Structural changes in the sacroiliac joint imaging in axial spondyloarthritis: from conventional radiography to magnetic resonance imaging?

Laura Pina Vegas¹,², Pascal Claudepierre¹,²

¹ Service de Rhumatologie, AP-HP, Hôpital Henri Mondor, F-94010 Créteil, France
² EpiDermE, Université Paris Est Créteil, F-94010 Créteil, France

Corresponding author:

Pr Pascal Claudepierre
Service de Rhumatologie, Hôpital Henri Mondor
51 Avenue du Maréchal de Lattre de Tassigny, 94010 Créteil Cedex
Tel: +33.1.49.81.47.04
Fax: +33.1.49.81.47.03
E-mail: pascal.claudepierre@aphp.fr
In this issue of *Rheumatology*, Protopopov and colleagues focused on sacroiliac joint (SIJ) imaging, a major concern in axial spondyloarthritis (axSpA) diagnosis and classification. Their objective was to compare conventional radiography and magnetic resonance imaging (MRI) of the SIJs for detection of structural lesions in axSpA from the ASAS (Assessment of SpondyloArthritis international Society) cohort, a cohort of patients with chronic back pain that began before 45 years of age, and was suggestive of axSpA (1).

The European League Against Rheumatism (EULAR) recommendations for the use of imaging in the diagnosis and management of axSpA in clinical practice still advocate conventional radiography as the first-line imaging (2). In addition, radiographic sacroiliitis remains a key component of the internationally accepted modified New York (mNY) criteria for ankylosing spondylitis (3). Nevertheless, it has been shown that it is very difficult to accurately detect sacroiliitis on conventional radiographs and that inter-rater reliability is poor (4). Furthermore, radiography visualizes only the late structural consequences of the inflammatory process, whereas early inflammatory changes can be detected by MRI, often several years before the onset of sacroiliitis on radiography. Significant advances have been made in imaging over the past decade and the question arises whether SIJs radiography can be replaced by cross-sectional techniques, particularly MRI, in axSpA. Indeed, while structural elementary lesions (mainly bone erosion, fat infiltration, sclerosis, and new bone formation (5)) are decisive for the differential diagnosis (6), presence or absence of these lesions playing an important role in differentiating axSpA from non-inflammatory conditions, there is considerable evidence to suggest that SIJs MRI can also be used for structural assessment.

In the study by Protopopov *et al.*, of the 183 included patients, 135 (74%) were diagnosed with axSpA by local rheumatologist (“gold standard”). Structural lesions indicative of axSpA on SIJs MRI had a sensitivity (Se) of 38%, specificity (Sp) of 92%, positive predictive value (PPV) of 93%, negative predictive value (NPV) of 35%, positive likelihood
ratio (LR+) of 4.6, and negative likelihood ratio (LR-) of 0.7. In comparison, sacroiliitis according to mNY criteria had a Se of 55%, a Sp of 71%, a PPV of 84%, a NPV of 36%, a LR+ of 1.9, and a LR- of 0.6. The agreement for the global assessment on MRI was substantial between the 7 readers (Fleiss' Kappa coefficient of 0.6) and moderate between the 2 readers for the assessment of radiographic structural damage (Cohen's Kappa coefficient of 0.5). Thus, structural damage of the SIJs detected by MRI demonstrated better diagnostic performance and inter-reader reliability compared with conventional radiography. This study also confirmed that combining those two methods did not significantly increase the performance (Se 62%, Sp 69%, PPV 85%, NPV 39%, LR+ 2.0, LR- 0.6). Otherwise, computed tomography (CT) of the SIJs is another modality that is receiving increasing attention as the “gold standard” for the detection of structural lesions because it allows direct visualization of cortical and trabecular bone and benefits from a higher resolution than MRI (7). Of note, although not studied in this article, a combination of low dose CT and MRI of the SIJs has previously been shown to outperformed MRI alone in the diagnosis of axSpA (8). Indeed, MRI appears to be the most sensitive and CT the most specific method for the diagnosis of axSpA. Nevertheless, SIJs CT is currently not recommended in routine practice for the diagnosis of axSpA (2).

Interestingly, in this study, SIJs MRI remained discriminative in patients with no change on radiography (LR+ 5.6, LR- 0.9), whereas radiography was not discriminative in MRI-negative patients (LR+ 1.5, LR- 0.8). In clinical practice, inflammatory and structural lesions on SIJs MRI are considered simultaneously. As already demonstrated in other studies (8), there was some increase in diagnostic performance when considering the combination of active and chronic inflammatory changes on SIJs MRI (sensitivity improvement to 47%, without major changes in other parameters). Thus, all of these data add to the body of evidence that the...
The diagnostic performance of SIJs MRI to detect radiographic damage is superior to radiography when axSpA is suspected.

Nevertheless, these results are not without limitations. As acknowledged in the article, the “gold standard” chosen (i.e., the diagnosis of axSpA according to the local physician) induces a problem of circularity since the results of the evaluated imaging are taken into account by the physician to establish the diagnosis of axSpA. A better “gold standard” to assess structural changes in the SIJs would have been a SIJs CT. However, in another study, when low-dose SIJs CT was considered as the “gold standard”, MRI remained superior to radiography in detecting these lesions (9). In addition, it should be kept in mind that a global assessment of any elementary structural lesions (rather than a very strict definition based on the types and number of each elementary lesion required for a positive structural MRI diagnosis) can only be reliable when performed by experts, which is not often the case in “real life”. Therefore, results might differ when images are assessed by non-expert readers.

Continued training of rheumatologists and radiologists in imaging interpretation is the main way to improve diagnostic confidence in clinical daily practice. Nevertheless, deep neural networks could in the future function as assistance to detect inflammatory or structural changes indicative of axSpA (10). Finally, MRI has a potentially limited accessibility, especially in some parts of the world, and remains an expensive tool. However, the costs of misdiagnosis and of under- or overtreatment should be included in this analysis.

To summarize, this article highly contributes to the current discussion of which imaging to perform as first-line when axSpA is suspected. SIJs MRI has the potential to replace conventional radiography for the detection of structural damage in the diagnosis and classification of this disease. Thus, future recommendations on the use of imaging in axSpA may evolve in the coming years not only in Europe, but also worldwide.
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