

Imaging in axial Spondyloarthritis

- Translation of study data into clinical practice -



RHEUMAZENTRUM RUHRGEBIET 



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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

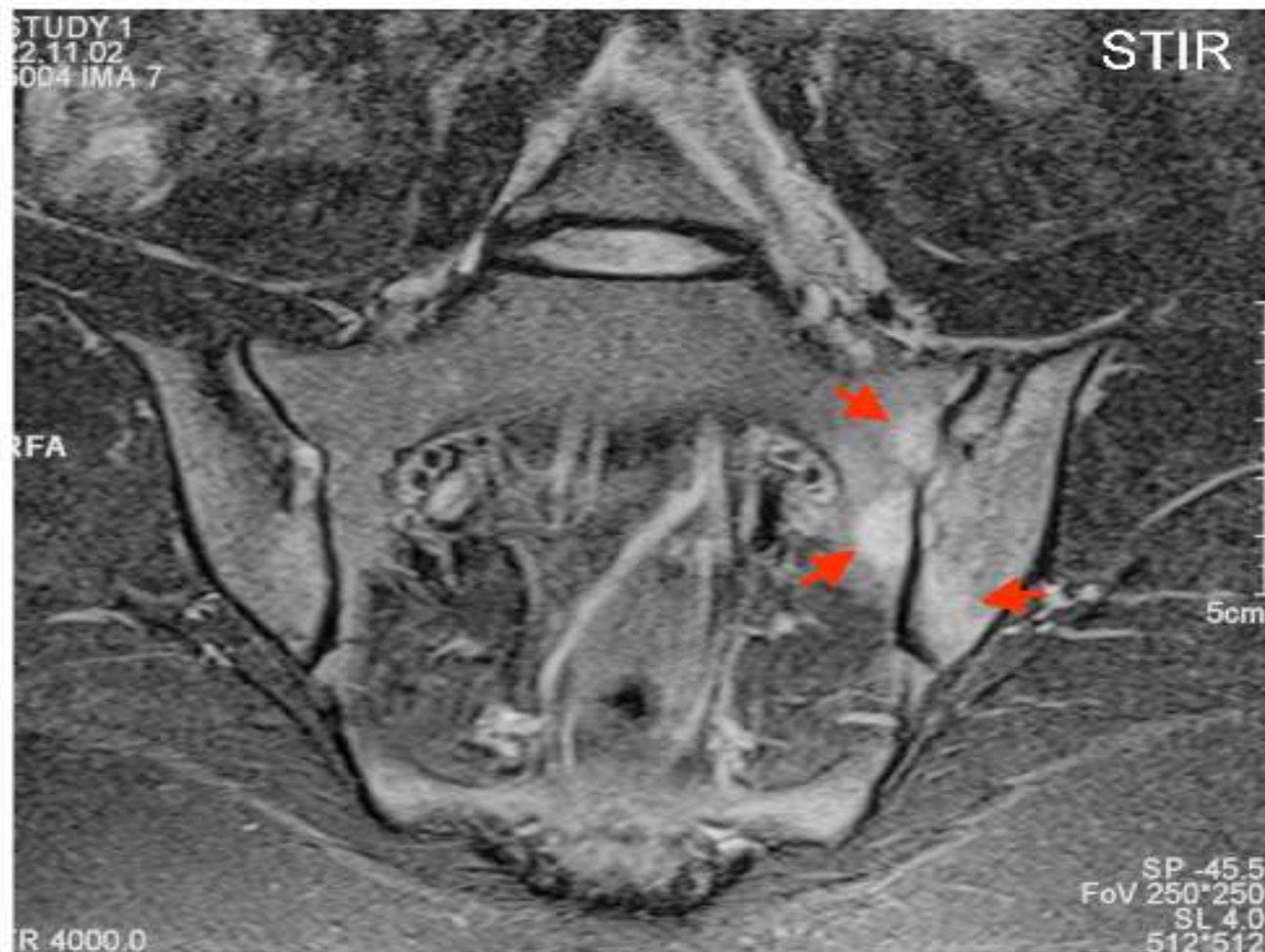
Sensitivity: 66.2%, Specificity: 97.3%

Clinical arm alone

Sensitivity: 58.6%, Specificity: 83.3%

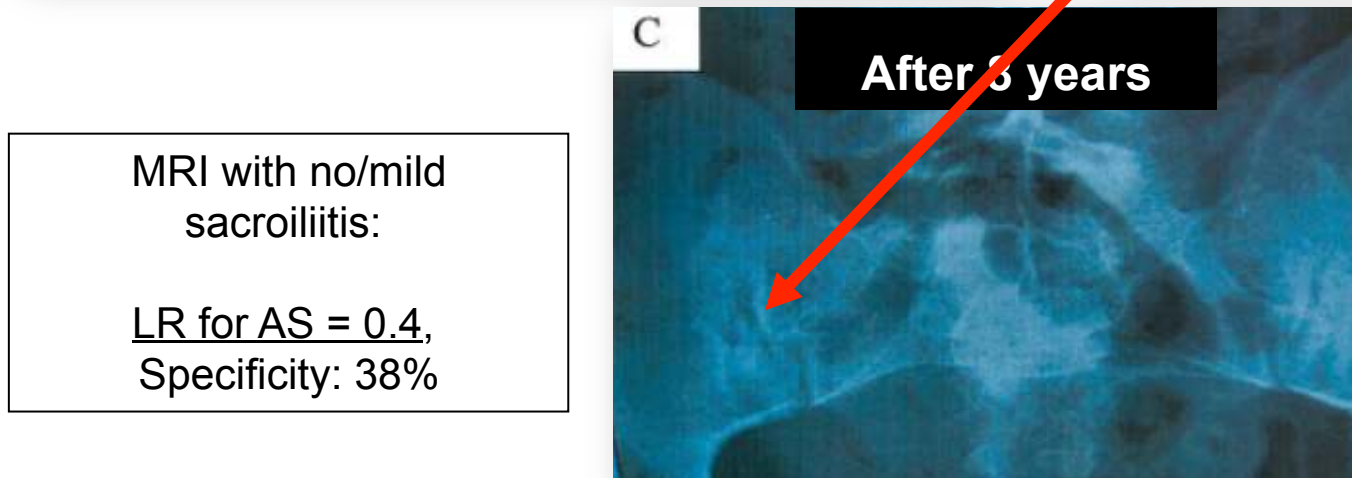
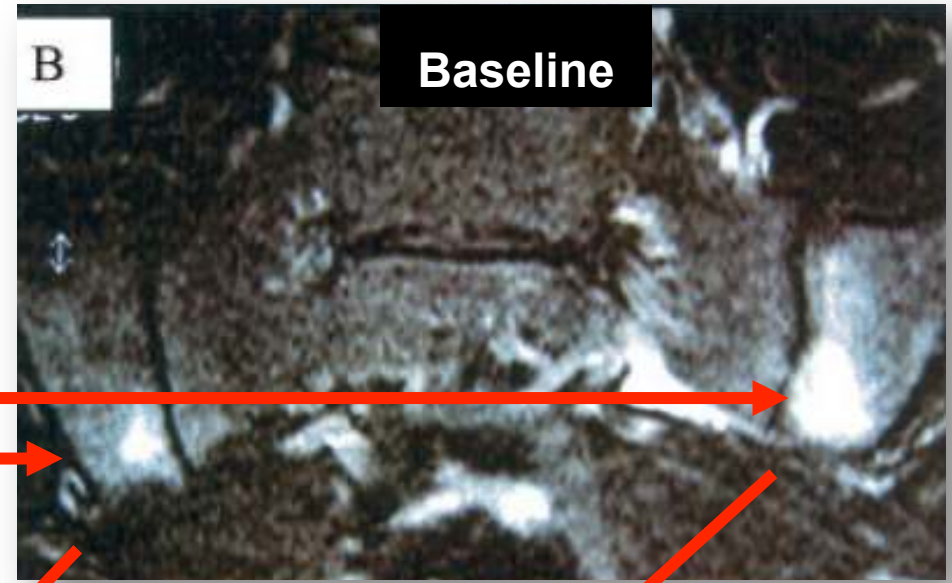
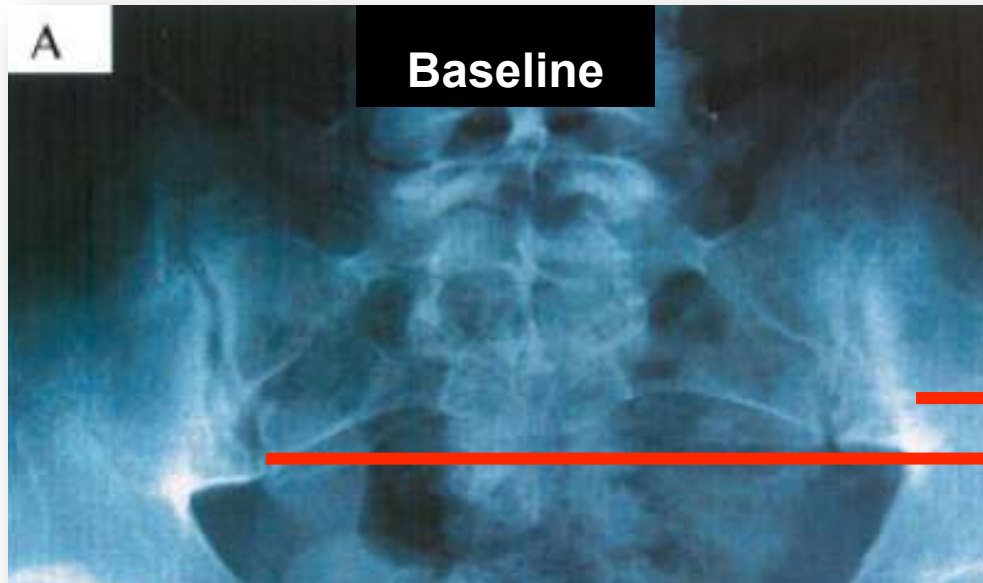
Active Inflammatory Lesions: Minimal Amount of Signal Required

If there is more than 1 signal on a single slice, 1 slice may be enough.



The severity of bone marrow edema is associated with faster radiographic progression in axSpA

Patients with ,early' SpA and positive HLA-B27



MRI with no/mild sacroiliitis:

LR for AS = 0.4,
Specificity: 38%

MRT with severe sacroiliitis:

LR for AS = 8.0,
Specificity: 92%

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plus
 ≥ 1 SpA feature#

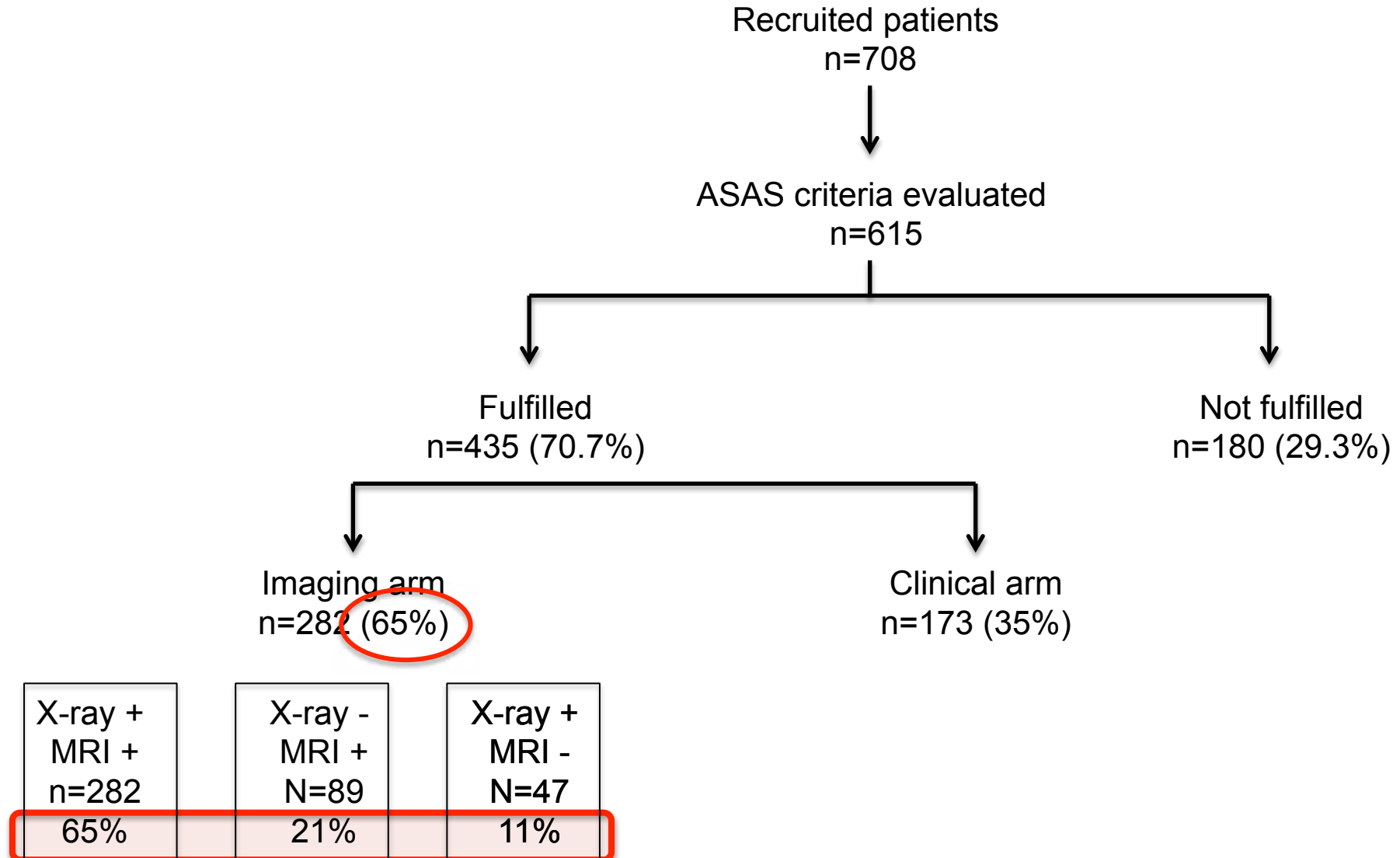
#SpA features

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How many patients are assessed as axSpA by using imaging?

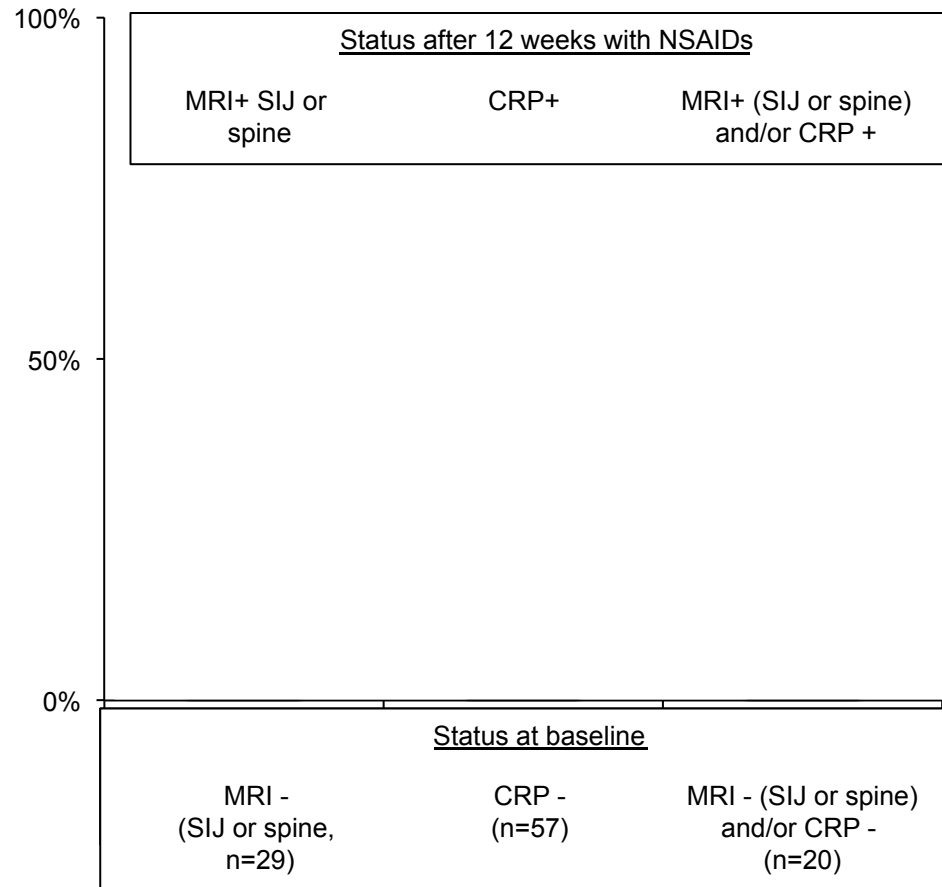


How frequently should I repeat MRI (is there fluctuation of inflammation)?

Follow up over 3 months
without anti-TNF treatment

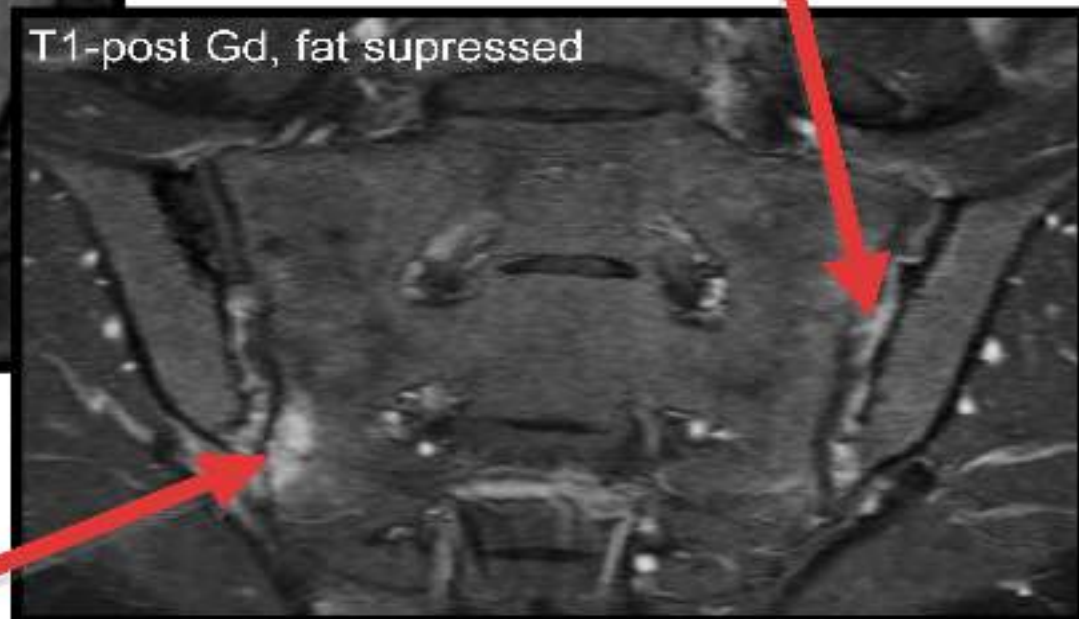
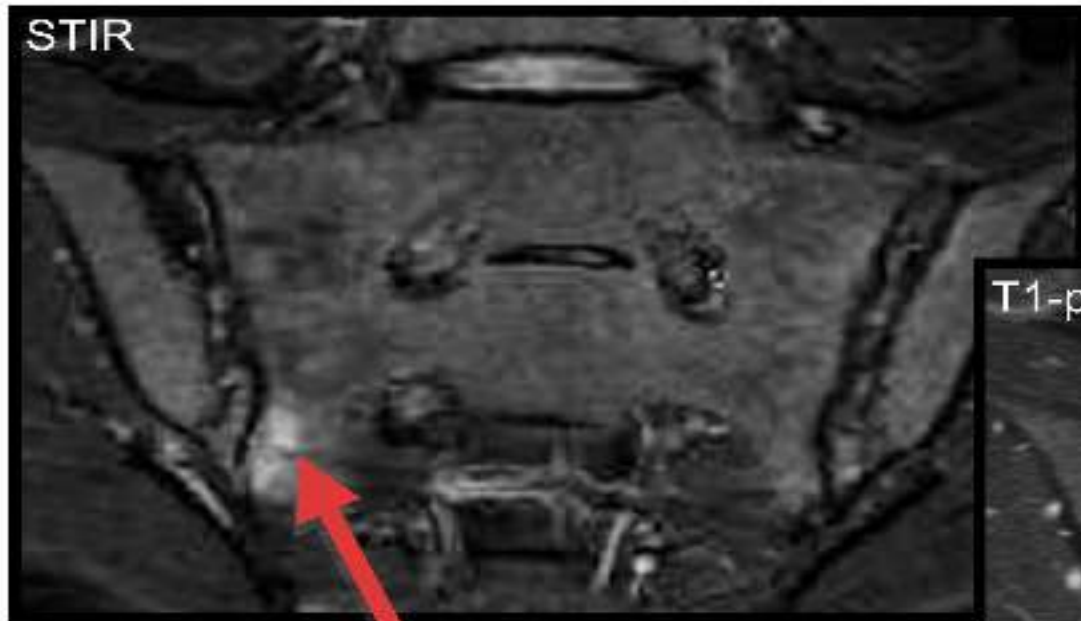


How frequently should I repeat MRI (is there fluctuation of inflammation)?



Which MRI sequences should I use?

Is T1-post-Gadolinium better than STIR?



Gd injection enables detection of intra-articular changes (synovitis)

Similar depiction of osteitis

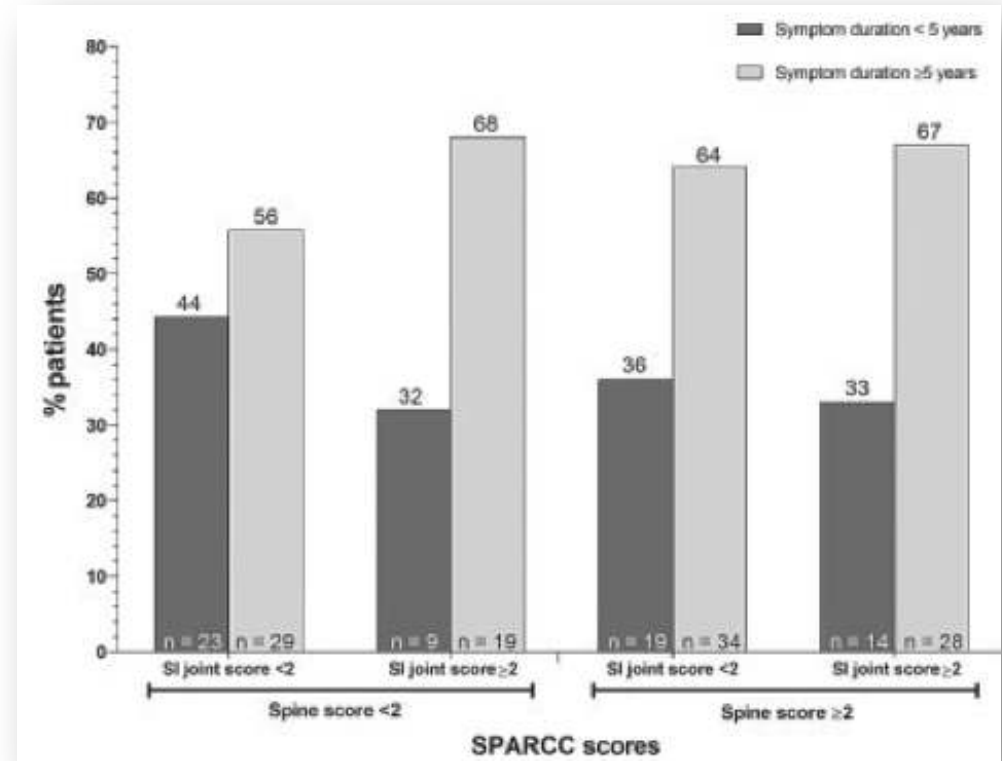
Do I need spinal MRI in axSpA?

BME found in:	nr-axSpA (n=31)	AS (n=24)	nsBP (n=33)
SIJ MRI*	46%	95.8%	15.9%

*MRIs where readers had high confidence for scoring
nsBP = non-specific back pain

Do I need spinal MRI in axSpA?

	Spine score $\geq 2^*$
SIJ score $\geq 2^*$	58%



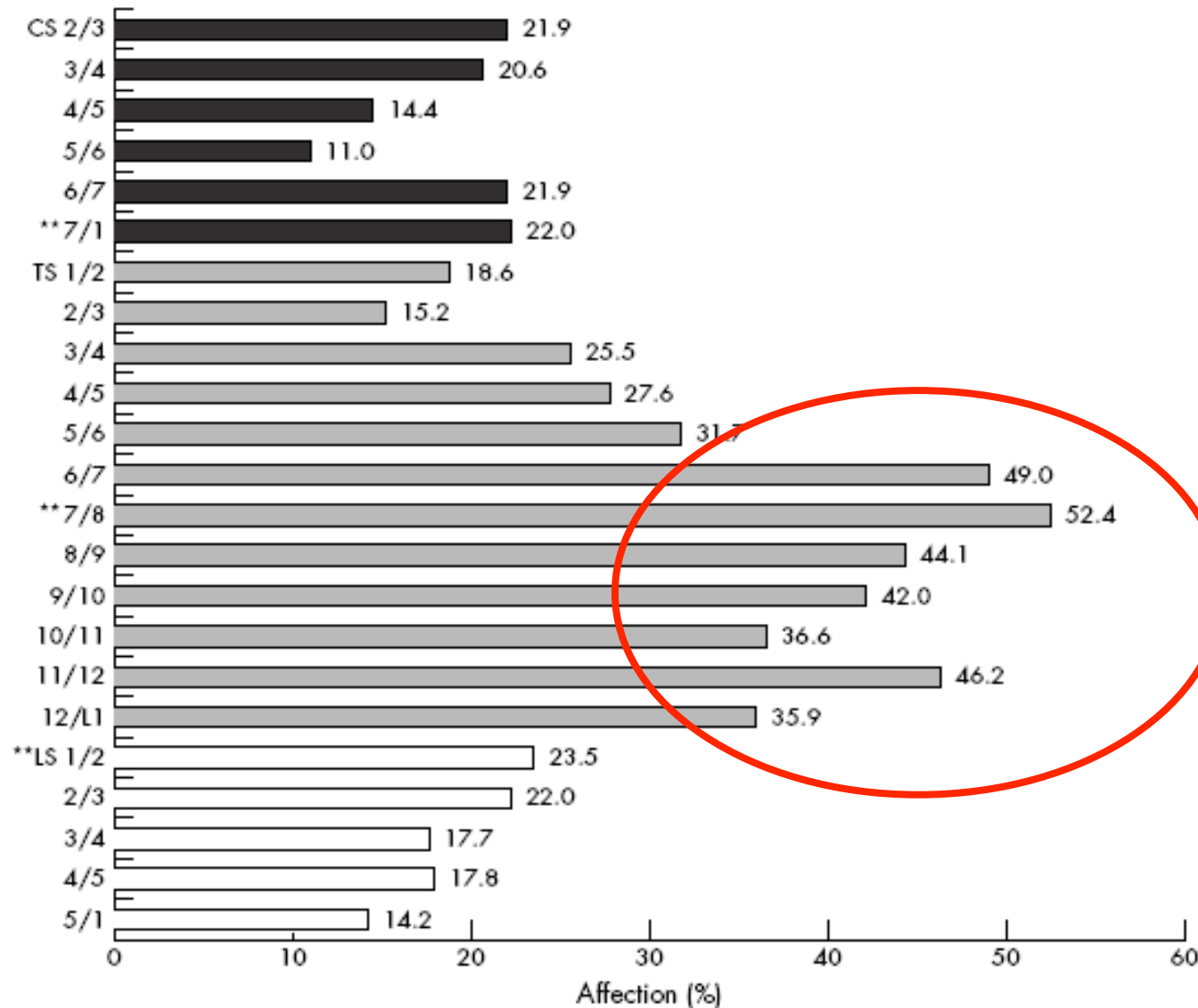
* = „positive“ MRI

Which segment is most frequently affected in axial SpA?

Spinal segment

% of vertebral segments

T1 after Gadolinium



Which spinal site should I examine by MRI in symptomatic patients?

Association between MRI inflammation and axial pain sites in the DESIR cohort (multivariate analysis)

	Inflammatory lesions by MRI					
	Thoracic (n=122)		Lumbar (n=137)		Sacroiliac (n=295)	
	OR (95% CI)*	p Value	OR (95% CI)*	p Value	OR (95% CI)*	p Value
Thoracic pain	1.71 (1.09–2.67)	0.02	1.15 (0.76–1.73)	0.5	0.85 (0.60–1.20)	0.37
Lumbar pain	1.06 (0.50–2.22)	0.87	2.53 (1.03–6.20)	0.04	1.00 (0.54–1.82)	0.99
Buttock pain	1.23 (0.73–2.07)	0.43	1.00 (0.62–1.63)	0.99	2.86 (1.84–4.46)	0.0001

Association between MRI inflammation and axial pain sites in patients fulfilling Assessment of SpondyloArthritis international Society criteria, the DESIR cohort (multivariate analysis)

	Inflammatory lesions by MRI					
	Thoracic (n=109)		Lumbar (n=111)		Sacroiliac (n=269)	
	OR*	p Value	OR*	p Value	OR*	p Value
Thoracic pain	1.66 (1.01–2.71)	0.04	1.21 (0.76–1.94)	0.42	0.77 (0.49–1.20)	0.25
Lumbar pain	1.09 (0.49–2.41)	0.83	2.79 (1.05–7.45)	0.04	0.82 (0.39–1.72)	0.60
Buttock pain	1.22 (0.68–2.20)	0.49	0.94 (0.53–1.65)	0.83	3.42 (2.00–5.85)	0.0001

What else is important in MR imaging in axial SpA?

Female, 24 years, AS, currently thoracolumbar symptoms



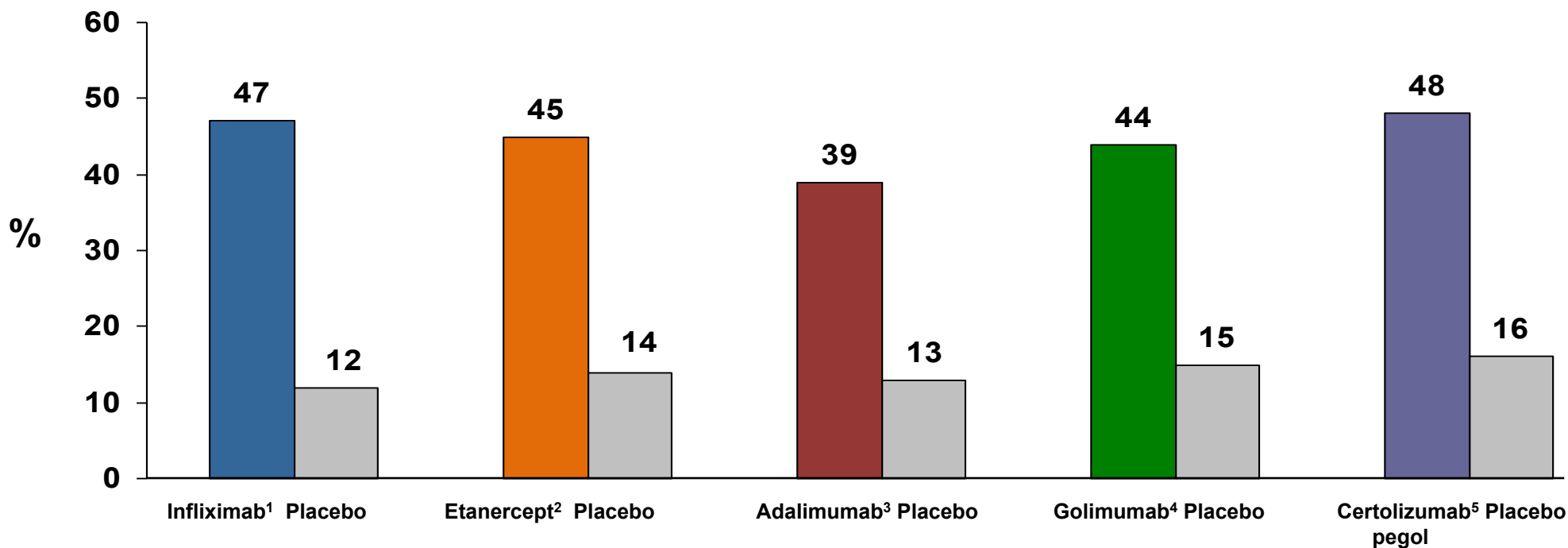
What is more important for limitation of mobility in AS: inflammation or syndesmophytes?

	Entire ankylosing spondylitis population (n=214)	Disease duration ≤ 3 years (n=53)	Disease duration > 3 years (n=161)
mSASSS			
B	0.865	0.380	0.924
95% CI	0.677–1.054	–0.099 to 0.858	0.715–1.134
p Value	<0.001	0.117	<0.001
ASspiMRI-a			
B	0.236	0.595	0.156
95% CI	0.041–0.432	0.173–1.016	–0.070 to 0.383
p Value	0.018	0.007	0.174

- Disease duration ≤ 3 years: MRI changes (BME) influenced BASMI changes
- Disease duration > 3 years: X-ray changes influenced BASMI changes

ASAS 40 Response after 24 Weeks of Treatment of AS Patients with TNF α Blocking Agents*

*Different studies, no head to head comparison

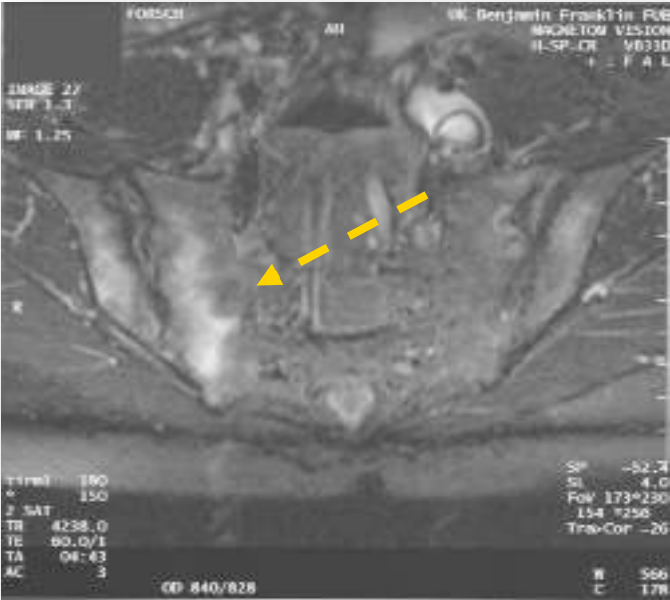


Cimzia is not currently approved for this indication in Australia

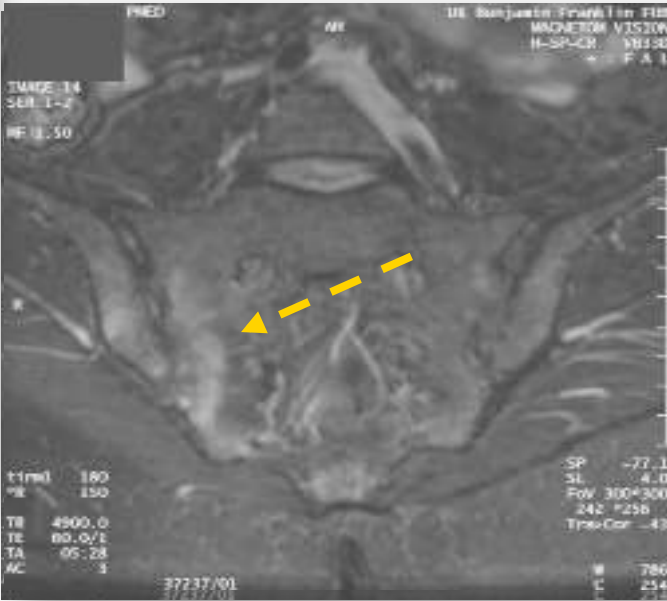
1. van der Heijde D et al. Arthritis Rheum 2005;52:582-91
2. Davis JC et al Ann Rheum Dis 2005;64:1557-62
3. van der Heijde D et al. Arthritis Rheum 2006;54:2136-46
4. Inman RD et al. Arthritis Rheum 2008;58:3402-12
5. Landewé et al. Ann Rheum Dis 2014;73:39-47.



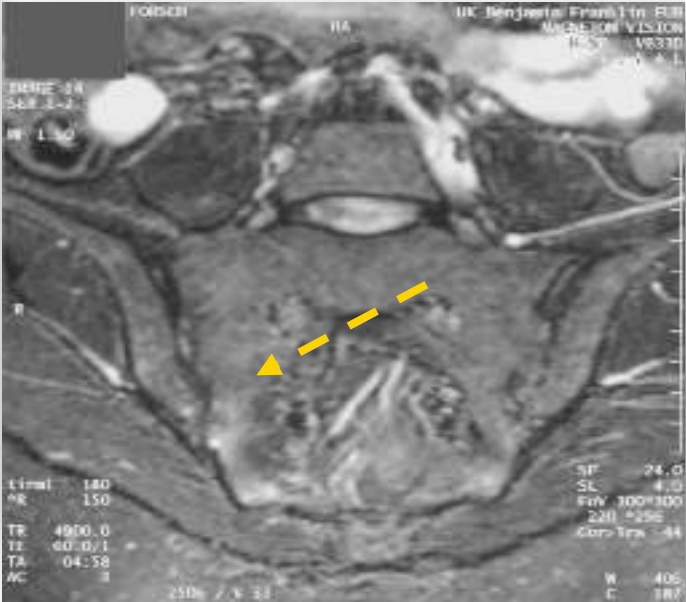
How fast can I expect improvement of bone marrow edema in patients treated with aTNF?



at baseline



6 weeks



24 weeks

Does clinical assessment correlate with what I see on MRI?

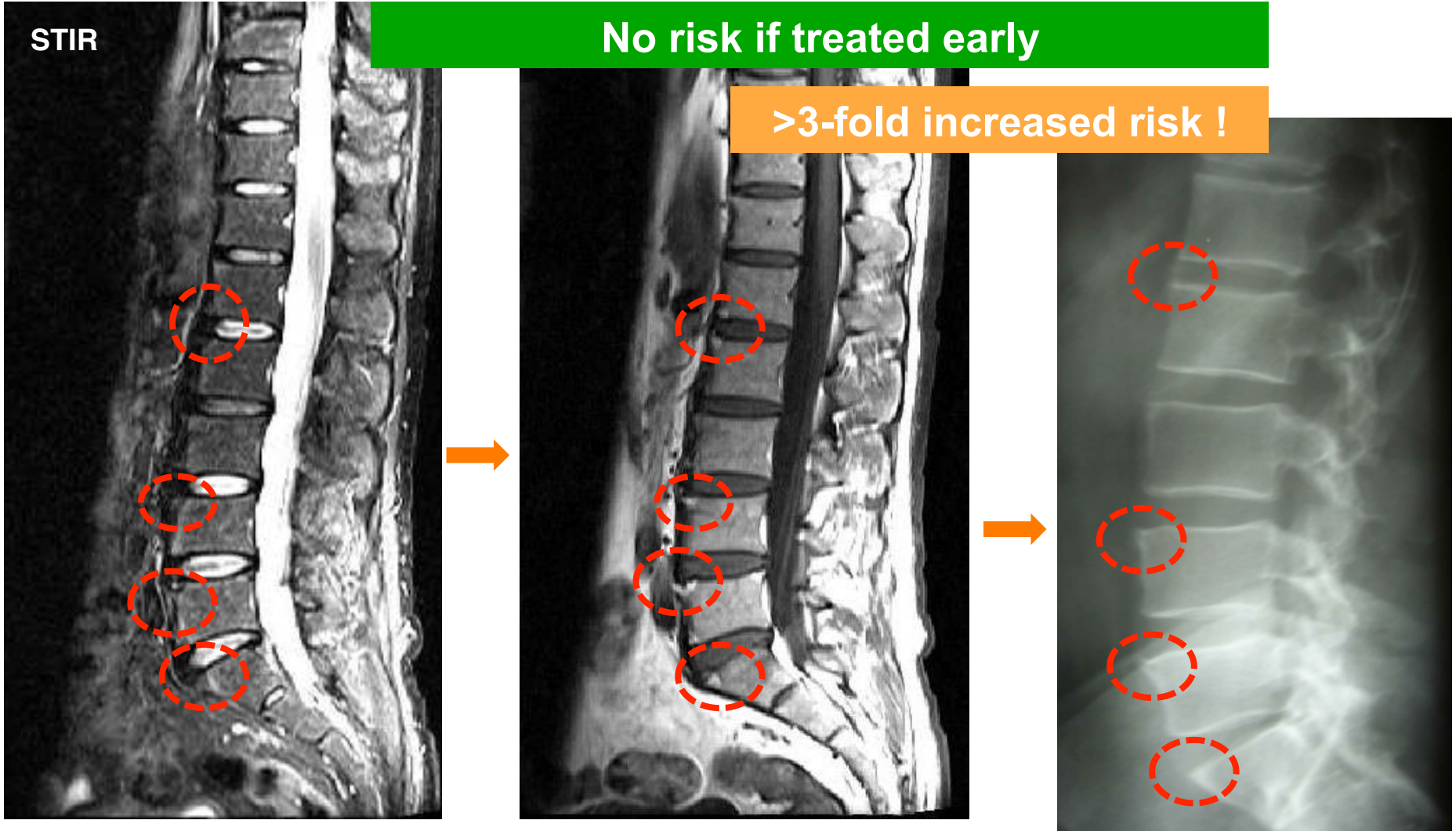
	Baseline	Change 0-102 weeks
	MRI activity score	MRI activity score
ASDAS	0.161 p=0.016	0.230 p=0.002
CRP	0.283 p<0.001	0.318 p<0.001
BASDAI	-0.092 p=0.174	0.139 p=0.063

What about chronic MRI lesions for diagnosing axSpA?



Rudwaleit M et al. Ann Rheum Dis 2009;68:1520-1527 (with permission)

Relationship between inflammation and fatty lesions on the occurrence of new syndesmophytes

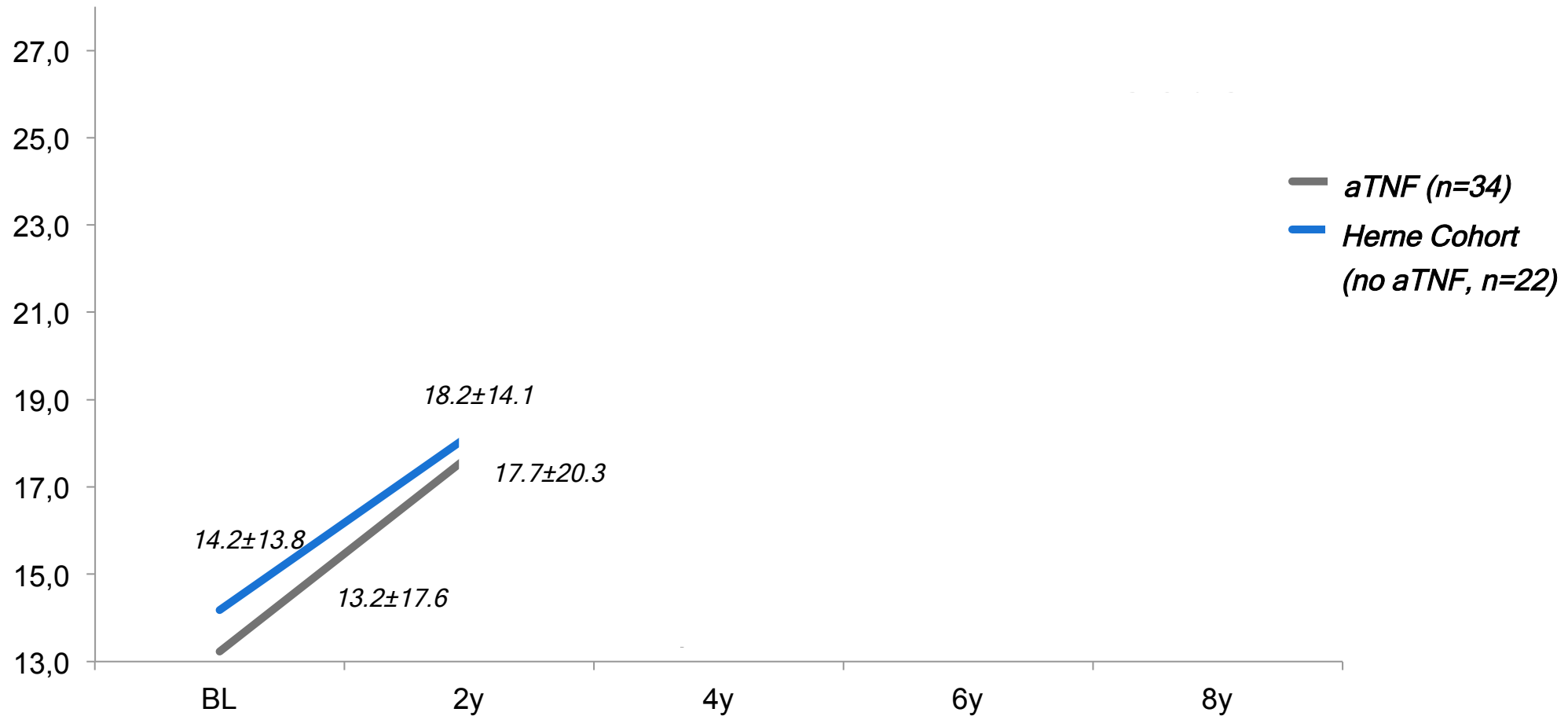


Is there a correlation between clinical findings and postinflammatory lesions?

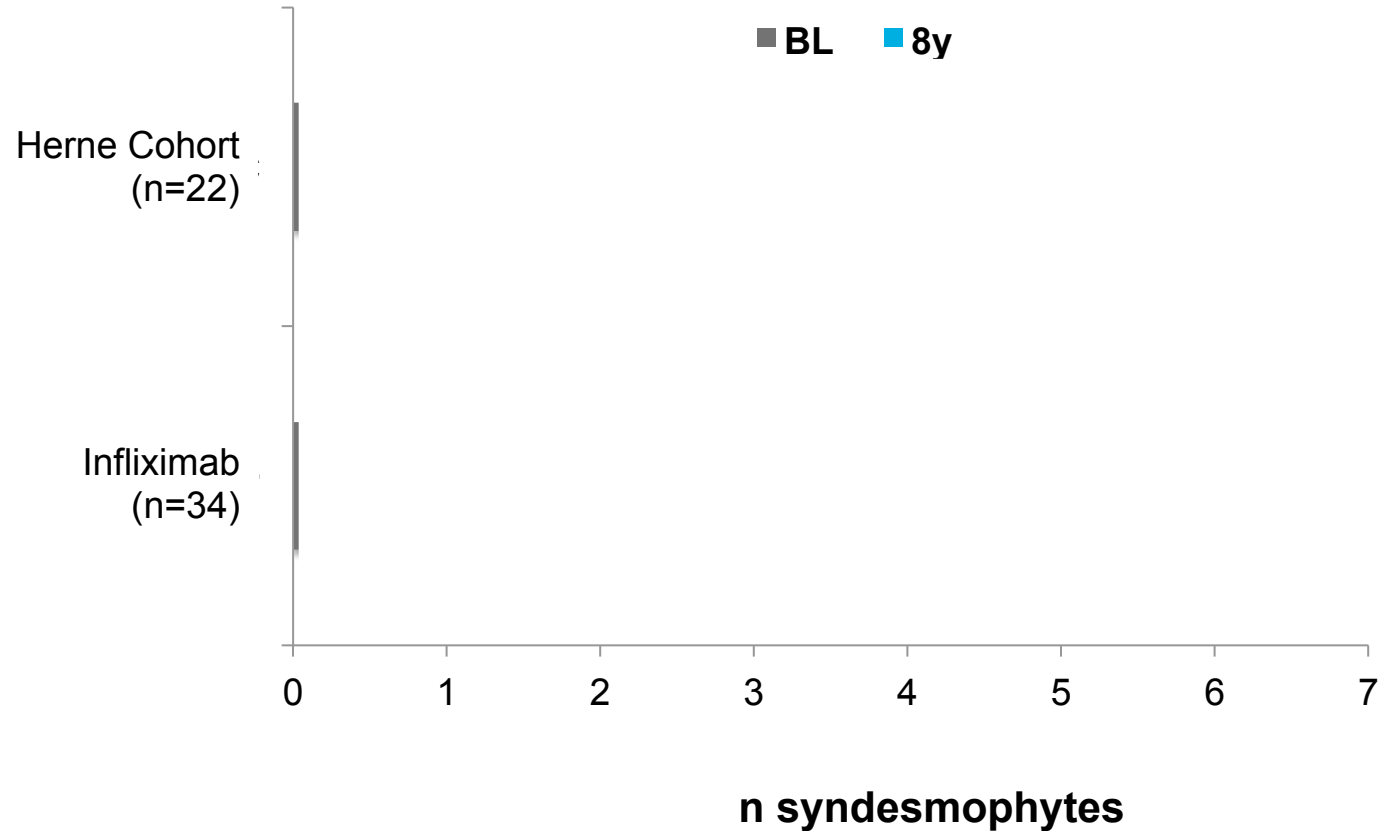
Relative risk for development of fatty lesions on MRI		RR (95% CI)	P-value
Increased	Baseline mSASS score	1.03 (1.01 - 1.04)	0.0003
Decreased	BASDAI 50%	0.85 (0.76 - 0.95)	0.005
	Young age	0.97 (0.93 - 1.00)	0.0327

Radiographic progression in AS after 8 years of anti-TNF treatment

mSASSS change

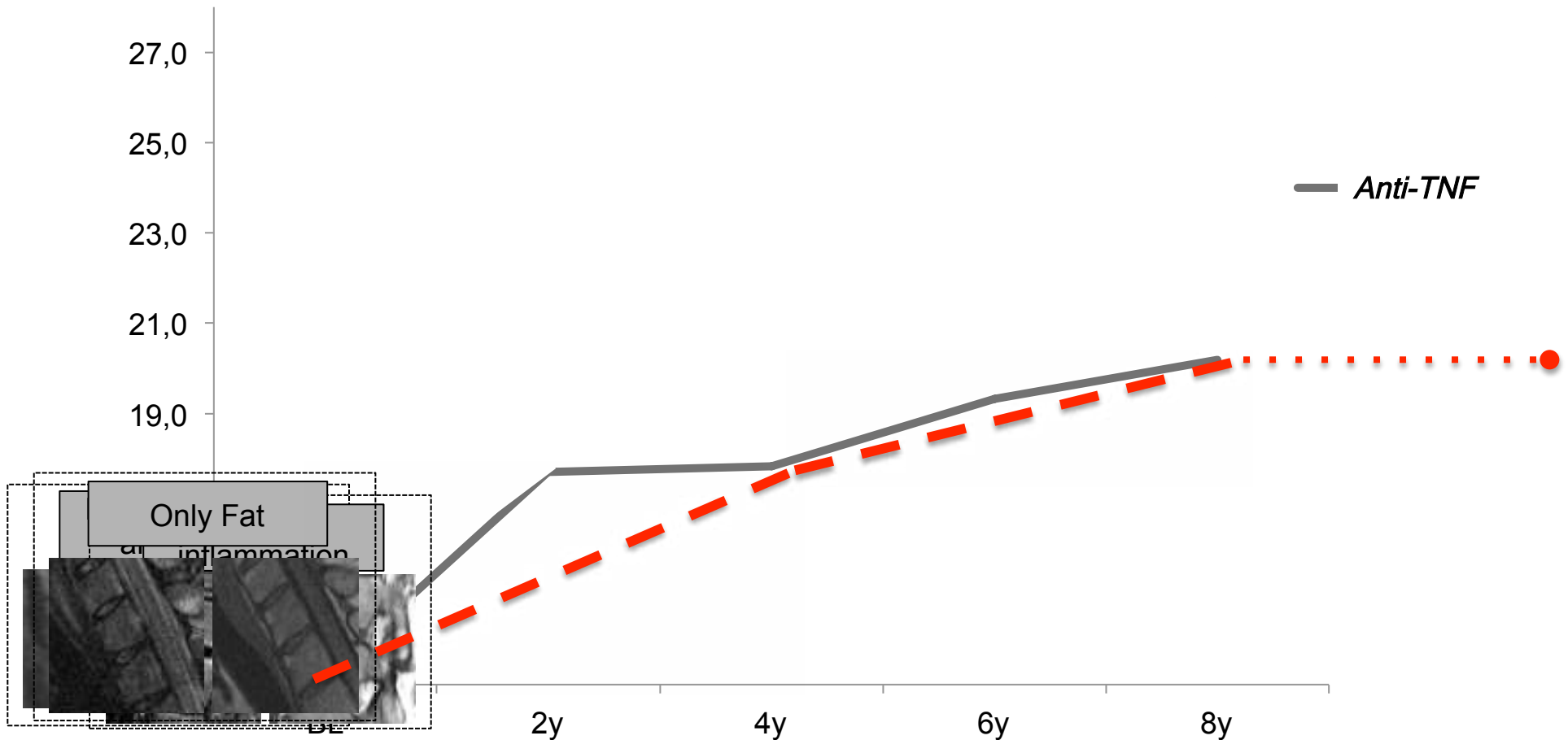


Radiographic progression in AS after 8 years of anti-TNF treatment



How can the effect of anti-TNF on the radiographic progression in AS be explained?

Radiographic progression



Is MRI detecting the entire inflammatory activity in axSpa?

- 109 Patients with IBP (Calin)
- Mean age= 19.2 years

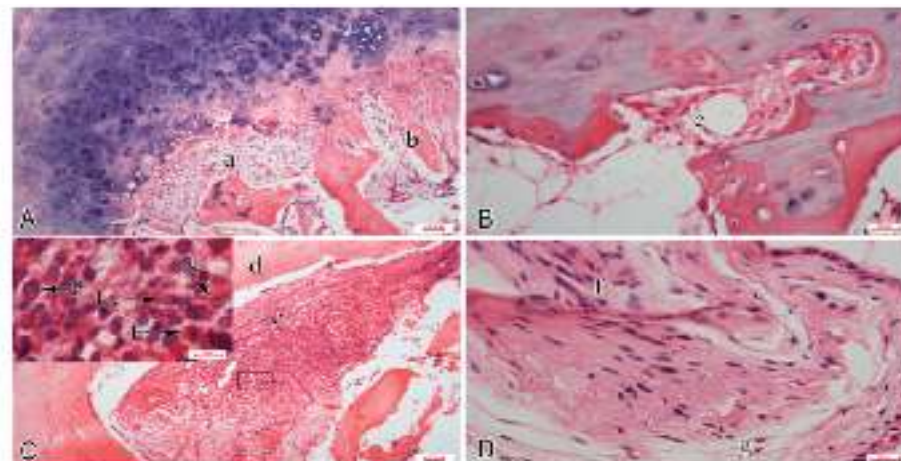
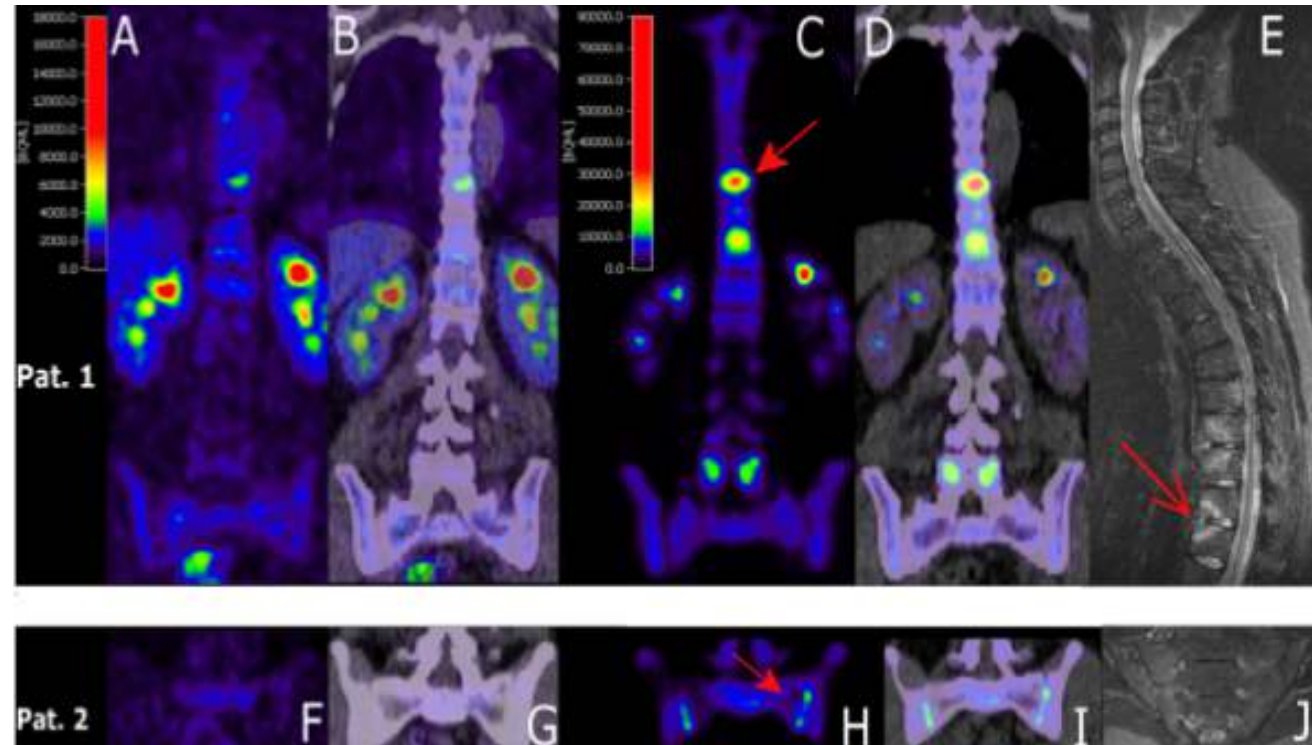
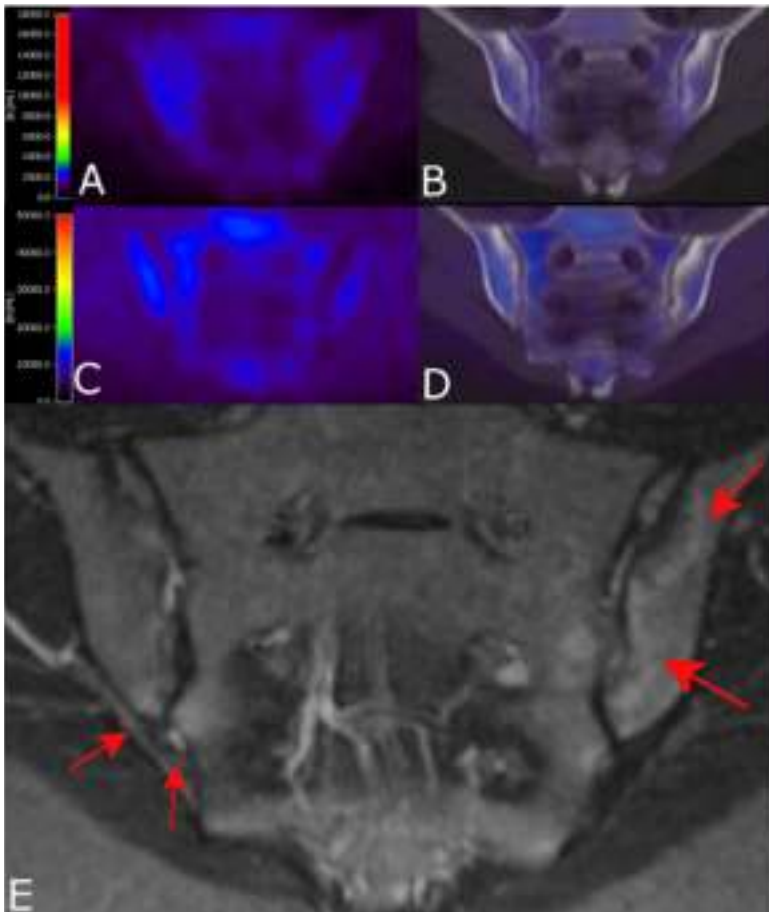


Figure 1. Pathologic features of sacroiliitis in hematoxylin and eosin-stained sacroiliac (SI) joint tissues obtained by needle biopsy. A, SI joint section showing granulomatous tissue (a) and subchondral bone plate destruction (b). B, SI joint section showing disappearance of the subchondral bone plate (c) and pannus invasion in the cartilage (d). C, SI joint section showing arthritis, with dense connective tissue (ligament) and inflammatory cell invasion (e). D = bone tissue. Inset shows a higher-magnification view of the pannus (f). N = neutrophilic leukocyte; P = plasmocyte; L = lymphocyte; E = eosinophilic granulocyte. B, SI joint section showing tenositis, with hyperplasia of synovial lining cells (g) and hyperplasia of dense connective tissues and interstitial edema (g). Bar = 50 μ m in A and C; 20 μ m in B and D; and 10 μ m in inset.

N= 77	MRI+	MRI -	Total
Biopsy +	23	38	61
Biopsy -	0	16	16
Total	23	54	77

70.4% (38/54) with negative MRI but positive biopsy

Imaging in axial SpA – future perspectives



Imaging in axSpA – A view to the future

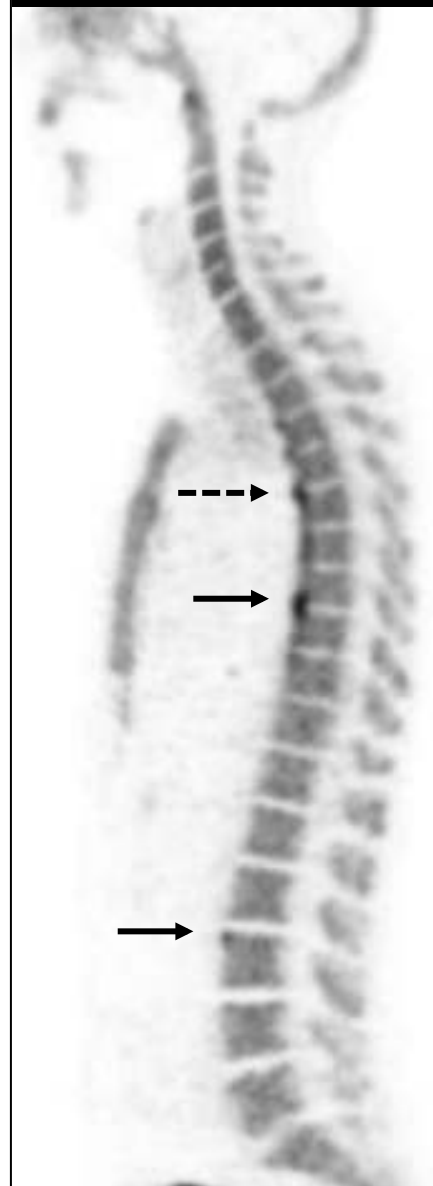
3 Tesla MRI
– STIR sequence



3 Tesla MRI
– T1 sequence



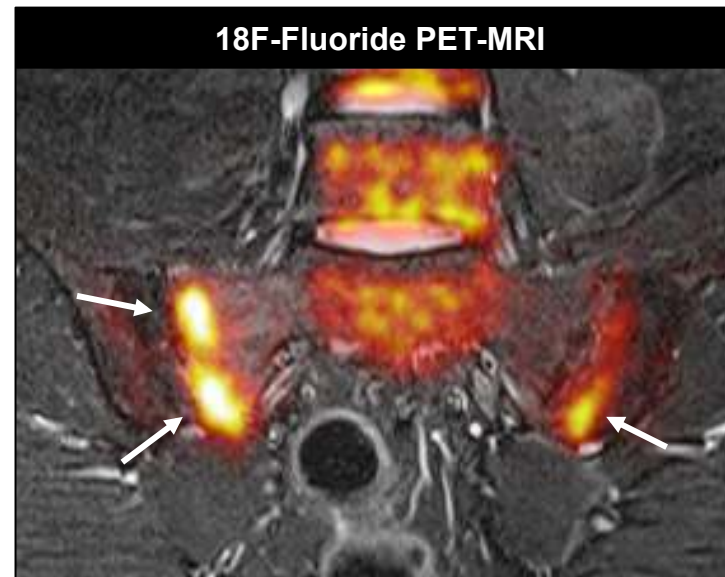
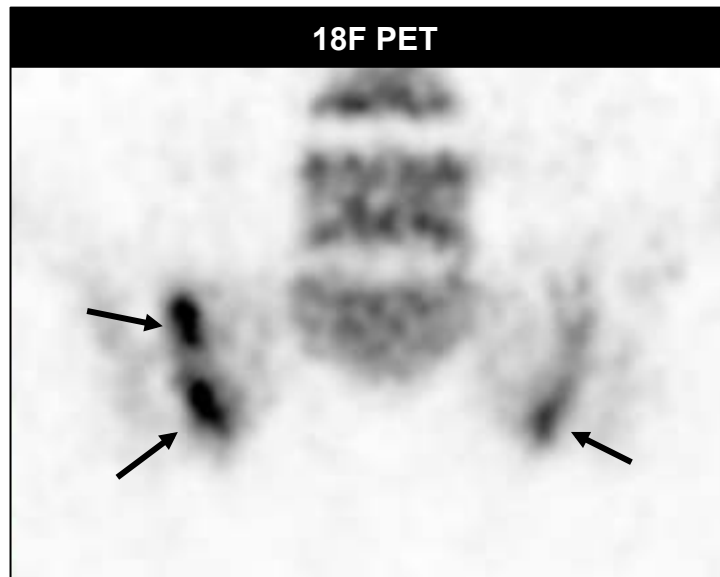
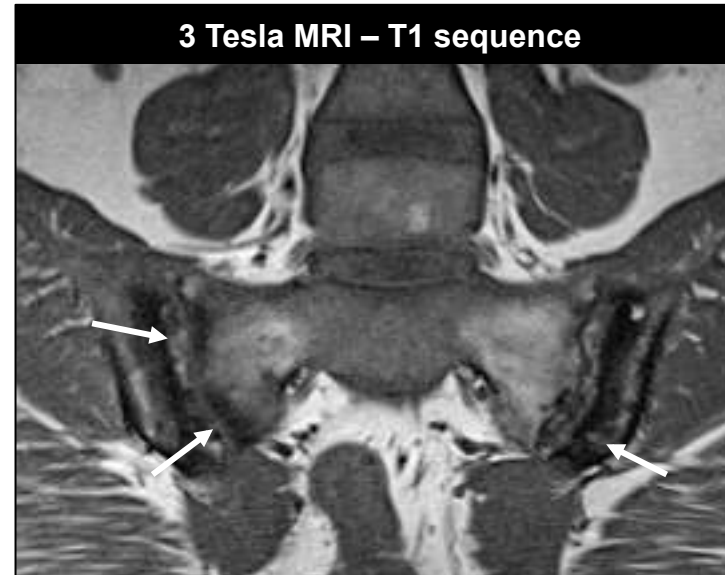
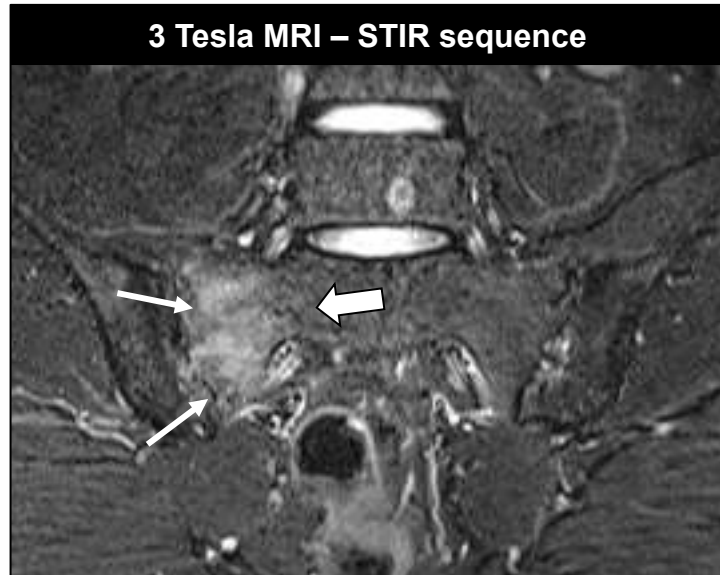
18F PET



18F-Fluoride PET-MRI



Imaging in axSpA – A view to the future



An Unusual Cause of Low Back Pain

LUKAS A. HOLZER and ANDREAS LEITHNER

J Rheumatol 2015;42;549-550

- 63-year old female
- Chronic low back pain since about 20 years
- Surgery in lumbar spine for discus herniation 19 years ago
- Surgery for intramuscular lipoma in right lumbosacral paravertebral muscles 16 years ago.
- Clinically pain in the right lumbosacral paravertebral region.
- No signs of inflammation, no neurological deficit.

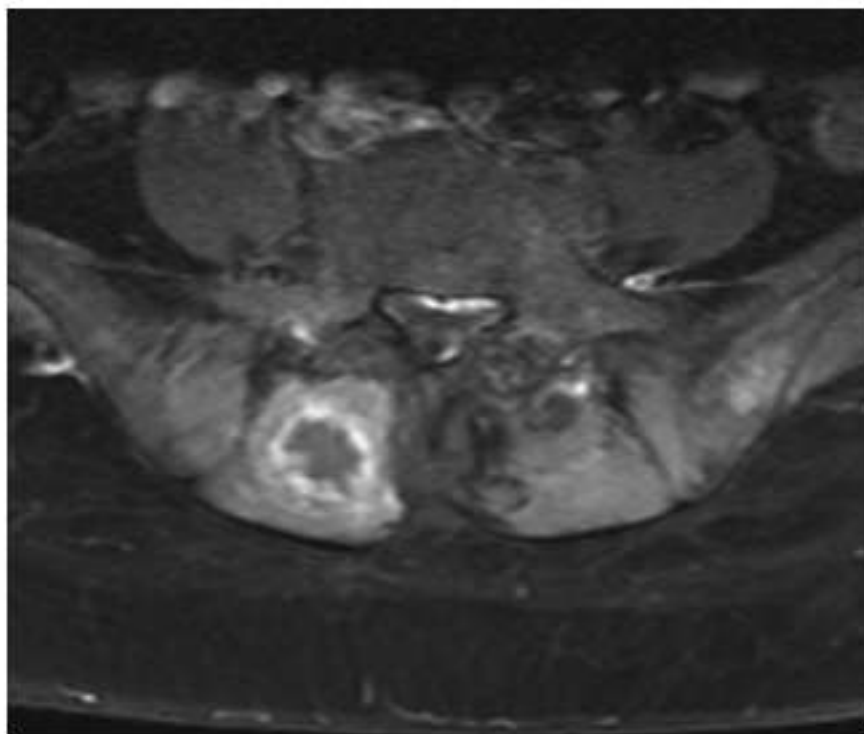


Figure 1. MRI in axial plane showing a mass of a maximum size of 3.5 cm in diameter in the right paravertebral muscles with central necrosis and an enhanced hyperintense rim after contrast medium injection. MRI: magnetic resonance imaging.



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