Comparing MRI and conventional radiography for the detection of structural changes indicative of axial spondyloarthritis in the ASAS cohort

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ABSTRACT

Objectives. To compare magnetic resonance imaging (MRI) and conventional radiography of sacroiliac joints (SIJs) for detection of structural lesions typical for axial spondyloarthritis (axSpA).

Methods. Adult patients from the Assessment of SpondyloArthritis international Society (ASAS) cohort with symptoms suggestive of axSpA and both SIJ MRIs and radiographs available for central reading were included. Radiographs were evaluated by three readers according to the modified New York (mNY) criteria grading system. The presence of structural damage on radiographs was defined as 1) fulfilment of the radiographic mNY criterion and 2) additionally, a lower threshold for sacroiliitis of at least grade 2 unilaterally. MRI scans were assessed for the presence of structural changes indicative of axSpA by 7 readers. Diagnostic performance (sensitivity - Se, specificity - Sp, positive and negative predictive values – PPV and NPV – and positive and negative likelihood ratios - LR+ and LR-) of MRI and radiographs (vs. rheumatologist's diagnosis of axSpA) were calculated.

Results. Overall, 183 patients were included, 135 (73.7%) were diagnosed with axSpA. Structural lesions indicative of axSpA on MRI had Se 38.5%, Sp 91.7%, PPV 92.9%, NPV 34.6%, LR+ 4.62, LR- 0.67. Sacroiliitis according to the mNY criteria had Se 54.8%, Sp 70.8%, PPV 84.1%, NPV 35.8%, positive LR+ 1.88, LR- 0.64. Radiographic sacroiliitis of at least grade 2 unilaterally had Sn 65.2%, Sp 50.0%, PPV 78.6%, NPV 33.8%, LR+ 1.30, LR- 0.69.

Conclusion. Structural lesions of SIJ detected by MRI demonstrated better diagnostic performance and better inter-reader reliability compared to conventional radiography.

Keywords: axial spondyloarthritis, structural lesions, sacroiliitis, magnetic resonance imaging, radiography, erosions, sclerosis, fat lesions, ankylosis, ankylosing spondylitis

Key Messages:

- MRI shows better diagnostic performance detecting structural changes indicative of spondyloarthritis compared to conventional radiography.
- Inter-reader reliability of MRI detecting structural changes indicative of spondyloarthritis is superior to conventional radiography.

Introduction

The presence of structural post-inflammatory changes in the sacroiliac joints is a hallmark of axial spondyloarthritis (axSpA). Its detection by radiography plays an important role in diagnosis (1) and determines the classification (either radiographic axSpA (r-axSpA, or ankylosing spondylitis - AS) or non-radiographic axSpA (nr-axSpA)) (2). This differentiation still plays a role in clinical practice, as some treatments are currently only available for patients with r-axSpA. Radiographic sacroiliitis is usually defined according to the modified New York (mNY) criteria for AS: bilateral sacroiliitis of grade ≥2 or unilateral sacroiliitis of grade ≥3 (3). Detection of radiographic sacroiliitis is complicated due to substantial inter-reader variability, high measurement error (4, 5) and low "signal-to-noise" ratio (6). Despite these limitations, European Alliance of Associations for Rheumatology (EULAR) recommendations for the use of imaging in the diagnosis and management of axSpA in clinical practice recommend radiography of sacroiliac joints as the first imaging method if axSpA is suspected (1). Magnetic resonance imaging (MRI) is generally recommended as a second-line imaging modality (after radiography), still, it might be used as the first or only imaging modality in some situations (1). However, recent data indicating high reliability and validity of detection of typical structural changes in sacroiliac joints by MRI (7, 8) has challenged this recommended order.

The objective of this study was to compare MRI and radiography of the sacroiliac joints (SIJs) for detection of structural lesions typical for axial spondyloarthritis (axSpA) in an international multi-reader exercise with the central reading of images from the Assessment of SpondyloArthritis international Society (ASAS) cohort.

Methods

A detailed description of the ASAS cohort has been reported elsewhere (2). In short, the cohort included consecutive patients with chronic back pain of unknown origin, ≥3 months of duration that began before 45 years of age, and symptoms or findings suggestive of axSpA; twenty-five centres in 16 countries had included 691 patients between November 2005 and October 2009. For this analysis, adult patients with both baseline radiographs and MRI of SIJs available for central reading were included.

MRI scoring process is described elsewhere (9). Briefly, seven central readers with >10 years of experience assessed T1-weighted MRI images for the presence/absence of structural lesions indicative of axSpA globally and separately for each type of lesion (sclerosis, erosion, fat lesion, backfill, ankylosis). Structural changes were considered as present if ≥4 of 7 of readers recorded them. MRI Readers also had access to STIR sequences. The inter-reader variability of structural damage detection on MRI was analysed using Fleiss' Kappa coefficient.

Pelvic radiographs, similarly to other cohorts (10, 11) were scored independently by two trained and calibrated central readers (different from the MRI readers), according to the scoring system of the mNY (grade 0-4 for each SIJ). Patients with bilateral sacroiliitis grade ≥2 or unilateral grade ≥3 were classified as r-axSpA, otherwise as nr-axSpA. In case of disagreement in classification (nr-axSpA or r-axSpA) between the primary readers, images were adjudicated by the third central reader. Two definitions of radiographic damage were applied: a) radiographic sacroiliitis according to the mNY criteria (bilateral

sacroiliitis grade ≥2 or unilateral grade ≥3) and b) at least unilateral radiographic sacroiliitis grade ≥2 (representing distinct structural changes at least in one SIJ) in the opinion of two readers. The inter-reader variability of structural damage detection was analysed using Cohen's Kappa coefficient.

Both MRI and radiographs readers were blinded for the clinical information and expert physician's diagnosis as well as for the scoring results of the other imaging method.

The diagnostic performance (sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), positive likelihood ratio (LR+) and negative likelihood ratio (LR-)) was estimated both for MRI and radiography using the expert physician's diagnosis of axSpA as the gold standard.

Absolute agreement (percentage of patients with or without structural changes on both MRI and radiography) and Cohen's Kappa coefficient of agreement between MRI and radiography were determined.

Results

Based on the availability of MRI and radiographs at baseline, 183 patients were included in the current analysis. Of them, 135 (73.8%) were diagnosed with axSpA by local rheumatologist (as compared to 290 (57.1%) of excluded patients), with other common diagnoses being mechanical back pain (6.6%), degenerative disc disease (6.0%), and undifferentiated back pain (2.7%). MRI images were available to the local physicians in 66.5% of excluded patients, hence probably resulting in a lower number of diagnoses. Baseline characteristics of the study sample, compared to the patients from the ASAS cohort suspected with axSpA, who did not have these images available, are presented in **Supplementary Table 1.**

Based on the central reading, 56 (30.6%) patients had axSpA-typical MRI structural lesions, 88 (48.1%) had definite radiographic sacroiliitis according to the mNY criteria, and 112 (61.2%) had radiographic sacroiliitis ≥ grade 2 unilaterally (**Table 1**). The individual MRI lesions most commonly observed were erosions (50 patients, 27.3%), fat lesions (39; 21.3%) and sclerosis (34; 18.6%). Based on the granular score, 71 patients (38.8%) had at least one structural lesion.

The reliability of structural damage assessment on MRI (including individual structural MRI features) was reported previously (9). Overall, the agreement for the global assessment was substantial between 7 readers (Fleiss' Kappa 0.65, 95%CI 0.61 to 0.68). The reliability of the assessment of radiographic structural damage was moderate: radiographic sacroiliitis according to the mNY criteria – Cohen's Kappa 0.47, 95%CI 0.59 to 0.34; radiographic sacroiliitis ≥ grade 2 unilaterally – Cohen's Kappa 0.50, 95%CI 0.62 to 0.37).

Structural lesions detected by MRI (global assessment) showed high specificity (91.7%) and sensitivity of 38.5%. PPV was 92.9%, NPV was 34.6%. LR+ and LR- were 4.62 and 0.67, respectively (**Table 1**). Diagnostic performance of distinct MRI lesions is displayed in the **Table 1**, with erosions performing the best (LR+ 8.53). Sacroiliitis according to the mNY criteria had higher sensitivity (54.8%) but substantially poorer specificity (70.8%), PPV (84.1%) and LR+ (1.88) were also lower compared to MRI. Sacroiliitis ≥ grade 2 unilaterally showed even lower specificity (50%), sensitivity of 65.2% with other parameters similar to mNY criteria. Combining radiography and MRI has not improved the performance (**Table 1**). Radiography in the subgroup of patients with negative MRI results demonstrated limited added value with LR+ of 1.54 (**Supplementary Table 2**). In contrast, MRI In the subgroup of patients with no sacroiliitis according to the mNY criteria was characterized by high specificity and PPV and LR+ of 5.57 (**Supplementary Table 3**).

The agreement between on the presence of structural changes typical of axSpA between MRI (global evaluation) and radiographs was moderate for radiographic sacroiliitis according to the mNY criteria

(Cohen's Kappa 0.40, 95% CI 0.28 to 0.53) and fair for radiographic sacroiliitis ≥ grade 2 unilaterally (Cohen's Kappa 0.36, 95% CI 0.25 to 0.46; **Supplementary Table 4)**.

Examples of agreement and disagreement between the imaging methods and the physician's diagnosis are presented in **Figure 1**.

Discussion

In this report, we demonstrated high specificity of structural damage in SIJs detected by MRI for the diagnosis of axSpA exceeding such of conventional radiography. Radiography was found to be more sensitive but this was most likely related to the generally higher number of positive cases including the false-positive ones (that was especially true for the low threshold definition of sacroiliitis ≥ grade 2 unilaterally) as reflected by the low specificity. As reported previously (12), the sensitivity of MRI has somewhat increased if active inflammatory changes were also considered.

The obtained data add to the body of evidence that the diagnostic performance of MRI for detecting radiographic damage is at least not inferior to radiography when axSpA is suspected. Combining those two methods does not increase the performance significantly. Interestingly, MRI was still highly discriminative in patients with no changes on radiography (LR+ 5.57), while radiography was not in MRI-negative patients (LR+ 1.54).

Our results comply with the recent reports. *Diekhoff et al.* showed that MRI was superior to radiography in detecting structural lesions in SIJs in patients with axSpA with low dose computed tomography taken as the reference (7). Same authors demonstrated no added value of combination of radiography and MRI compared to MRI alone, while a combination of low dose computed tomography and MRI was superior over MRI alone (8). In general, MRI was the most sensitive method, CT was the most specific method, while conventional radiography was neither sensitive nor specific for the diagnosis of axSpA (8). *Bakker et al.* showed in the DESIR cohort that structural lesions on MRI can be used reliably as a substitute for radiographs to classify patients with axSpA according to the ASAS classification criteria (13). Good agreement between MRI and radiography in detecting structural changes was also reported earlier (14).

The reliability of assessment MRI structural lesions was in general comparable with the reliability of radiographic sacroiliitis assessment in this exercise. It should be taken into account, however, that both radiographs and especially MRIs were evaluated by experienced readers calibrated for the specific imaging assessment, therefore, the diagnostic performance might differ if performed in clinical practice.

Interestingly, the diagnostic performance of radiography in our study was significantly poorer compared to previous reports (15, 16). ASAS cohort included patients with rather recent chronic back pain and no determined diagnosis of axSpA and therefore, with a lower probability of significant radiographic sacroiliitis. In contrast, the older studies usually reported the performance of radiography in patients with AS, where the diagnosis is based on the positive radiographic findings.

The sensitivity for the MRI structural lesions was also quite low due to 2 factors. Firstly, as said before, patients with rather short symptom duration (median 3 years) were included, in contrast to previous studies (10, 11), thus allowing less time for MRI structural lesions to develop. Secondly, for this study, as for the vast majority of others (7, 8, 10, 11), physician's diagnosis of spondyloarthritis was used as the reference when exploring the performance of MRI due to the lack of better alternatives. It is now known that structural lesions occur almost as frequently as active lesions (17). However, at the time of the recruitment (2005-2009), less data was available on the role of MRI in the diagnosis of axSpA in general, and about the performance of structural changes on MRI in particular; the data-driven

definitions were only developed recently (9, 18). In contrast, radiographic changes were known to be strongly associated with spondyloarthritis, thus, potentially bringing different "weight" to this imaging outcomes at the time of physician assessment and diagnosis.

Our study has some limitations. Firstly, only the grade of radiographic sacroiliitis was determined with no detailed scoring of radiographic changes (erosions, sclerosis etc.). However, considering the high inter-reader variability even in detecting the grade (5), the added value of detailed assessment seemed questionable. Secondly, no "gold standard" or "standard reference" assessments (such as computed tomography) were available, and the clinical diagnosis of a local physician was used as the reference. Both radiographs and MRIs (in majority of patients) were available for physicians to establish the diagnosis. This may lead to a problem of circularity, since the performance of a tool, which is to some extent was included in the "gold standard", was evaluated. On the other hand, the current analysis is based on the results of the central assessment of images, which was independent of local assessment and any clinical information. Thirdly, complete sets of MRIs were not available for central assessment in all patients of the ASAS cohort; this introduces a potential risk of selection bias.

In conclusion, structural changes indicative of axSpA detected by MRI demonstrated better diagnostic performance compared to radiographic sacroiliitis. Thus, MRI has the potential to replace radiography for the detection of structural damage in SIJ in both classification and diagnostic settings, the fact that is likely to be reflected in the future recommendations on the use of imaging in axSpA.

Conflicts of interest

The authors declared the following potential conflicts of interest with respect to the research, authorship, and/or publication of this article: MP: reports honoraria from Novartis. FP: reports honoraria from AbbVie, Amgen, Bristol-Myers Squibb, Hexal, Janssen, MSD, Novartis, Pfizer, Roche and UCB; reports grants/research support from Lilly, Novartis and UCB. SW: declares no conflicts of interest. PMM: reports consultancy fees from Abbvie, BMS, Celgene, Eli Lilly, Galapagos, Janssen, MSD, Novartis, Orphazyme, Pfizer, Roche and UCB. RGL: reports consultancy fees from Calyx, CARE Arthritis Ltd, Image Analysis Group. UW: declares no conflicts of interest. SJP: declares no conflicts of interest. MØ: reports consultancy fees from Abbvie, BMS, Boehringer-Ingelheim, Celgene, Eli-Lilly, Hospira, Janssen, Merck, Novartis, Novo, Orion, Pfizer, Regeneron, Roche, Sandoz, Sanofi and UCB; reports honoraria for being a member of speakers' bureau from Abbvie, BMS, Celgene, Eli-Lilly, Galapagos, Gilead, Janssen, Merck, Novartis, Orion, Pfizer, Roche and UCB; reports grants/research support from

Ethics

The study complies with the Declaration of Helsinki. The study was approved by the ethics committee of the Charité-Universitätsmedizin Berlin and by the local ethics committees of the participating centres. All patients gave written informed consent before any study-related procedures.

Data availability statement

The data underlying this article will be shared on reasonable request to the corresponding author.

Table 1. The diagnostic performance of structural changes detected by MRI and by radiographs in the ASAS cohort.

		Expert physician's diagnosis of axSpA		Sensitivity	Specificity	PPV	NPV	LR+ (95%CI)	LR- (95% CI)
		No (n=48)	Yes (n=135)						
Presence of structural lesions typical for axSpA on MRI according to the global assessment	No (n=127)	**44 (24.0%)**	83 (45.4%)	38.5%	91.7%	92.9%	34.6%	4.62 (1.77 to 12.10)	0.67 (0.57 to 0.79)
	Yes (n=56)	4 (2.2%)	**52 (28.4%)**						
Erosions on MRI	No (n=133)	**46 (25.1%)**	87 (47.5%)	35.6%	95.8%	96%	34.6%	8.53 (2.16 to 33.77)	0.67 (0.59 to 0.77)
	Yes (n=50)	2 (1.1%)	**48 (26.2%)**						
Sclerosis on MRI	No (n=149)	**42 (23.0%)**	107 (58.5%)	20.7%	87.5%	82.4%	28.2%	1.66 (0.73 to 3.76)	0.91 (0.79 to 1.04)
	Yes (n=34)	6 (3.3%)	**28 (15.3%)**						
Fatty lesions on MRI	No (n=144)	**45 (24.6%)**	99 (54.1%)	26.7%	93.8%	92.3%	31.3%	4.27 (1.38 to 13.22)	0.78 (0.69 to 0.89)
	Yes (n=39)	3 (1.6%)	**36 (19.7%)**						
Ankylosis on MRI	No (n=179)	**48 (26.2%)**	131 (71.6%)	3.0%	100%	100%	26.8%	-	0.97 (0.94 to 1.00)
	Yes (n=4)	0 (0.0%)	**4 (2.2%)**						
Radiographic sacroiliitis fulfilling the mNY criteria	No (n=95)	**34 (18.6%)**	61 (33.3%)	54.8%	70.8%	84.1%	35.8%	1.88 (1.18 to 3.00)	0.64 (0.49 to 0.83)
	Yes (n=88)	14 (7.7%)	**74 (40.4%)**						
Radiographic sacroiliitis $\geq$ grade 2 unilaterally	No (n=71)	**24 (13.1%)**	47 (25.7%)	65.2%	50%	78.6%	33.8%	1.30 (0.96 to 1.78)	0.70 (0.48 to 1.00)
	Yes (n=112)	24 (13.1%)	**88 (48.1%)**						
Presence of structural lesions typical for axSpA on MRI according to the global assessment OR Radiographic sacroiliitis fulfilling the mNY criteria	No (n=84)	**33 (13.1%)**	51 (25.7%)	62.2%	68.8%	84.9%	39.3%	1.99 (1.28 to 3.09)	0.55 (0.41 to 0.73)
	Yes (n=99)	15 (13.1%)	**84 (45.9%)**						
Presence of structural OR active lesions indicative of axSpA on MRI according to the global assessment	No (n=115)	**43 (23.5%)**	72 (39.3%)	46.7%	89.6%	92.7%	37.4%	4.48 (1.92 to 10.47)	0.60 (0.49 to 0.72)
	Yes (n=68)	5 (2.7%)	**63 (34.4%)**						

clinical diagnosis of a local physician was used as the reference

axSpA – axial spondyloarthritis; CI – confidence interval; MRI – magnetic resonance imaging; mNY criteria – modified New York criteria.

Supplementary Table 1. Baseline characteristics of the patients included in the study in comparison to the whole ASAS cohort

Baseline parameters	Patients with both MRI and radiographs of SIJ available for central reading at baseline (n=183)	Patients with imaging unavailable for central reading at baseline (n=508)
Age, years (mean ± SD)	32.1±8.8	35.6±11.2
Male sex, n (%)	87 (47.5)	290 (42.9)
HLA-B27 positivity, n (%)	95 (51.9)	236 (46.5)
Back pain duration, years (median [IQR])	3.0 [1;8]	4.0 [1;10]
Expert physician's diagnosis of axSpA, n (%)	135 (73.7)	290 (57.1)
Family history of SpA, n (%)	36 (19.7)	120 (23.6)
Arthritis ever, n (%)	75 (41.0)	164 (32.3)
Enthesitis ever, n (%)	72 (39.3)	200 (39.4)
Uveitis ever, n (%)	23 (12.6)	41 (8.1)
Psoriasis ever, n (%)	15 (8.2)	40 (7.9)
IBP, n (%)	107 (58.5)	318 (62.6)
CRP (mean ± SD), mg/l	2.5±11.0	1.0±2.0
Radiographs of SIJ performed and available to local physician, n (%)	183 (100%)	508 (100%)
MRI of SIJ performed and available to local physician, n (%)	183 (100%)	338 (66.5%)

axSpA – axial spondyloarthritis; CRP – C-reactive protein; IBP – inflammatory back pain; MRI – magnetic resonance imaging; SD – standard deviation; SIJ – sacroiliac joints; SpA - spondyloarthritis

Supplementary Table 2. The diagnostic performance of radiography of sacroiliac joints in the group of patients with no structural damage detected by MRI.

		Expert physician's diagnosis of axSpA		Sensitivity	Specificity	PPV	NPV	LR+ (95%CI)	LR- (95%CI)
		No (n=44)	Yes (n=83)						
Radiographic sacroiliitis fulfilling the mNY criteria	No (n=84)	**33 (26.0%)**	51 (40.2%)	38.5%	75.0%	74.4%	39.3%	1.54 (0.86 to 2.75)	0.82 (0.64 to 1.04)
	Yes (n=43)	11 (8.7%)	**32 (25.2%)**						

clinical diagnosis of a local physician was used as the reference

axSpA – axial spondyloarthritis; CI – confidence interval; MRI – magnetic resonance imaging; mNY criteria – modified New York criteria.

Supplementary Table 3. The diagnostic performance of MRI of sacroiliac joints in the group of patients with no structural damage detected by radiography.

|		Expert physician's diagnosis of axSpA		Sensitivity	Specificity	PPV	NPV	LR+ (95%CI)	LR- (95%CI)
		No (n=34)	Yes (n=61)						
Structural damage detected by MRI	No (n=84)	**33 (34.7%)**	51 (40.2%)	16.4%	97.1%	90.9%	39.3%	5.57 (0.75 to 41.70)	0.86 (0.76 to 0.98)
	Yes (n=11)	1 (1.1%)	**10 (10.5%)**						

clinical diagnosis of a local physician was used as the reference

axSpA – axial spondyloarthritis; CI – confidence interval; MRI – magnetic resonance imaging; mNY criteria – modified New York criteria.

Supplementary Table 4. Comparison of MRI with conventional radiographs for the detection of structural damage in the sacroiliac joints at the patient level (n=183)

		Radiographic sacroiliitis fulfilling the mNY criteria		Absolute agreement	Kappa value (95% CI)	At least unilateral sacroiliitis Grade 2		Absolute agreement	Kappa value (95% CI)
		No (n=95)	Yes (n=88)			No (n=71)	Yes (n=112)		
Presence of structural lesions typical for axSpA on MRI according to the global assessment	No (n=127)	84 (45.9%)	43 (23.5%)	70.5%	κ=0.40 (0.28 to 0.53)	67 (36.6%)	60 (32.2%)	65.0%	κ=0.36 (0.25 to 0.46)
	Yes (n=56)	11 (6.0%)	45 (24.6%)			4 (2.2%)	52 (28.4%)		
Presence of any structural changes (erosions, sclerosis, ankylosis or fat lesions) on MRI	No (n=112)	76 (41.5%)	36 (19.7%)	69.9%	κ=0.39 (0.26 to 0.53)	64 (35.0%)	48 (26.2%)	69.9%	κ=0.43 (0.31 to 0.54)
	Yes (n=71)	19 (10.4%)	52 (28.4%)			7 (3.8%)	64 (35.0%)		
Presence of erosions or sclerosis or ankylosis on MRI	No (n=116)	78 (42.6%)	38 (20.8%)	69.9%	κ=0.39 (0.26 to 0.52)	65 (35.5%)	51 (27.9%)	68.9%	κ=0.41 (0.30 to 0.53)
	Yes (n=67)	17 (9.3%)	50 (27.3%)			6 (3.3%)	61 (33.3%)		
Presence of erosions on MRI	No (n=133)	84 (45.9%)	49 (26.8%)	67.2%	κ=0.33 (0.21 to 0.46)	67 (36.6%)	66 (36.1%)	61.7%	κ=0.31 (0.20 to 0.41)
	Yes (n=50)	11 (6.0%)	39 (21.3%)			4 (2.2%)	46 (25.1%)		
Presence of sclerosis on MRI	No (n=149)	88 (48.1%)	61 (33.3%)	62.9%	κ=0.24 (0.13 to 0.35)	69 (37.7%)	80 (43.7%)	55.2%	κ=0.21 (0.13 to 0.30)
	Yes (n=34)	7 (3.8%)	27 (14.8%)			2 (1.1%)	32 (17.5%)		
Presence of ankylosis on MRI	No (n=179)	95 (51.9%)	84 (45.9%)	54.1%	κ=0.05 (0.00 to 0.09)	71 (38.8%)	108 (59.0%)	41.0%	κ=0.03 (0.00 to 0.06)
	Yes (n=4)	0 (0.0%)	4 (2.2%)			0 (0%)	4 (2.2%)		
Presence of fat lesions on MRI	No (n=144)	88 (48.1%)	56 (30.6%)	65.6%	κ=0.30 (0.18 to 0.41)	68 (37.2%)	76 (41.5%)	56.8%	κ=0.24 (0.14 to 0.33)
	Yes (n=39)	7 (3.8%)	32 (17.5%)			3 (1.6%)	36 (19.7%)		

CI – confidence interval; mNY criteria – modified New York criteria; MRI – Magnetic resonance imaging;
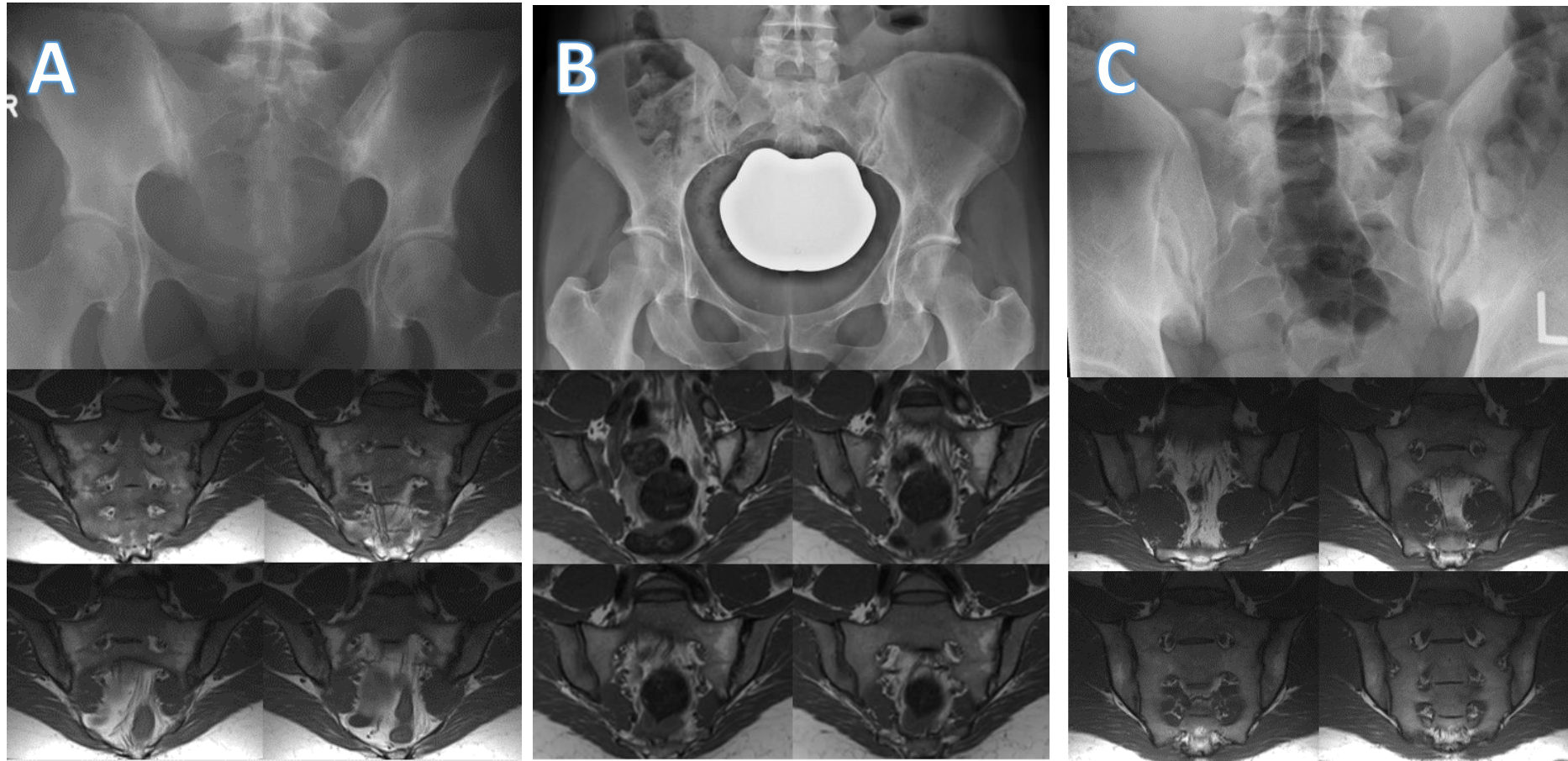
Figure 1. Examples of agreement and disagreement on the assessment of structural damage on radiographs and MRI of sacroiliac joints in the context of the diagnosis of axSpA.

A) 40-year-old female patient; radiographic structural damage – 2/2 readers (Reader 1 – grade 3/3, reader 2 – grade 3/3); MRI structural changes indicative of axSpA – 7/7 central readers (sclerosis 6/7 readers, fat lesions 7/7 readers, erosions 7/7 readers); expert physician's diagnosis – axSpA. B) 33-year-old female patient; radiographic structural damage – 0/2 readers (Reader 1 – grade 1/1, reader 2 – grade 1/2); MRI structural changes typical for axSpA – 7/7 central readers (sclerosis 3/7 readers, fat lesions 7/7 readers, erosions 7/7 readers); expert physician's diagnosis – axSpA. C) 23-year-old male patient; radiographic structural damage – 2/3 readers (Reader 1 – grade 2/2, reader 2 – grade 1/1, adjudicator – 2/2); MRI structural changes typical for axSpA – 0/7 central readers (sclerosis 2/7 readers, fat lesions 0/7 readers, erosions 1/7 readers); expert physician's diagnosis – no axSpA.

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