Axial SpA:
MRI findings and mimickers

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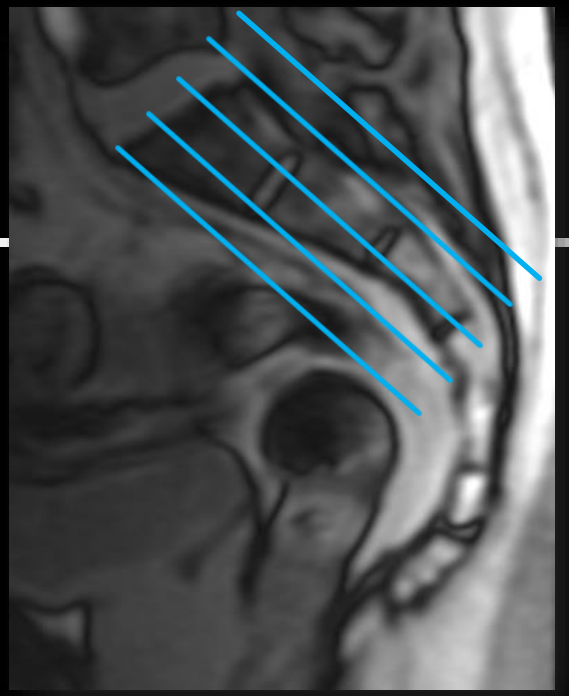
Advantages of MR Imaging

- Visualization of active inflammatory lesions
  - Early in disease course *(1-2 w after onset of symptoms, >5y for X-rays)*
  - Inconclusive radiographic findings (nrAxSpA)
- Depiction of structural lesions early in the disease course
- Monitoring of disease activity and assessment of response to therapy

Lambert RG, et al. Ann Rheum Dis 2016;1958-1963
Sieper J, ET AL. Lancet 2017;390:73-84

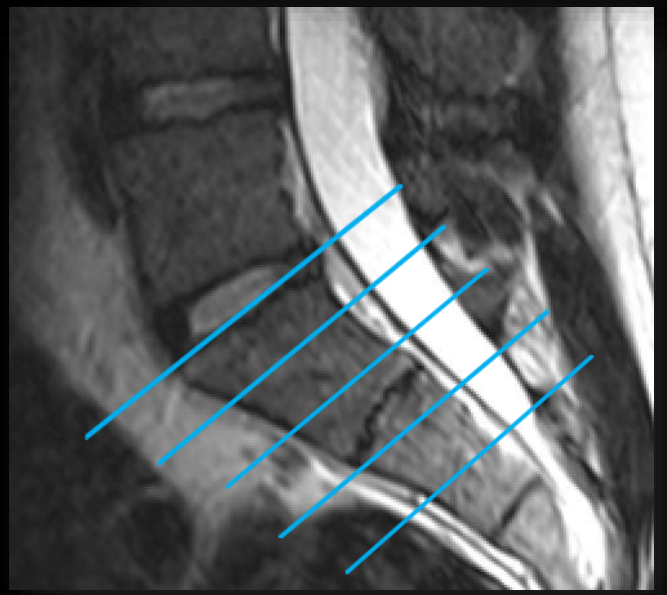
MR imaging protocol (1.5 T)



Coronal oblique
- T1-w
- STIR or FS PD/T2

Axial oblique
- STIR or FS PD/T2

*Both planes
- T1-w FS Gd



- slice thickness: 3-4 mm
- interslice gap: 0.3 mm

Lambert RG, et al. Ann Rheum Dis 2016;1958-1963
Rudwaleit M, et al. Ann Rheum Dis 2009;68:1520-7
Schueller-Weidekamm C, et al. Semin Musculoskelet Radiol 2014;18:265-279

SIJ involvement in aSpA
MR imaging findings

Structural lesions

1. Subchondral sclerosis
2. Fatty [illegible] ion
3. Erosions
4. Bony bridges/ankylosis

T1-w

Inflammatory lesions

1. [illegible]
2. [illegible]
3. [illegible]

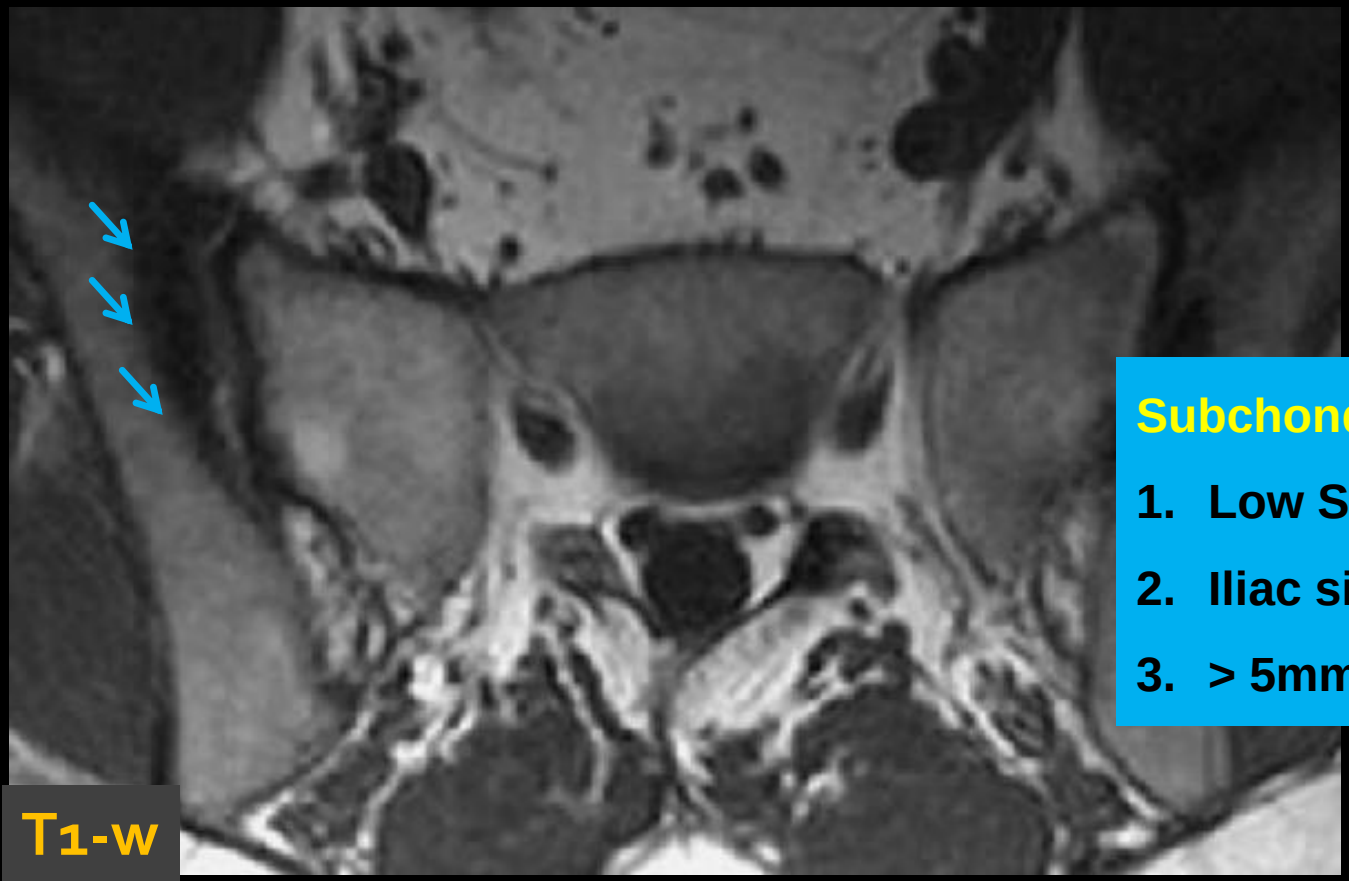
STIR
FS PD/T2
T1-w FS Gd

- **Better depiction of inflammatory lesions**
- **DD of sacroiliitis**

T1-w
What to look for…

Structural lesions

Subchondral sclerosis
Fatty deposition
Erosions
Bony bridges/ankylosis



T1-w

Subchondral sclerosis

1. **Low SI on all sequences**
2. **Iliac side**
3. **> 5mm from the joint surface**

Rudwaleit M, et al. Ann Rheum Dis 2009;68:1520-7
Schueller-Weidekamm C, et al. Semin Musculoskelet Radiol 2014;18:265-279

T1-w
What to look for…

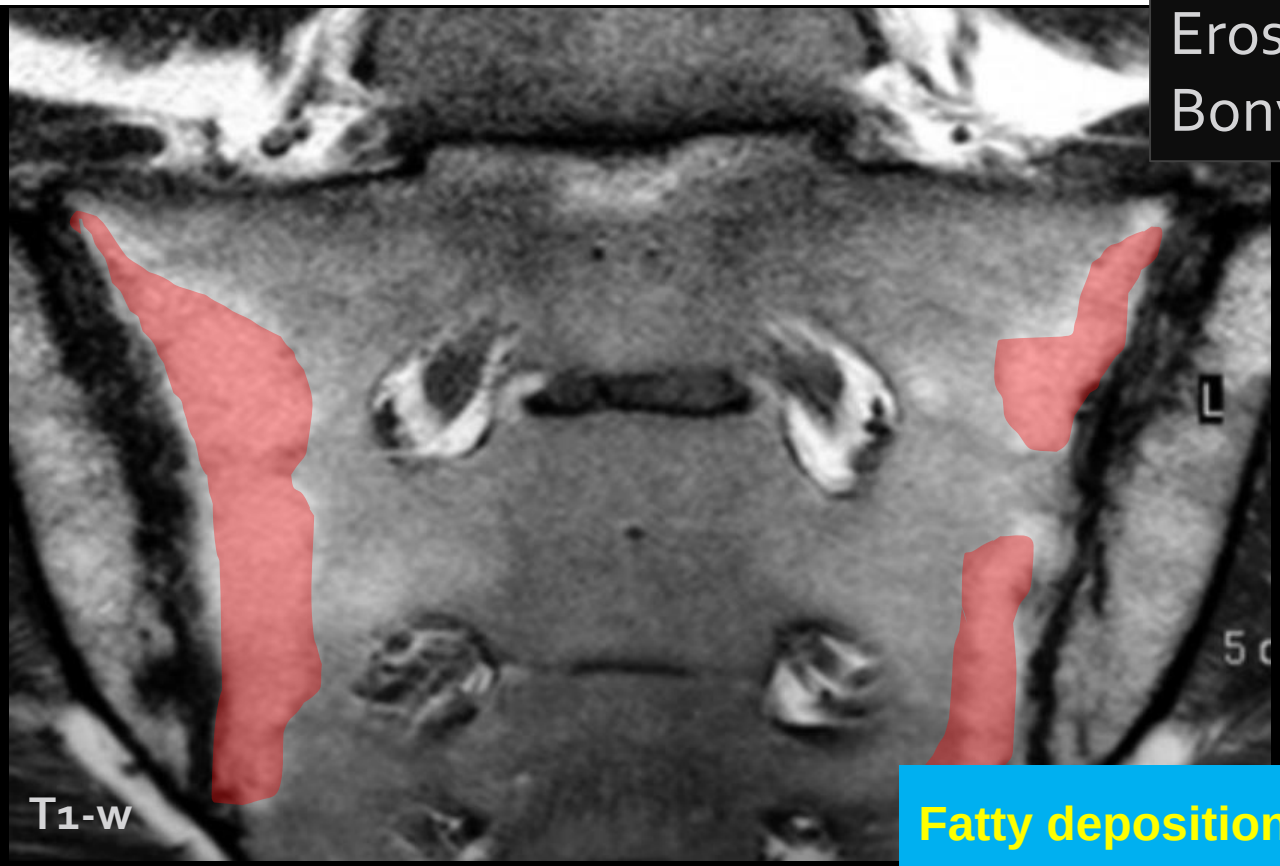
Structural lesions

Subchondral sclerosis

Fatty deposition

Erosions

Bony bridges/ankylosis



Fatty deposition ***healed inflammation***

1. **High SI T1-w**
2. **Low SI on fluid sensitive sequences**
3. **>5mm from joint surface**

Rudwaleit M, et al. Ann Rheum Dis 2009;68:1520-7
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T1-w
What to look for…

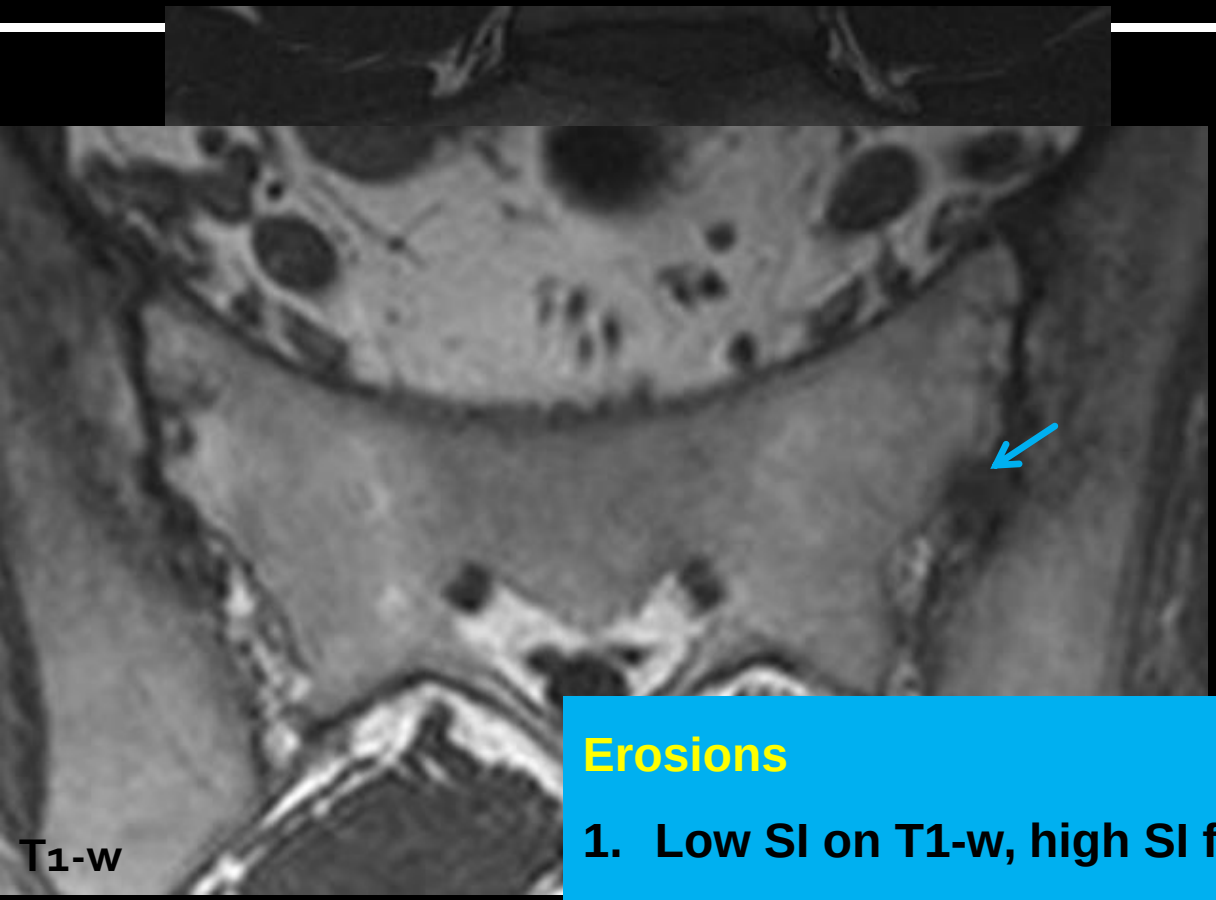
Structural lesions

Subchondral sclerosis

Fatty deposition

Erosions

Bony bridges/ankylosis



Erosions

1. **Low SI on T1-w, high SI fluid sensitive/Gd when active**
2. **Synovial part of SIJs**
3. ***"Pseudo-widening"*: confluent lesions**

Rudwaleit M, et al. Ann Rheum Dis 2009;68:1520-7
Schueller-Weidekamm C, et al. Semin Musculoskelet Radiol 2014;18:265-279

T1-w
What to look for…

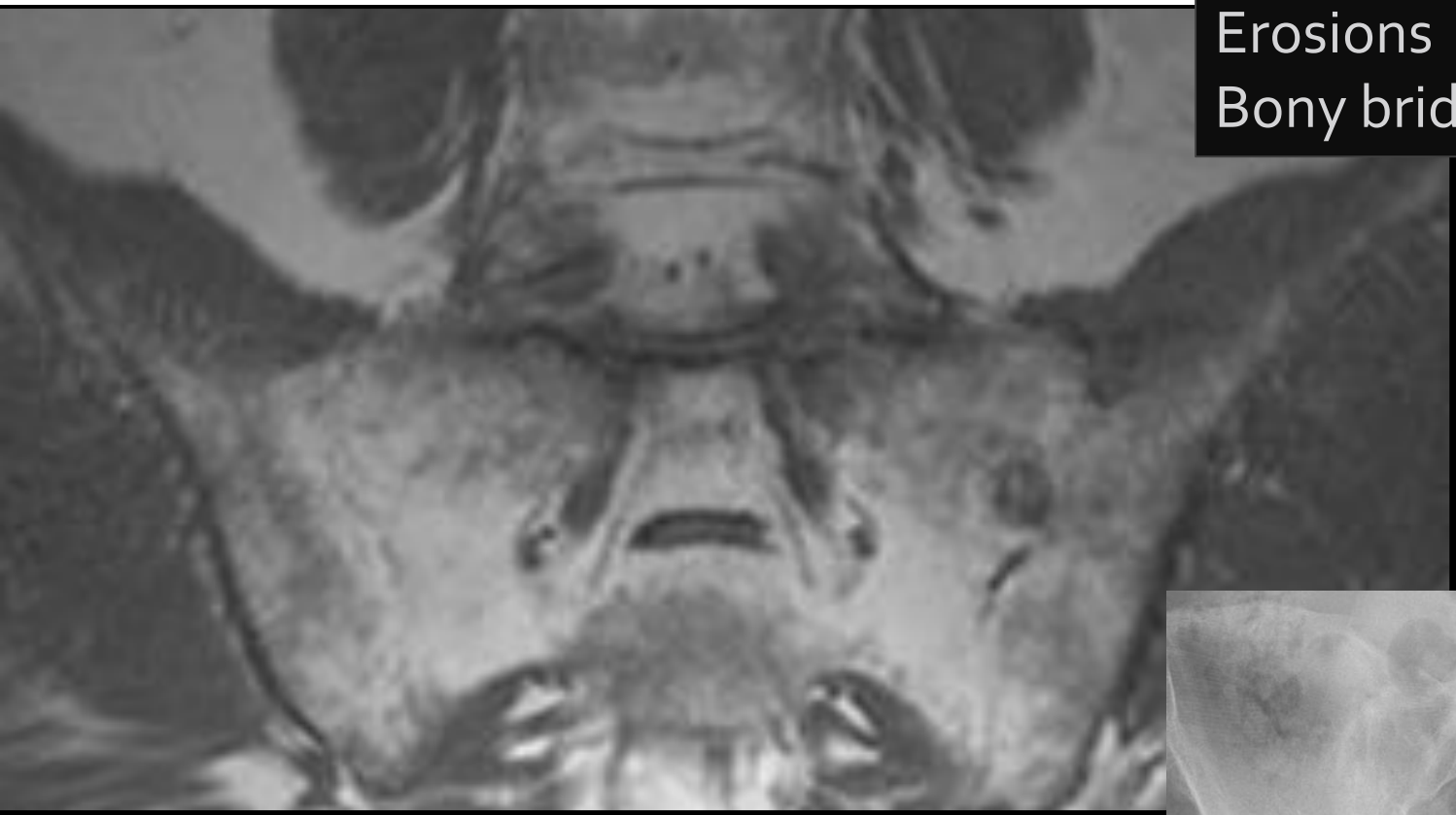
Structural lesions

Subchondral sclerosis

Fatty deposition

Erosions

Bony bridges/ankylosis



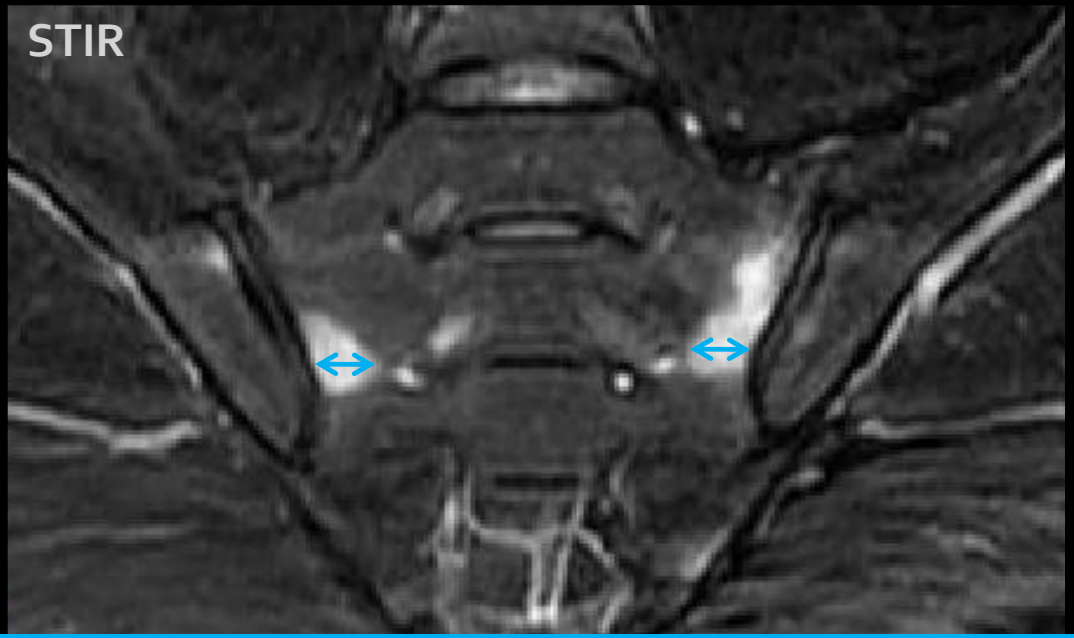
Ankylosis

Low or high SI on T1-w

Fluid sensitive / T1-w FS Gd
What to look for…

Inflammatory lesions

BME / osteitis
Synovitis
Enthesitis
Capsulitis



BME / osteitis *1-2 w after onset of symptoms*

1. **Fluid sensitive sequences / T1-w FS Gd: high SI (CSF, vessels)**
2. **Depth: > 1cm**
3. **Location: subchondral, dorsocaudal part of SIJ (iliac side first!)**

Lambert RG, et al. Ann Rheum Dis 2016;1958-1963
Rudwaleit M, et al. Ann Rheum Dis 2009;68:1520-7
Schueller-Weidekamm C, et al. Semin Musculoskelet Radiol 2014;18:265-279

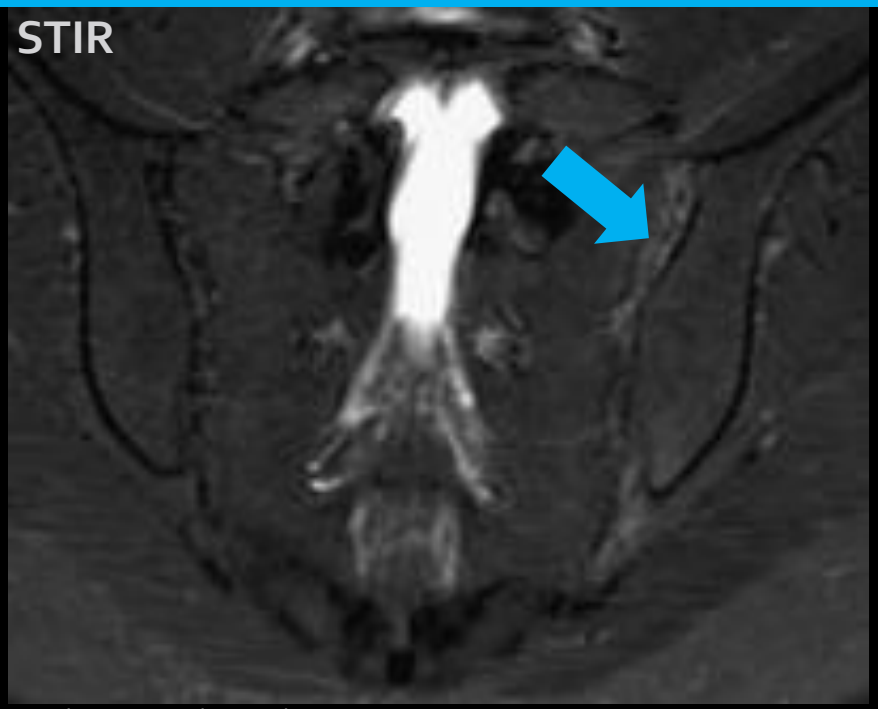
Fluid sensitive / T1-w FS Gd What to look for…

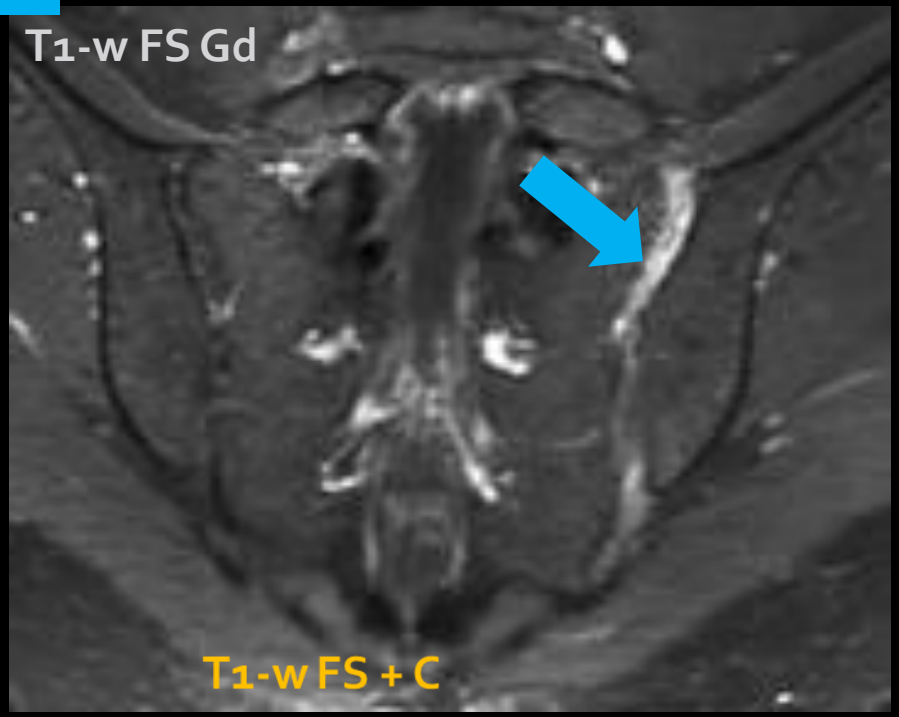
Inflammatory lesions

BME / osteitis
Synovitis
Enthesitis
Capsulitis

Synovitis

1. **Fluid sensitive/T1-w FS Gd: high SI**
2. **Synovial part of SIJ**
3. **T1-w FS Gd > STIR**





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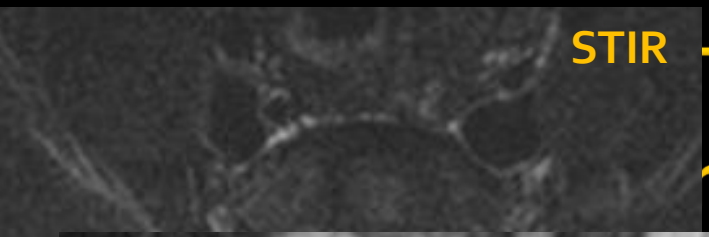
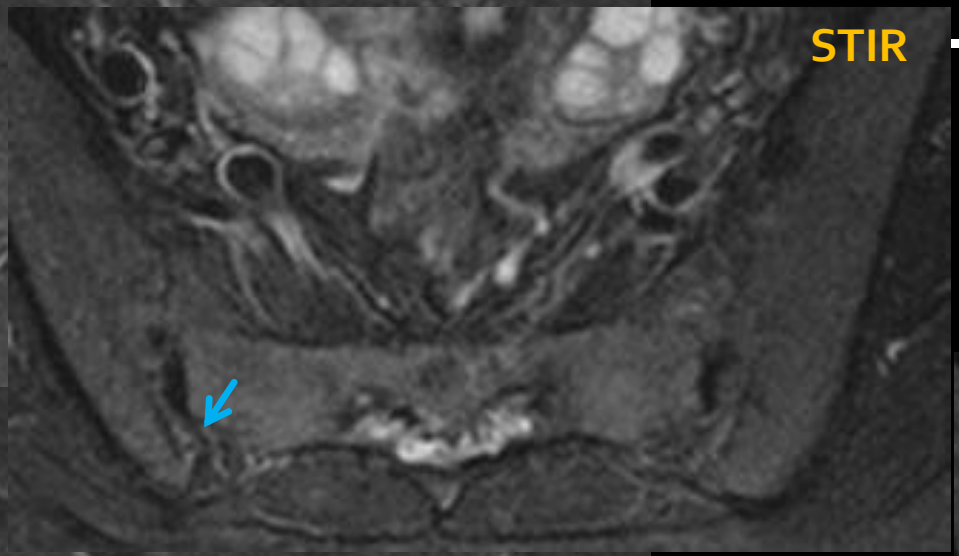
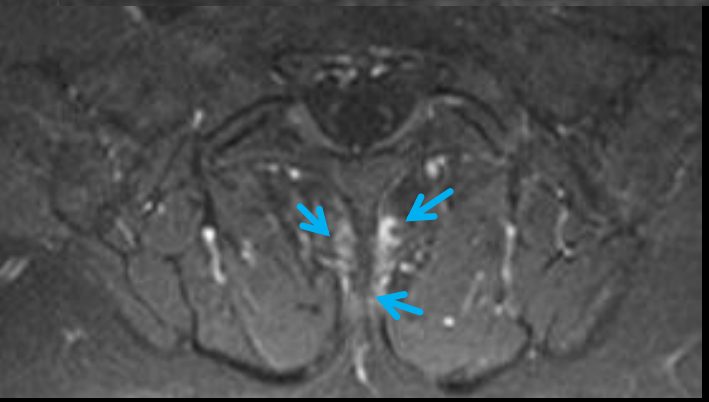


T1-w FS Gd

...





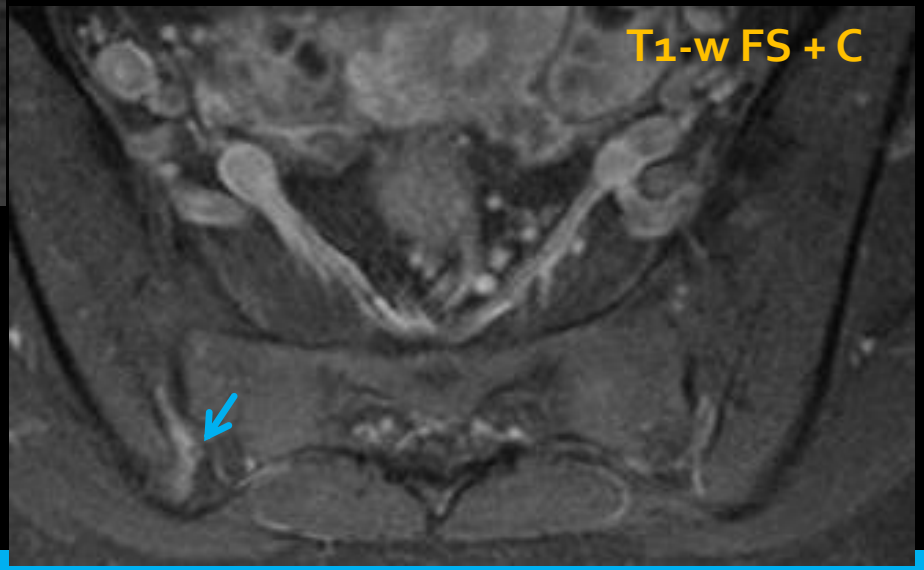
Inflammatory lesions

BME / osteitis

Synovitis

Enthesitis

Capsulitis



Enthesitis

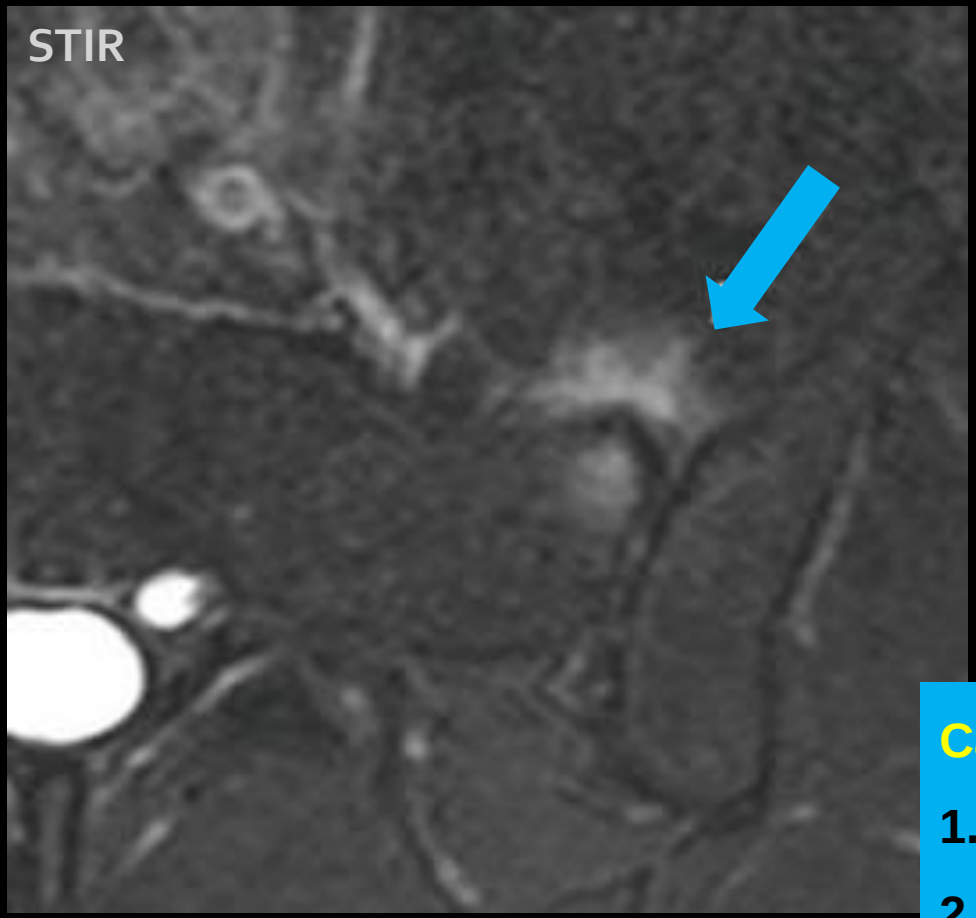
1. **Fluid sensitive/T1-w FS Gd: high SI**
2. **T1-w FS Gd > STIR**

Lambert RG, et al. Ann Rheum Dis 2016;1958-1963
Rudwaleit M, et al. Ann Rheum Dis 2009;68:1520-7
Schueller-Weidekamm C, et al. Semin Musculoskelet Radiol 2014;18:265-279

Fluid sensitive / T1-w FS Gd What to look for…

Inflammatory lesions

BME / osteitis
Synovitis
Enthesitis
Capsulitis



Capsulitis

1. **Fluid sensitive/T1-w FS Gd: high SI**
2. **Anterior and posterior capsule**
3. **T1-w FS Gd > STIR**

Lambert RG, et al. Ann Rheum Dis 2016;1958-1963
Rudwaleit M, et al. Ann Rheum Dis 2009;68:1520-7
Schueller-Weidekamm C, et al. Semin Musculoskelet Radiol 2014;18:265-279

ASAS criteria - Criticism

- Morphologic features of BME (extent, intensity) are not defined => moderate specificity, overdiagnosis

Weber U, et al. Best Pract Res Clin Rheumatol 2018 ;32:342-356

- Contextual presence of erosions => increases specificity

185 patients, nrAxSpA duration 2.5 years

- 45.3% erosion + BME
- 10.9% erosion without BME

Weber U, et al. Best Pract Res Clin Rheumatol 2018 ;32:342-356

Maksymowych WP, et al. Arthritis Res Ther 2017;19:126

sufficient for defining "Sacroiliitis on MRI"

In borderline cases, the final decision may be influenced by the presence of other inflammatory and/or structural (erosions) lesions

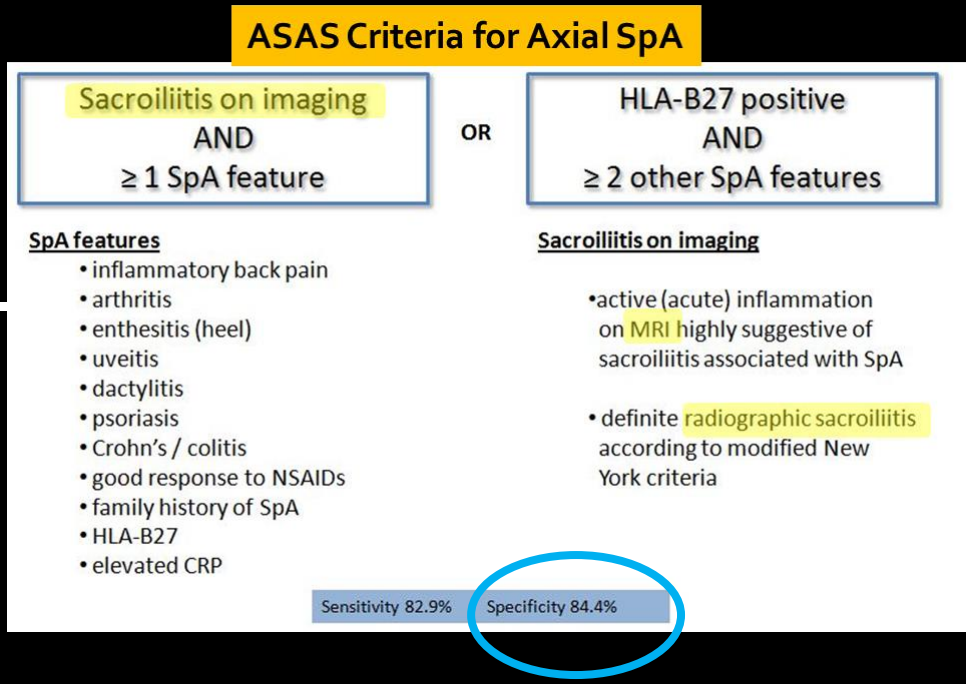
Sacroiliitis on MRI

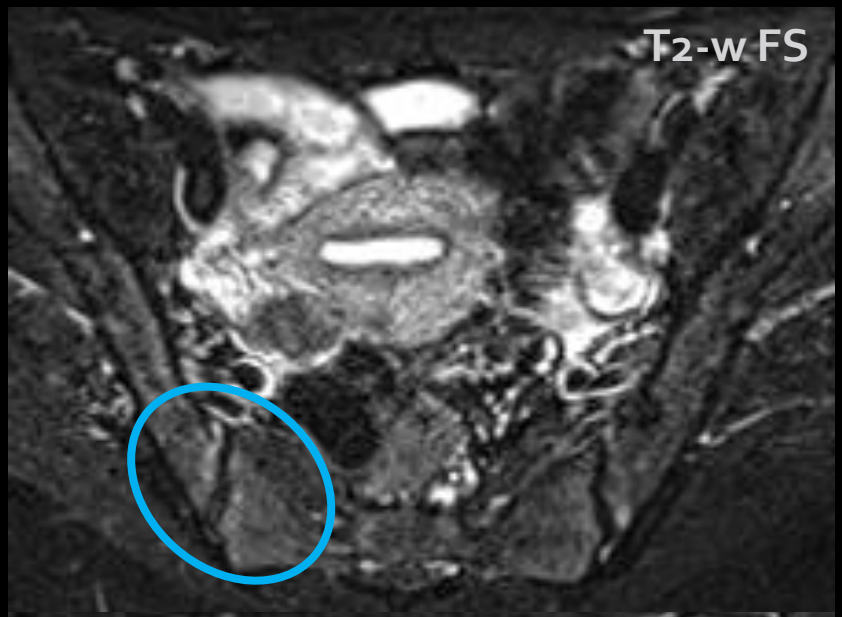
2 BME lesions on a single slice **OR** 1 BME lesion on 2 consecutive slices

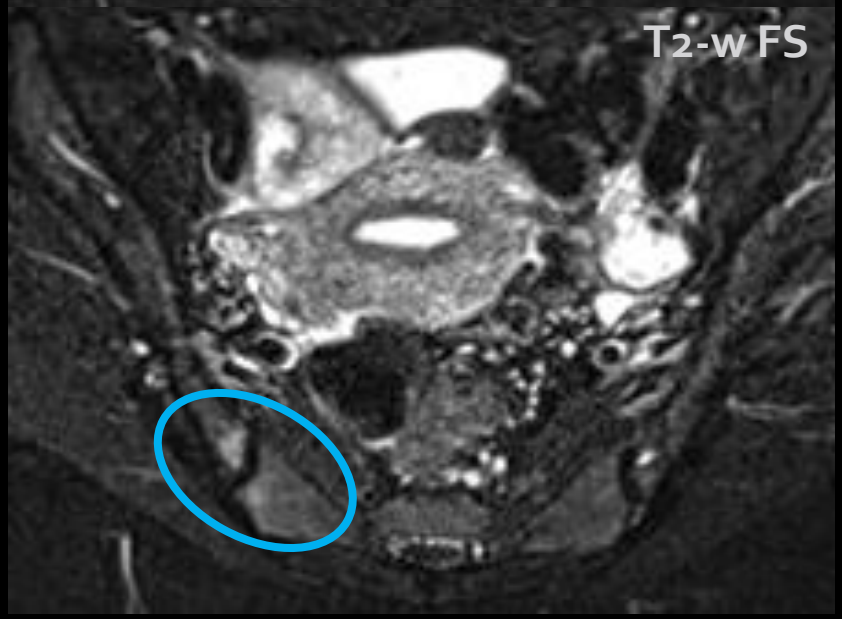
Lambert RG, et al. Ann Rheum Dis 2016;1958-1963
Rudwaleit M, et al. Ann Rheum Dis 2009;68:1520-7
Schueller-Weidekamm C, et al. Semin Musculoskelet Radiol 2014;18:265-279

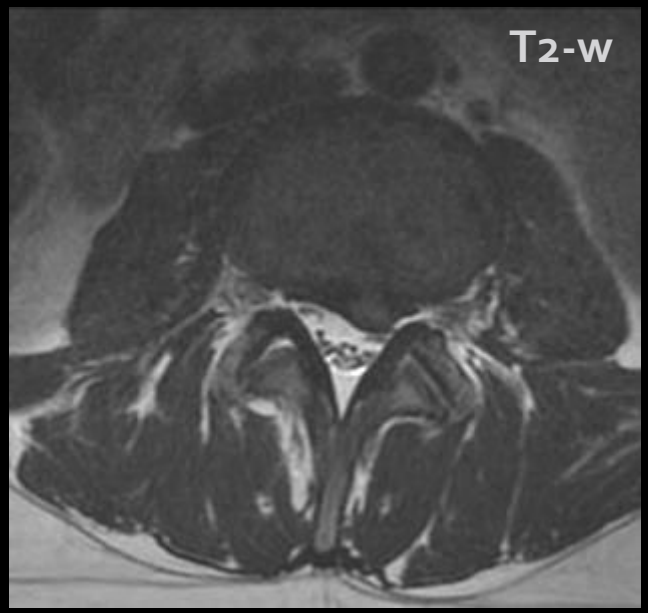
Mimickers

- Stress reaction/mechanical load
- Insufficiency/fatigue fractures
- Infectious sacroiliitis
- Condensans ilii
- OA
- DISH
- BME variants/disorders
  - Young age (red marrow)
  - Bone marrow hyperplasia
  - Multiple myeloma/myelodysplastic syndromes
  - Tumor









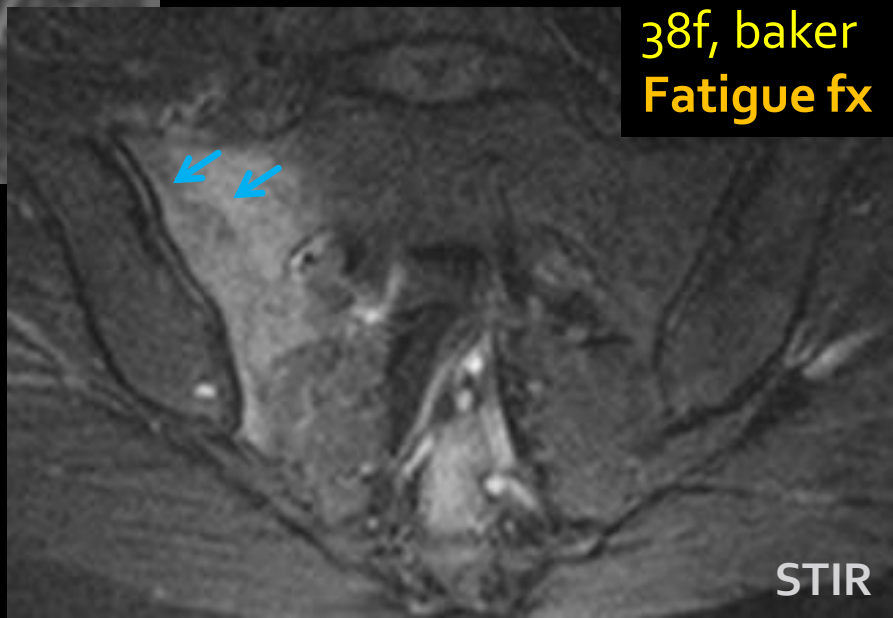
Minor BME
No other inflammatory lesions
No structural lesions

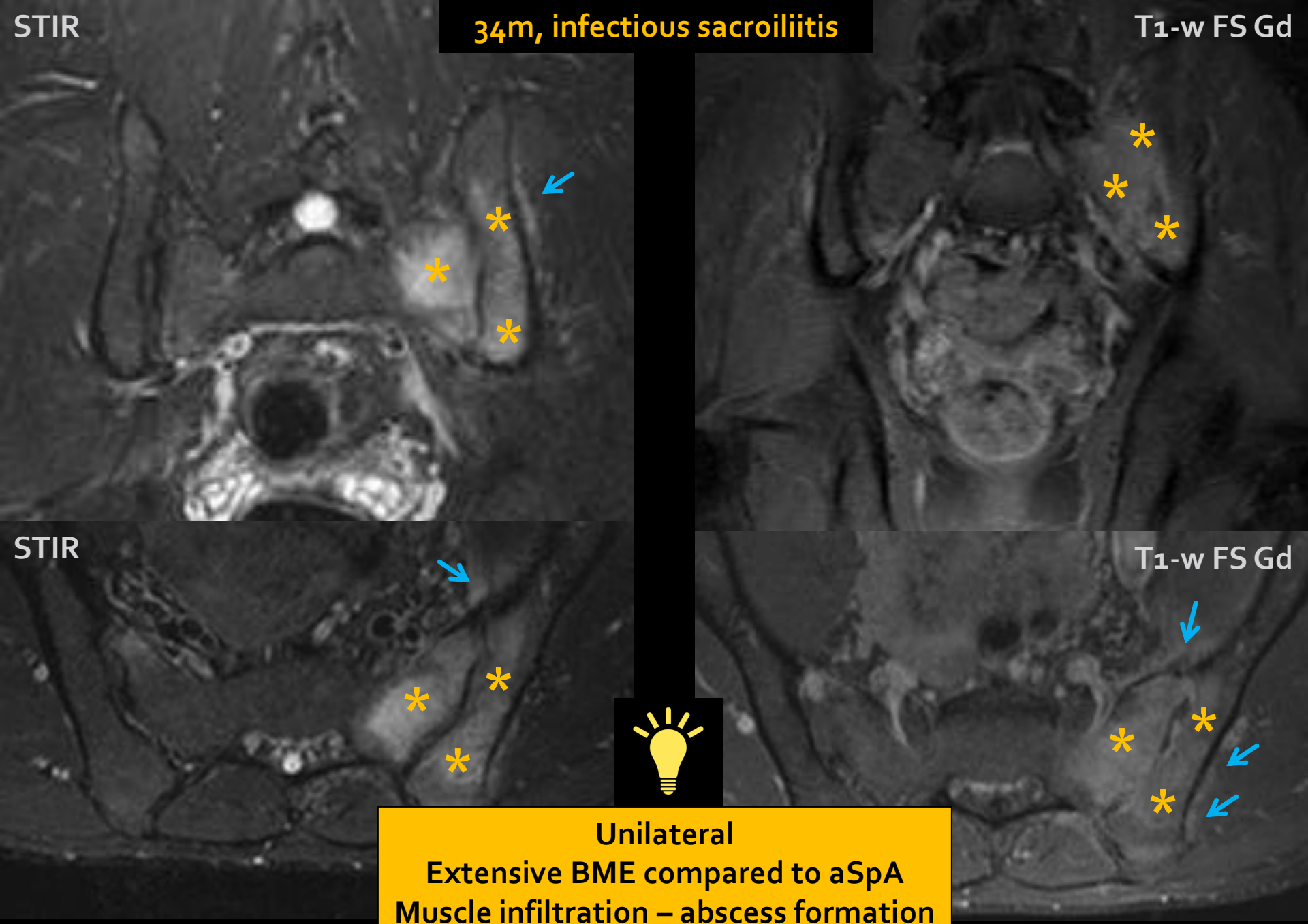
36f, low back pain and LT sciatica since 3m

Mechanical load

64f, osteoporosis
Insufficiency fx

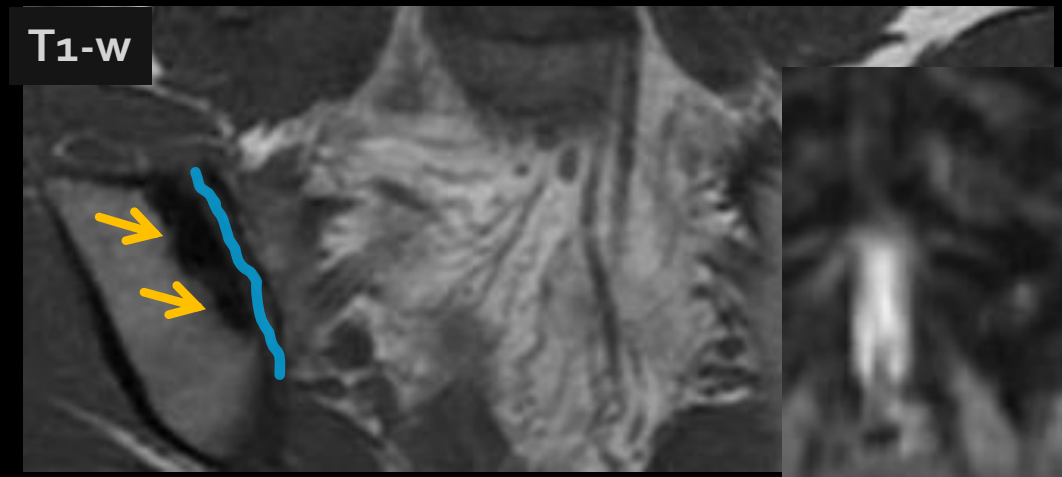
Unilateral/bilateral
Sacral wings
Fracture line

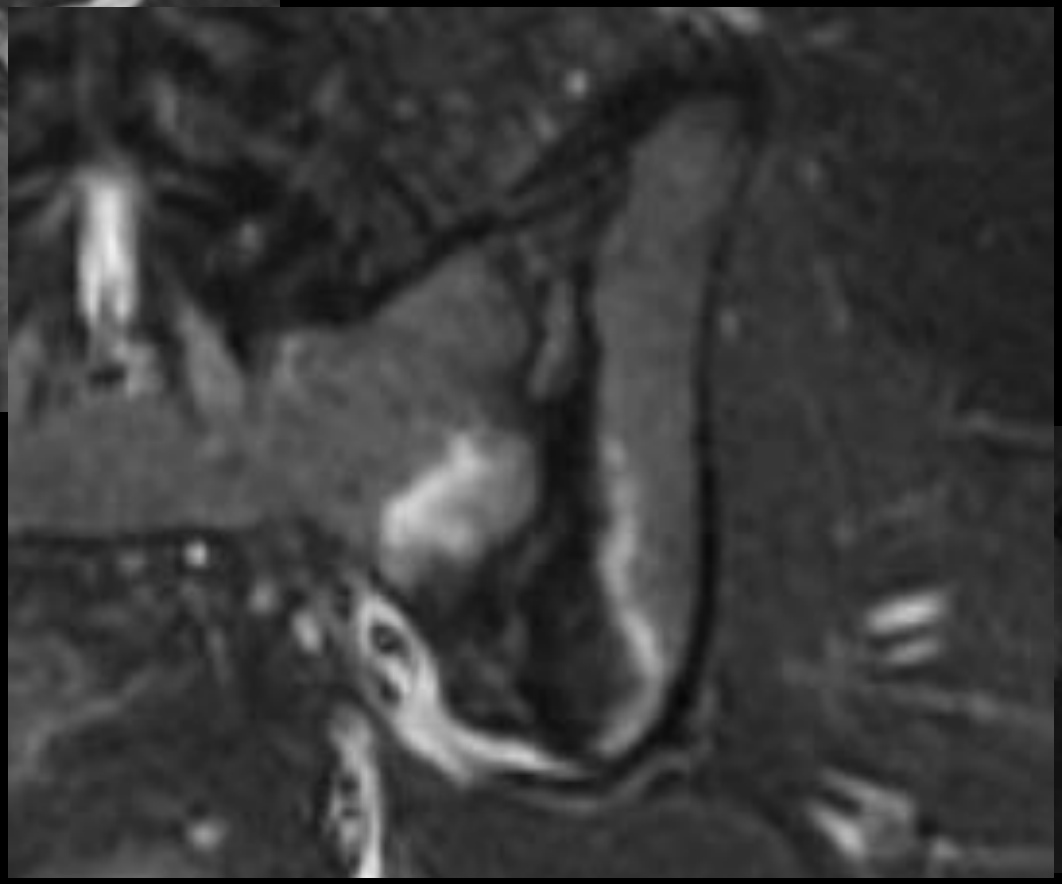




Stürzenbecher A, et al. Skeletal Radiol 2000;29:439-46
Jans L, et al. Eur J Radiol 2014;83:179-184

34f, Condensans ilii



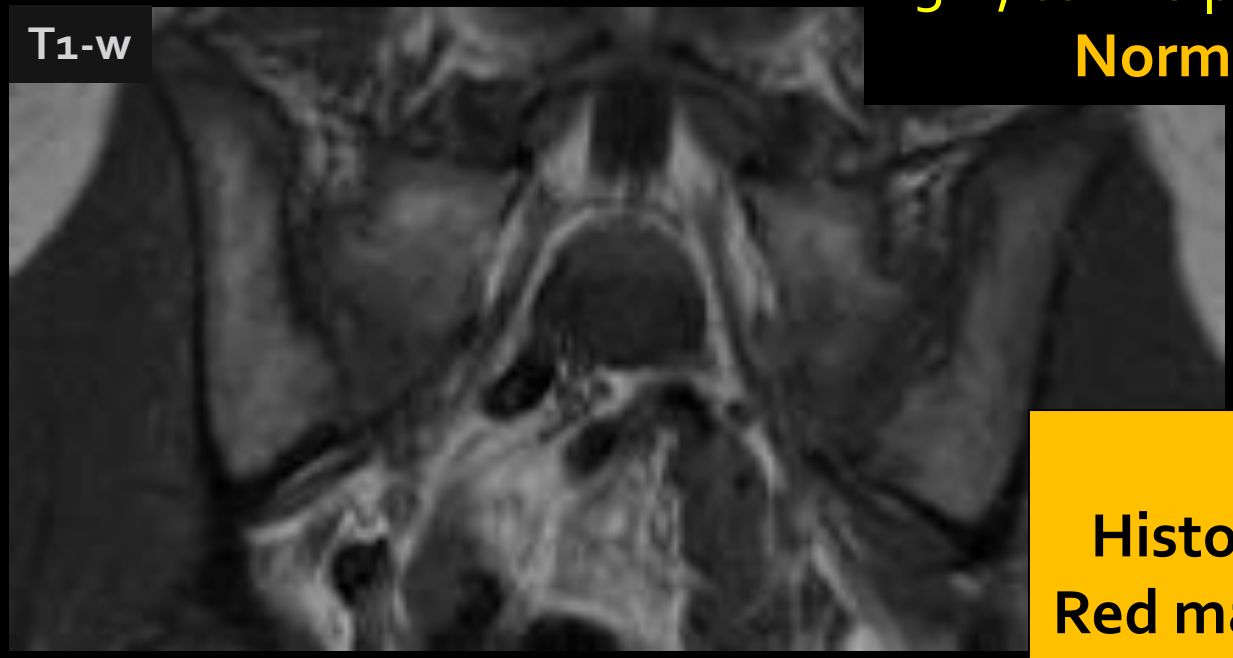


Triangular subchondral sclerosis
Anteroinferior part, iliac side (predominantly)
No erosions, fatty deposition, joint irregularity
BME: linear, along sclerosis

Mitra R. Rheumatol Int 2010;30:293-6
Ma L, et al. Int J Rheum Dis 2018;21:299-307

13m, tennis player, deep gluteal pain

Normal bone marrow



Age
History (physical activity)
Red marrow SI (STIR) < BME

Take home…

- key for early di
- M

2 BME lesions on a single sit

Sole presence of other inflamm
sufficient for defin

In borderline cases, the final
presence of other inflammatory

1. Infectious sacroiliitis
2. Stress reaction/mechanical load
3. Insufficiency/fatigue fractures
4. OA

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- row)
- lastic
- syndrom
- Tumor

Clinical, laboratory and imaging combination: KEY for correct diagnosis

Thank you!

Evangelia E. Vassalou, MD PhD

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