Magnetic Resonance Imaging Compared to Conventional Radiographs for Detection of Chronic Structural Changes in Sacroiliac Joints in Axial Spondyloarthritis

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ABSTRACT. Objective. We investigated the performance of magnetic resonance imaging (MRI) compared to conventional radiographs for detection of chronic structural changes in the sacroiliac joints (SIJ) in patients with axial spondyloarthritis (SpA).

Methods. We included 112 patients with definite axial SpA (68 with ankylosing spondylitis and 44 with nonradiographic axial SpA), for whom radiographs and MRI scans of the SIJ performed at the same time were available. Radiographs and MRI of the SIJ were scored for subchondral sclerosis (score 0–2), erosions (score 0–3), and joint space changes (score 0–5) in each SIJ. Readers provided an overall impression of the extent of damage according to the scoring system of the modified New York criteria.

Results. In total, 224 SIJ from 112 patients were available for analysis. There was rather low agreement between MRI and radiographs concerning definite erosions of SIJ ($\kappa = 0.11$), moderate agreement for definite subchondral sclerosis ($\kappa = 0.46$) and definite joint space abnormalities ($\kappa = 0.41$), and almost perfect agreement for joint ankylosis ($\kappa = 0.85$). MRI demonstrated a good overall performance in detection of definite "chronic" sacroiliitis, with a sensitivity of 84% and a specificity of 61%. For sacroiliitis fulfilling the modified New York criteria, MRI had a sensitivity of 81% and a specificity of 64% using radiographs as the reference method.

Conclusion. MRI demonstrated good overall performance for detection of chronic structural changes in the SIJ as compared to radiographs. (First Release July 1 2013; J Rheumatol 2013;40:1557–67; doi:10.3899/ jrheum.130141)

Key Indexing Terms:
AXIAL SPONDYLOARTHRITIS ANKYLOSING SPONDYLITIS SACROILIAC JOINTS
SACROILIITIS MAGNETIC RESONANCE IMAGING RADIOGRAPHY

Axial spondyloarthritis (axSpA) is a common classification term for patients with typical clinical, laboratory, and imaging signs of SpA and predominant involvement of the axial skeleton, that is, the sacroiliac joints (SIJ) and spine[1]. Nonradiographic axSpA (nr-axSpA), i.e., axSpA without radiographic signs of structural damage in the axial skeleton, and ankylosing spondylitis (AS) with radiographic sacroiliitis are probably 2 stages of the same disease (axSpA)[2], although some patients remain in the nonradiographic stage and never progress to AS. Conventional radiographs of the SIJ aiming at detection of structural changes (subchondral sclerosis, erosions, joint space widening/narrowing, ankylosis) compatible with radiographic sacroiliitis remain the first imaging method in

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case of suspicion of axSpA[3]. Moreover, a diagnosis of definite AS according to the modified New York criteria relies on the presence of definite radiographic sacroiliitis (at least grade 2 bilateral or grade 3 unilateral)[4]. However, reading and interpretation of sacroiliac radiographs are difficult, related to the anatomical complexity of the SIJ and large interreader variability[5]. Further, radiographs are associated with exposure to ionizing radiation that raises many safety issues concerning this method of investigation[6].

Magnetic resonance imaging (MRI) is a reliable method for detection of active inflammatory changes in the SIJ[7], and it is not associated with ionizing radiation. MRI is potentially also able to detect chronic structural changes (such as sclerosis, erosions, and ankylosis[7]) that are visible on conventional radiographs[8]. Structural changes might even be more visible on MRI because of the tomographic expression of imaging. Nonetheless, the diagnostic value of MRI in the detection of structural lesions in the SIJ has not been clearly defined.

In our study, the performance of MRI in comparison to conventional radiographs for detection of chronic structural changes in the SIJ in patients with axial SpA was investigated in detail.

MATERIALS AND METHODS

Patients. In total, we studied 112 consecutive patients with definite axial SpA who participated in investigator-initiated trials with tumor necrosis factor-α (TNF-α) blockers (adalimumab[9], etanercept[10,11,12], and infliximab[13]) conducted in the rheumatology department at Campus Benjamin Franklin of the Charité University Hospital, Berlin, between 2000 and 2012; and for whom a set of images consisting of radiographs of the SIJ and MRI of the SIJ (in at least a T1-weighted sequence) performed at the same time (not more than 3 months apart) were available. Patients with both nonradiographic and radiographic forms of axSpA were included. All patients with AS fulfilled the modified New York criteria[4] for AS with definite radiographic sacroiliitis (at least grade II bilaterally, or grade III unilaterally). A diagnosis of nr-axSpA was based on the opinion of the rheumatologist; however, all patients would have also fulfilled the Assessment of Spondyloarthritis International Society (ASAS) criteria for axSpA, which were not available at the time of inclusion[14]. The final classification into AS and nr-axSpA was based on the current reading of radiographs of the SIJ: 68 patients were classified as AS and 44 as nr-axSpA. The mean age of patients was 36.5 ± 7.7 years in AS and 37.6 ± 9.2 years in nr-axSpA; the mean symptom duration was 10.4 ± 8.8 years in AS and 6.4 ± 5.4 years in nr-axSpA. In total, 66.2% of the patients with AS and 52.3% of the nr-axSpA patients were males; and HLA-B27 was positive in 85.3% in the AS group and in 77.3% in nr-axSpA. In 52 patients (46.4%), the required set of images was available from the baseline of a respective study; for 60 patients (53.6%) the analyzed sets were available at other timepoints; the mean duration of anti-TNF therapy at the time of imaging was 1.7 ± 2.4 years in the whole group.

Reading of the images. Images were collected centrally, digitized if necessary, anonymized, and subsequently scored independently by 2 trained readers (DP, IG). The readers scored MRI scans and radiographs separately, in a concealed and randomly selected order different for MRI and radiographs, and were blinded to all clinical data.

Structural changes in the SIJ on radiographs were scored separately for erosions, sclerosis, and joint space changes (Table 1). Also, an overall grading of radiographic sacroiliitis according to the modified New York criteria[4,15] (Table 1) was performed. The radiographic criterion of the modified New York criteria for AS was considered to be fulfilled if sacroiliitis of at least grade 2 bilaterally or at least grade 3 unilaterally was evident.

Chronic structural changes of SIJ on MRI, as defined by the ASAS/Outcome Measures in Rheumatology Clinical Trials (OMERACT) MRI group[7], were scored on T1-weighted MRI images, according to a recently published scoring system[16,17] with some modifications (a possible subchondral sclerosis, a detailed scoring of joint space changes, and an overall impression score were added; Table 1). Short-tau inversion recovery (STIR) images played a confirming role in the detection of chronic structural changes as required by the ASAS/OMERACT MRI group (e.g., differentiation between subchondral sclerosis and osteitis, or better visualization of erosions, especially if active)[7]. Definite structural changes were considered present if they were scored by both readers.

Further, an overall impression by grading of sacroiliitis according to the modified New York criteria[4,15] (Table 1) was performed. Because the focus of our study was on chronic structural lesions and because a relevant proportion of patients were undergoing TNF blocker therapy at the time, active inflammatory changes visible on STIR images were not analyzed.

Statistics. Data analysis was performed on the level of patients and on the level of single SIJ. Definite structural changes were considered to be present if both readers agreed. Interreader agreement and agreement between 2 imaging methods (radiographs and MRI) regarding detection of different structural changes, presence of definite SI, and fulfillment of the radiographic part of the modified New York criteria were assessed by means of Cohen's kappa (κ) test, and results were interpreted according to the method of Landis and Koch[18]. Fisher's exact test was applied for assessment of intergroup difference in the frequencies of certain structural changes. A p value < 0.05 was considered statistically significant.

For the purpose of our study, radiographic scoring was accepted as the gold standard, and the sensitivity of the MRI findings was calculated in relation to the positive radiographic results and the specificity of a positive MRI finding in relation to a negative radiographic finding.

Clinical trials used as a source for imaging and clinical information were approved by the ethics committee in Berlin, Germany. Written informed consent was obtained from all patients.

RESULTS

In total, 224 SIJ were available for the analysis. There was a fair interreader agreement concerning structural changes visible on radiographs: κ for definite erosions was 0.224 (95% CI 0.093–0.355), with κ = 0.261 (95% CI 0.145–0.377) for definite subchondral sclerosis, κ = 0.192 (95% CI 0.110–0.274) for definite joint space alteration, and κ = 0.123 (95% CI 0.019–0.227) for ascertainment of definite sacroiliitis (at least grade 2). For the same structural changes detected on MRI, the interreader agreement was generally better: κ for definite erosions was 0.462 (95% CI 0.344–0.580), with κ = 0.331 (95% CI 0.225–0.437) for definite subchondral sclerosis, κ = 0.468 (95% CI 0.354–0.582) for definite joint space changes, and κ = 0.385 (95% CI 0.252–0.518) for definite ascertainment of sacroiliitis.

The interreader agreement concerning structural changes visible on MRI was better in patients with AS (with definite sacroiliitis on radiographs fulfilling the modified New York criteria) in comparison to nr-axSpA: κ for erosions was 0.509 versus 0.346, for sclerosis 0.409 versus 0.231, and for joint space changes 0.476 versus 0.286, respectively.

Definite erosions (score ≥ 2), according to both readers,

Table 1. Scoring of chronic structural changes of sacroiliac joints (SIJ) on magnetic resonance imaging (MRI); T1-weighted sequence) and radiographs.

	Type of Structural Changes	
	Radiographs of SIJ, Score Per Joint	MRI of SIJ, Score Per Joint
Erosion	0 No erosions	0 No erosions
	1 Possible erosions or small single erosions (1–2 erosions)	1 Possible erosions or small single erosions (1–2 erosions)
	2 Definite single erosions (3–5 erosions)	2 Definite single erosions (3–5 erosions)
	3 Multiple erosions (> 5), large joining erosions	3 Multiple erosions (> 5)
Sclerosis	0 No subchondral sclerosis	0 No subchondral sclerosis
	1 Possible subchondral sclerosis	1 Possible subchondral sclerosis
	2 Definite subchondral sclerosis	2 Definite subchondral sclerosis
Joint space	0 No changes of the joint space width	0 No changes of the joint space width
	1 Possible narrowing or widening of the joint space	1 Possible narrowing or widening of the joint space
	2 Definite widening of the joint space	2 Definite widening of the joint space
	3 Definite narrowing of the joint space	3 Definite narrowing of the joint space
	4 Partial joint ankylosis	4 Partial joint ankylosis (up to 2/3 of the joint)
	5 Total joint ankylosis	5 Total ankylosis (more than 2/3 of the joint)
Fatty lesion*	—	0 Fatty lesion absent
	—	1 Fatty lesion present
Overall impression — sacroiliitis grade	0 Normal	0 Normal
	1 Suspicious changes	1 Suspicious changes
	2 Minimal abnormality — small localized areas with erosion or sclerosis, without alteration in the joint width	2 Minimal abnormality — small localized areas with erosion or sclerosis, without alteration in the joint width
	3 Unequivocal abnormality — moderate or advanced sacroiliitis with 1 or more of erosions, evidence of sclerosis, widening, narrowing, or partial ankylosis	3 Unequivocal abnormality — moderate or advanced sacroiliitis with 1 or more of erosions, evidence of sclerosis, widening, narrowing or partial ankylosis
	4 Severe abnormality — total ankylosis	4 Severe abnormality — total ankylosis

* Fatty lesions were scored per quadrant per joint.

were detected in 33 (14.7%) SIJ on radiographs, and in 71 (31.7%) SIJ on MRI [18 (20.5%) SIJ in nr-axSpA and 53 (39.0%) SIJ in AS], but erosions were seen in only 15 (6.7%) SIJ by both imaging methods (Figure 1A). In 150 (67%) joints, both imaging methods demonstrated concordant results (either absence or presence of definite erosions). However, κ for the agreement between 2 imaging methods was rather low: 0.109 (95% CI –0.016 to 0.234); that is, κ = 0.152 in the AS subgroup and κ = –0.114 in the nr-axSpA subgroup. Taking radiography as the reference method, MRI had a sensitivity of 46% and a specificity of 71% for the detection of erosions of the SIJ (Table 2). Several examples of the direct comparison of MRI with radiographs are presented in Figures 2, 3, and 4.

Definite subchondral sclerosis (score ≥ 2) was seen, in the opinion of both readers, in 130 SIJ (58.6%) on radiographs, in 116 SIJ (52.3%) on MRI [35 (39.8%) SIJ in nr-axSpA and 81 (60.4%) SIJ in AS), and in 93 SIJ (41.9%) by both imaging methods (Figure 1B). Thus, radiographs and MRI showed concordant results regarding the absence/presence of subchondral sclerosis in a total of 162 of the assessed joints (73%). κ for this outcome was 0.455 (95% CI 0.339–0.571), that is, κ = 0.401 in the AS subgroup and κ = 0.367 in the nr-axSpA subgroup. The sensitivity of MRI for the detection of subchondral sclerosis (using radiography again as the reference method) was 72% and the specificity was 75% (Table 2).

Definite changes of the joint space width (score ≥ 2) were found in the opinion of both readers in 79 SIJ (35.6%) on radiographs, in 65 SIJ (29.3%) on MRI [9 SIJ (10.2%) in nr-axSpA and 56 SIJ (41.8%) in AS], and in 43 SIJ (19.4%) on both radiographs and MRI [κ = 0.407 (95% CI 0.282–0.532); Figure 1C; that is, κ = 0.290 in the AS subgroup and no definite changes of joint space by definition in the nr-axSpA subgroup]. Concordant results of the 2 imaging methods (either presence or absence of definite changes) were observed in 164 SIJ (74%). The sensitivity and specificity of MRI for this type of structural change were 54% and 85%, respectively (Table 2).

Importantly, definite ankylosis (partial or total) was detected in 26 SIJ (11.7%) by radiographs, in 27 SIJ (12.2%) by MRI, and in 23 SIJ (10.4%) by both imaging methods (Figure 1D). In total, 215 SIJ (97%) were classified equally by both imaging methods for the presence of ankylosis. κ for the presence of ankylosis was 0.850 (95% CI 0.742–0.958). The sensitivity of MRI for detection of

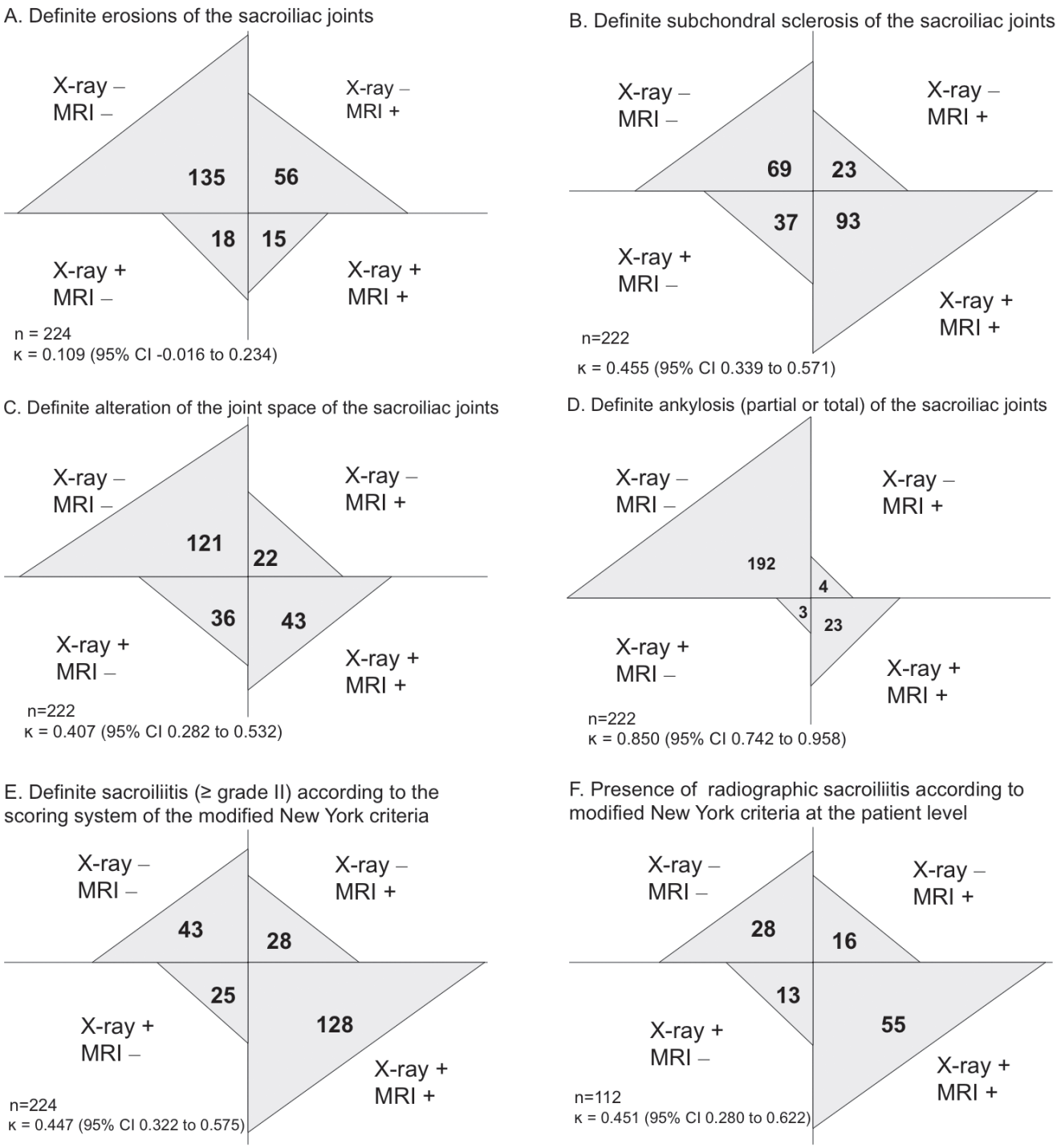

Figure 1. Comparison of radiographs (X-ray) and magnetic resonance imaging (MRI) scans for detection of definite erosions (A), definite subchondral sclerosis (B), definite alteration of the joint space (C), definite ankylosis (D), definite sacroiliitis (≥ grade 2) at the level of single joints (E), and for fulfilling the modified New York criteria (sacroiliitis ≥ grade 2 bilaterally or grade 3 unilaterally) at the patient level (F).

ankylosis of SIJ was 89% and the specificity was 98% (Table 2).

Definite sacroiliitis (at least grade II for the modified New York criteria) was found in the opinion of both readers in 153 SIJ (68.3%) on radiographs, in 156 SIJ (69.6%) on MRI, and in 128 SIJ (57.1%) on both radiographs and MRI (Figure 1E). In total, radiographs and MRI together showed concordant results regarding the absence/presence of definite sacroiliitis in 171 (76%) of the assessed joints [κ = 0.447 (95% CI 0.322–0.572)]. The sensitivity of MRI as

Table 2. Performance of magnetic resonance imaging (MRI) in detection of chronic structural changes in the sacroiliac joints (SIJ) compared to radiographs in patients with axial spondyloarthritis.

Type of Structural Changes Assessed	Concordant Results of MRI and Radiographs* n (%)	Kappa (95% CI)	Sensitivity† of MRI, %	Specificity† of MRI, %
Definite erosions (n = 224 SIJ)	150 (67)	0.109 (–0.016–0.234)	46	71
Definite subchondral sclerosis (n = 222 SIJ)	162 (73)	0.455 (0.339–0.571)	72	75
Definite changes of the joint space (n = 222 SIJ)	164 (74)	0.407 (0.282–0.532)	54	85
Definite ankylosis (n = 222 SIJ)	215 (97)	0.850 (0.742–0.958)	89	98
Definite sacroiliitis on the level of single joints (n = 224 SIJ)	171 (76)	0.447 (0.322–0.572)	84	61
Sacroiliitis fulfilling the modified New York criteria at the patient level (n = 112 patients)	83 (74)	0.451 (0.280–0.662)	81	64

* Either absence or presence of definite structural changes. † Radiographs as reference method.

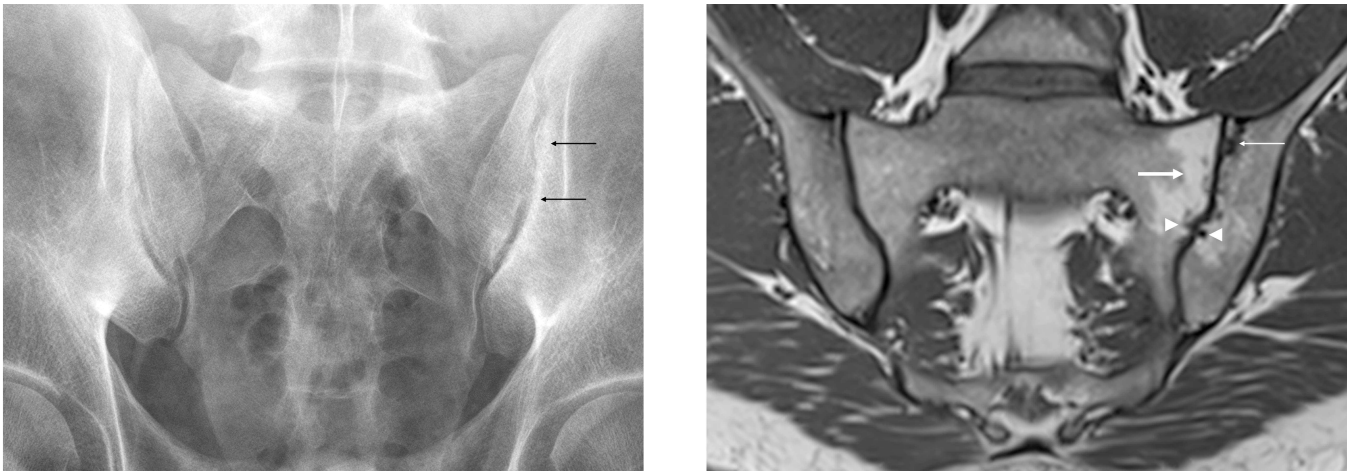

Figure 2. Radiograph (A) and MRI in a T1-weighted sequence (B) of sacroiliac joints (SIJ) of a 30-year-old patient with nonradiographic axial SpA. A: normal right SIJ (score for erosions 0, subchondral sclerosis 0, joint space change 0, sacroiliitis grade 0) and suspicious changes (possible subchondral sclerosis, thin arrows) of left SIJ (score for erosions 0, subchondral sclerosis 1, joint space change 0, sacroiliitis grade 1) are seen. B: right SIJ is normal (all scores 0); on the left side, subchondral sclerosis (thin arrow) and definite erosions (arrowhead) are evident (score for erosions 2, subchondral sclerosis 2, joint space change 0, sacroiliitis grade 2). In addition, a large fatty lesion is present (thick arrow). MRI: magnetic resonance imaging; SpA: spondyloarthropathy.

compared to radiographs for detection of "chronic" sacroiliitis was 84% and specificity was 61% (Table 2).

On the patients' level, in the opinion of both readers, 68 subjects (60.7%) fulfilled the radiographic criterion of the modified New York criteria for AS. Using MRI, 71 patients (63.4%) could be classified as AS because of the presence of definite sacroiliitis scored according to the modified New York criteria (Figure 1F). In total, in 83 patients (74%), radiographs and MRI provided a unanimous conclusion regarding the presence or absence of sacroiliitis fulfilling the modified New York criteria. κ for agreement between radiographs and MRI on this outcome was 0.451 (95% CI 0.280–0.622). The sensitivity of MRI in detection of sacroiliitis fulfilling the modified New York criteria was 81% and specificity was 64% (Table 2).

Although fatty lesions on MRI were not included in the overall assessment of "chronic" sacroiliitis compared to radiographs, they were scored and demonstrated good correlations with other structural changes in the SIJ. Definite fatty lesions were found in 62 SIJ (72.1%) in nr-axSpA and in 122 SIJ (91.0%) in AS. In SIJ with and without fatty lesions, definite joint space changes were found in 34.2% versus 5.6% of joints, respectively ($p < 0.001$); ankylosis in 14.7% versus 0% ($p = 0.010$); definite subchondral sclerosis

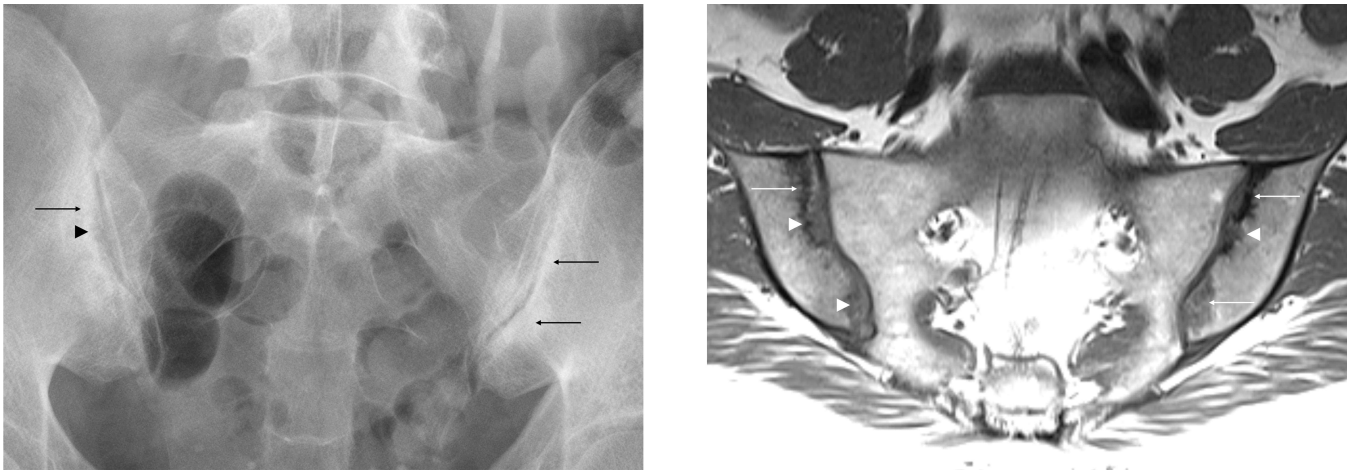

Figure 3. Radiograph (A) and MRI in a T1-weighted sequence (B) of sacroiliac joints (SIJ) of a 46-year-old patient with ankylosing spondylitis. A: definite structural changes in both SIJ are visible: subchondral sclerosis (thin arrows), large erosion on the right side (arrowhead) giving an impression of joint space (pseudo)widening, and joint space narrowing on the left side. Scores for the right SIJ: erosions 3, subchondral sclerosis 2, joint space change 2, sacroiliitis grade 3; left SIJ: erosions 1, subchondral sclerosis 2, joint space change 3, sacroiliitis grade 3. B: several erosions are visible in both SIJ (arrowheads) including the large joining erosion, which was evident on radiograph, as well as subchondral sclerosis (thin arrows) and joint space narrowing in the caudal part of the left SIJ. Scores for right SIJ: erosions 3, subchondral sclerosis 2, joint space change 2, sacroiliitis grade 3; left SIJ: erosions 1, subchondral sclerosis 2, joint space change 3, sacroiliitis grade 3. MRI: magnetic resonance imaging.

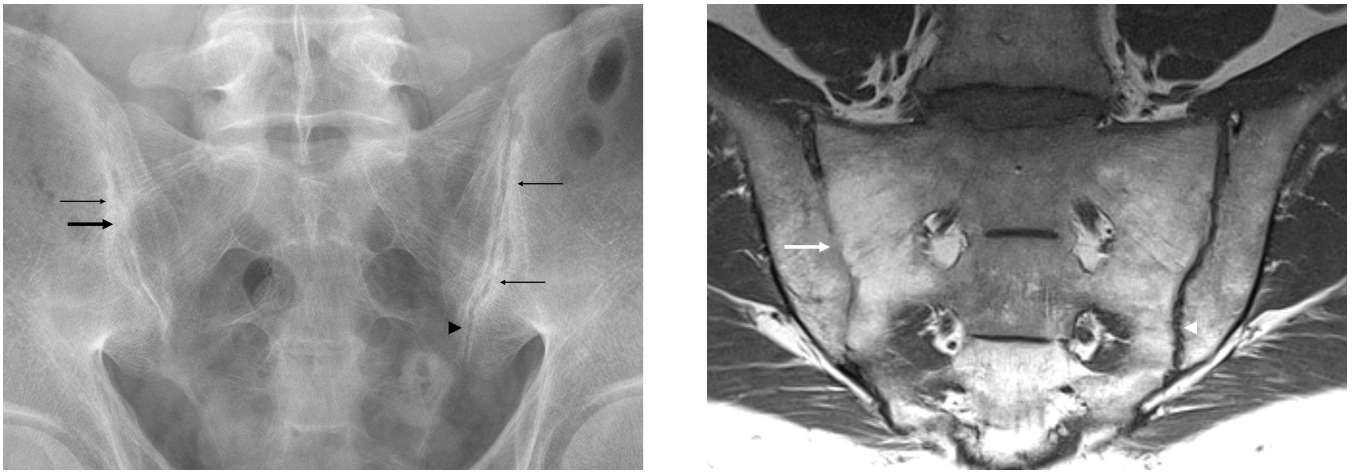

Figure 4. Radiograph (A) and magnetic resonance imaging in a T1-weighted sequence (B) of sacroiliac joints (SIJ) of a 42-year-old patient with advanced ankylosing spondylitis. A: definite subchondral sclerosis (thin arrows), partial ankylosis of right SIJ (thick arrow), narrowing of left joint space and localized area of small erosions (arrowhead) are visible. Scores for right SIJ: erosions 0, subchondral sclerosis 2, joint space change 4, sacroiliitis grade 3; left SIJ: erosions 2, subchondral sclerosis 2, joint space change 3, sacroiliitis grade 3. B: partial ankylosis of right SIJ is clearly visible, while joint space narrowing on the left side and subchondral sclerosis are not clearly visible. A number of small erosions in the left SIJ (arrowhead) were also found. Scores for right SIJ: erosions 0, subchondral sclerosis 1, joint space change 4, sacroiliitis grade 3; left SIJ: erosions 3, subchondral sclerosis 0, joint space change 1, sacroiliitis grade 2.

in 56.5% versus 27.8% (p = 0.002); and definite erosions in 35.9% versus 11.1% of the joints (p = 0.003).

DISCUSSION

We assessed the capability of MRI for assessment of chronic structural changes of SIJ and compared MRI with radiographs in the detection of "chronic" sacroiliitis.

As a first step we developed a new scoring system for radiographic sacroiliitis that, in contrast to the rather vague system of the modified New York criteria, allowed separation of different structural changes of SIJ on radiographs. For MRI scans of SIJ (T1-weighted sequence) we used a modification of the previously published scoring system for structural changes[16,17] that could be compared with the radiographic results (Table 1).

In general, the reliability of MRI for assessment of all

types of chronic structural changes was clearly better in comparison to radiographs, as shown in other studies[5,19].

When different structural changes in the SIJ were analyzed separately, a significant variation in agreement between the imaging methods became evident. The lowest level of agreement between radiographs and MRI was on the presence of erosions of SIJ. Interestingly, definite erosions were detected more frequently on MRI than on radiographs: 31.7% versus 14.7% of the assessed SIJ, respectively. This result raises the question whether MRI, because of its tomographic expression and because of better contrast for anatomical structures, might be more sensitive in detection of erosions in the SIJ in comparison to radiographs. In Figure 2, for example, MRI showed better performance in detection of definite structural changes (in particular, erosions) in a patient with nr-axSpA. At the same time, in more advanced disease, as in Figure 3, radiographs and MRI provided concordant results for erosions.

The reliability of detection of erosions as assessed by interreader variability was greater with MRI than with radiographs: $\kappa = 0.462$ versus $\kappa = 0.224$, respectively. Importantly, erosions on MRI were detected more reliably in patients with AS ($\kappa = 0.509$) than in those with nr-axSpA ($\kappa = 0.346$), which can probably be explained by higher reliability of definite structural changes in advanced disease.

Erosions have been suggested to be the most relevant chronic structural change in the SIJ for a diagnosis of SpA. In a study by Vogler, *et al* on computed tomography (CT) investigations of the SIJ, erosions always came out first regarding discrimination between patients with AS and the normal population[20]. In a study by Wick, *et al*, erosions on MRI were found to be the most disease-specific finding for AS[21]. In another study, addition of erosions to bone marrow edema substantially increased the sensitivity of MRI for the diagnosis of axSpA[22].

However, in our study the frequencies of definite sclerosis and joint space changes detected on MRI were higher than those for erosions, although the specificity might be lower if a non-SpA control group were investigated[20]. Further, subchondral sclerosis and joint space changes (and especially ankylosis) demonstrated better agreement between MRI scans and radiographs in comparison to erosions. This indicates that subchondral sclerosis and joint space narrowing/ankylosis might be the only visible chronic lesions in some cases with advanced disease (Figure 4). Therefore, subchondral sclerosis and joint space alteration including ankylosis might be relevant for assessment of chronic SIJ changes using MRI. On the other hand, the good concordance of the 2 imaging methods for ankylosis also indicates that MRI is not more sensitive here and does not give additional information in comparison to radiographs.

Interestingly, fatty lesions, which can be seen on MRI only and are considered to be a sequela of active inflammatory lesions of bone, indicating a process of bone repair[16,23,24], were the most common chronic changes we observed, and demonstrated a correlation with other structural changes of SIJ. Although the sensitivity and specificity of fatty lesions for the diagnosis of SpA are still not clear and the SpA-compatible fatty lesions are still not well defined, the presence of subchondral, sharp-contoured fat deposition in a young patient, especially in combination with other structural lesions (Figure 2), might be indicative for axSpA.

The overall agreement between the 2 imaging methods in recognition of definite sacroiliitis (of at least grade II) in our study was moderate, with $\kappa = 0.447$, and sensitivity and specificity of MRI (considering radiographs as the reference method) were 84% and 61%, respectively. Similar data were obtained at the patient level for sacroiliitis fulfilling the modified New York criteria: MRI demonstrated a sensitivity of 81% and specificity of 64% compared to radiographs in our study. To date, there is only 1 report comparing MRI and radiographs directly in detection of "chronic" sacroiliitis[25]. In that study, radiographs and MRI were scored according to the modified New York grading system, but no detailed scoring of different structural changes was performed. With radiography as the reference method, the authors found that MRI had a sensitivity of 49% and specificity of 98% in detection of sacroiliitis fulfilling the modified New York criteria[25].

Compared to CT scanning, radiography demonstrated a limited diagnostic value for the detection of "chronic" sacroiliitis[26], especially in patient with recent onset of back pain[27]. In the report by Devauchelle-Pensec, *et al*[27], patients were qualified for CT of SIJ if sacroiliitis on radiography was considered uncertain or if patients had duration of buttock pain > 6 months. The investigators found low agreement between radiographs and CT for detection of definite sacroiliitis ($\kappa = 0.16$), with underestimation of prevalence of sacroiliitis by radiography: sacroiliitis was detected on radiographs in only 6 patients (3.5%; and confirmed by CT in 4 patients) but on CT scans in 32 patients (18.5%)[27].

The major limitation of our study is the lack of a gold standard for chronic structural changes of the SIJ. We demonstrate that recognition of chronic structural lesions could be done reliably with MRI in more than 80% of the patients with radiographic sacroiliitis. However, the performance of MRI for detection of chronic structural changes might be better, especially in patients with early disease. The best candidate for a gold standard seems to be CT, which allows depiction of bony changes in the SIJ with high resolution[26]. There is to our knowledge only 1 study comparing MRI, CT, and radiography for assessment of chronic changes in the SIJ[28]. In that study, MRI and CT showed good agreement and were both superior to radiography in staging of erosions and osseous sclerosis[28].

However, CT — if applied at standard radiation doses — is associated with higher ionizing radiation than radiography, and may be associated with an increased risk of cancer development[29,30]. Low-dose CT, which seems to be associated with a substantially lower dose of ionizing radiation, would be a safer alternative to standard CT[31].

Further, our study included only patients with definite axial SpA. To clarify the specificity of chronic structural changes of SIJ detected by MRI, a validation study including patients with low-back pain of a noninflammatory origin would be required.

Another important aspect of the study was the development of a new radiographic scoring system for sacroiliitis, which includes a more detailed quantification of chronic lesions, and was more sensitive to change than the current scoring system of the modified New York criteria. This should be tested in future analyses. As well, the reliability of the new radiographic scoring system in detection of particular structural changes (erosions, sclerosis, joint space narrowing) should be compared to that of CT.

We demonstrated that MRI reliably detects chronic structural changes of SIJ using standard radiography as a reference method. Whether MRI might be superior to radiography in detection of structural changes in the SIJ must be further investigated in a comparative study with CT.

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