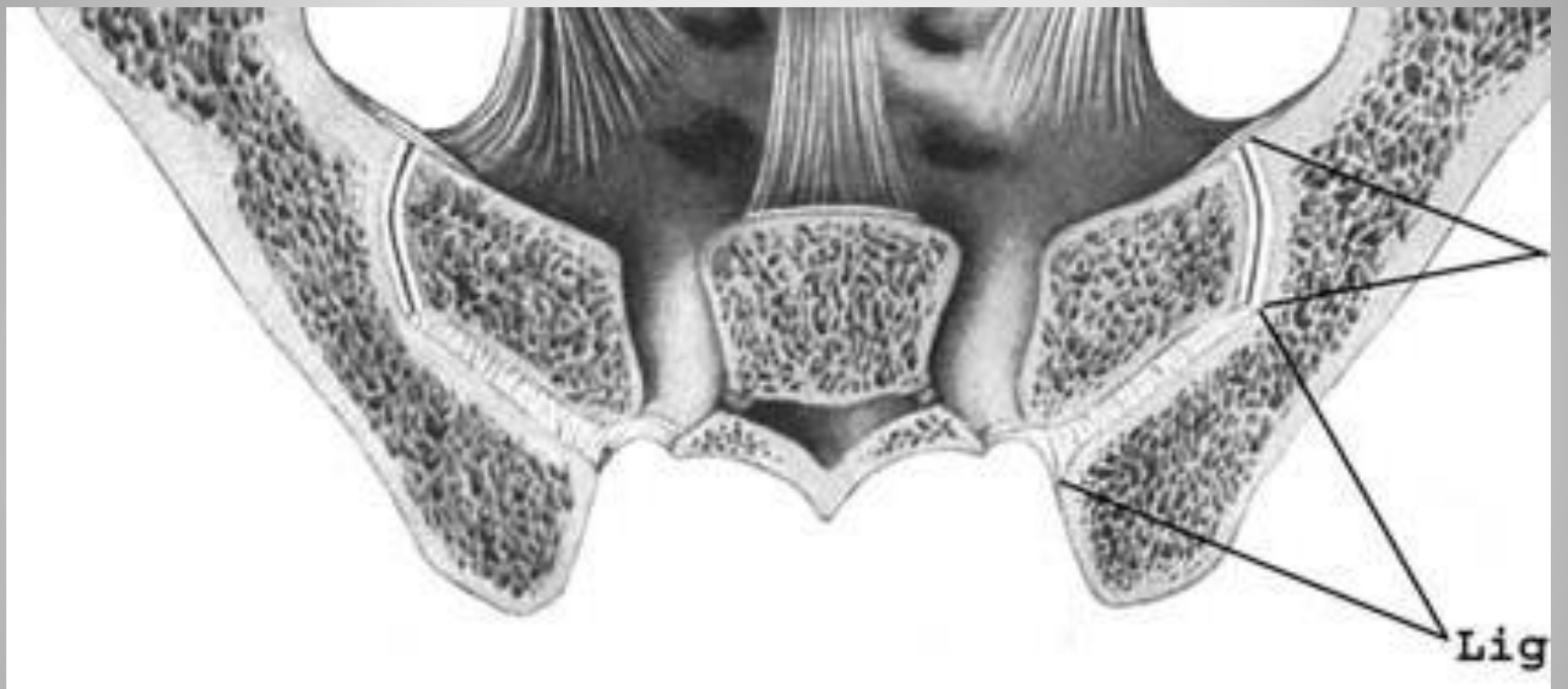


Ankylosing spondylarthritis

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- **The joint is composed of two compartments:**
- **1/ C-shaped cartilaginous part that lies inferiorly/ anteriorly**
- **2/ ligamentous part superiorly/posterior containing strong interosseous ligaments.**
- **The majority of patients have symmetric sacroiliitis even in early AS**
- **Sacroiliitis is commonly the first manifestation of SpA, and the diagnosis of sacroiliitis by imaging is therefore important in order to detect early SpA.**



- The early visible changes are blurring of the cortical margins, superficial erosions and subchondral sclerosis, sometimes with patchy periarticular osteoporosis.
- As erosion progresses, the joint space will for a period appear wider, but with further disease progression the erosions fill in with chondroid and fibrous material, which calcify, resulting in joint space narrowing and eventually joint fusion

Table 9.8 Diagnostic criteria of ankylosing spondylitis (modified New York classification 1984)

The diagnosis of ankylosing spondylitis is based on radiographic signs of unilateral or bilateral **sacroiliitis** and **clinical criteria**:

1. Previous or acute **pain** in the region of the thoracolumbar transition or lumbar spine
2. **Limited motion** of the lumbar spine in all three planes
3. **Limited chest expansion** (< 2.5 cm measured at the level of the fourth intercostal space)

Ankylosing spondylitis is **definitely** present in cases with:

- bilateral sacroiliitis grade 3–4 and at least one of the clinical criteria
- unilateral sacroiliitis grade 3–4 with clinical criterion 1 or clinical criteria 2 and 3
- bilateral sacroiliitis grade 2 with clinical criterion 1 or clinical criteria 2 and 3

Ankylosing spondylitis is **probably** present in cases with bilateral sacroiliitis grade 3–4 without clinical criteria

Gradation of the radiologic findings of the SI joint:

Grade 0: Normal finding

Grade 1: Questionable erosions

Grade 2: Erosions with subchondral sclerosis, beginning osseous bridging

Grade 3: Pseudo-widening of the joint space, erosions, sclerosis, and osseous bridging

Grade 4: Ankylosis

Five grades of sacroiliitis according to New York Criteria



Grade 0, normal joints



Grade 1, suspicious changes of the left SIJ in the form of slight irregularity of the joint facets (26-year-old woman)



Grade 2, minimal abnormality in the form of small areas of erosions (*black arrow*) and sclerosis (*white arrow*) without alteration in the joint width (28-year-old man)



Grade 3 changes in the form of moderate erosion with subchondral sclerosis and focal joint space widening (25-yearold woman).



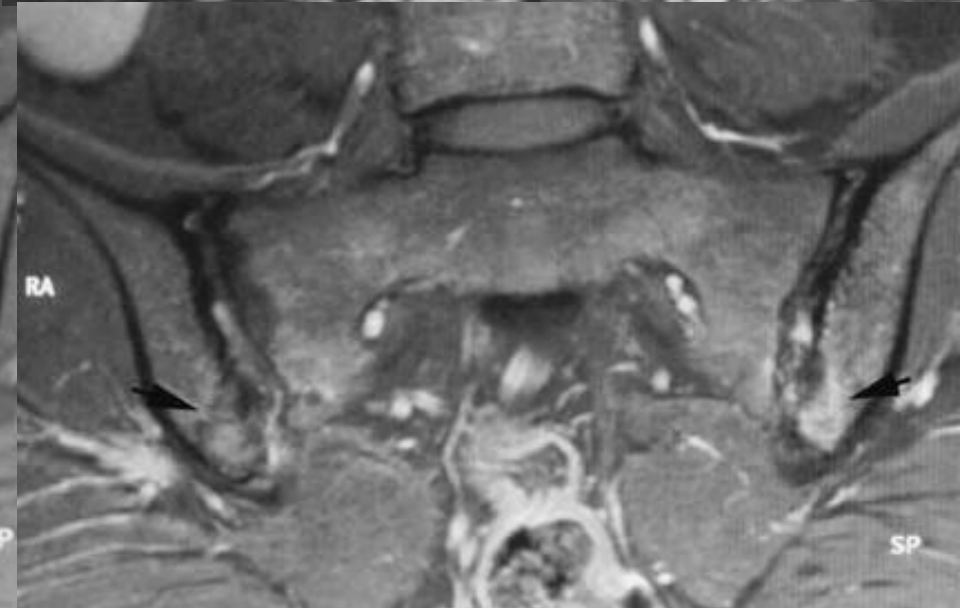
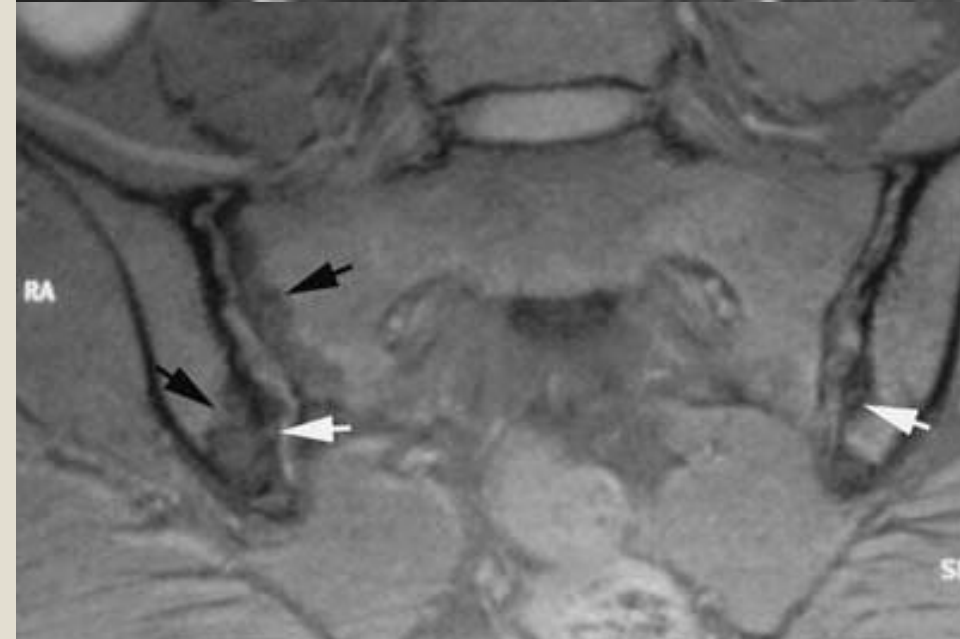
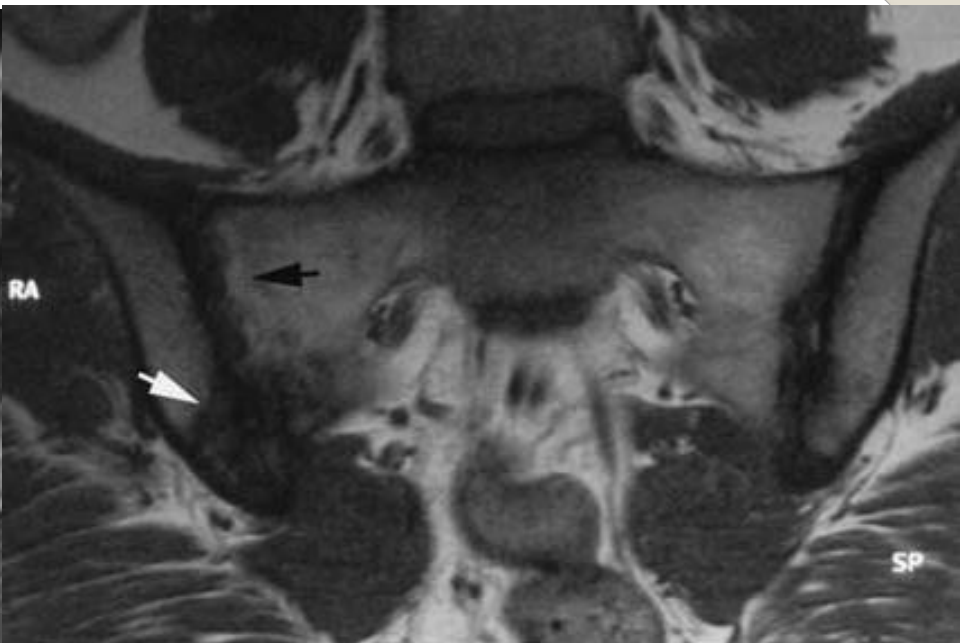
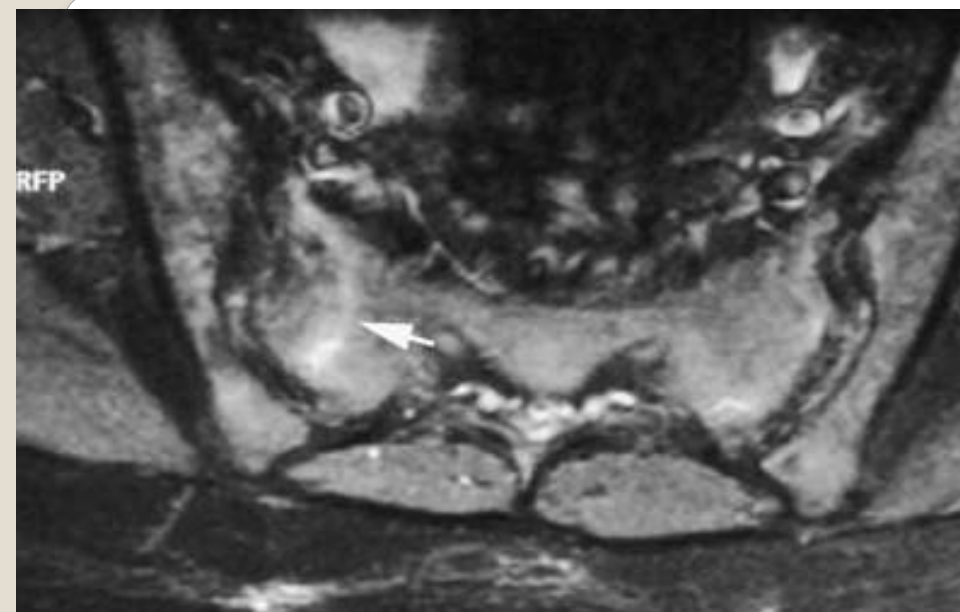
Grade 3–4, severe abnormality in the form of joint ankylosis, but still visible joint contours (34-year-old man).



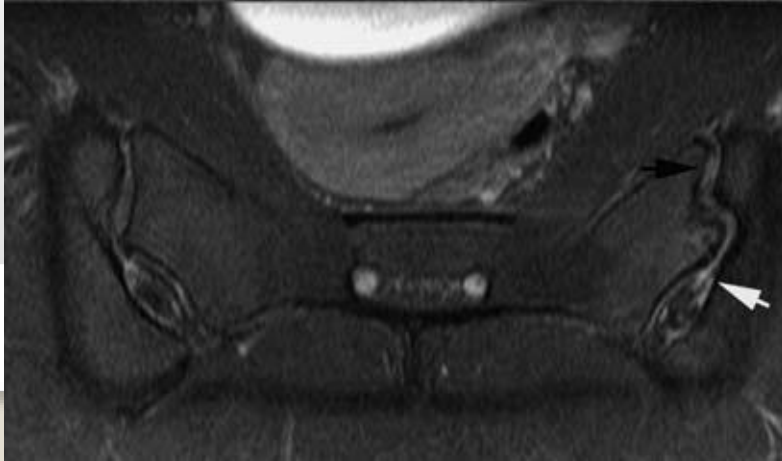
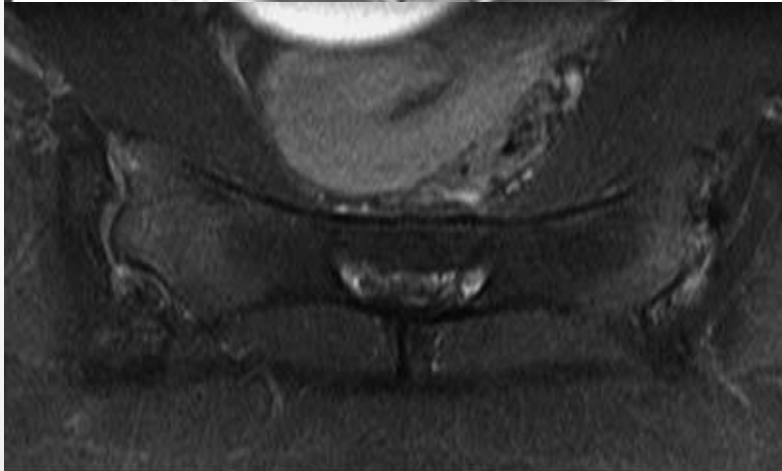
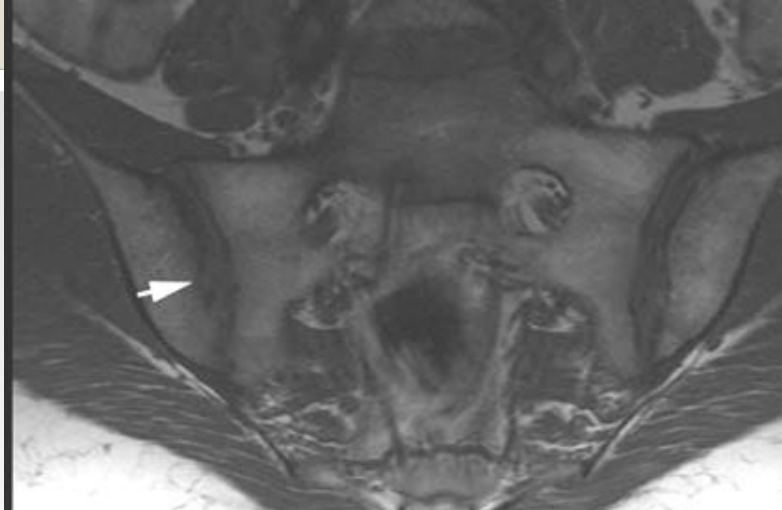
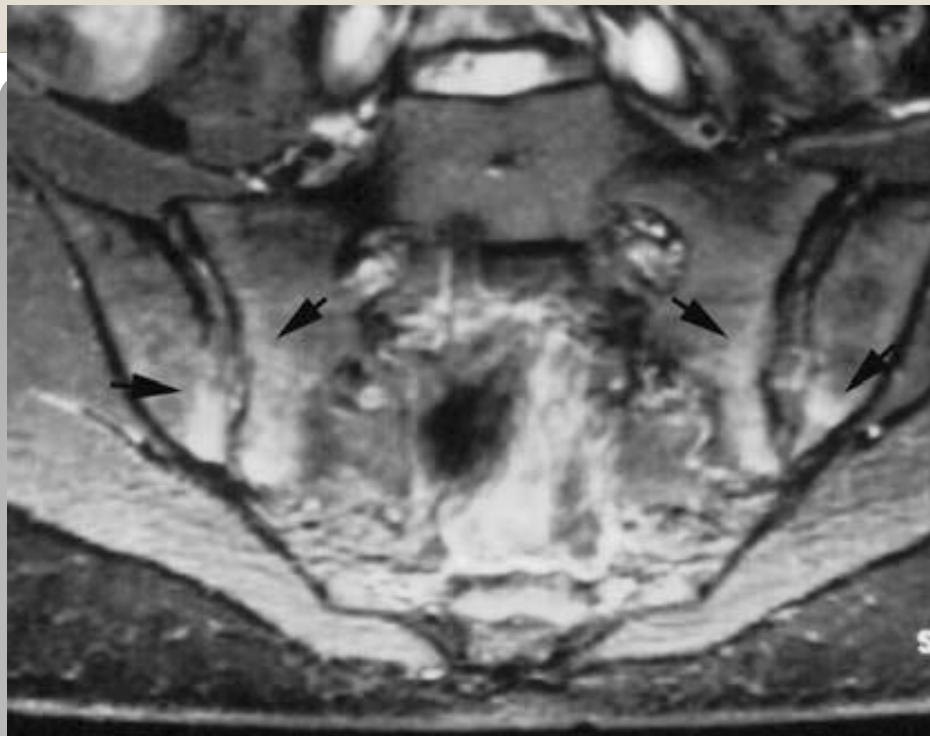
Grade 4 with homogeneous joint ankylosis including ankylosis corresponding to the ligamentous structures (53-year-old man)

- **Imaging does not play a major role in differentiating between the subtypes of spondyloarthritis because their imaging features are comparable, especially in early disease.**
- **One exception is undifferentiated spondyloarthritis, which is diagnosed in cases with no definite radiologic signs of sacroiliitis.**
- **Another exception is psoriatic arthritis, which is known to produce parasyndesmophytes, a form of bony outgrowth distinct from syndesmophytes**

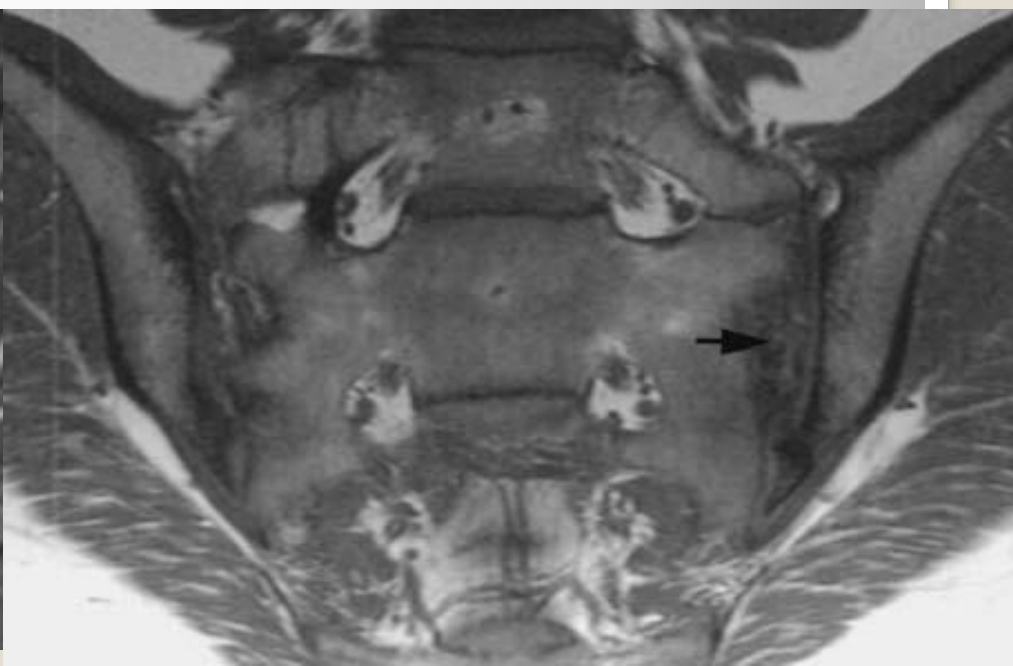
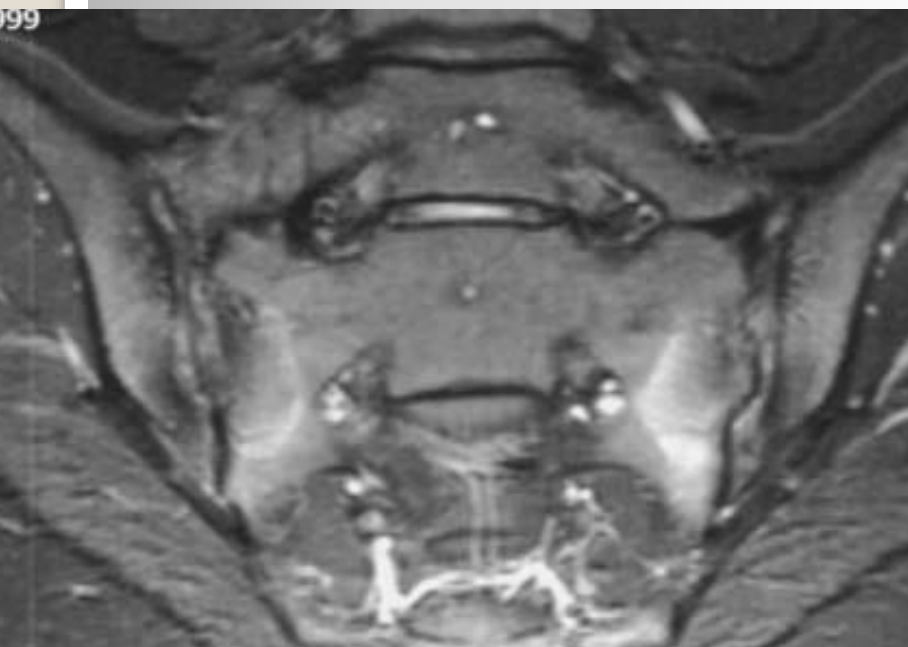
- **The necessary MR sequences depend on the diagnostic purpose.**
 - **Screening for sacroiliitis :**
 - **semi-axial STIR with fat suppression** (displays inflammation as areas of high signal intensity)
 - **and a semi-coronal T1-w,** (displaying chronic changes such as erosion and fatty bone marrow changes, appearing as areas of increased signal intensity)
-
- **Erosions, sclerosis, and changes of joint width are signs of chronic disease, as well as fat deposition in the bone marrow, which can be regarded a sign of degeneration and healing**



- Recommended MR sequences: (a) semi-axial STIR and (b) semi-coronal T1 image, supplemented by (c) semi-coronal
- T1 FS image before and (d) after Gd right-sided grade 2 changes at radiography.
- The STIR image displays definite increased signal intensity around the right joint (*arrow*). *The T1 image shows decreased signal intensity corresponding to the inferior part of the joint, compatible with sclerosis (white arrow). There is accompanying joint space narrowing and slightly increased signal intensity in the sacrum corresponding to slight fatty marrow changes (black arrow). The T1 FS image (c) displays definite erosion at both SIJs, most pronounced at the right iliac joint facet (white arrows). The iliac area with sclerosis shows lower signal intensity than corresponding to the sacral areas of fatty marrow changes (black arrows). Enhancement in the subchondral bone, and also in both joint spaces is clearly seen on the post-contrast image (d, arrows)*



- Early ankylosing spondylitis (AS) in a patient with suspicious changes at radiography
- (a) Semi-coronal STIR, (b) T1, and (c) post-contrast T1 FS, and (d) semi-axial post-contrast T1 FS. The semi-coronal images display nearly symmetrical oedema and enhancement in the subchondral bone (*black arrows*) and the joint space (*white arrows*). At axial images (d) the involvement is seen to occur both in the cartilaginous (*black arrow*) and the ligamentous part of the joint (*white arrow*). The T1 image (b) shows irregular joint space width with erosion of the iliac joint facet on the right side (*arrow*), but no fatty marrow changes



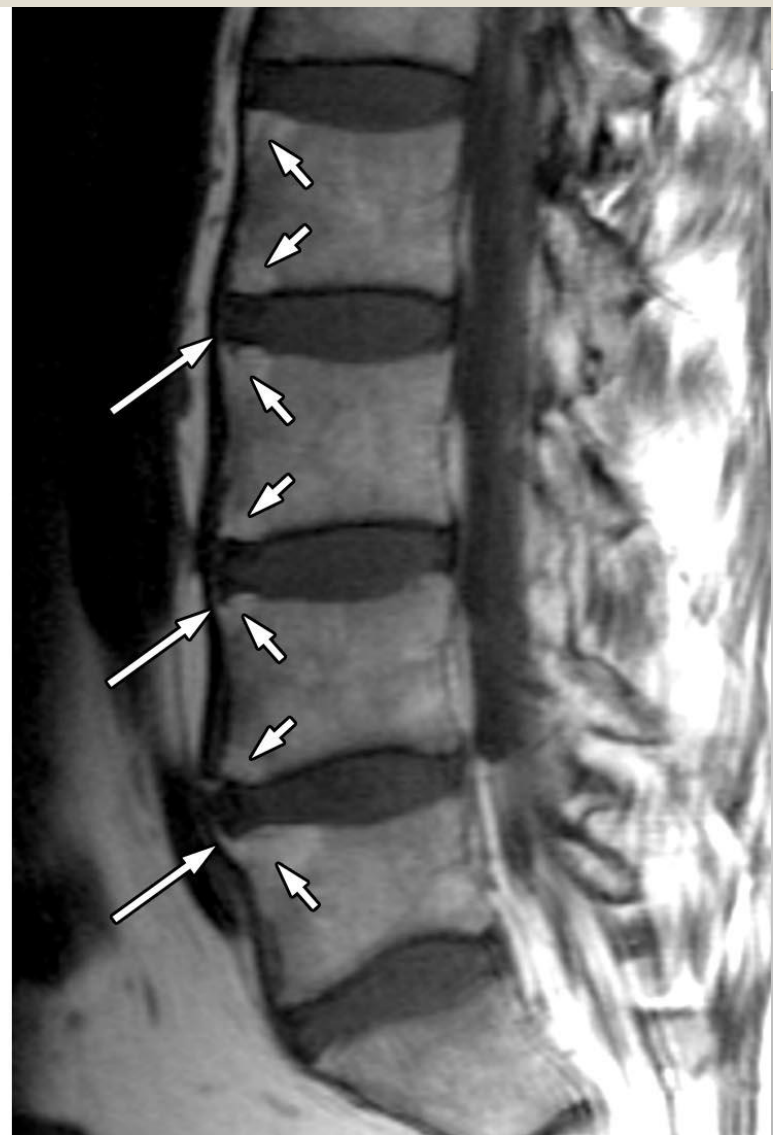
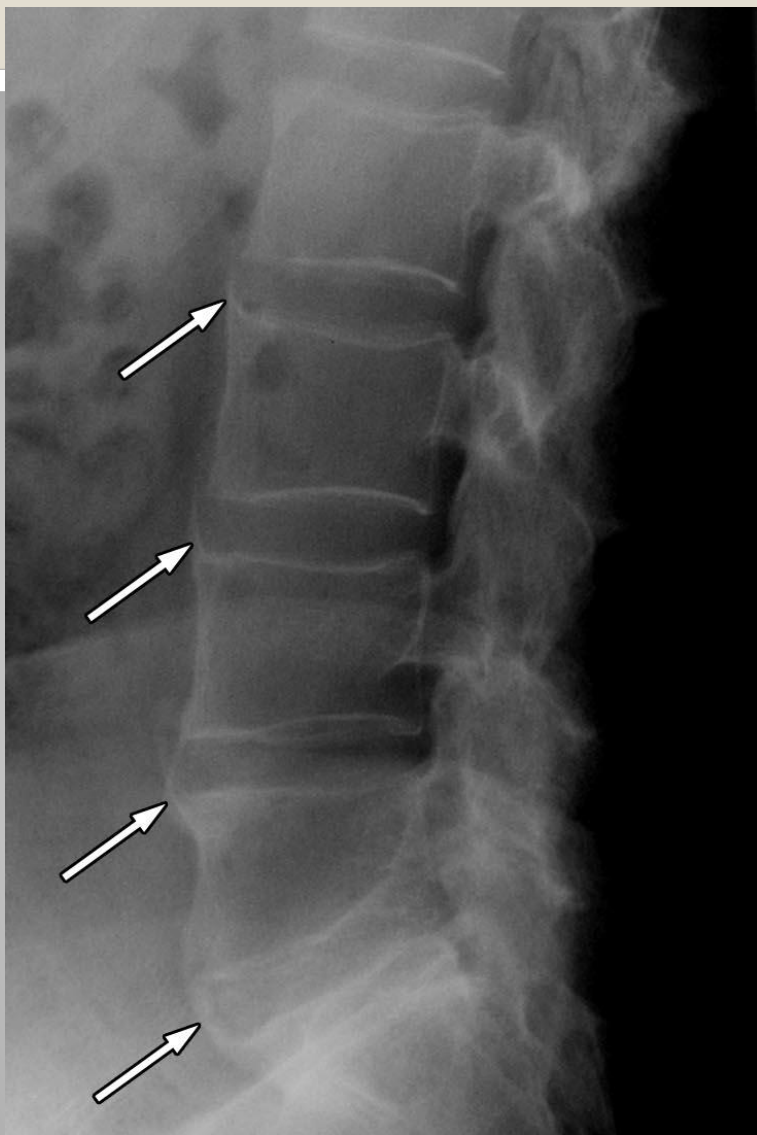
- **An MR imaging protocol that has proved useful for evaluating the spinal column comprises a sagittal T1-w and a sagittal (STIR) sequence at 1.5 T. Administration of a paramagnetic contrast medium is required in spinal MR imaging only in specific cases.**

Spinal Changes

- **Irregularities and erosions involving the anterior and posterior edges of the vertebral endplates and are also known as Romanus lesions.**
- **Later in the course of the disease, sclerotic changes of the edges of the vertebral endplates appear, findings referred to as “shiny corners**
- **Because such a junction of bone and ligamentous structure is an enthesis by definition, anterior or posterior spondylitis can be regarded as an enthesitis**

Anterior and Posterior Spondylitis

- **Later in the disease course, the epiphyseal ring can appear hyperintense on T1-weighted images . Such hyperintense lesions represent circumscribed areas of postinflammatory, fatty bone marrow degeneration . Only at this stage are shiny corners depicted by conventional radiography—that is, long after inflammation has run its course.**

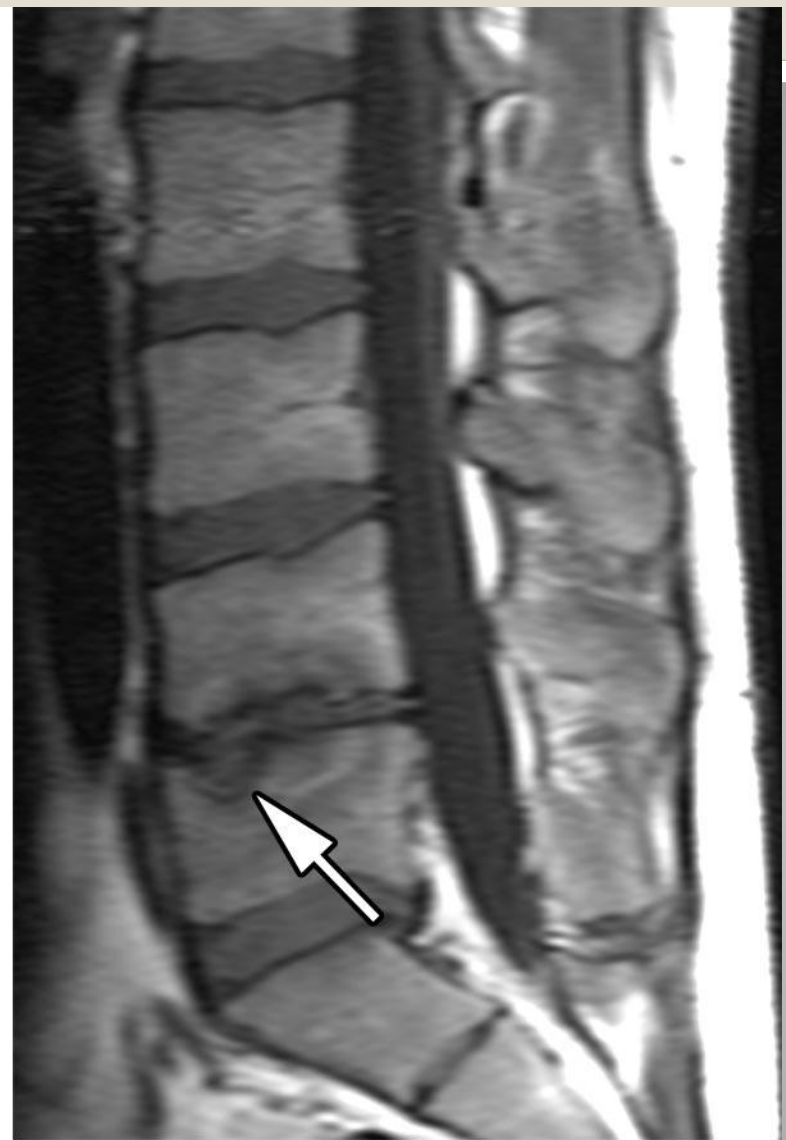
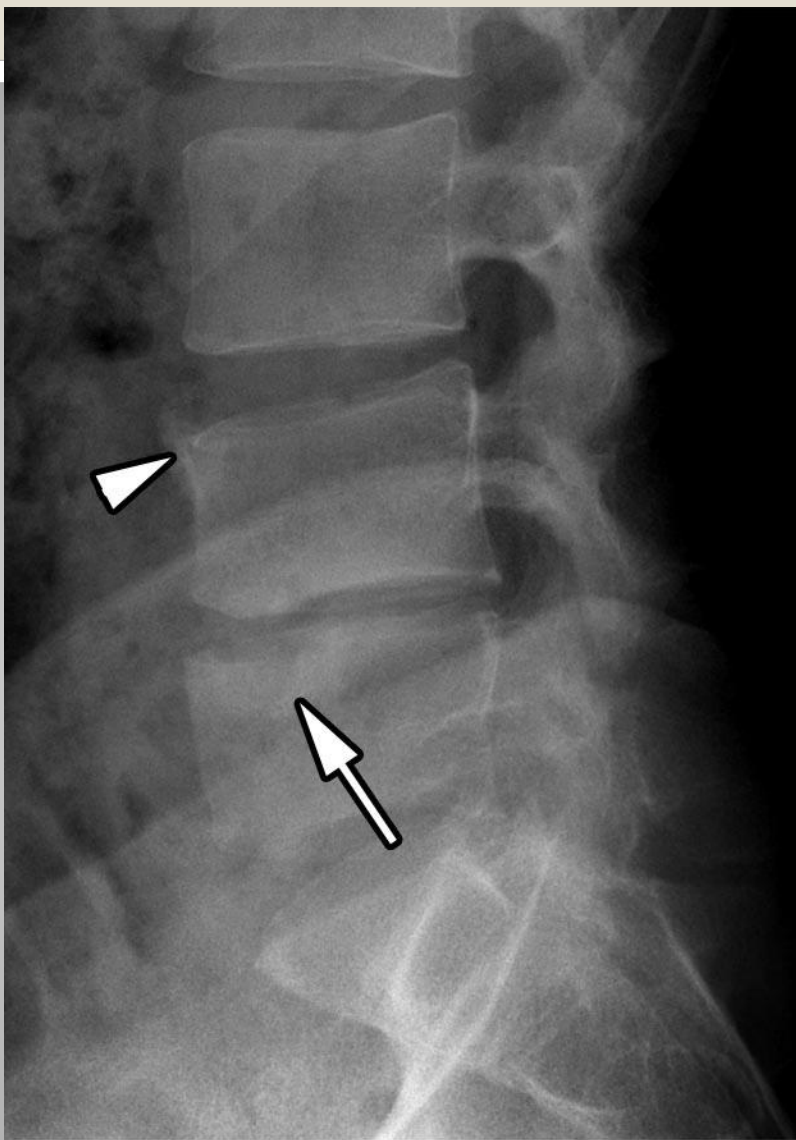


Spondylitis (inactive Romanus lesions) in AS. Lateral X-ray shows syndesmophytes at L3 through S1 and a shiny corner at the superior endplate of L5. On the corresponding T1-w, the syndesmophyte at L5 is barely visible. Postinflammatory fatty bone marrow degeneration of the anterior vertebral edges is seen, findings compatible with inactive Romanus lesions.

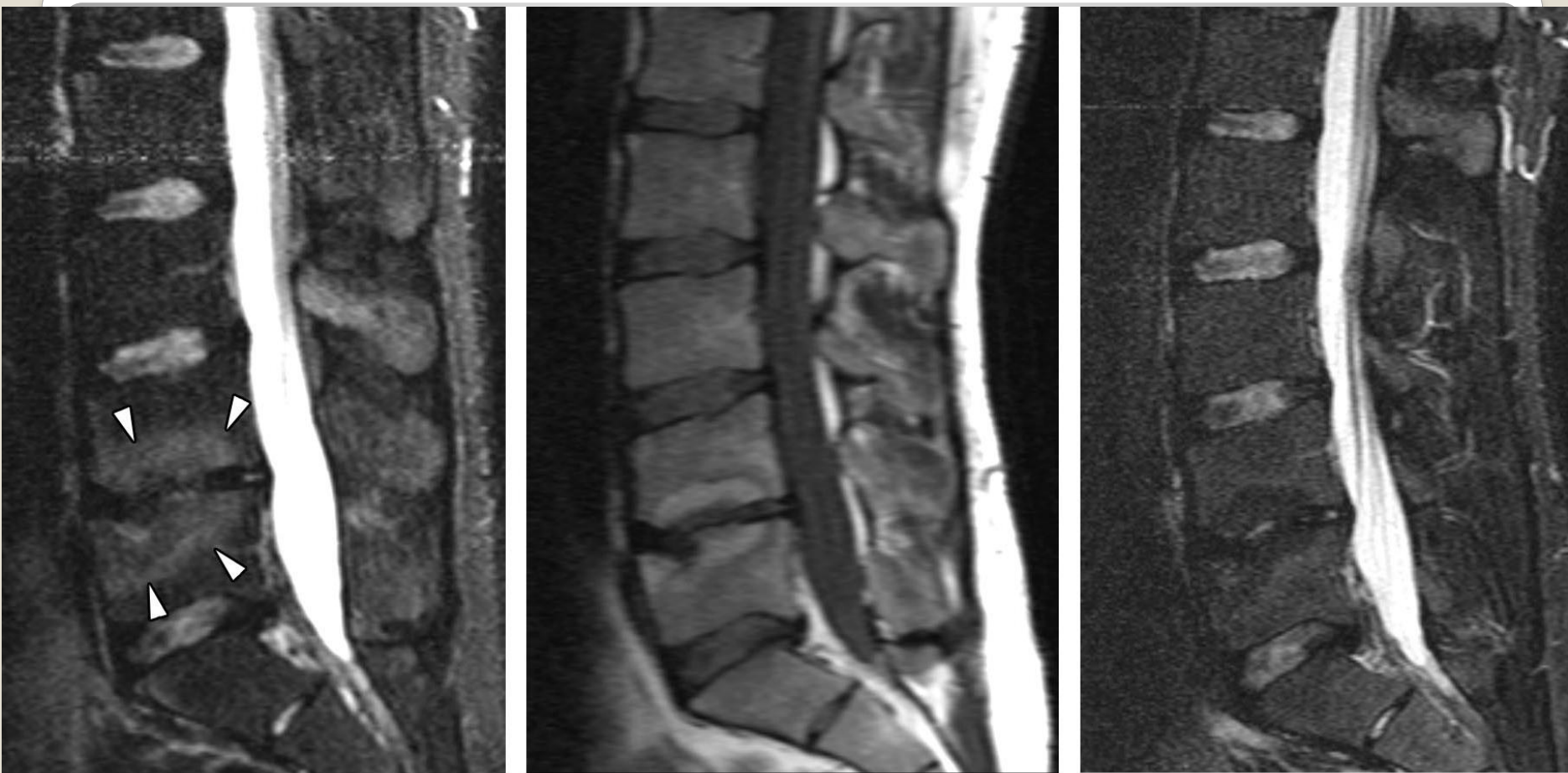
- Inflammatory involvement of the intervertebral disks by spondyloarthritis is known as spondylodiskitis or Andersson lesion, according to Andersson, who first described this condition in 1937
- At MR imaging, these lesions are depicted as disk-related signal-intensity abnormalities of one or both vertebral halves of a diskovertebral unit; they appear hyperintense on STIR images and hypointense on T1-w images, where they are often hemispherically shaped

Spondylodiskitis

- **In X-ray depicts irregularities and erosions of the vertebral endplates that are not related to the anterior or posterior edge but rather to the central portion ; such findings are now known to be late features of spondyloarthritis.**



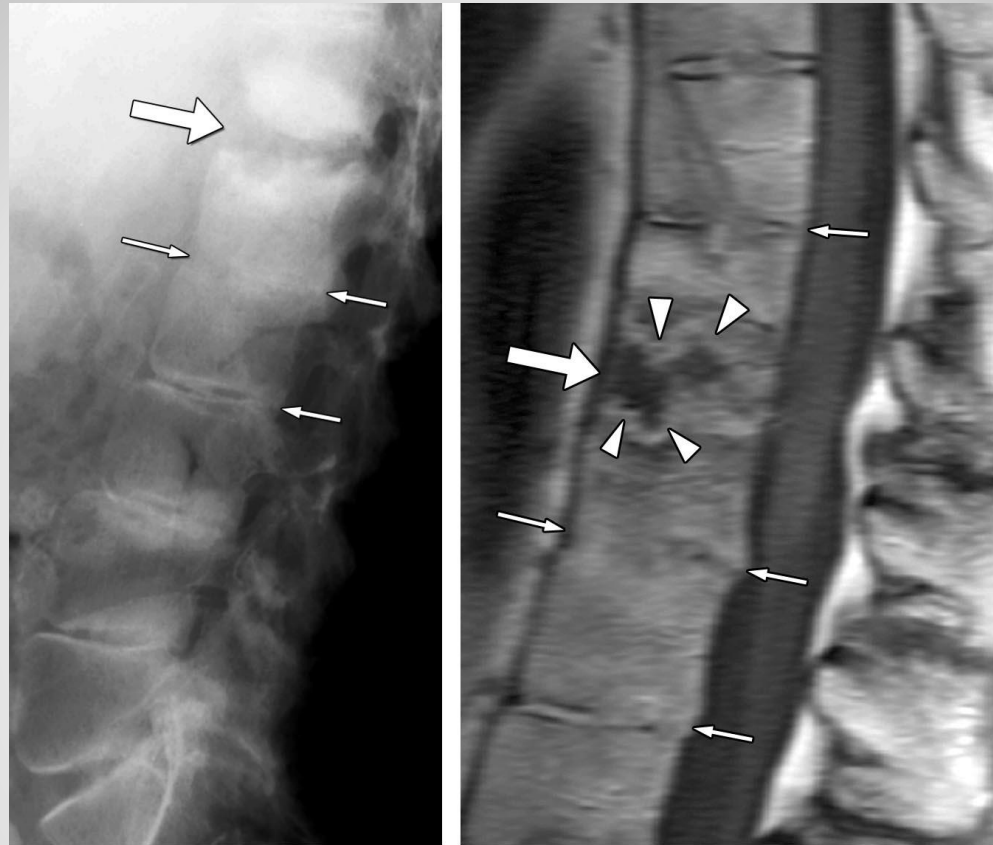
Spondylodiskitis (inflammatory Andersson lesions) in AS. (a) Lateral X-ray of the lumbar spine shows height reduction of intervertebral disk space, sclerosis of the endplates at L4-5, erosion (arrow) of the superior endplate of L5 (Andersson lesion), and a syndesmophyte at L4 (arrowhead). (b) Sagittal T1-w reveals erosive defects of the inferior endplate (arrow) of L4 and superior endplate of L5, as well as signal loss in the surrounding bone marrow



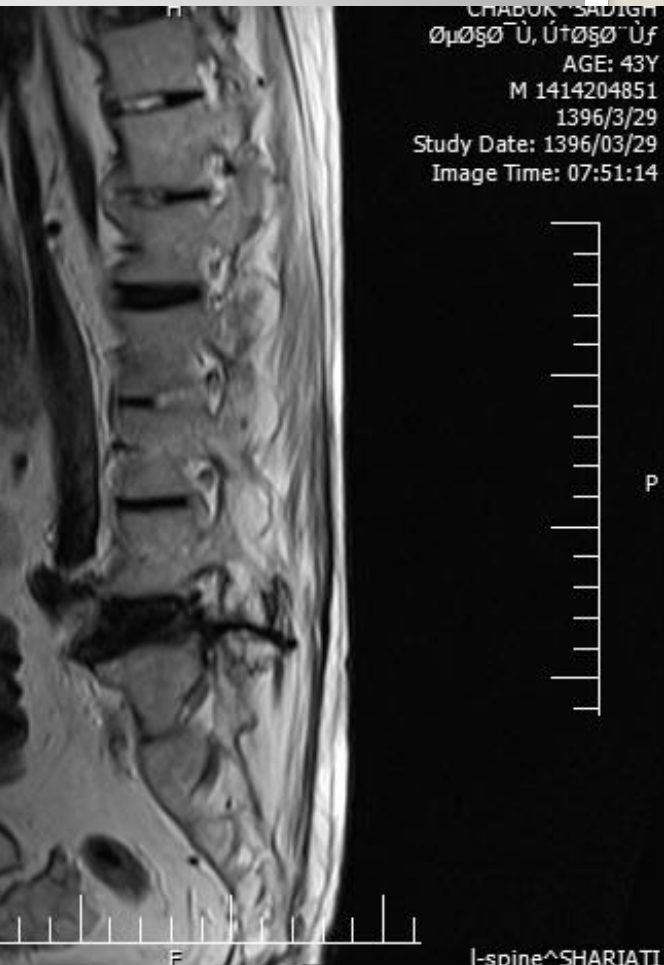
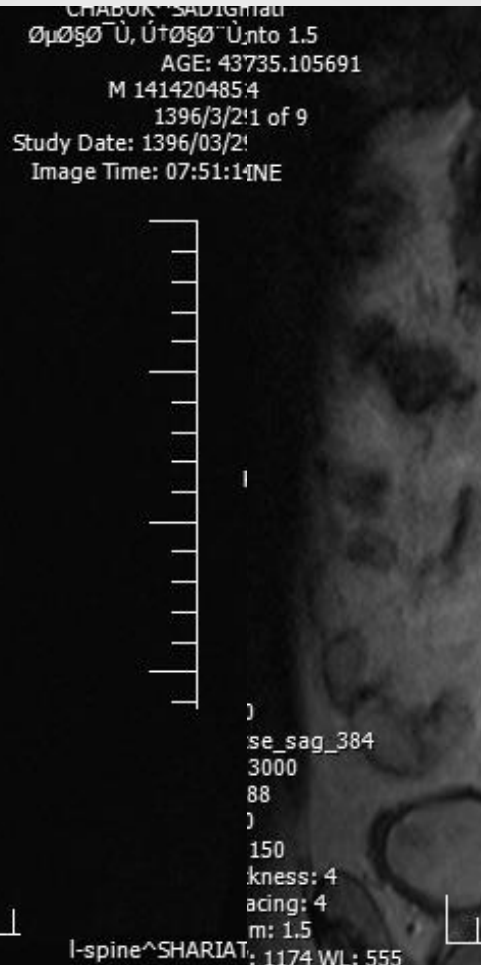
(c) Corresponding STIR image shows increased signal intensity (arrowheads) adjacent to the intervertebral disk (florid Andersson lesion). (d) Sagittal T1-weighted image obtained 26 weeks after treatment with TNF- inhibitor shows increased signal intensity in the former low-signal-intensity areas, findings indicative of postinflammatory fatty bone marrow degeneration. (e) Corresponding STIR image shows complete regression of the former high-signal-intensity changes.

- Insufficiency fractures occur as fatigue fractures at the level of the disk (transdiskal) or at the level of the vertebral body (transvertebral).

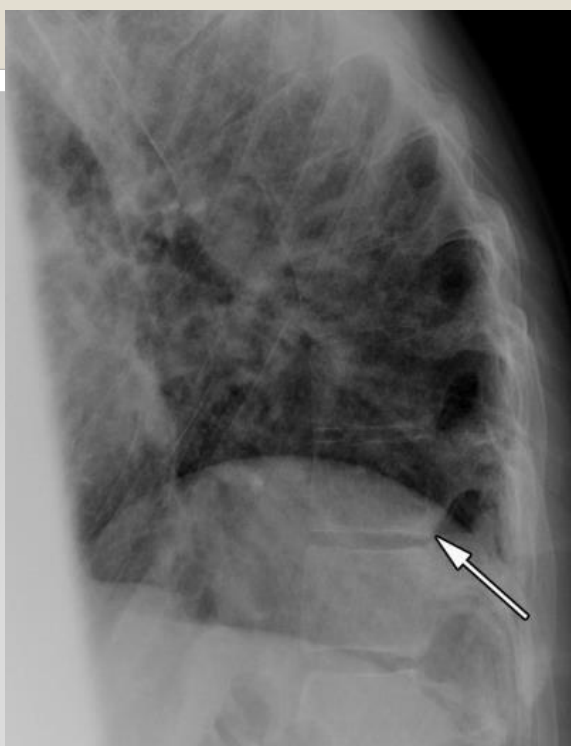
Insufficiency Fracture



Insufficiency fracture^a (noninflammatory Andersson lesion)^b in a 60-year-old patient with a long history of AS. (a) Lateral X-ray of the lumbar spine shows gross bony destruction of the T12-L1 disk with irregular contours of the endplates and increased sclerosis of adjacent vertebral bodies (large arrow). Ankylosis of inferior articular segments (small arrows) and barreling of L3 through L5 are seen. (b) Sagittal contrast-enhanced T1-w shows subacute hematoma with low signal intensity and marginal contrast enhancement (arrowheads), indicative of peripheral revascularization at T12-L1 (large arrow). Ankylosis of the superior and inferior segments is seen (small arrows). The fracture extends to the posterior elements.



Arthritis of the Synovial Joints of the Vertebral Column



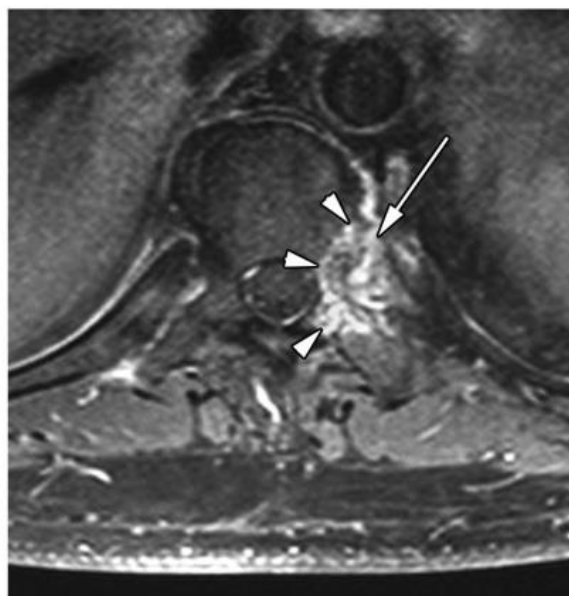
a.



b.



c.



d.

- Arthritis of the zygapophyseal joints in AS. X-ray shows a posterior shiny corner at T9–10. (b) Sagittal T1-w shows circumscribed loss of signal in the area of the vertebral arch (arrows) and zygapophyseal joints. (c) contrast-T1-w shows pronounced enhancement of the vertebral arch, articular processes, and adjacent soft tissue (arrows), findings suggestive of arthritis of apophyseal joints. Marginal spondylitis is seen (arrowheads). (d) contrast-T1-w shows enhancement near the costovertebral joint (arrow), a finding indicative of synovitis with concomitant osteitis of the adjacent rib and vertebral portions (arrowheads)

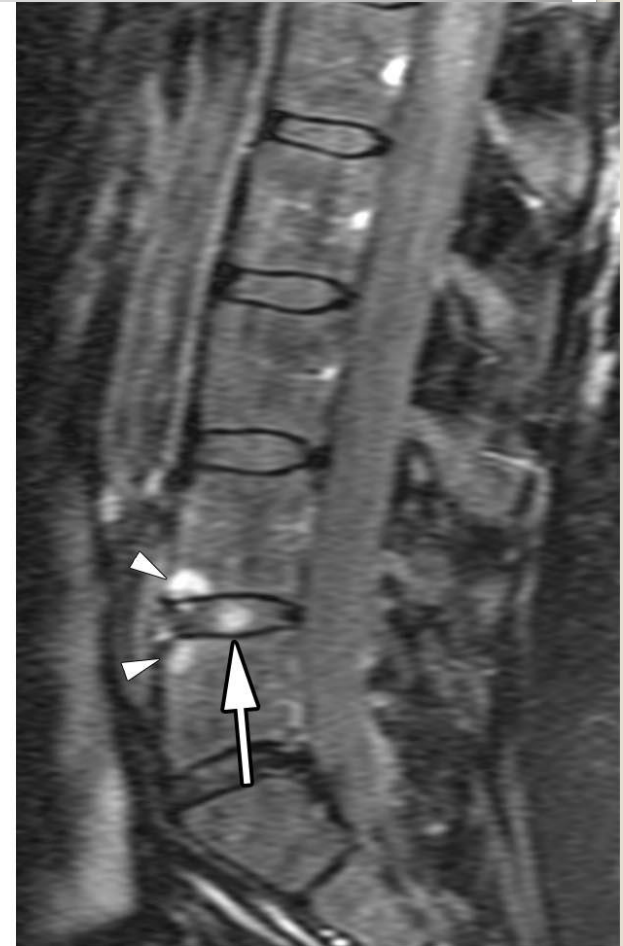
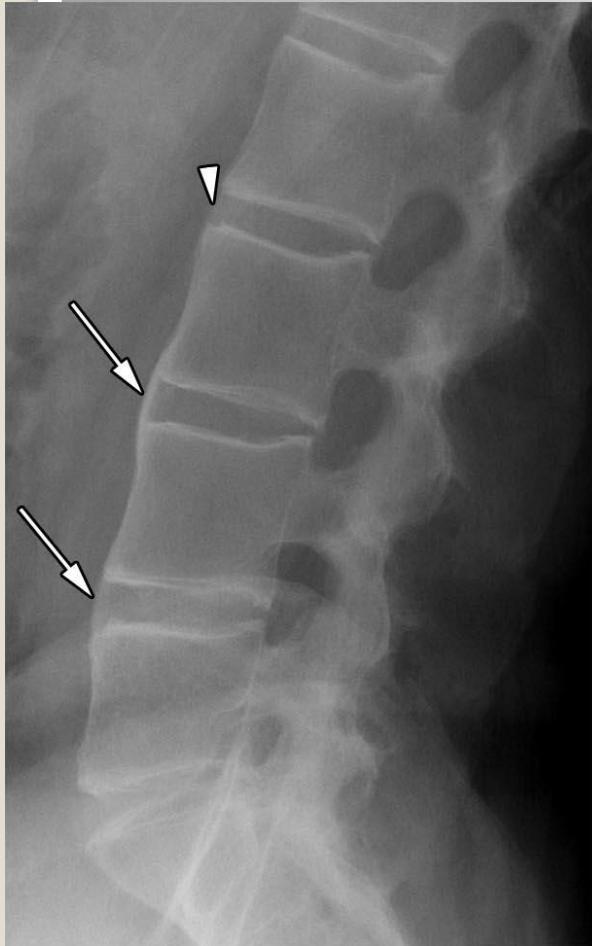


Enthesitis in AS. (a) T1-w shows thickening of the supraspinal ligament from C7 through T3 (arrows). (b) contrast T1-w shows pronounced enhancement in the area of the interspinal and supraspinal ligaments (arrows), a finding indicative of enthesitis.

Enthesitis

- Ankylosis involves the vertebral edges or center, with bony extension through the disk. The former is thought to occur secondary to anterior or posterior spondylitis , whereas the latter is a sequel of an inflammatory Andersson lesion.

Syndesmophytes and Ankylosis



Ankylosis and syndesmophytes in AS. (a) X-ray shows anterior syndesmophytes at L3-4 and L4-5 (arrows) and a defect of the epiphyseal ring at the anterior edge of L3 (arrowhead). Beginning ossification of intervertebral spaces L1-2 and L2-3 is evident. (b) On the T1-w, syndesmophytes are not seen. (c) contrast T1-w shows enhancement in the area of the epiphyseal rings at L4-5 (arrowheads), a finding representing a Romanus lesion. Subtle enhancement (arrow) of intervertebral disk L4-5 (an early Andersson lesion) is also seen.



@bestpaint

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