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ORIGINAL RESEARCH

Long-term evolution of postpartum sacroiliac bone marrow oedema: a 5-year longitudinal follow-up study

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ABSTRACT

Introduction Bone marrow oedema (BME) on MRI of the sacroiliac joints (SIJ) commonly occurs after pregnancy. Our goal was to assess the evolution of BME over a period of 5 years and the potential development of structural lesions.

Methods MRI-SIJ was performed after an uncomplicated vaginal delivery, with a follow-up 5 years later, evaluating both inflammatory and structural lesions.

Results 19 women were assessed. Mean age was 35.3 years, with median body mass index of 20.8. Six subjects reported back pain, of which only one reported inflammatory back pain (IBP). No association was found between IBP and Spondyloarthritis Research Consortium of Canada (SPARCC) score (p=0.24), nor with a positive MRI according to the Assessment of SpondyloArthritis international Society (ASAS) definition at baseline (p=0.64). Thirty-two percent (6/19) presented with BME after 5 years, 3 of whom met the ASAS definition of a positive MRI-SIJ, irrespective of subsequent pregnancies. A new delivery during follow-up was linked to the total number of structural lesions at year 5, whereas mean weight gain across all pregnancies correlated with sclerosis. Sclerosis and erosions were more frequently detected by synthetic CT compared with T1-weighted MRI.

Conclusions In postpartum women, no significant development of structural MRI lesions was observed 5 years after a single delivery, despite the presence of BME in a significant number of individuals postpartum and at follow-up. These results support the hypothesis that, unlike BME in SpA, childbirth-related mechanical stress-induced BME does not lead to structural lesions. However, subsequent pregnancies may contribute to their development.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Several publications have addressed the high prevalence of non-specific bone marrow oedema (BME) and structural lesions on MRI attributed to mechanical stress in various non-SpA conditions, including postpartum women, mimicking both inflammatory and structural lesions occurring in axial spondyloarthritis (axSpA). Ample evidence has shown that inflammatory lesions due to axSpA progress into structural lesions both at the level of the sacroiliac joints and the spine. However, the natural evolution of non-specific BME has not yet been elucidated.

WHAT THIS STUDY ADDS

⇒ We observed no significant development of structural MRI lesions 5 years after delivery, which is in stark contrast to the natural evolution of inflammatory lesions in axSpA.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Based on our findings, the evolution of lesions over time may add information to any diagnostic uncertainty, as true inflammatory lesions evolve into structural lesions over time, while non-specific BME does not.

INTRODUCTION

Historically, axial spondyloarthritis (axSpA) has been divided into radiographic axSpA (r-axSpA) or ankylosing spondylitis (AS) and non-radiographic axSpA (nr-axSpA). Nevertheless, both entities are considered to be part of a single disease continuum.[1] Overall, evolution from nr-axSpA to r-axSpA increases with disease duration and is characterised by a certain degree of structural changes of the sacroiliac joints (SIJ) on conventional radiographs (CR) defined by the modified New York criteria grading system.[2–5] As CR may not be decisive in the assessment of nr-axSpA or early disease, MRI has become an important imaging modality.[6 7] This imaging technique has proven well suited for the detection of active inflammatory lesions but can also depict structural lesions.

With the rapid increase in awareness of axSpA and the growing implementation of MRI in the field, the rheumatology community now faces new challenges related to overdiagnosis, partly driven by the overinterpretation of MRI-detected lesions, both

inflammatory and structural. This issue is particularly relevant in patients with chronic back pain or HLA-B27 positivity, as only 5% will ultimately suffer from axSpA.[8] The interpretation of imaging has been under scrutiny, due to the current Assessment of SpondyloArthritis international Society (ASAS) classification criteria for sacroiliitis wrongfully being used as a diagnostic tool, and the lack of consensus regarding the inclusion of structural lesions in the aforementioned definition.[9 10]

Several publications have addressed the high prevalence of non-specific bone marrow oedema (BME) and structural lesions on MRI, mimicking both inflammatory and structural lesions occurring in axSpA, in various non-SpA conditions, including military recruits,[11] postpartum women,[12–14] patients with non-specific persistent low back pain,[15] ice hockey players, recreational runners[13 16] and healthy individuals.[17 18] The presence of these non-specific lesions has generally been attributed to mechanical stress. Over the years, ample evidence has shown that inflammatory lesions due to axSpA progress into structural lesions both at the level of the SIJs and the spine.[19 20] However, the natural evolution of non-specific BME in non-SpA populations has not yet been elucidated. Therefore, we re-evaluated the postpartum healthy women from the originator study by MRI-SIJ, synthetic CT (sCT) and follow-up questionnaires, in which women following uncomplicated vaginal delivery underwent serial MRI-SIJ,[14] by repeating the MRI-SIJ, synthetic CT (sCT) and questionnaires, to unravel the natural course of non-specific BME in these healthy individuals after 5 years. We hypothesised that non-specific BME would behave differently over time and would not result in structural lesions, as opposed to true inflammatory lesions in the context of axSpA.

METHODS

Study design and subjects

All 35 subjects from the previous monocentric prospective study on sacroiliac MRI lesions in women following uncomplicated vaginal delivery were included in the longitudinal follow-up study. The participants were invited to undergo a follow-up MRI - SIJs after approximately 5 years. Exclusion criteria for the originator study included a diagnosis of SpA or other inflammatory conditions, severe scoliosis, treatment with biologic or targeted synthetic disease-modifying antirheumatic drugs (b/tsDMARDs), contraindications for MRI, delivery by caesarean section and multiple pregnancies at inclusion. For the follow-up study, only women with a current pregnancy or new contraindication for MRI were excluded. Additional pregnancies in the follow-up period were allowed.

In addition to the demographic, clinical and obstetric data readily available, the following updated data were collected: subjects' weight and height, the presence of a diagnosis of axSpA or related disease, the presence and duration of back pain symptoms, ASAS classification criteria for inflammatory back pain (IBP), Visual Analogue Scale (VAS) back pain at night, VAS back pain day and night, smoking status and use of b/tsDMARDs or non-steroidal antiinflammatory drugs (NSAIDs) in the previous 3 months. Gravida/para/abortus status was updated. In case of pregnancy during follow-up, additional obstetric data were recorded: weight gain during pregnancy, date of delivery, duration of labour, the use of epidural anaesthesia, mode of delivery and sex, weight, length, and head circumference of the newborn. HLA-B27 status of all subjects had been determined at baseline.

MRI assessment

At baseline, an MRI-SIJ was performed within the first 10 days after childbirth. In the 5-year extension study, a follow-up MRI-SIJ was performed approximately 5 years after the initial evaluation. Details on baseline images were published before.[14] The MRI scan protocol contained semicoronal short tau inversion recovery and T1-weighted sequences.

sCT images were reconstructed with commercially available software (BoneMRI Pelvic Region, V.1.5; MRIguidance). Slice thickness in sCT is 1 mm compared with 3 mm on MRI-SIJ. The software reconstructed sCT images from 3D T1-GRE images using a deep learning method based on the U-net architecture.[21]

For this follow-up study, three well-trained, calibrated readers evaluated baseline and 5-year follow-up MRI-SIJ images (NH, MdH, GV). Readers were blinded to all demographic, clinical and obstetric characteristics as well as time point. All MRIs were scored for inflammatory and structural lesions using the ASAS definitions.[22–24]

Inflammatory lesions were graded using the Spondyloarthritis Research Consortium of Canada (SPARCC) scoring system with a maximum score of 72.[25] In addition, the MRIs were assessed for the fulfilment of a positive MRI-SIJ according to the ASAS definition (ie, BME lesions highly suggestive of axSpA appearing as a single BME lesion on ≥2 consecutive slices or ≥2 BME lesions on the same slice).[10]

Structural lesions were quantified. Readers scored the presence of sclerosis, erosions, fatty lesions and (partial) ankylosis per quadrant per SIJ on six consecutive slices. For each structural lesion, this resulted in a maximum score of 48. In addition, erosion scores of ≥3 and fatty lesion scores of ≥3 were calculated for each subject at each time point, as these have shown a higher specificity for axSpA.[26] Individual reader scores were combined and presented as medians. For dichotomous outcomes, consensus scores were obtained as a majority decision from two out of three readers.

All sCTs were assessed by two readers independently, using a simplified version of the scoring method from the SIMACT study.[27] With this method, the presence of erosions, sclerosis and ankylosis was assessed per quadrant, throughout the total cartilaginous part of the SI joint, consistent with the quadrant distribution in the MRI assessment SPARCC method. Results were based on

the consensus of both readers. For comparison, sCT and MRI were assessed separately for the presence of erosions, sclerosis and ankylosis per SIJ quadrant. Descriptive data were presented on quadrant level instead of patient level (ie, eight quadrants per patient). This resulted in a maximum score of 144 quadrants per structural lesion, taking into account that ankylosis always occurs in 2 quadrants.

The agreement between the readers was high, both for MRI and sCT images, with an intraclass correlation coefficient (ICC) above 0.7 for MRI and sCT, individually.

Bias

Selection bias was minimised by a random sampling method to select the participants both in the initial study and regarding recruitment for follow-up. Every participant of the originator study was contacted for inclusion in the follow-up study. Measurement and observer bias were minimised by standardised data collection and blinding of the three well-trained readers for time point and clinical information. Potential confounders such as other sources of mechanical stress, medication and smoking were collected throughout the study.

Data management and statistical analysis

Study data were collected and managed using the electronic data capture tool REDCap. The statistical analysis was performed through IBM SPSS Statistics V.29 software. Means, medians, SD and IQRs were calculated via descriptive statistics. Mann-Whitney U test was applied to compare continuous variables between two unpaired groups. Fisher's exact test assessed proportions of categorical variables between independent groups. Paired comparisons of categorical and continuous variables between baseline and 5-year follow-up MRIs used the McNemar test and Wilcoxon matched-pairs signed-ranks test, respectively. Spearman's rank correlation coefficient evaluated correlation between continuous variables. Statistical significance was set at $p<0.05$. The sample size precluded statistical adjustment for possible confounders.

RESULTS

Subjects

The original POPAS study included a total of 35 subjects, who underwent a baseline MRI-SIJ after delivery.[14] Subsequent MRI-SIJ was indicated at 6 months and 12 months, the latter only if BME persisted at 6 months. A total of 19 subjects (54.3%) participated in the 5-year follow-up study. One subject was excluded due to a current pregnancy. Two subjects declined the invitation, 1 subject had moved abroad and 10 subjects were lost to follow-up (LTFU) (figure 1). Three of the five subjects (60%) who underwent an MRI at 12 months participated in the extension study. Participants with missing data due to LTFU, drop-out or adverse events were not replaced.

A comparison of the baseline characteristics of the 5-year follow-up group and the drop-outs revealed no significant differences in demographic, clinical or obstetric variables, except for body mass index (BMI) (table 1). Subjects with 5-year follow-up data had lower body weight compared with the drop-outs. IBP was significantly more frequently reported at baseline in the drop-outs, compared with subjects with 5-year follow-up, whereas the prevalence of back pain symptoms and chronic low back pain was similar between the two groups. At baseline, no significant association was found between IBP and the total SPARCC score nor the prevalence of a positive MRI according to the ASAS definition. Only one subject was HLA-B27 positive but failed to complete subsequent visits. All participants with a positive family history of SpA at baseline enrolled in the follow-up study, as did the patients with concomitant psoriasis (PsO).

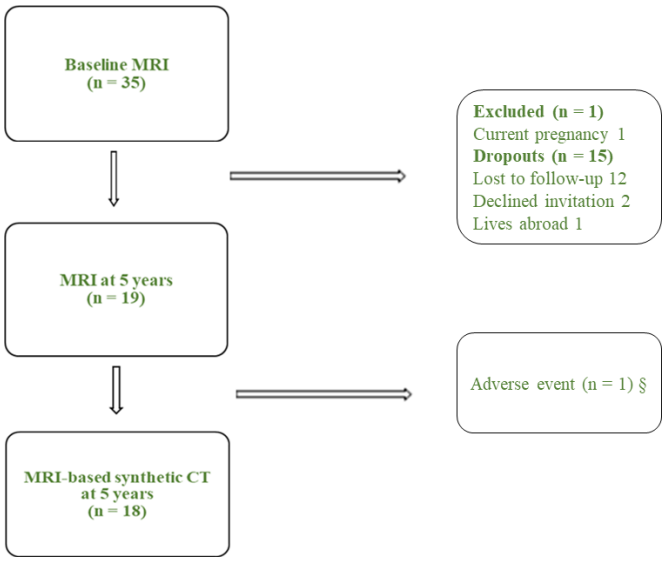

Figure 1 Study flow chart. §One patient experienced excessive local heating at the level of the sacrum.

Mean time between the follow-up MRI-SIJ and baseline was 4.8 years (SD 0.52 years, range 4.1–5.5 years). None of the subjects developed SpA over the follow-up period. Eleven of the 19 participants (58%) had another delivery after the baseline MRI-SIJ assessment. The mean interval between delivery and current follow-up MRI in these subjects was 2.1 years (SD 0.65, range 1.2–3.5). Considering all follow-up participants, the 5-year follow-up MRI was performed on average 3.2 years (SD 1.38, range 1.2–5.3 years) after the last delivery. None of the participants had given birth in the previous 12 months.

No differences were seen regarding inflammatory or structural lesions on MRI-SIJ between the groups at baseline, as depicted in table 2.

At the 5-year follow-up, six subjects (32%) had BME lesions on MRI-SIJ. When BME was present at year 5, it was located at the anterior parts of the SIJ in 90% of the cases and on the iliac side in 67%, although the latter observation was not statistically significant. There were no deep or intense lesions, nor was there any capsulitis or enthesitis reported. A high signal in the joint space was seen in three subjects at baseline, compared with two subjects after 5 years. An overview of status scores and

Table 1 Demographic and clinical characteristics of drop-outs and 5-year follow-up subjects at baseline and the 5-year follow-up visit

	5-year follow-up subjects (n=19)		Drop-outs (n=16)
	Baseline	Follow-up	Baseline
Demographics			
Age (years), mean (SD)	30.3 (2.47)	35.3 (2.58)	28.9 (2.7)
Smoking status, n (%)			
Never	17 (90)	17 (90)	12 (75)
Cessation >3 years	1 (5)	2 (10)	1 (6)
Cessation <3 years	1 (5)	0 (0)	2 (12)
Current smoker	0 (0)	0 (0)	1 (6)
Profession, n (%)			
Physical labour	2 (10)	2 (10)	4 (25)
Non-physical labour	16 (84)	17 (90)	11 (70)
Unemployed/student	1 (5)	0 (0)	1 (6)
Clinical characteristics			
Weight (kg), mean (SD)	64.2 (9.20)*†	58.2 (6.09)	72.8 (11.24)*†
Height (cm), mean (SD)	168 (7.4)	167 (7.7)	166 (4.5)
BMI (kg/m²), mean (SD)	22.8 (2.31)*	20.8 (1.58)	26.5 (4.07)*
HLA B27 positivity, n (%)	0 (0)		1 (6)
Back pain symptoms, n (%)	6 (32)	6 (32)	5 (31)
≥3 months of back pain, n (%)	4 (21)	3 (16)	4 (25)
VAS back pain at night, median (IQR)	0 (0–4)	0 (0–0)	0.5 (0–2.75)
VAS back pain day and night, median (IQR)	3 (0–5)	0 (0–1)	1 (0–2)
Inflammatory back pain (ASAS criteria), n (%)	0 (0)*	1 (5)	4 (25)*
Family history of SpA, n (%)	2 (10)	2 (10)	0 (0)
Arthritis (history of current), n	0	0	0
Enthesitis (history or current), n	0	1	0
Dactylitis (history or current), n	0	0	0
Uveitis (history or current), n	0	0	0
Psoriasis (history or current), n (%)	3 (16)	3 (16)	0 (0)
IBD (history or current), n	0	0	0

*p<0.05.
†Weight before pregnancy.
ASAS, Assessment of SpondyloArthritis international Society; BMI, body mass index; IBD, inflammatory bowel disease; SpA, spondyloarthritis; VAS, Visual Analogue Scale.

change scores is given in table 3. As expected, a significant decrease compared with baseline was observed, both in the overall SPARCC score (p=0.002) and the proportion of subjects with a positive MRI from 12 (63%) to 3 (16%) (p=0.004) at year 5.

A low number of structural MRI lesions was found both at baseline and at 5-year follow-up. No (partial) ankylosis was observed. Subchondral sclerosis was more frequently observed at year 5 compared with baseline (3 vs 1 subject(s), 16% vs 5%), although this difference was not statistically significant. Two subjects developed sclerosis during follow-up, whereas one subject already exhibited sclerosis at baseline. When sclerosis was present, it was located at the anterior part on the iliac side in 70% of the cases (p<0.001). Three participants without any structural lesions at baseline developed respectively one quadrant with erosions, three quadrants with sclerosis and one quadrant with fatty lesions over the 5-year period. Erosions were detected almost exclusively on the iliac side.

No significant correlation was found between the extent of BME at baseline and sclerosis after 5 years of follow-up, both on MRI-SIJ or sCT. There was no difference in erosion or fatty lesion scores at either time point. Only one subject exhibited three erosions on MRI at both baseline and follow-up; this subject was the only one to have a combined erosion and fatty lesion score of 5. More than two fatty lesions were not seen in this study population.

Table 2 Comparison of inflammatory and structural sacroiliac MRI lesions at baseline between 5-year follow-up subjects and drop-outs

	5-year follow-up subjects (n=19)	Drop-outs (n=16)	P value
Inflammatory lesions at baseline			
Sacroiliitis (ASAS definition), n (%)	12 (63)	9 (56)	0.73
SPARCC score (/72)			
Subjects with ≥1 lesions, n (%)	17 (90)	10 (62)	0.1
Min.; Q1; median; Q3; max.	1; 2; 6; 17; 30*	1; 4; 10; 11; 23*	
Structural lesions at baseline			
Sclerosis (/48)			
Subjects with ≥1 lesions, n (%)	1 (5)	3 (19)	0.31
Min.; Q1; median; Q3; max.	13*†	1; 2; 2; 3; 3*	
Erosions (/48)			
Subjects with ≥1 lesions, n (%)	0	1 (6)	0.46
Min.; Q1; median; Q3; max.	NA	1*†	
Fatty lesions (/48)			
Subjects with ≥1 lesions, n (%)	0	0	NA
(Partial) ankylosis (/48)			
Subjects with ≥1 lesions, n (%)	0	0	NA

*Only those subjects with ≥1 lesion were retained.
†The values for minimum, Q1, Q3 and maximum are the same as the median because only one subject is included.
ASAS, Assessment of SpondyloArthritis International Society; max., maximum value; min., minimum value; NA, not available; SPARCC, Spondyloarthritis Research Consortium of Canada.

Relation between MRI findings and clinical data

Performing physical labour was significantly associated with higher SPARCC scores (median 5.5/72 vs 0/72, p=0.012) and the presence of a positive MRI-SIJ (2/2 vs 1/17 subjects, p=0.018) at year 5. Regarding the 5-year follow-up MRI, a trend was seen in an association between back pain symptoms and higher SPARCC scores, although no association was seen in the presence of chronic back pain. In particular, none of the six subjects with BME lesions at year 5 reported any back pain symptoms. Subjects' age, weight and BMI were also not significantly correlated with any MRI lesion. Similarly, no association

Table 3 Status score and change score of inflammatory and structural sacroiliac MRI lesions at year 5

	Status score at year 5 (n=19)		Change score (n=19)	
Inflammatory lesions				
Sacroiliitis (ASAS definition), n (%)		3 (16)		
SPARCC score (/72)	Subj. with ≥1 lesions, n (%)	6 (32)	Subj. with change, n (%)	14 (74)
	Min.; Q1; median; Q3; max.	1; 1; 2.5; 5.5; 7*	Min.; Q1; median; Q3; max.	–29; –11; –5.5; –4; 1†
Structural lesions				
Sclerosis (/48)	Subj. with ≥1 lesions, n (%)	3 (16)	Subj. with change, n (%)	3 (16)
	Min.; Q1; median; Q3; max.	1; 3; 10*	Min.; Q1; median; Q3; max.	1; 2; 3†
Erosions (/48)	Subj. with ≥1 lesions, n (%)	2 (10)	Subj. with change, n (%)	3 (16)
	Min.; Q1; median; Q3; max.	1; 3*	Min.; Q1; median; Q3; max.	–1; –1; 1†
Fat lesions (/48)	Subj. with ≥1 lesions, n (%)	1 (5)	Subj. with change, n (%)	2 (10)
	Min.; Q1; median; Q3; max.	1*	Min.; Q1; median; Q3; max.	–1; 1†
(Partial) ankylosis (/48)	Subj. with ≥1 lesions, n (%)	0	Subj. with change, n (%)	0

*Only those subjects with ≥1 lesion were retained.
†Only those subjects with change were retained.
ASAS, Assessment of SpondyloArthritis International Society; max., maximum value; min., minimum value; SPARCC, Spondyloarthritis Research Consortium of Canada.;

Table 4 Summary table of the correlation data

	SPARCC score (MRI)		Structural lesions (MRI)		Structural lesions (sCT)	
	r	P value	r	P value	r	P value
Age (years)	−0.10	0.69	0.06	0.82	−0.09	0.71
Weight (kg)	−0.29	0.24	−0.39	0.10	−0.20	0.42
BMI (kg/m²)	0.22	0.37	0.08	0.75	−0.21	0.40
Gravity	−0.23	0.34	0.16	0.51	0.41	0.09
Parity	0.19	0.44	0.30	0.20	0.34	0.17
Weight gain during pregnancy*	−0.26	0.44	0.55	0.08	0.09	0.80

*Only participants with additional childbirth during follow-up.
BMI, body mass index; sCT, synthetic CT.

was seen between smoking and structural lesions (data not shown).

Looking at the gravidity and parity status, the subject who gave birth to four children had the highest sclerosis score (10/48). In particular, all six subjects with BME at year 5 were equally divided between subjects with or without subsequent pregnancy and delivery (3/11 vs 3/8 subjects, p=0.58). The occurrence of a new delivery during follow-up was significantly associated with the overall number of structural lesions at year 5.

The analysis of mean weight gain across all recorded pregnancies, including baseline and follow-up pregnancies, revealed a correlation between sclerosis and weight gain. An overall summary of the correlation data for MRI and sCT data is presented in table 4.

Relation between T1-weighted MRI and sCT images

Both MRI and sCT were available in 18 women. Results are summarised in online supplemental table 1.

Six (33%) of these women reported back pain. On MRI, one quadrant with erosions was reported, compared with five quadrants with erosions seen on sCT. Three quadrants with sclerosis were reported on MRI and sCT, compared with 23 quadrants with sclerosis seen on sCT only (figure 2). No ankylosis was seen on MRI, nor on sCT.

DISCUSSION

In this paper, we report several novel findings. First and most important, we observed no significant development of structural MRI lesions 5 years after delivery, which is in stark contrast to the natural evolution of inflammatory lesions in axSpA.[19] Second, BME remained prevalent with higher SPARCC scores in individuals performing physical labour, even in the absence of a subsequent pregnancy, exemplified by both participants with blue-collar employment exhibiting BME at 5 years. Even in these postpartum women subjected to more mechanical stress, no substantial evolution in structural lesions was seen in our cohort, even though blue-collar labour has been associated with more pronounced structural progression in axSpA.[28] Yet, a new delivery during follow-up was linked to the total number of structural lesions at year 5, whereas mean weight gain across all pregnancies correlated with sclerosis. These results support the hypothesis that mechanical stress-induced sacroiliac BME on MRI does not necessarily evolve into structural lesions over a follow-up time of 5 years in young, healthy subjects in the context of childbirth, although subsequent pregnancies may contribute to the development of these structural lesions. To the best of our knowledge, this is the first report on the evolution of non-specific BME over time in a non-SpA population.

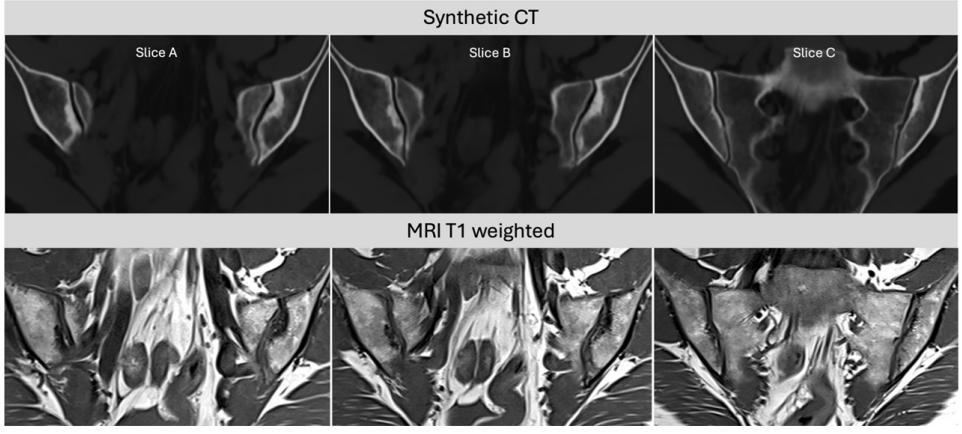

Figure 2 Comparison of sCT and MRI T1-weighted sequences. Although sclerosis was scored on sCT, MRI sclerosis did not reach ≥5 mm in depth and was, therefore, not accounted for on MRI. sCT, synthetic CT.

Although an increased frequency of structural lesions with age in healthy subjects was reported by our group, these results do not refute these data, as our participants remained in the same age category between baseline and follow-up (mean age (SD) 30.3 years (2.47) vs 35.3 years (2.58)).[17] Similarly, fat metaplasia has been described more frequently in healthy individuals compared to erosions, whereas in our study only one individual portrayed fatty lesions at follow-up. Nevertheless, similar to other structural lesions, fat metaplasia increased with age, possibly accounting for the lack thereof in our young population.[29] Therefore, the presence of structural lesions in patients within this age category may aid in making the correct diagnosis in the appropriate clinical context, as they seem to be infrequent in the general population.

Today, it is still debated whether the inclusion of structural lesions in the definition of a positive MRI could improve the specificity for diagnosis of axSpA.[8 17 18] Nevertheless, similar to literature on BME, several studies have shown that structural lesions can be seen in non-SpA populations and tend to increase with age.[15 19 20] As the singular lesions do not seem to be suitable for differentiation, the combined assessment of inflammatory and structural lesions and the use of higher lesion thresholds are being investigated.[21–24] Based on our findings, the evolution of lesions over time may add information to any diagnostic uncertainty, as true inflammatory lesions evolve into structural lesions over time, while non-specific BME does not.

In addition, MRI-based sCT has been developed to improve the accurate combined assessment of inflammatory and structural lesions in one imaging session. As sCT combines the sensitivity for detection of structural lesions of CT with the established benefits of MRI, it displays an unprecedented opportunity for use in clinical practice.[25] When comparing structural lesions on T1-weighted MRI to sCT, sclerosis and to a lesser extent erosions were more frequently detected in the latter. Some discrepancy could be explained by the scoring method as MRI sclerosis is only scored when ≥5 mm in depth, whereas on sCT only the presence of sclerosis is required for scoring. Additionally, slice thickness of 1 mm in sCT compared with 3 mm may also increase the level of detection, as on 1 mm sliced images the likelihood is higher to detect small lesions. Despite using this highly sensitive technique, only a small number of lesions were detected.

The primary limitation of our study is the small sample size. This constraint arises from the transitional nature of the population's life stage, which resulted in a high rate of relocation between the initial study and follow-up, thereby contributing to significant loss to follow-up.

Overall, HLA-B27 positivity was low, with only 1 postpartum subject out of 35 displaying this genetic susceptibility. Theoretically, HLA-B27 positive patients may be more prone to the aforementioned lesions based on their genetic predisposition. Nevertheless, HLA-B27 positive healthy individuals did not display different patterns of inflammatory or structural lesions regardless of gender.[29] More importantly, all participants with a positive family history of SpA were included in the follow-up study, as were the patients with concomitant PsO. Moreover, three of the five subjects (60%) who underwent an MRI at 12 months due to persistent BME postpartum participated in the extension study, capturing all of these subjects at risk.

Importantly, the baseline characteristics of the 5-year follow-up subjects did not differ significantly from the drop-outs, except for the presence of IBP and BMI. Notably, the subjects of our study maintained a healthy body weight, whereas the drop-outs would have been classified as overweight. It could be reasoned that by filtering out the overweight individuals, solely the effect of pregnancy or delivery has been elucidated in our study. Even though the cardinal symptom of axSpA is IBP, the fulfilment of its definition is not specific for axSpA. The latter translates into a rather small proportion of patients with axSpA not experiencing IBP, although a large proportion of patients without axSpA expressing symptoms of IBP.[30 31] Therefore, we hypothesize that the higher BMI in these patients may have led to more low back pain, spuriously fitting the IBP criteria. Unfortunately, data on physical activity or sports activities outside of the primary occupation were not collected.

Similarly, although not statistically significant, more sclerosis was seen at baseline in the subjects with higher BMI, possibly linked to protracted mechanical stress. Strikingly, among those who had another pregnancy during the follow-up period, not only a correlation was observed between sclerosis on MRI and weight gain during pregnancy but also a correlation with overall number of structural lesions. One might argue that mechanical stress can induce nonspecific BME, although only protracted mechanical stress may lead to structural lesions. Based on our results, 9 months of pregnancy and a single delivery in healthy individuals may not suffice to induce structural changes. Nevertheless, our data on multiparae suggest that intermittent intervals of enhanced mechanical stress, such as subsequent pregnancies and delivery or obesity, may eventually lead to structural lesions such as sclerosis. Future research should, therefore, focus on the natural course of BME in the context of other types and duration of mechanical stress.

In conclusion, we performed an MRI follow-up study 5 years after delivery in healthy postpartum women. Even though BME was prevalent shortly after delivery and the months thereafter, these BME lesions did not evolve into structural lesions over 5 years. Yet, subsequent pregnancies may add to the load of structural lesions over time. Hence, non-specific BME in non-SpA individuals seems to behave differently than true inflammatory BME in the context of SpA. By elucidating the natural evolution of BME in non-SpA individuals, this study contributes to the understanding and interpretation of imaging features on MRI-SIJ in the context of back pain with suspicion of axSpA.

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