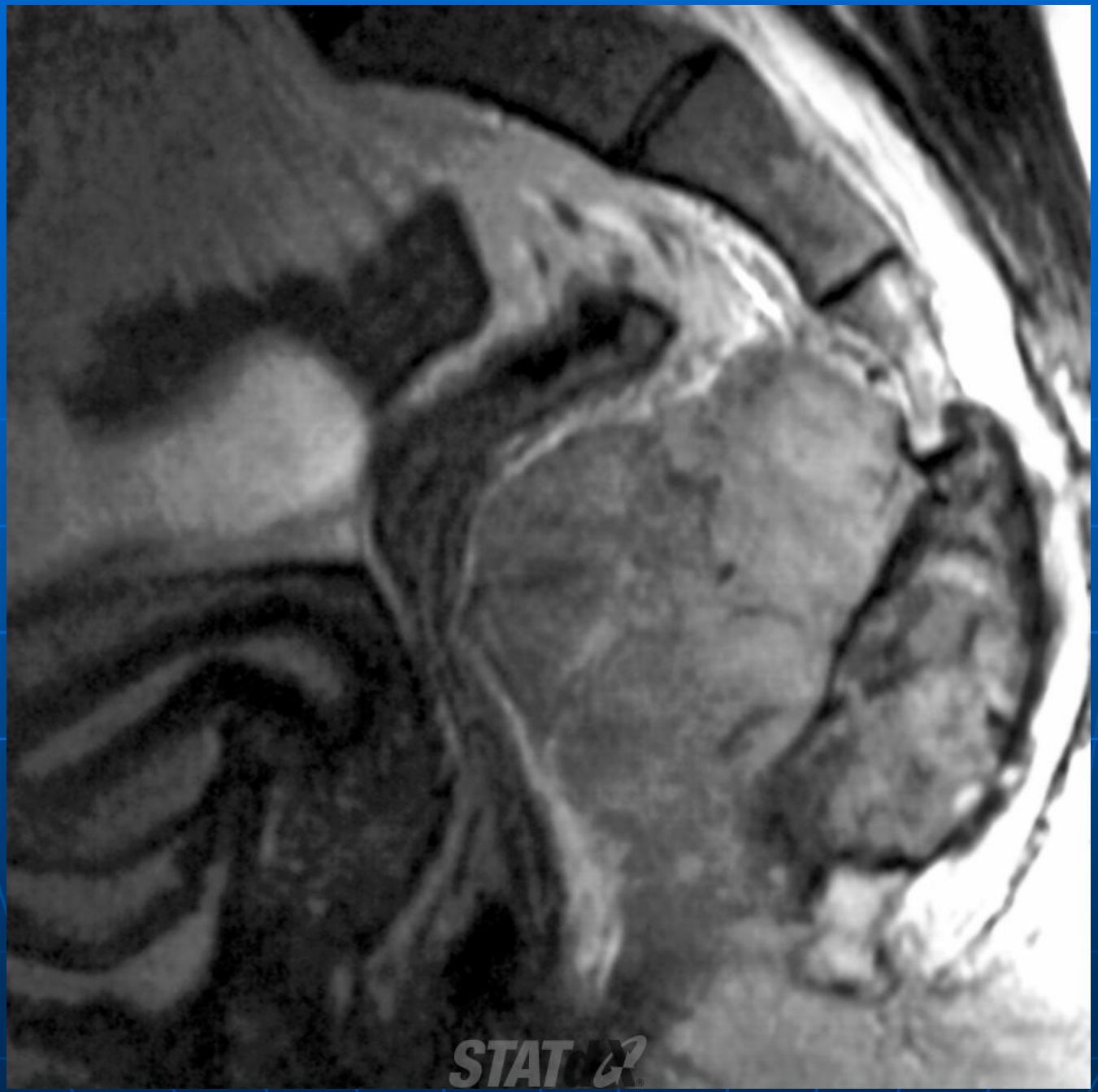
- 3% of all GCT occur in spine
- 4% of all GCT occur in sacrum
- Lytic, expansile lesion of vertebral body or sacrum
- Narrow zone of transition, margin not sclerotic
- Matrix absent, but may have residual bone trabeculae
- May have cortical breakthrough
- Heterogeneous contrast enhancement
- Nonenhancing areas of necrosis often present
- May be associated with aneurysmal bone cyst component
- MR
  - Intermediate to high signal intensity on T2WI, STIR
  - Fluid-fluid levels suggest associated ABC
  - Thin, curvilinear bands of low signal intensity on all sequences
    - Correspond to residual bone trabeculae or fibrous septa
  - ± low signal intensity hemosiderin
  - Heterogeneous contrast enhancement
  - Nonenhancing areas of necrosis often present



Axial NECT shows nearly complete cortical rim around a large sacral mass. There is a small region of cortical breakthrough (white solid arrow) and extension of the tumor from sacrum into the right iliac wing, across the SI joint (white open arrow).

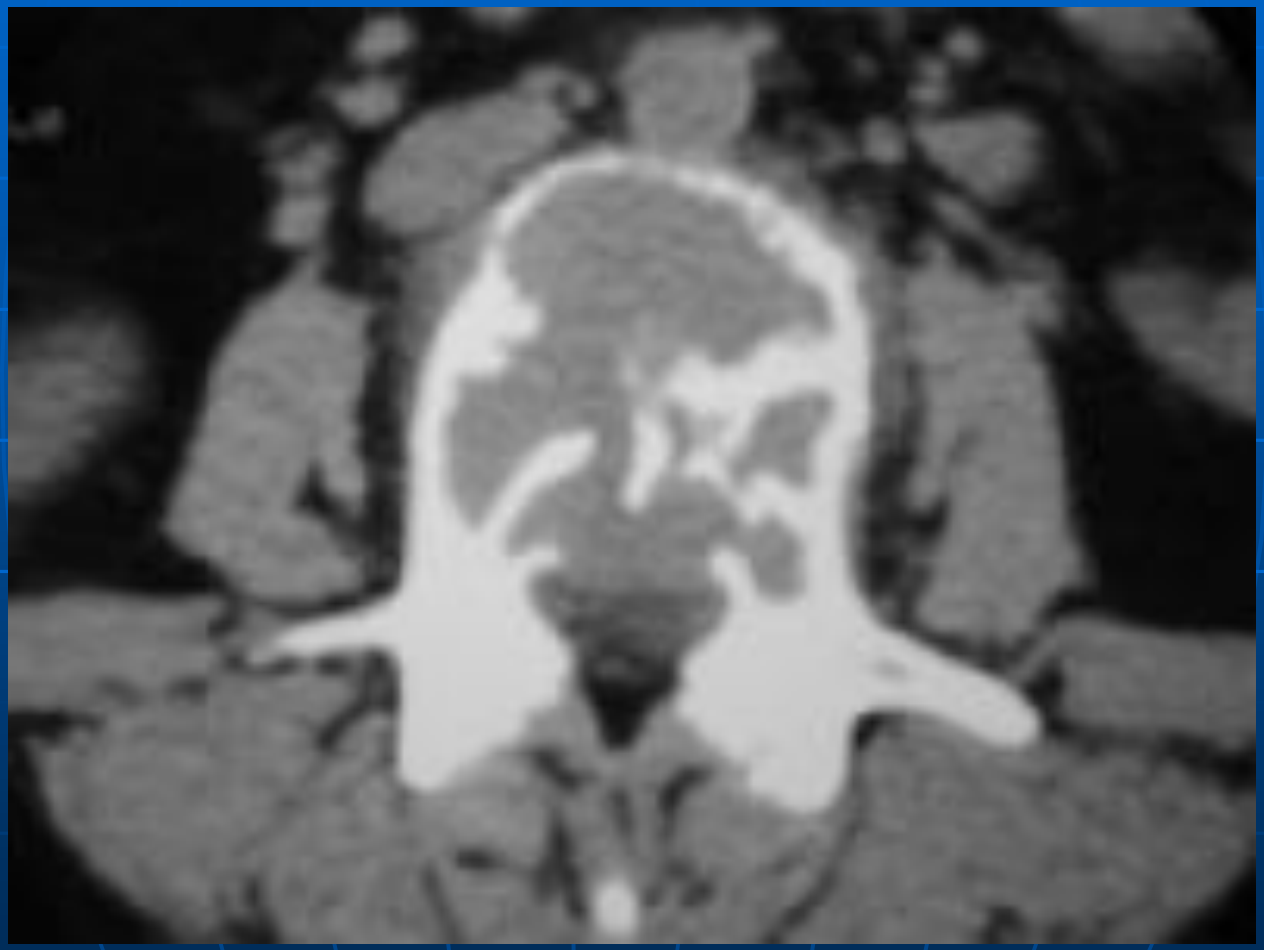


Axial CECT in the same patient shows a heterogeneously enhancing mass with cortical breakthrough (white curved arrow).



Sagittal T2WI MR in the same patient shows that the signal intensity of the lesion is heterogeneous, but remains fairly low. The signal intensity of GCT is variable and of limited utility in differential diagnosis.

Giant Cell Tumor



DDx:

- **Metastasis**
  - Usually appears more aggressive, but can be expansile
  - Involves vertebral body &/or neural arch
  - Often multiple
  - Usually in older patients
- **Myeloma**
  - Lytic lesion, often expansile
  - Vertebral body or sacrum
  - Can have sharp zone of transition, geographic appearance
  - Usually in older patients
  - Look for lesions elsewhere
- **Chordoma**
  - Lytic, expansile lesion
  - Most common in sacrum but can involve vertebral body
  - Arises in midline
  - No matrix
  - Can have large soft tissue component
- **Osteogenic Sarcoma (OGS)**
  - Wide zone of transition, permeative appearance
  - Vertebral body or neural arch
  - Soft tissue mass
  - Osseous matrix visible in 80%
  - May contain large numbers of giant cells
- **Aneurysmal Bone Cyst (ABC)**
  - Markedly expansile
  - Arises in neural arch, can extend into vertebral body
  - Can coexist with GCT
- **Osteoblastoma**
  - Lytic, expansile lesion neural arch
  - May extend into vertebral body
  - Bone matrix visible on CT scan
- **Brown Tumor of Hyperparathyroidism**
  - Radiologically and histologically identical to GCT
  - Due to osteoclast stimulation in hyperparathyroidism
  - Regresses with successful treatment of hyperparathyroidism