Editorial

Radiographic Evaluation of Sacroiliac Joints in Axial Spondyloarthritis — Still Worth Performing?

Radiographic evaluation of sacroiliac (SI) joints aimed at detection of radiographic sacroiliitis was for many years the only way to depict inflammatory (or more correctly — postinflammatory) changes in patients with ankylosing spondylitis (AS) prior to development of bony changes in the spine (syndesmophytes/bony ankyloses). Consequently, definite radiographic sacroiliitis (≥ grade II both sides or ≥ grade III unilaterally) was included in the modified New York criteria for AS (1984)[1] as an obligatory criterion in addition to clinical ones. In the following years, these criteria were used not only for classification but also for making a diagnosis of AS. It was, however, clear that definite structural changes in the SI joints visible on radiography require months to years to develop.

Identifying AS at an early stage became possible with the introduction of magnetic resonance imaging (MRI), which is able to depict active inflammation (osteitis or bone marrow edema) prior to development of structural damage visible on radiographs. Of course, identifying disease early also means a wider range of outcomes, including milder forms developing structural damage slowly or not developing it at all. This fact resulted in a change in terminology and the introduction of the term "axial spondyloarthritis (axSpA)," which covers patients with structural damage in the SI joints visible on radiographs (radiographic axSpA or AS), and patients without such damage (nonradiographic axSpA). Both subgroups (or stages) of axSpA are covered by the classification criteria for axSpA (2009)[2,3] developed by the Assessment of SpondyloArthritis International Society (ASAS). These criteria consist of 2 arms — imaging and clinical. The more specific imaging arm is fulfilled if either definite radiographic sacroiliitis (as defined in the modified New York criteria for AS[1]) or sacroiliitis on MRI (according to the ASAS definition[4]) is present, together with at least 1 additional SpA feature, in a patient with chronic back pain that started prior to 45 years of age[3]. Importantly, the ASAS definition of sacroiliitis on MRI relies largely on the presence of bone marrow edema, reflecting the presence of active inflammation; chronic structural changes (erosions, sclerosis, ankylosis, and fatty lesions) provide only contextual information. Presence of these lesions without bone marrow edema would not be sufficient for definition fulfillment.

Radiographic evaluation of the SI joints plays an important role not only for classification of patients with axSpA but also for making the diagnosis in daily clinical practice. According to the recently published European League Against Rheumatism recommendations for the use of imaging in the diagnosis and management of SpA in clinical practice, conventional radiography of SI joints is recommended as the first imaging method in the case of suspicion of axSpA[5]. Similarly, in the ASAS modification of the Berlin diagnostic algorithm for axSpA, radiography of SI joints is again the first imaging method to be applied in case of suspicion of axSpA[6]. Indeed, the method is quick, cheap, and widely available, and up to 50% of the patients with axSpA (even with a relatively short symptom duration of up to 5 yrs) might have definite structural changes in the SI joints visible on radiographs[7], which means immediate diagnosis and usually no need for an MRI.

Such wide use of radiographic evaluation of SI joints in classification and diagnostic approaches for axSpA — always with the central role — suggests high reliability and validity of the method. But is this method really a reliable and valid tool? Concerns about this have been raised many times over recent years. SI joints have a complex 3-D configuration, with wide individual anatomic variation that challenges plain radiographic examination. Different radiographic techniques (standard antero-posterior view, Ferguson view, oblique projections, SI joints on lumbar spine radiographs) also challenge reliability of the SI joint radiographic examination.

Finally, the definition of radiographic SI stages in use

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leaves much room for subjective interpretation: in particular, the difference between possible (grade 1) and minor (grade 2) definite abnormalities is elusive. Indeed, van Tubergen, *et al* (2003) showed the widest variability (lowest agreement) for sacroiliitis grade 1 and 2[8]. The same study challenged not only the reliability but also the validity of SI joint radiographs compared to computed tomography (CT; considered the gold standard of evaluation of structural changes but not recommended as a universal imaging method because of high exposure to ionizing radiation — at least in the case of conventional techniques). In fact, radiographs showed about 80% sensitivity and about 70% specificity for detection of structural changes in the SI joints. Remarkably, results were comparable for radiologists and rheumatologists and did not improve after training[8].

In the German Spondyloarthritis Inception Cohort (GESPIC) and in the Devenir des Spondyloarthropathies Indiffererenciees Recentes (DESIR) cohort — both with patients with axSpA at an early stage — moderate agreement was shown, with Cohen's κ 0.5–0.6 on the presence of definite sacroiliitis (at least grade 2) or on the fulfillment of the modified New York criteria between 2 trained central readers[9,10]. Remarkably, a similar level of agreement was shown in the DESIR cohort, also between the local and the central readings of radiographs[10]. The agreement on detection of separate structural changes (erosions, sclerosis, joint space alteration) was low to fair in the DESIR cohort[10], which is in line with our own data obtained earlier in a broader (in terms of disease duration) population of patients with axSpA[11].

The moderate reliability of radiographic evaluation of SI joints is likely to have an effect on sensitivity to change over time: in prospective cohort studies, a substantial proportion of patients demonstrated regression of radiographic sacroiliitis grade after 2 years of followup[9,12], which is considered to be a measurement error of reading blinded for the timepoint. Further, in this issue of *The Journal*, Christiansen, *et al* report on the reliability of radiographic assessment of SI joints in a group of 104 patients with early (symptom duration 2–12 mos) axSpA[13]. Radiographs of SI joints were centrally assessed by 7 readers (2 musculoskeletal radiologists and 5 rheumatologists with different levels of experience) according to the modified New York criteria and for different types of structural changes (erosions, sclerosis, joint space widening, narrowing, and ankyloses). The level of agreement was — in line with previous reports — fair to moderate for the fulfillment of the modified New York criteria: κ value of 0.27 between 2 junior rheumatologists, 0.34 between 2 senior rheumatologists, and 0.46 between 2 radiologists. These data indicate that training/experience have only some effect on the inter-reader variability of the assessment of SI radiographs. The percentage agreement (positive/negative), however, was 80% or higher for almost all comparisons. Interestingly, erosions demonstrated the lowest reliability and therefore the highest contribution to interreader variability, followed by joint space widening, ankyloses, and narrowing; in contrast, subchondral sclerosis demonstrated good reliability.

Taken together, the published data suggest that radiographic evaluation of SI joints is a method with, at best, only moderate reliability, validity, and sensitivity to change, especially in early axSpA. However, there is no imaging method that could immediately replace pelvic radiography for diagnosis/classification of axial SpA. MRI and CT both seem to have better reliability, validity, and sensitivity to change in comparison to conventional radiographs for detection of structural changes in the SI joints in axial SpA; however, both methods are associated with higher costs. The performance of MRI in detection of erosions may be lower than in CT, conventional CT is associated with high ionizing irradiation dose, and low-dose CT (with ionizing irradiation dose comparable to that of conventional pelvic radiograph) is not yet established enough for detection of sacroiliitis.

Clearly, we urgently need more data on the reliability and validity of detection of structural changes in the SI joints with MRI versus CT; and a definition of a "positive MRI" should be developed for structural changes in the SI joints for classification purposes. Thus, radiographic evaluation of SI joints — with all the limitations described above — is likely to remain one of the major imaging tools for diagnosis and classification of axSpA in the coming years; that is, until the mentioned data gaps regarding other imaging methods are closed.

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