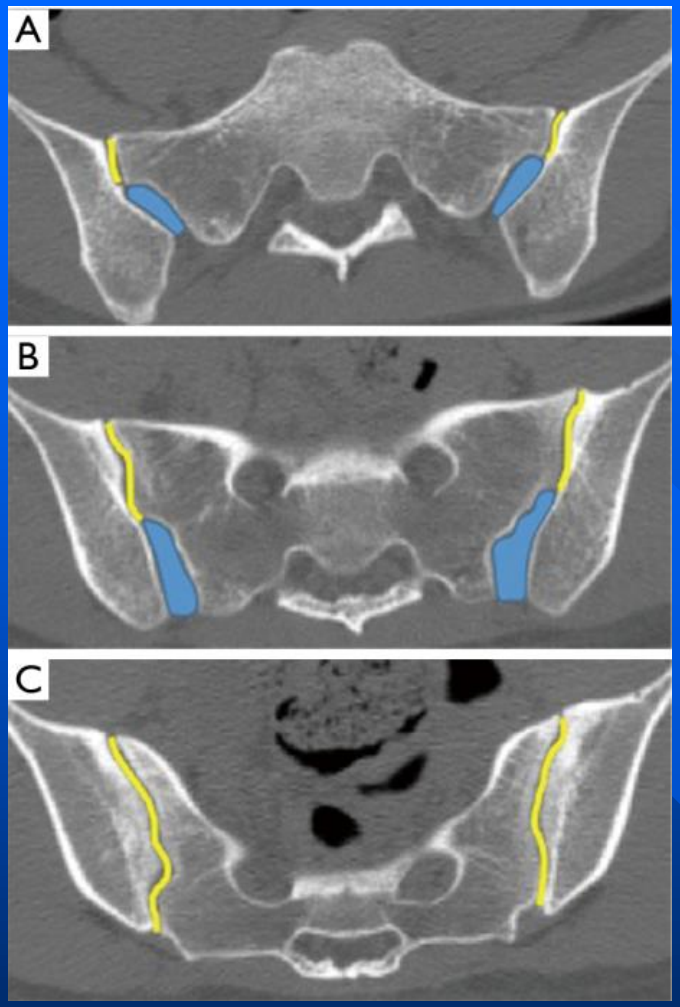
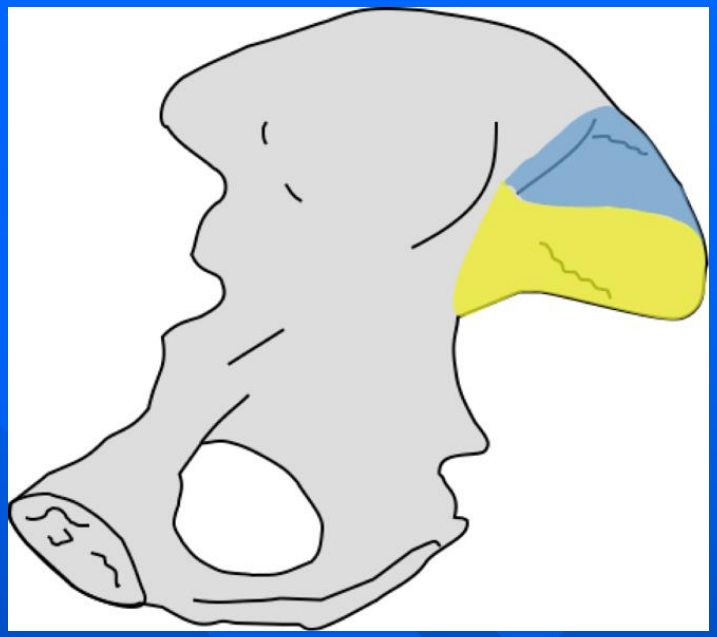
Sacroiliitis

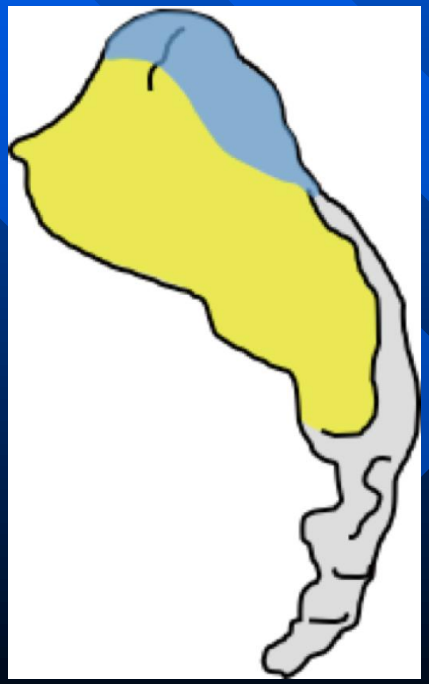
- Sacroiliac joint (SIJ) inflammatory disease most frequently occurs in spondyloarthropathies
- SIJ involvement patterns
  - Typically bilateral symmetric
    - » Ankylosing spondylitis (AS), inflammatory bowel disease spondylitis
  - Typically bilateral asymmetric
    - » Psoriatic arthritis (PsA), chronic reactive arthritis
    - » May develop bilaterally symmetric disease in late stages
- Purely productive SIJ disease may mimic sclerosis of sacroiliitis
  - Osteoarthritis, diffuse idiopathic skeletal hyperostosis (DISH), osteitis condensans ilii
  - Sclerosis is predominantly on iliac side
  - No erosive component to these processes
  - Watch for location of sclerosis of SIJs to differentiate mimics from true spondyloarthropathies & from one another
- MR imaging reveals hallmarks of osteitis (bone marrow edema), enthesitis, and synovitis that are key to diagnosis of axial spondyloarthropathies



Axial CT images showing the position of the synovial (yellow) and ligamentous (blue) components of the sacroiliac joint from (A) cranial, (B) mid- and (C) caudal aspects of the sacroiliac joints



Looking at the iliac side of the SI joint, the synovial part (yellow) is located anteroinferiorly while the ligamentous part (blue) is located posterosuperiorly.



Looking at the sacral side of the SI joint, the synovial part (yellow) is located anteroinferiorly and the ligamentous part (blue) is located posterosuperiorly.

Information

- Bone marrow edema, synovitis, capsulitis and enthesitis are the MR features of inflammation.
- Subchondral fat deposition like synovitis, capsulitis and enthesitis, is a supportive rather than a primary diagnostic criterion for Spa
- Erosions, while adding specificity, are also not entirely diagnostic of sacroiliitis as they can be seen in other entities such as osteoarthritis and osteitis condensans ilii
- Erosions are seen in ~5% of patients with non-specific low back pain

Marrow Edema

- The most prevalent, reliable and diagnostic MRI feature of active sacroiliitis is bone marrow edema (Figure 7).
- Bone marrow oedema is a marker of inflammation and needs to be significant in degree before a diagnosis of sacroiliitis can be made.
- Bone marrow oedema needs to be either ≥1 cm in depth and visible on at least two contiguous MR images, or at two separate locations on the same image before it can be considered significant

Ankylosing Spondylitis

- **Ankylosing Spondylitis**
  - Sacroiliitis begins with erosions
    - Loss of distinctness of SIJ cortices ("white cortical lines") because of multiple small, discrete erosions
    - Erosions lead to widening of joints
    - Usually bilaterally symmetric but occasionally one side lags behind other & they appear asymmetric
  - Later: Bilateral fusion involving synovial and fibrous joint
  - Eventual profound osteoporosis
  - Spine involvement: Multiple contiguous segments
    - Thin, vertical syndesmophytes lead to body fusion
    - Facets fuse with ossification of interspinous ligaments
    - Leads to bamboo spine
    - MR may show enthesitis
      - Marrow edema at anterior vertebral body corners (Romanus lesion)
      - Marrow edema at discovertebral endplate (Andersson lesion)
  - Peripheral involvement: Large proximal joints (hip, shoulder)
  - M > F; onset 2nd or 3rd decade

Inflammatory Bowel Disease

- Similar in appearance but much less frequent than AS
- Sacroiliitis begins with erosions
  - Loss of distinctness of SIJ cortices
  - Erosions lead to widening of joints
  - Usually bilaterally symmetric, but occasionally one side lags behind other & they appear asymmetric
- Sclerosis accompanies eventual fusion
- Spine involvement: Tends to be continuous
  - Thin, vertical syndesmophytes lead to vertebral body fusion
  - Facets fuse as well, leads to bamboo spine
- Peripheral involvement: Large proximal joints (hip, shoulder)
- Watch for signs of inflammatory bowel disease
  - Staple lines from ileoanal pull-through
  - Colostomy
  - Signs of steroid use
  - Tubular, featureless bowel pattern of colitis

Psoriatic Arthritis, Late

- Sacroiliitis in PsA generally bilateral but asymmetric
  - May appear symmetric, especially in early or end stage (bilateral fusion)
- Differentiating features of end-stage fused sacroiliitis of PsA from AS
  - Normal bone density
  - Extensive erosive disease with accompanying sclerosis (reparative bone)
  - Character of spine involvement (bulky paravertebral ossifications, skip regions)
  - Peripheral joint disease favors hands, feet, rather than large proximal joints
  - Skin disease

Chronic Reactive Arthritis, Late

- Spondyloarthropathy in chronic reactive arthritis generally bilateral but asymmetric
  - May appear symmetric, especially in early or end stage (bilateral fusion)
- Differentiating features of end-stage fused sacroiliitis of chronic reactive arthritis from AS
  - Normal bone density
  - Character of spine involvement (bulky paravertebral ossifications, skip regions)
  - Peripheral joint disease favors ankles & feet rather than large proximal joints
  - Clinical symptoms of urethritis & uveitis

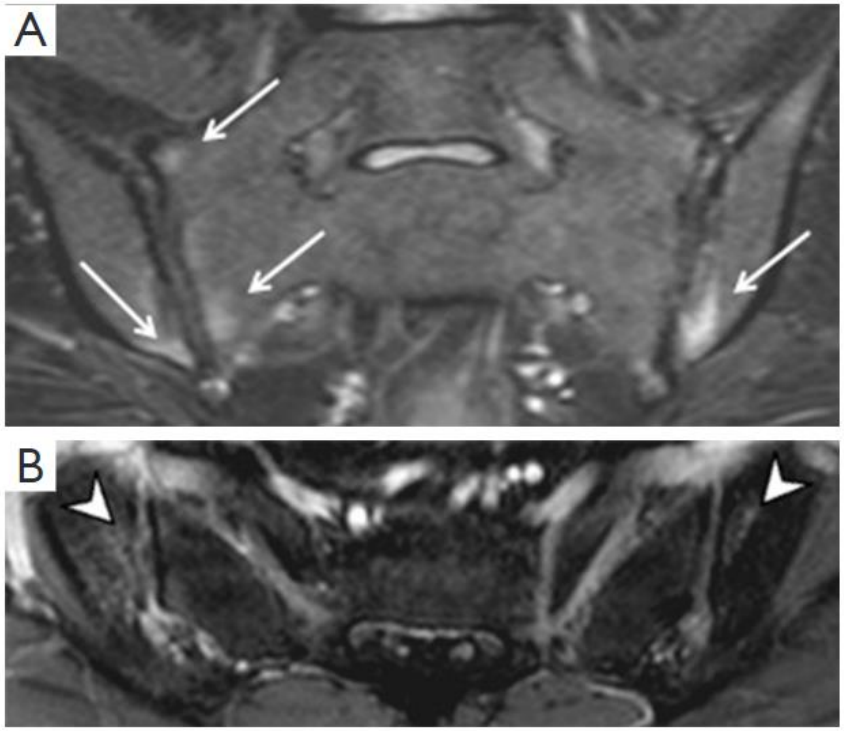


Figure 7 Sacroiliitis on MRI. (A) Bone marrow oedema (arrows) on T2W FS oblique coronal images and (B) corresponding enhancement (arrowheads) on T1W FS post-contrast axial images. This degree of bone marrow oedema is sufficient to diagnose sacroiliitis.

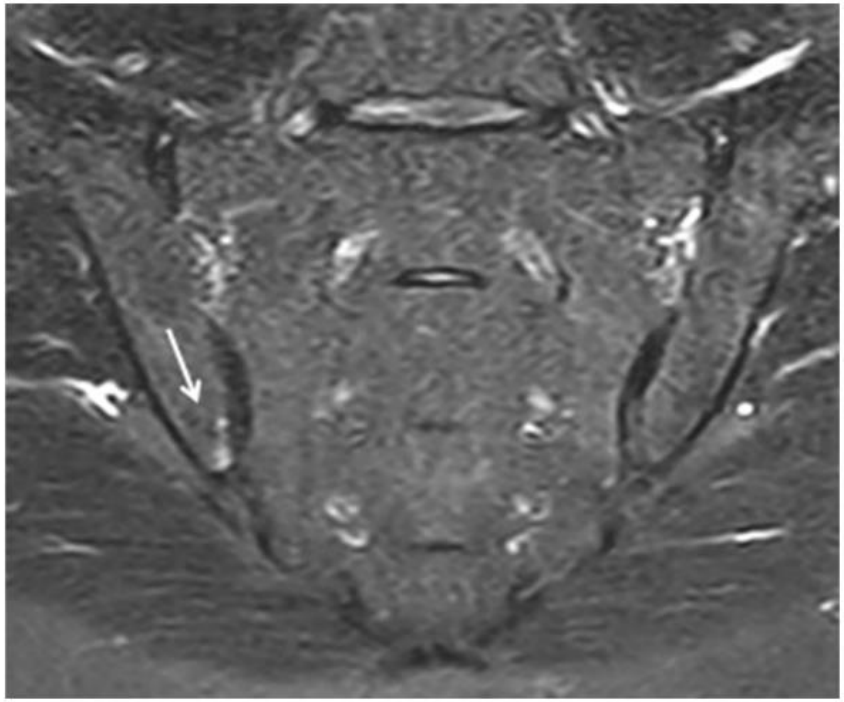


Figure 8 Small area of bone marrow oedema (arrow) and enhancement can be physiological or related to osteoarthritis or osteitis condensans ilii. For bone marrow oedema to be pathognomonic of sacroiliitis, it needs to be of >1 cm in width or depth and be apparent on more than 1 image or at 2 separate sites on the same image.

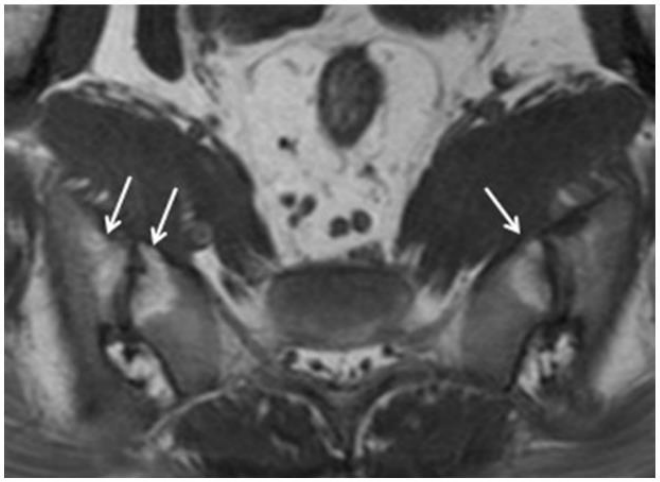


Figure 12 Peri-articular fatty deposition (arrows) can only be appreciated on MRI. This finding is suggestive of chronic sacroiliitis, but is non-specific, being also often seen in osteoarthritis and, less so, in osteitis condensans ilii.

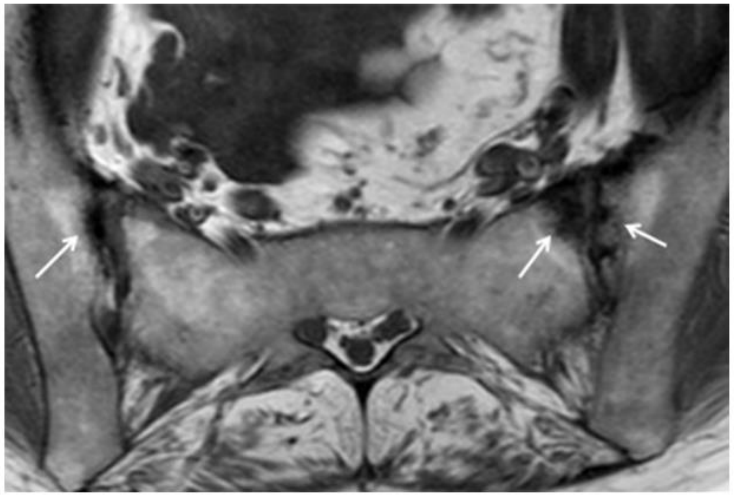


Figure 13 Subchondral sclerosis (arrows) is a non-specific sign of sacroiliitis. Sclerosis can be physiological, related to osteitis condensans ilii, physical stress or osteoarthritis.

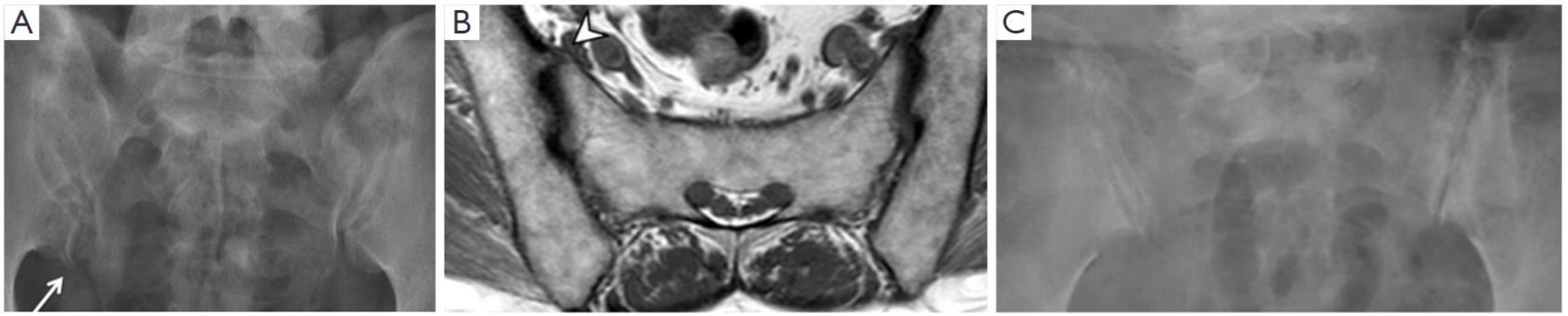
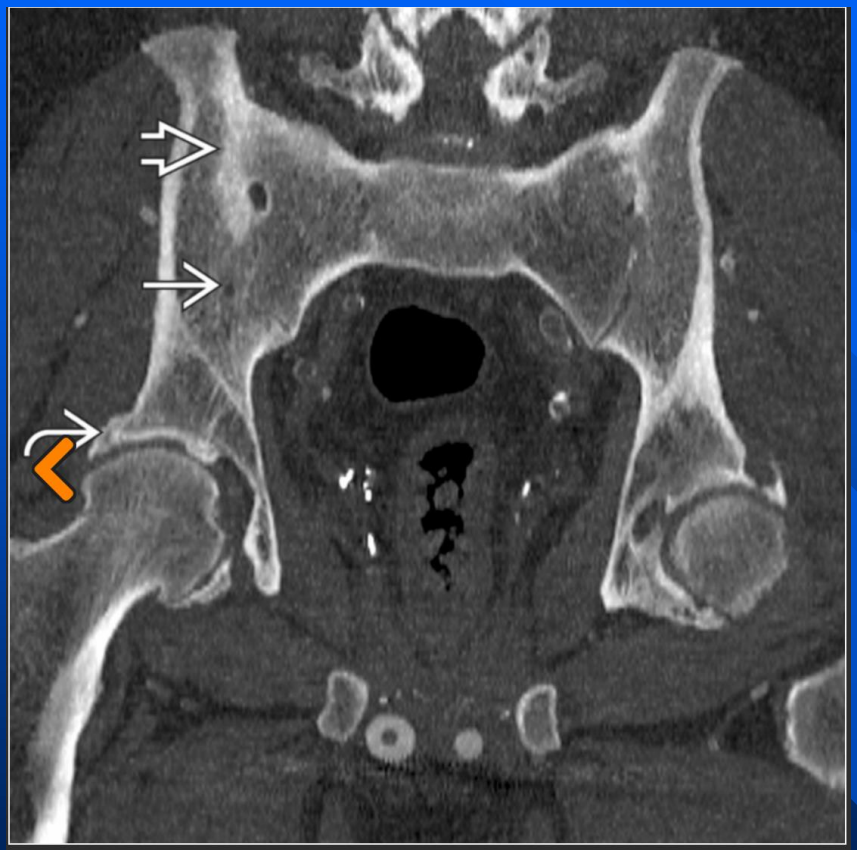


Figure 18 Osteoarthritis. (A) Inferior osteophytosis (arrow) on radiograph and (B) anterior marginal osteophytosis (arrowhead) seen on MRI as features of osteoarthritis or instability. (C) Joint irregularity with subchondral sclerosis is due to osteoarthritis rather than sacroiliitis on radiograph.

Ankylosing Spondylitis



Ankylosing Spondylitis
View Full Screen Image
Coronal oblique CT shows bilateral SIJ fusion involving both the synovial → and fibrous ⇨ portions of the joint. Note the extensive productive arthrosis of the hip joints with central and marginal osteophytes ↗.

Ankylosing Spondylitis, Early
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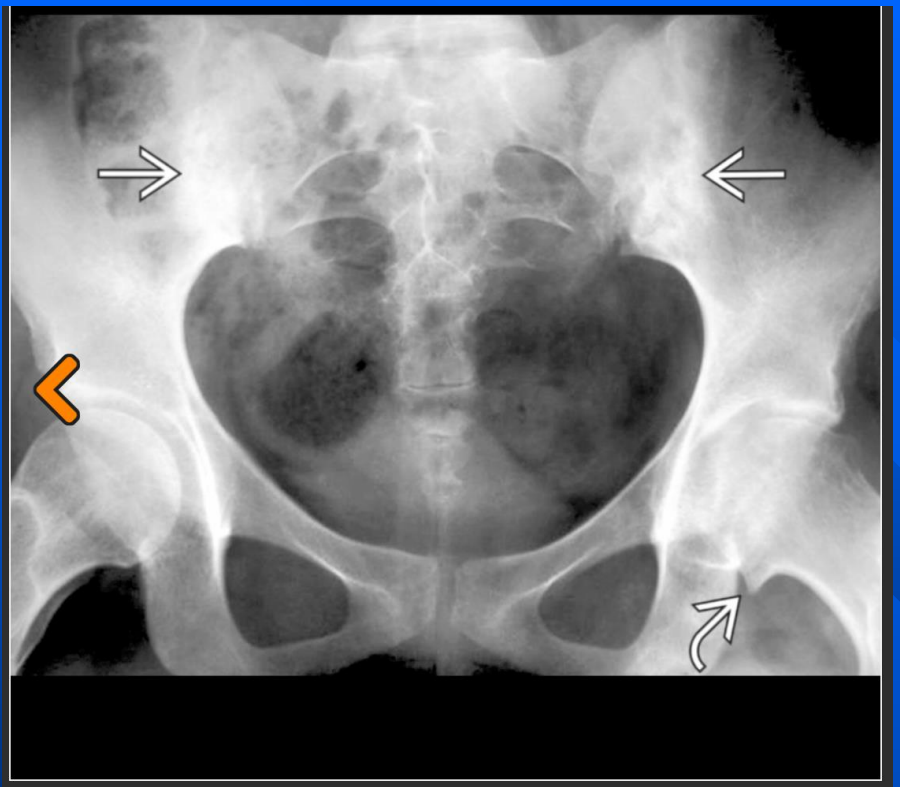
Anteroposterior radiograph shows the normal width & appearance of the left SIJ → in a 14 year old but widening and erosions on the right ⇨. This represents very early and unilateral sacroiliitis in a teenager who was proven to have anklyosing spondylitis.



Inflammatory Bowel Disease Arthritis
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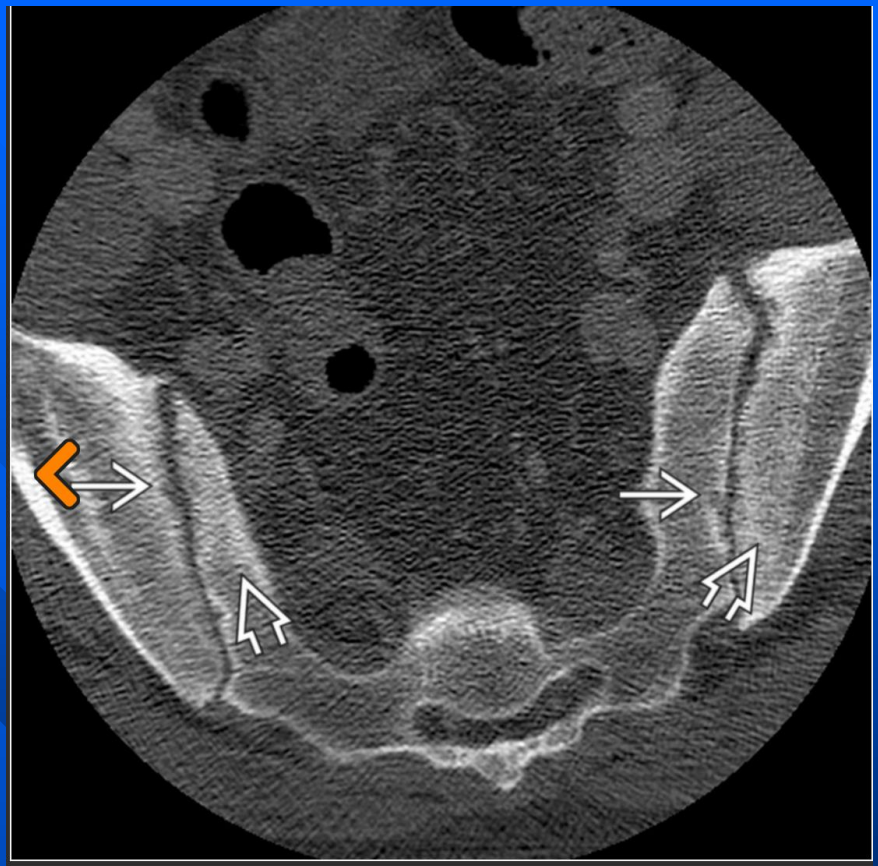
Anteroposterior radiograph shows bilateral & symmetric mixed erosive and productive changes at the SIJs → with no bone fusion. The left hip shows an osteophyte ↗ in this young adult. This is either ankylosing spondylitis or inflammatory bowel disease.



Chronic Reactive Arthritis, Late
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Axial CT shows small poorly defined erosions → on both the iliac and sacral sides of the SIJs with diffuse adjacent sclerosis ⇨, representing reparative bone in this 41-year-old man with known chronic reactive arthritis. This is more typically a bilateral asymmetric arthritis but may become symmetric in more advanced disease.

Chronic Reactive Arthritis

Chronic Reactive Arthritis, Early
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Axial T2 FS MR shows mild bone marrow edema ↗ of the iliac bone as well as the sacrum at the same level. A discrete erosion → is present in the sacrum. A biopsy revealed no evidence of infection. This 30-year-old woman had a history of uveitis and urethritis.

Chronic Reactive Arthritis, Early
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Axial T1 C+ FS MR in the same patient demonstrates mild enhancement of the ilium and sacrum marrow ↗ with discrete erosion of the sacrum →.

Psoriatic Arthritis

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AP radiograph in a 24-year-old woman with back pain shows sclerosis at the inferior SI joints, greater on the iliac sides. There are probable erosions on the left, consistent with sacroiliitis. Note the asymmetry of involvement. The patient was diagnosed with PsA.

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Angled coronal T1 MR in the same patient is shown. T1 images are used for evaluating structural changes and show subchondral sclerosis and erosion. Mild periarticular low signal intensity likely corresponds to bone edema.

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Coronal T1 C+ FS MR in the same patient better shows inflammation associated with erosions → and bone marrow inflammation ⇨, indicating active disease. There is also enhancing synovitis within the joint ↗.

View Full Screen Image

Axial CT in a 43-year-old man with PsA is shown. There is asymmetric sacroiliitis with subchondral sclerosis → and erosions ↗ on the left and mild sclerosis on the right. CT is better than CR at identifying erosions, while MR is able to detect preerosive disease and active inflammation.