NEW INSIGHTS IN
RHEUMATOLOGY
AND ITS THERAPEUTICAL IMPLICATIONS

January 28, 2021

MRI in SpA
Clinical and therapeutical implications

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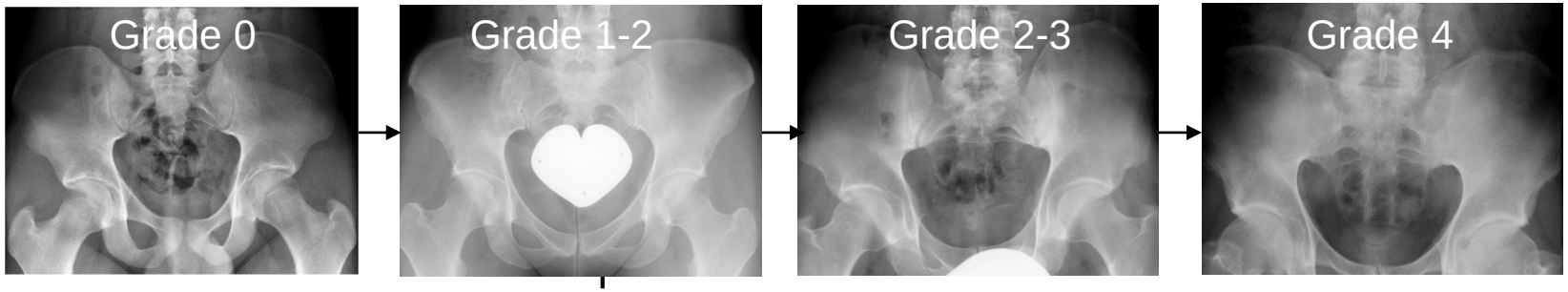
FLS SCIENCE

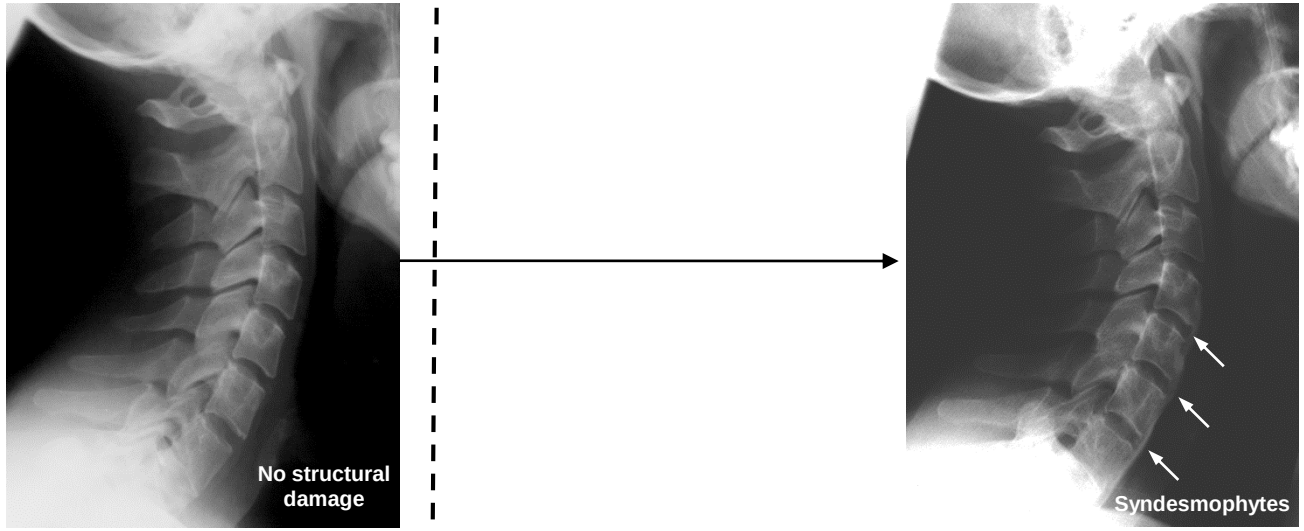
Continuum of Axial Spondyloarthritis

NEW INSIGHTS IN RHEUMATOLOGY AND ITS THERAPEUTICAL IMPLICATIONS

Sacroiliac joints



Spine



Non-radiographic stage (non-radiographic axial SpA)

Radiographic stage (radiographic axial SpA =ankylosing spondylitis)

Clinical symptoms, active inflammation on MRI, but no structural changes on x-ray

Structural changes in the sacroiliac joints

Structural changes in the spine (syndesmophytes)

Time (Years)

Poddubnyy D, et al. Rheum Dis Clin North Am 2012;38:387-403.

ASAS Classification Criteria for Axial Spondyloarthritis (SpA)

In patients with ≥3 months back pain and age at onset <45 years

Sacroiliitis on imaging*

plus

≥1 SpA feature

OR

HLA-B27

plus

≥2 other SpA features

***Sacroiliitis on imaging**

- **Active (acute) inflammation on MRI highly suggestive of sacroiliitis associated with SpA**
- **Definite radiographic sacroiliitis according to the modified New York criteria**

SpA features:

- Inflammatory back pain
- Arthritis
- Enthesitis (heel)
- Uveitis
- Dactylitis
- Psoriasis
- Crohn‘s/colitis
- Good response to NSAIDs
- Family history for SpA
- HLA-B27
- Elevated CRP

n=649 patients with back pain;

Overall
Sensitivity: 82.9%, Specificity: 84.4%
Imaging arm alone
Sensitivity: 66.2%, Specificity: 97.3%
Clinical arm alone
Sensitivity: 56.6%, Specificity: 83.3%

CRP, C-reactive protein; HLA, human leukocyte antigen;
MRI, magnetic resonance imaging;
NSAIDs, non-steroidal anti-inflammatory drugs:
Rudwaleit M et al. *Ann Rheum Dis*. 2009;68:777–83 (with permission).

Spondyloarthritis

CLINICAL SCIENCE

MRI lesions in the sacroiliac joints of patients with spondyloarthritis: an update of definitions and validation by the ASAS MRI working group

Walter P Maksymowych ,[1] Robert GW Lambert,[2] Mikkel Østergaard,[3] Susanne Juhl Pedersen,[3] Pedro M Machado ,[4,5,6] Ulrich Weber ,[7,8,9] Alexander N Bennett,[10] Juergen Braun,[11] Ruben Burgos-Vargas,[12] Manouk de Hooge ,[13,14] Atul A Deodhar,[15] Iris Eshed,[16] Anne Grethe Jurik,[17,18] Kay-Geert Armin Hermann,[19] Robert BM Landewé,[20,21] Helena Marzo-Ortega,[22] Victoria Navarro-Compán,[23] Denis Poddubnyy,[24] Monique Reijnierse,[25] Martin Rudwaleit,[26] Joachim Sieper,[24] Filip E Van den Bosch,[13,14] Désirée van der Heijde ,[27] Irene E van der Horst-Bruinsma,[28] Stephanie Wichuk,[1] Xenofon Baraliakos[11]

1. ASAS definition of positive MRI for the classification of SpA (figures 1A–C and 2)[3 4]: MRI evidence of bone marrow inflammation must be present, and the features required for the definition of active sacroiliitis on MRI are as follows:
   a. BME on a T2W sequence sensitive for free water (eg, STIR and T2FS) or bone marrow contrast enhancement on a T1W sequence (eg, T1FS post-Gd). BME is depicted as a hyperintense signal on STIR images and usually as a hypointense signal on T1 images. A hyperintense signal on contrast-enhanced, T1-weighted, fat-saturated images (T1 post-Gd) reflects increased vascularisation and is referred to as osteitis. The sacral interforaminal bone marrow signal forms the reference for assignment of normal signal in the bone marrow.[7]
   b. Inflammation must be clearly present and located in a typical anatomical area (subchondral bone).
   c. MRI appearance must be highly suggestive of SpA.

Maksymowych WP, et al. Ann Rheum Dis 2019;78:1550–8.

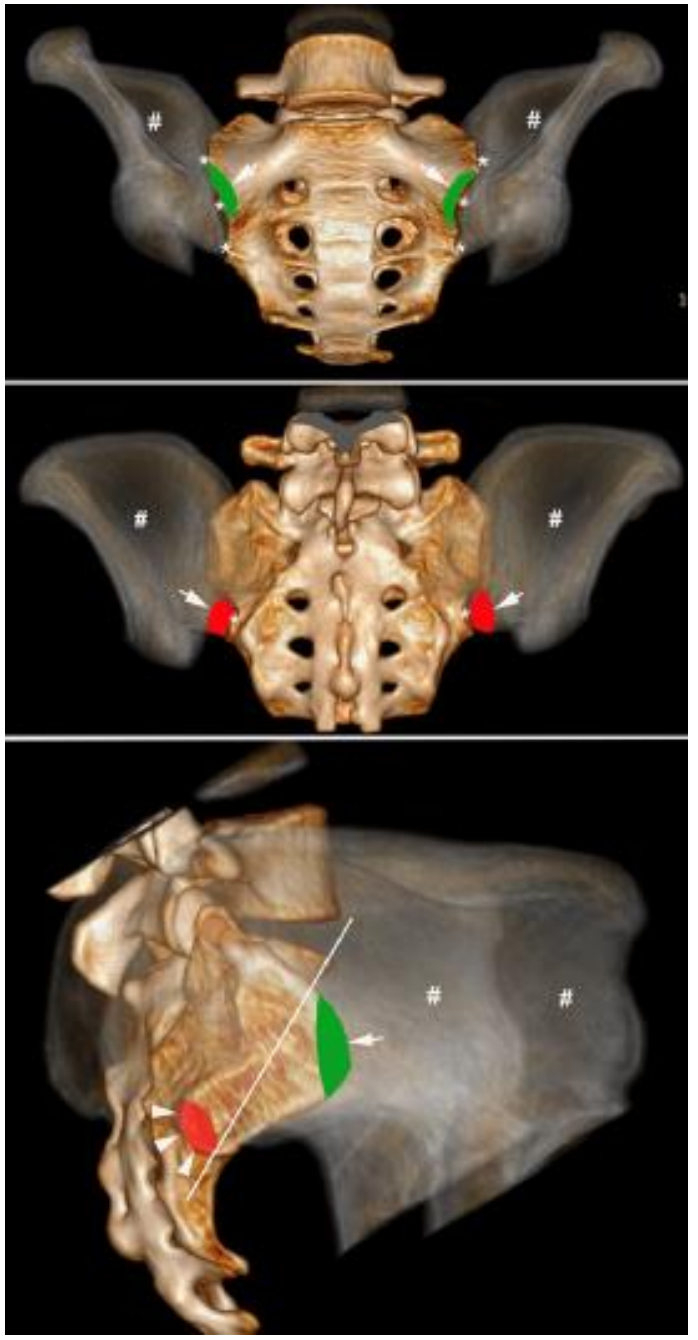
ARTHRITIS & RHEUMATOLOGY
Vol. 70, No. 5, May 2018, pp 736–745
DOI 10.1002/art.40429

Check for updates

Frequency and Anatomic Distribution of Magnetic Resonance Imaging Features in the Sacroiliac Joints of Young Athletes

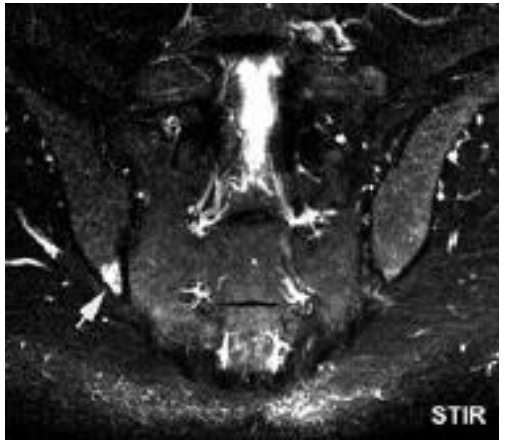
Exploring "Background Noise" Toward a Data-Driven Definition of Sacroiliitis in Early Spondyloarthritis

Ulrich Weber,[1] Anne Grethe Jurik,[2] Anna Zejden,[2] Ejnar Larsen,[3] Steen Hylgaard Jørgensen,[3] Kaspar Rufibach,[4] Christian Schioldan,[5] and Søren Schmidt-Olsen[3]



N = 20 recreational runners and 22 elite ice hockey players

Results. **The proportions of recreational runners and elite ice hockey players fulfilling the ASAS definition of active sacroiliitis, as recorded concordantly by ≥2 of 3 readers, were 30–35% and 41%, respectively. In recreational runners before and after running, the mean ± SD number of SI joint quadrants showing BME was 3.1 ± 4.2 and 3.1 ± 4.5, respectively, while in elite ice hockey players, it was 3.6 ± 3.0. The posterior lower ilium was the single most affected SI joint region, followed by the anterior upper sacrum. Erosion was virtually absent.**



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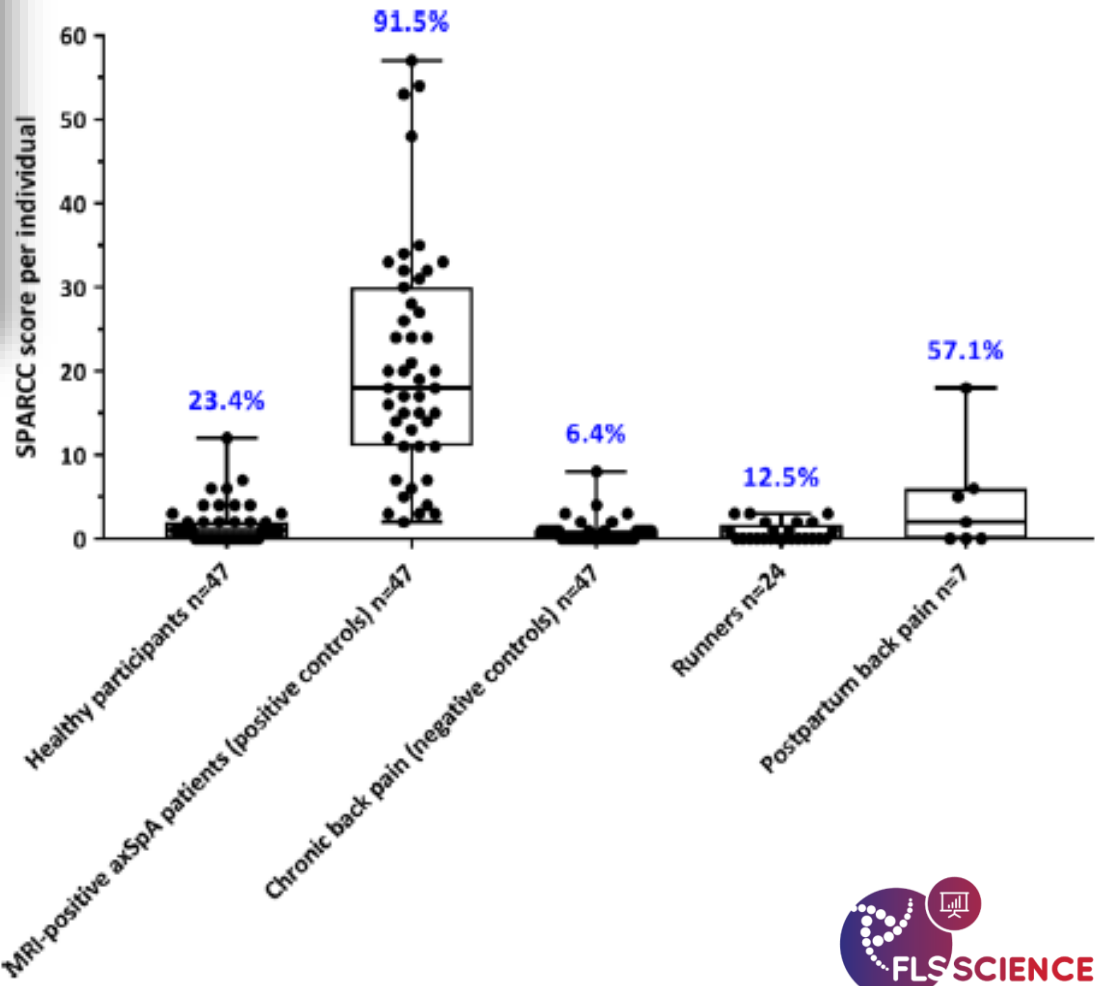
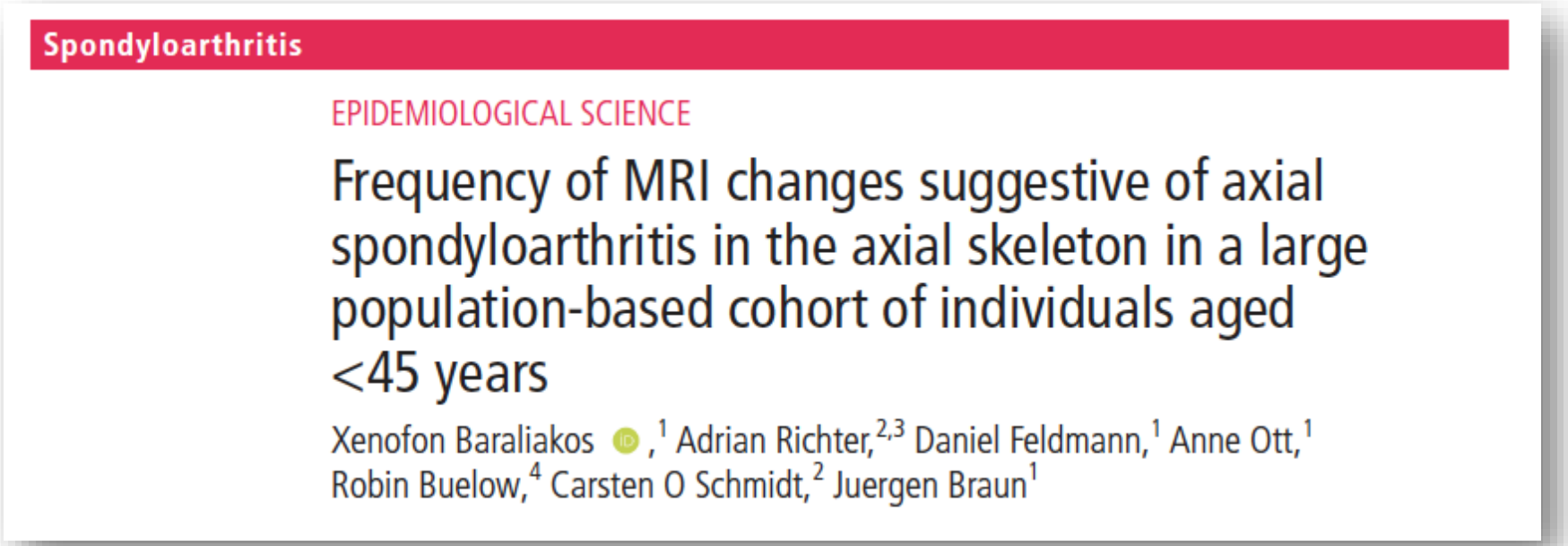
Vol. 70, No. 7, July 2018, pp 1042–1048
DOI 10.1002/art.40475

Magnetic Resonance Imaging of the Sacroiliac Joints Indicating Sacroiliitis According to the Assessment of SpondyloArthritis international Society Definition in Healthy Individuals, Runners, and Women With Postpartum Back Pain

Janneke de Winter,[1] Manouk de Hooge,[2] Marleen van de Sande,[1] Henriëtte de Jong,[1] Lonneke van Hoeven,[3] Anoek de Koning,[4] Inger Jorid Berg,[5] Roberta Ramonda,[6] Dominique Baeten,[7] Désirée van der Heijde,[4] Angelique Weel,[3] and Robert Landewé[8]





Spondyloarthritis

EPIDEMIOLOGICAL SCIENCE

Frequency of MRI changes suggestive of axial spondyloarthritis in the axial skeleton in a large population-based cohort of individuals aged <45 years

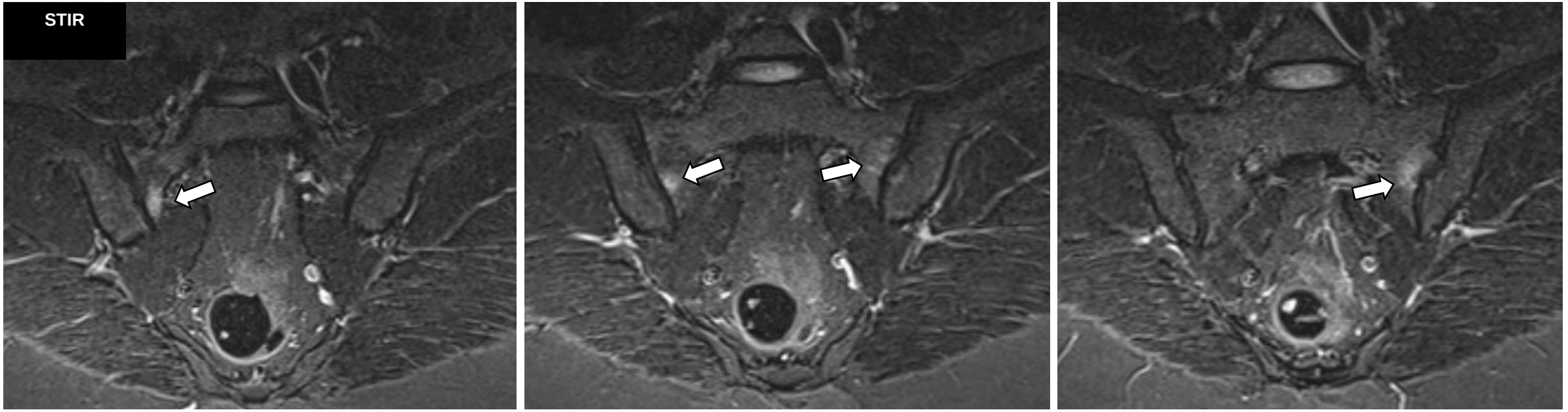
Xenofon Baraliakos ,[1] Adrian Richter,[2,3] Daniel Feldmann,[1] Anne Ott,[1] Robin Buelow,[4] Carsten O Schmidt,[2] Juergen Braun[1]

- N = 793 healthy individuals (49.4% males) with MRI of the SIJ and spine from the SHIP (Study of Health in Pomerania) cohort. HLA-B27 was positive in 67/756 (8.9%), CRP was elevated in 45/705 (6.4%) participants.
- All spinal- (sagittal T1/T2 sequences) and SIJ- (semi-coronal STIR sequences) MRIs were evaluated by two trained readers blinded to clinical data.
- The MRIs were read concentrating on BME (SIJ, based on quadrants and spine, based on segments) and FL (spine, based on segments) suggestive of axSpA.

Baraliakos X, et al. Ann Rheum Dis 2020;79:186-92.

Bone Marrow Edema in the SIJ of Healthy Subjects

- Bone marrow edema lesions were found in 136 volunteers (17.2%) on SIJ-MRI
- Localisation (SIJ): out of 187 quadrants with BME lesions, the majority (n=66, 35.3%) was located in the upper sacral quadrant.



Patient A, male, 27 years

- Low back pain for about 3 years
- Pain at night, buttock pain, morning stiffness of about 30 minutes, no clear improvement with exercises and rest
- No peripheral manifestations
- Skin psoriasis, elbow and knee area, about 5% BSA
- HLA-B27: positive
- CRP 9.1 mg/l (N <5)

EULAR Imaging Recommendations for Spondyloarthritis

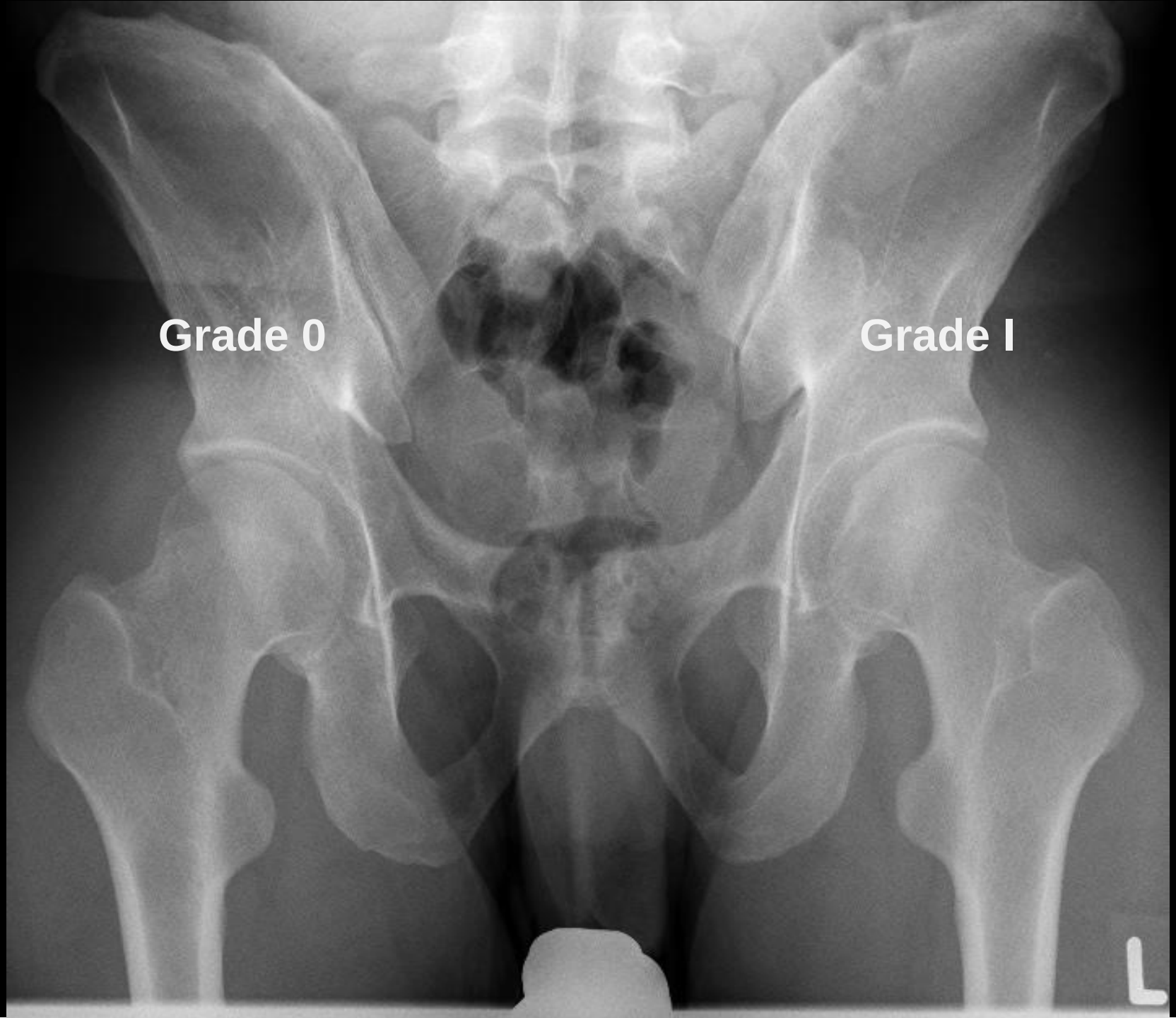
Diagnosing axial SpA

- In general, conventional radiography of the SI joints is recommended as the first imaging method to diagnose sacroiliitis as part of axial SpA. In certain cases, such as young patients and those with short symptom duration, MRI of the SI joints is an alternative first imaging method.

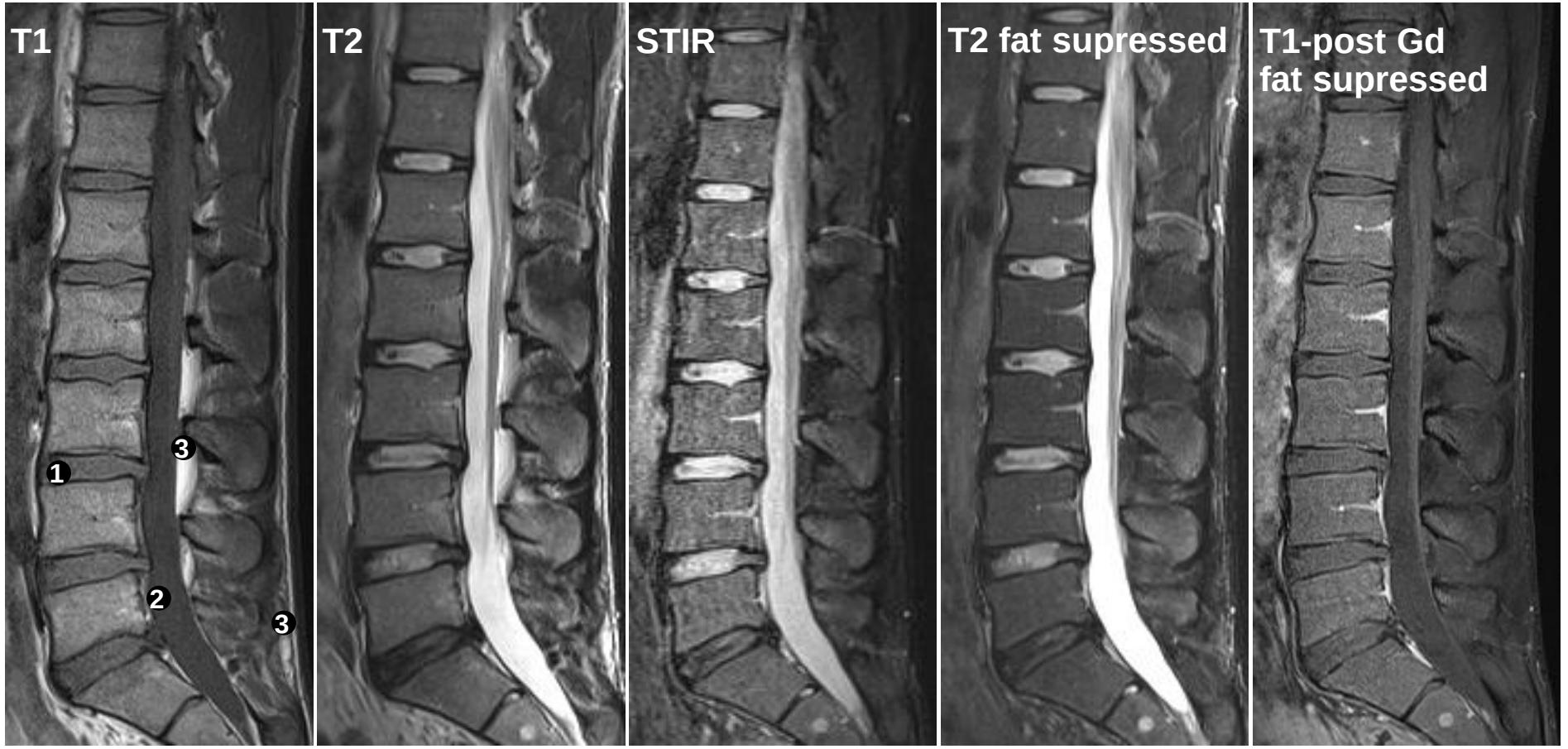
- If the diagnosis of axial SpA cannot be established based on clinical features and conventional radiography, and axial SpA is still suspected, MRI of the SI joints is recommended. On MRI, both active inflammatory lesions (primarily bone marrow oedema (BME)) and structural lesions (such as bone erosion, new bone formation, sclerosis and fat infiltration) should be considered. MRI of the spine is not generally recommended to diagnose axial SpA.

- Imaging modalities other than conventional radiography and MRI are not generally recommended in the diagnosis of axial SpA.

Mandl P, et al. Ann Rheum Dis 2015;74:1327-39.


Grade 0
Grade I
L

MRI-Sequences Used for SpA



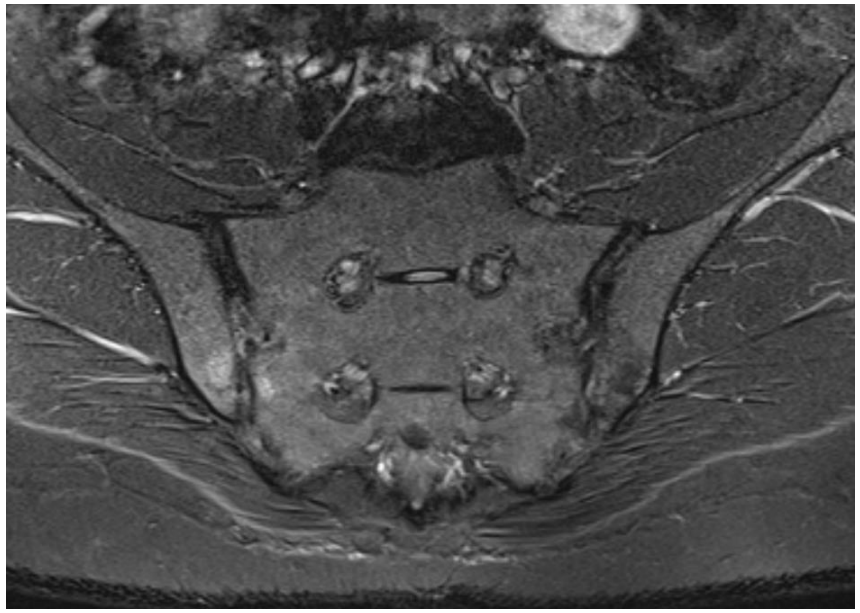
L5/S1 level: degenerated disc, otherwise normal

Anatomical areas relevant for orientation:
❶ intervertebral disc, ❷ spinal fluid, ❸ fat tissue

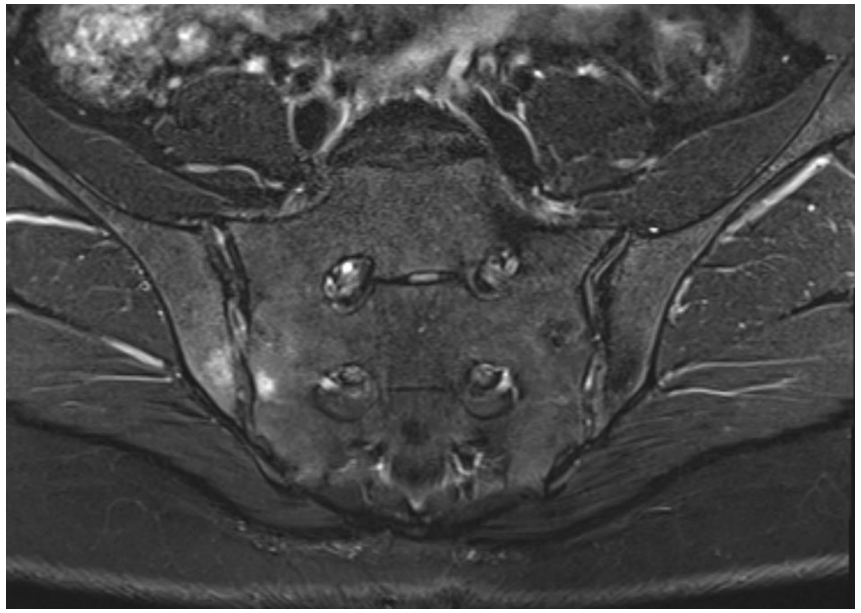
FAQ

Q: What is the difference between STIR (TIRM, SPIR) and T2-weighted sequence with fat suppression?

A: There is no difference for rheumatologists.



STIR



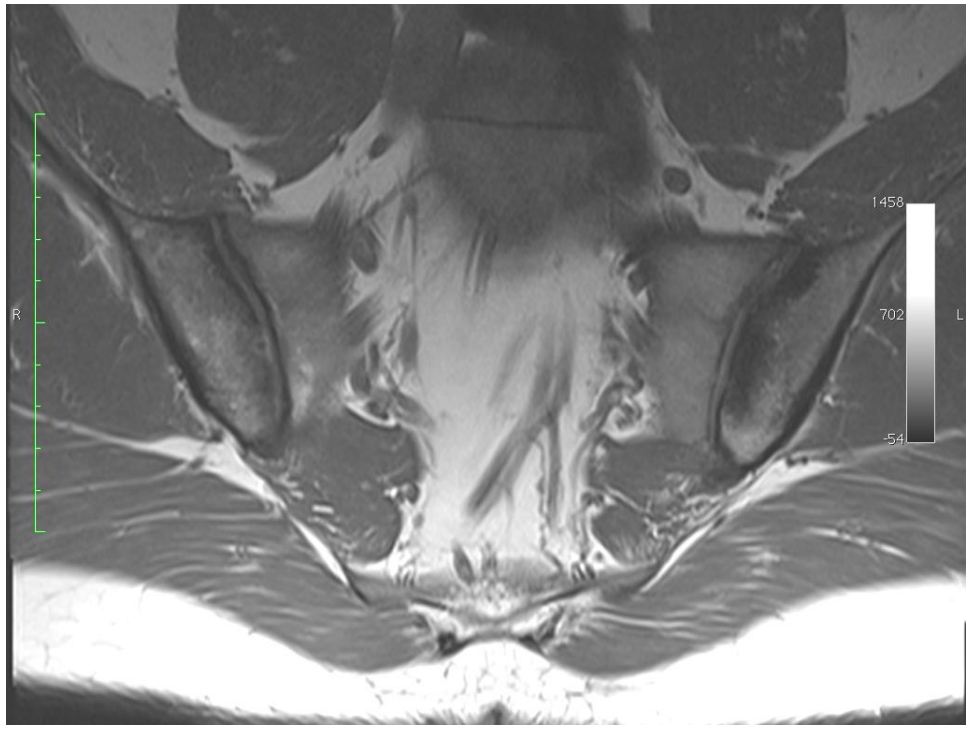
T2 with FS

MRI Sequences, which are Relevant for the Diagnosis of Axial SpA

STIR

Recognition of active inflammation:
- Osteitis / Bone Marrow Edema

T1-weighted



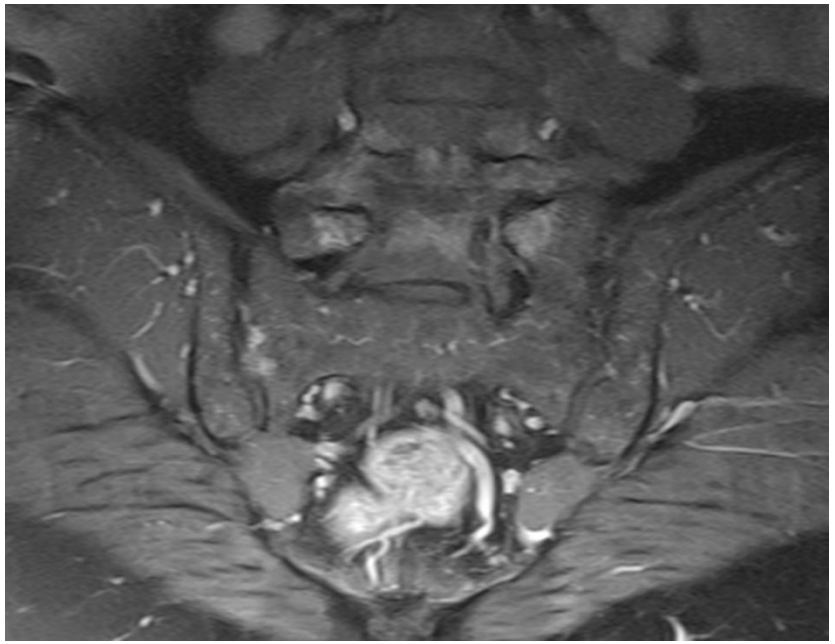
Recognition of post-inflammatory changes:
- Erosions
- Sclerosis
- Ankylosis
- Fat lesions / fatty metaplasia

FAQ

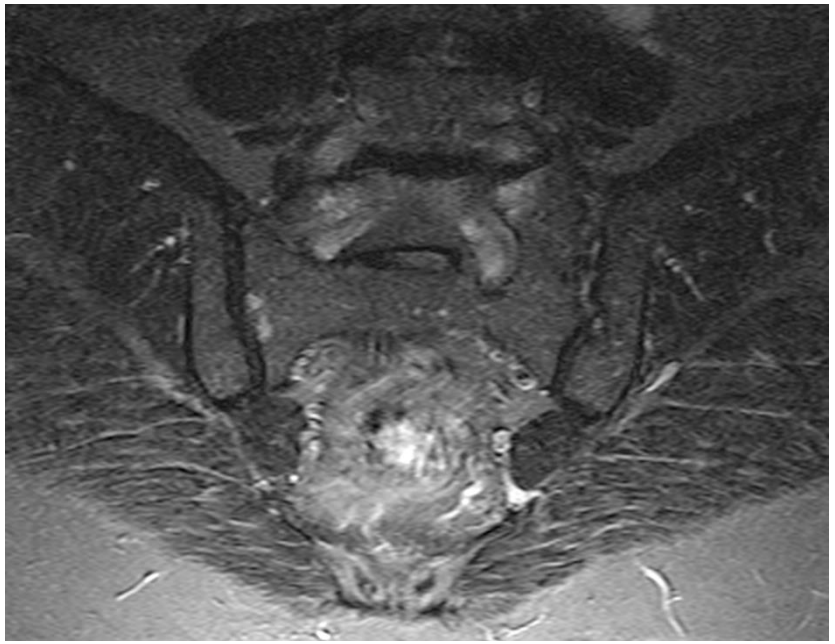
Q: Should I use Gadolinium to diagnose sacroiliitis?

A: No.

And your radiologist doesn‘t need Gd in axSpA too.

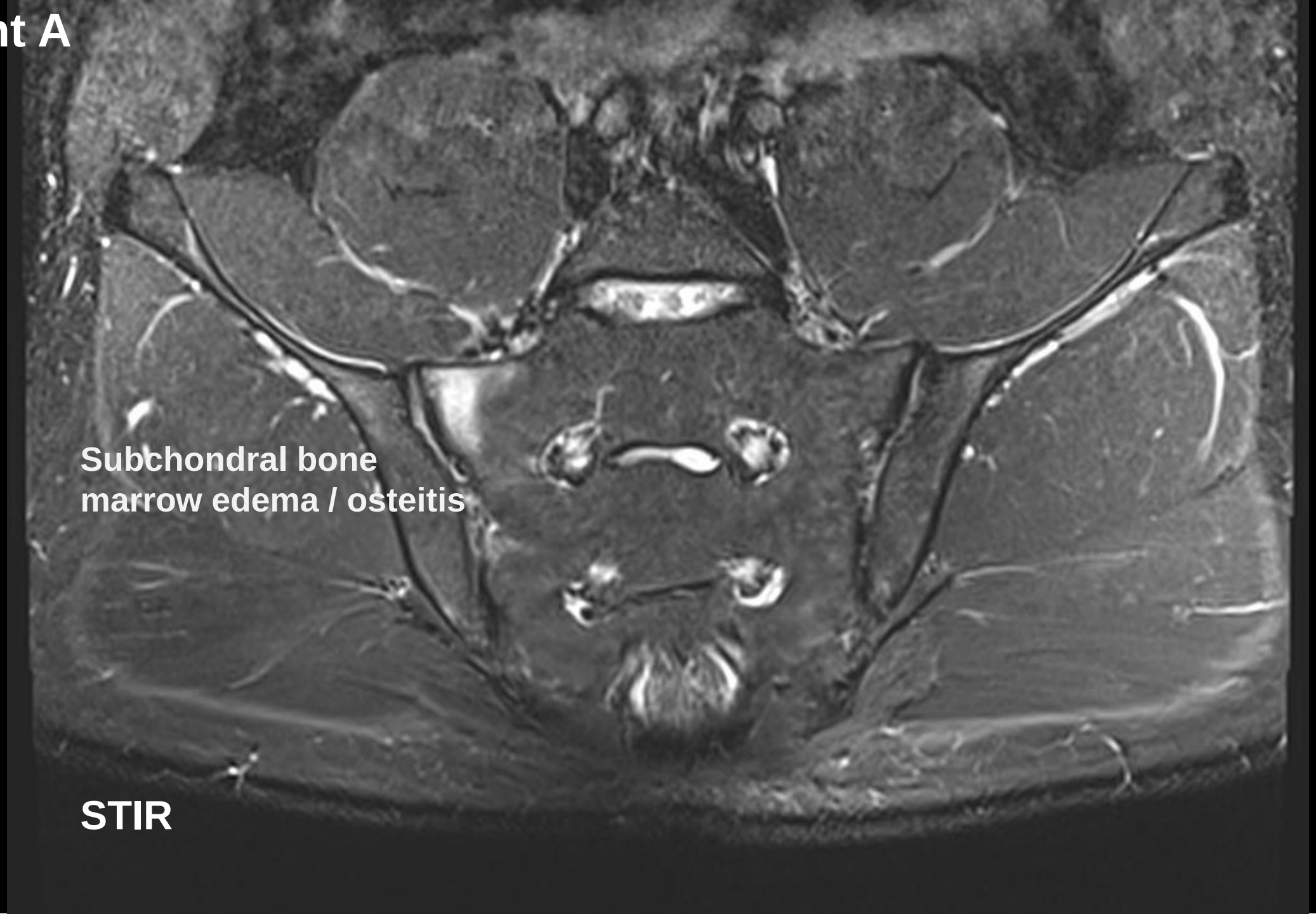


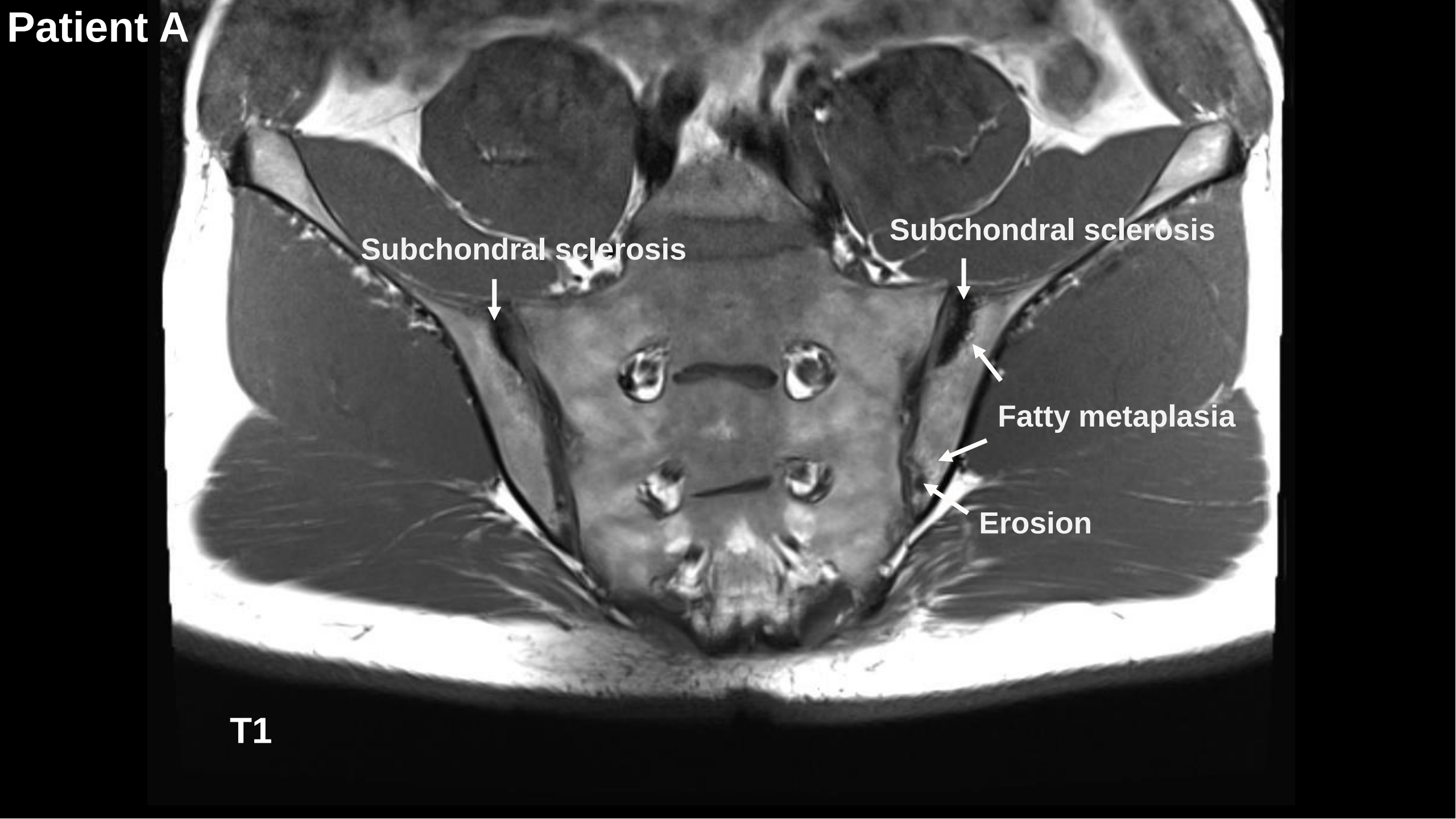
T1 with FS, post Gd



STIR

Patient A




Patient A
Subchondral sclerosis
Subchondral sclerosis
Fatty metaplasia
Erosion
T1

Patient A

STIR

T1

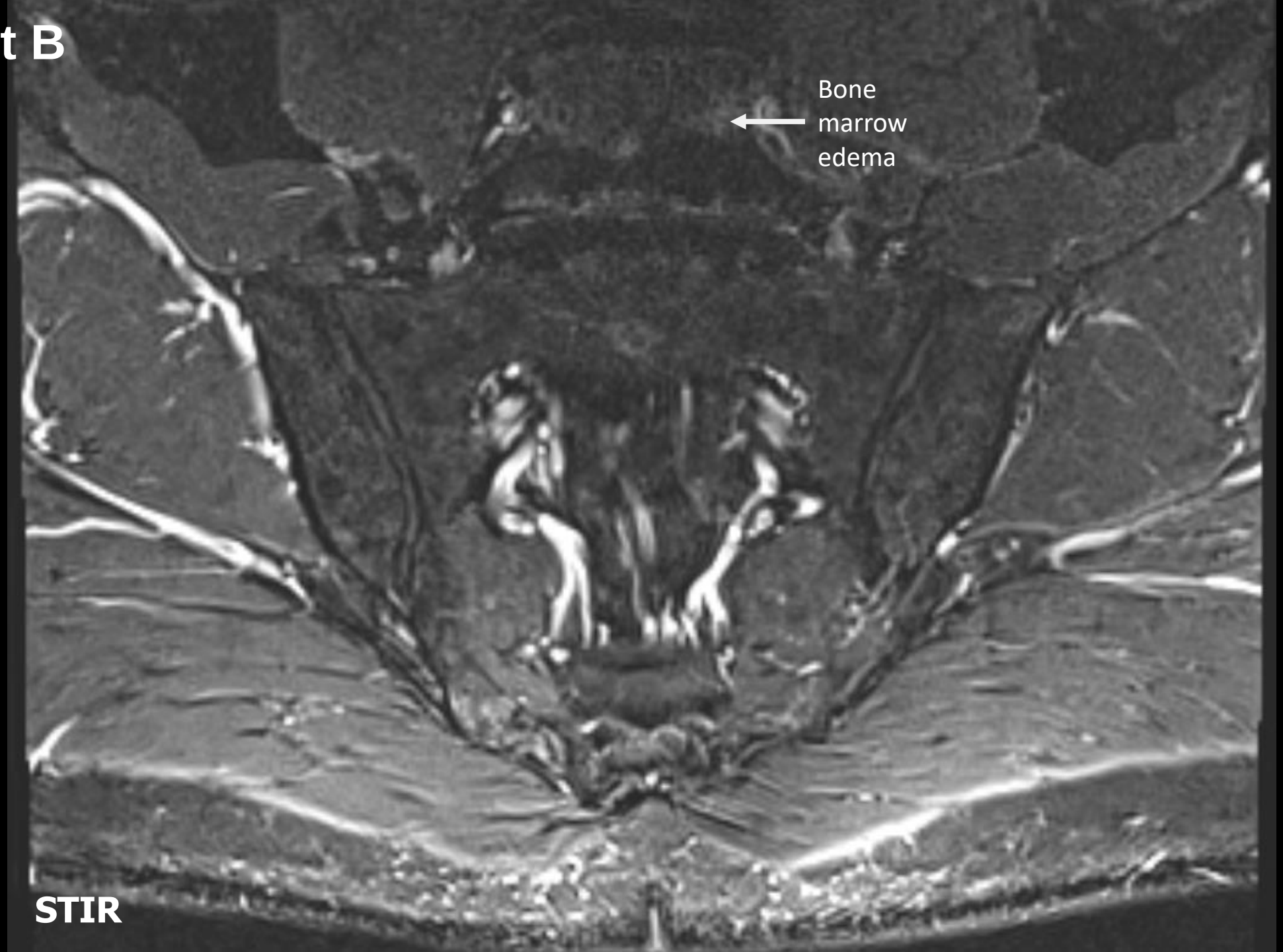
Diagnosis: axial spondyloarthritis

Patient B, male, 53 years

- Intermittent IBP for about 20 years.
- Acute anterior uveitis, 2 episodes in the last year; 3 episodes in large time intervals.
- No other SpA manifestation.
- HLA-B27: positive
- CRP currently normal

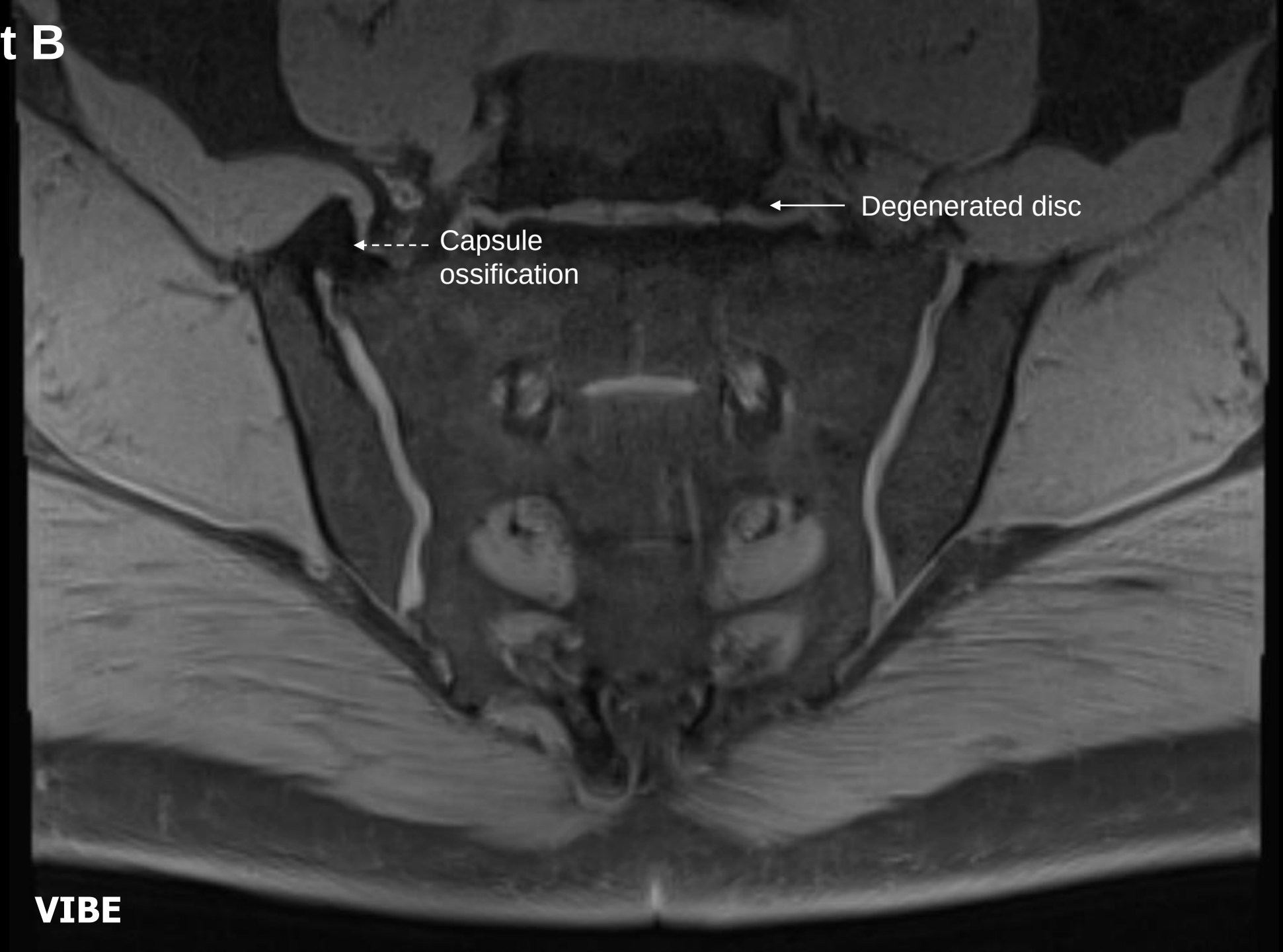
Patient B

Patient B

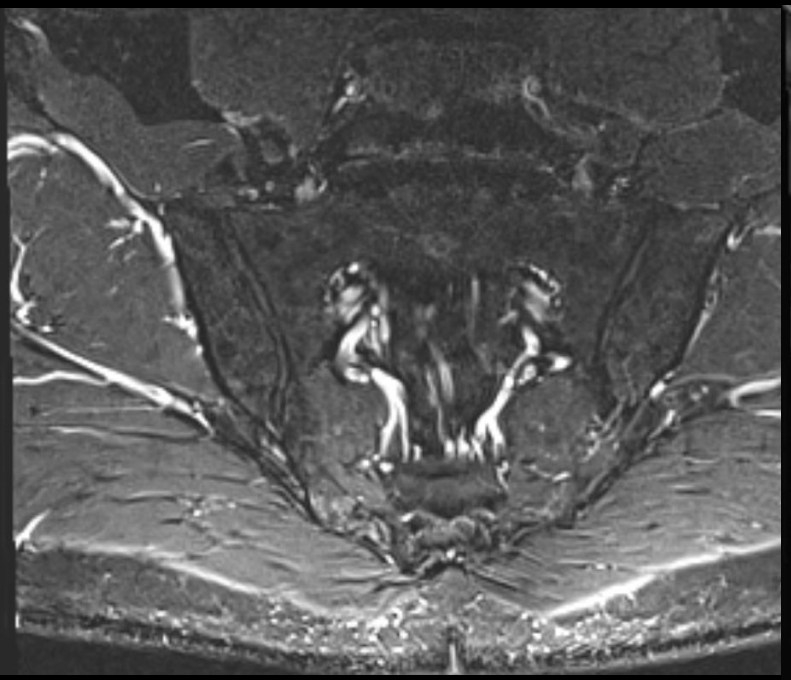


Patient B

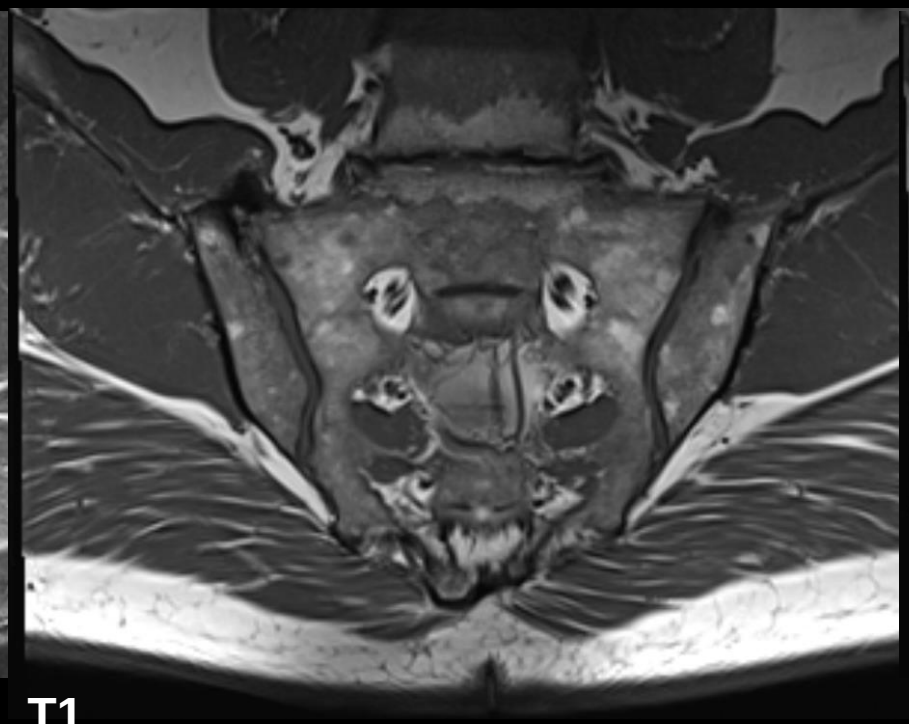
Patient B



Patient B



STIR



T1

VIBE

Diagnosis: degenerative disc disease

Most important differential diagnoses for axial SpA

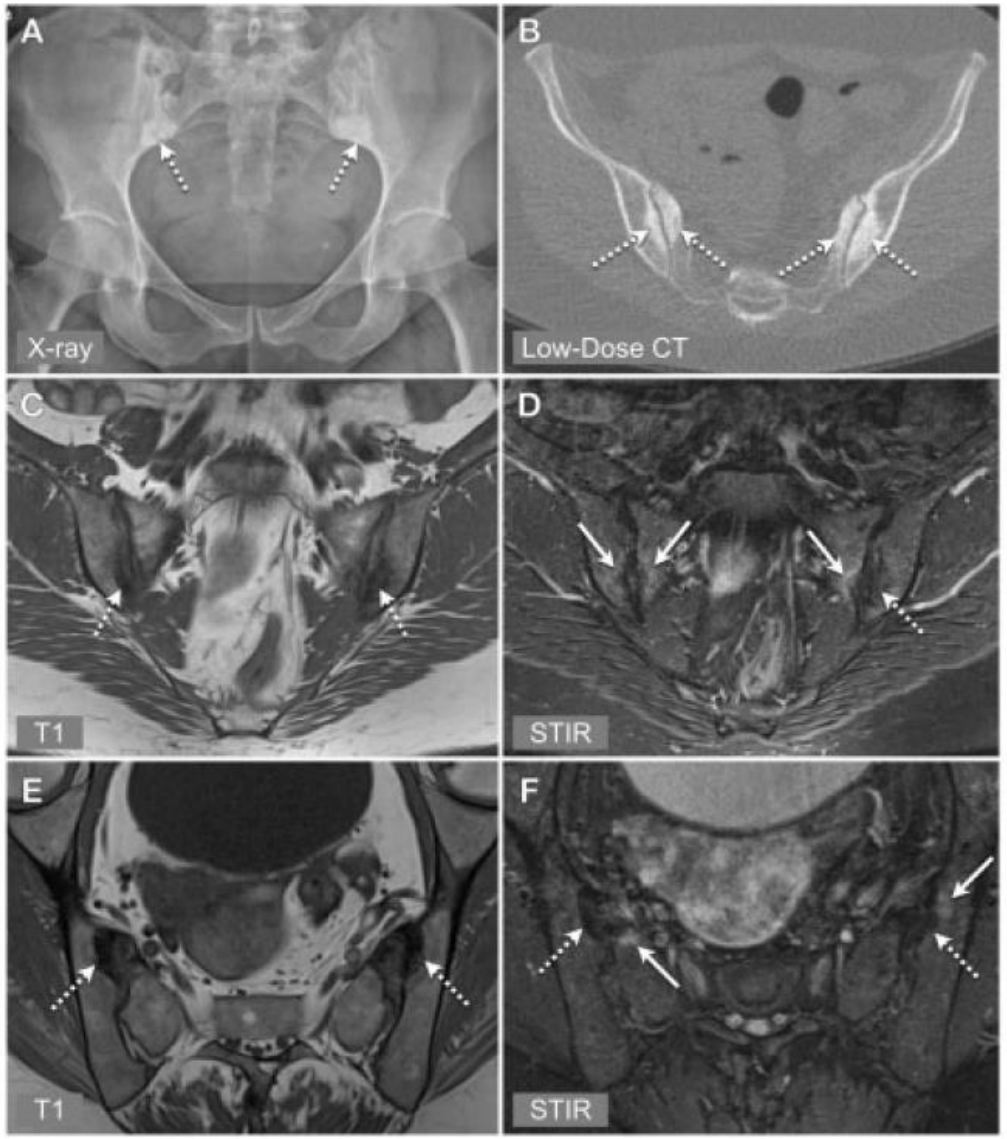
- Mechanical stress / Degenerative diseases :
- Degenerative disc disease, spondylosis, osteoarthritis of the SIJ
- Lumbosacral transitional vetrebrae
- Osteitis condensans (Hyperostosis triangularis) ilii
- DISH

- Infection

- Fracture

- Tumor

Identification of a typical pattern of MRI lesions of sacroiliac joints in patients with osteitis condensans ilii



A 45-year-old female patient with intermittent inflammatory back pain for 10 years, HLA-B27-positivity and positive family history of axSpA. No other SpA-features.

Imaging:

- plain radiography (A),
- low dose computed tomography (B),
- MRI, T1-weighted oblique coronal plane (C),
- STIR, oblique coronal plane (D),
- T1-weighted axial plane (E),
- STIR axial plane (F).

Poddubnyy D, et al. Rheumatology (Oxford) 2020.

FAQ

Q: Should I perform MRI of the spine for the axSpA diagnosis?

A: Normally not, MRI of the sacroiliac joints is sufficient for the diagnosis of axSpA; isolated spinal involvement without sacroiliac affection is rather exceptional.

However, MRI of the spine is useful for the differential diagnosis and assessment of disease activity.


STIR
S
0040626494
33 y , 32 y
t2_tirm_sag_3mm_p2_LWS
5123566
7
226
97
P
-32
TE: 65 TR: 4480
FS: 1.5


T1
S
0040626494
33 y , 32 y
t1_tse_sag_384_LWS
5123566
6
645
299
P
-47
TE: 11 TR: 540
FS: 1.5

FAQ

Q: Should I perform MRI of the sacroiliac joints and/or spine for the disease monitoring?

A: Normally not, especially in a stable disease with good treatment response. However, MRI (and / or CT) should be performed in a case of new back pain (especially with sudden onset and/or related to trauma) in patients with otherwise stable disease (differentiation between inflammatory and non-inflammatory reasons of back pain).

EULAR Imaging Recommendations for Spondyloarthritis

Axial SpA: monitoring activity

- MRI of the SI joints and/or the spine may be used to assess and monitor disease activity in axial SpA, providing additional information on top of clinical and biochemical assessments. The decision on when to repeat MRI depends on the clinical circumstances. In general, STIR sequences are sufficient to detect inflammation and the use of contrast medium is not needed.

Mandl P, et al. Ann Rheum Dis 2015;74:1327-39.

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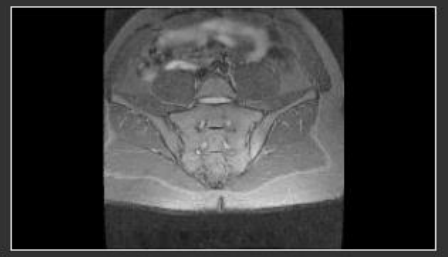
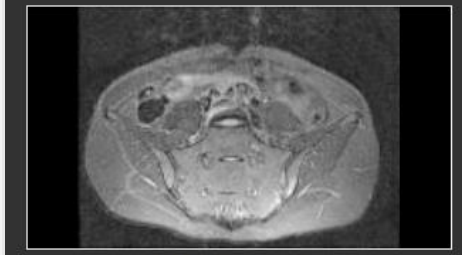
ASAS Case 01


ASAS Case 02


ASAS Case 03


ASAS Case 04


ASAS Case 05


ASAS Case 06


ASAS Case 07


ASAS Case 08

https://www.asas-group.org/

Take Home Messages

- MRI of sacroiliac joints is a method of objective detection of inflammatory / post-inflammatory changes and plays, therefore, one of the most important roles in the early diagnosis and differential diagnosis of axial SpA.
- Bone marrow edema in the sacroiliac joints might be induced by mechanical stress.
- The presence of bone marrow edema on MRI of the sacroiliac joints should be interpreted in the context of the anatomical localization (SpA - subchondral bone, mid part of the joint), size (small lesion = low specificity), presence of structural changes (especially erosions, which are typical for SpA) and in the clinical context.
- STIR and T1-weighted sequences are normally sufficient, no Gd is needed. The VIBE sequence is helpful in detection of erosions.
- Osteitis condensans ilii (OCI) is an important differential diagnosis for axial SpA. OCI is characterized by the presence bone marrow edema and sclerosis (fat lesions are also possible) in the anterior part of the sacroiliac joints and by the absence of erosions.

¡THANK YOU!

Denis Poddubnyy