

# Imaging Scoring Methods in Axial Spondyloarthritis



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## KEYWORDS

- Axial spondyloarthritis • Scoring system • Inflammation • Chronic changes • MRI
- Sacroiliac joints • Spine

## KEY POINTS

- For visualization of inflammatory activity in the sacroiliac joints and the spine in axial spondyloarthritis, MRI is considered the best available imaging technique. MRI, together with conventional radiographs and computed tomography, is able to visualize chronic structural changes.
- Inflammatory changes represent bone marrow edema and are identified as sacroiliitis, whereas chronic structural changes may be seen as erosion, fat metaplasia, sclerosis, or new bone formation in both the sacroiliac joints and the spine.
- Several validated scoring methods exist for quantification of both inflammatory and chronic structural changes when using MRI and conventional radiographs.

Inflammatory and chronic structural changes are objective signs of axial spondyloarthritis (axSpA). In the sacroiliac joints (SIJs), inflammation (sacroiliitis) can be visualized as bone marrow edema, whereas chronic structural changes are visualized as fat metaplasia, erosions, sclerosis, or ankylosis in the areas around the SIJ. In the spine, bone marrow edema in the vertebral bodies represents spondylitis but can also affect the facet and the costovertebral and costotransverse joints (arthritis), whereas structural changes are visualized as fat metaplasia, sclerosis, or ankylosis of the vertebral edges.

MRI is the best imaging method for visualization of active inflammatory changes<sup>1</sup> and for fat metaplasia,<sup>2</sup> whereas structural changes such as erosions and sclerosis are seen better on computed tomography (CT)<sup>3</sup> or on MRI but less well on conventional radiographs. However, radiographs are still considered the gold standard for visualization of new bone formation and ankylosis.<sup>4</sup> CT is even better for the detection of erosions and bone formation, but both techniques are unable to visualize inflammation.

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In daily practice, recognition of imaging findings is used for diagnosing patients with axSpA,<sup>5</sup> but a quantification of these lesions is not necessary. Furthermore, measurement of the magnitude of pathologic changes in the axial skeleton of patients with spondyloarthritis is used in clinical trials for studying the natural course of the disease or for the efficacy of antiinflammatory drugs or biologics on the possible inhibition or deceleration of new bone formation.<sup>6</sup> For this purpose, different scoring systems have been developed and proposed for the quantification of lesions in both the SIJ and the spine in patients with axSpA. In addition to clinical parameters, the objective assessment of imaging outcomes provides important information on the efficacy of treatment in patients with axSpA.

## SCORING OF THE SACROILIAC JOINTS

### *Conventional Radiographs*

The quantification of structural changes in conventional SIJ radiographs has been used for the classification of patients with ankylosing spondylitis (AS); modified New York criteria were published in 1984.<sup>7</sup> The semiquantitative method of quantification used in these criteria had already been proposed in 1966 (Table 1).<sup>8</sup> According to the modified New York criteria, a patient could be classified as having AS if the structural lesions on conventional radiographs were graded as at least 2 bilaterally or with a grade 3 (Fig. 1) or grade 4 unilaterally, in addition to clinical symptoms such as inflammatory back pain and limitation of mobility in the spine and/or the thorax. The obvious limitation of these criteria is that clinicians have to wait for structural changes to occur; this has been considered unacceptable because of the long delay of up to 7 to 10 years for a diagnosis of AS.<sup>9</sup> Therefore, new criteria and a new nomenclature have been developed and proposed by the Assessment in SpondyloArthritis international Society (ASAS).<sup>5,10</sup>

Table 1 Grading of radiographic sacroiliitis	
Grade	Definition of Radiographic Changes
0	Normal
1	Suspicious changes
2	Minimal abnormalities: small localized areas with erosion or sclerosis, without alteration in the joint width
3	Unequivocal abnormality: moderate or advanced sacroiliitis with 1 or more signs of erosions, sclerosis, widening, joint space narrowing, or partial ankylosis
4	Severe changes: total ankylosis

Data from van der Linden S, Valkenburg HA, Cats A. Evaluation of diagnostic criteria for ankylosing spondylitis. A proposal for modification of the New York criteria. *Arthritis Rheum* 1984;27(4):361–8; and Bennett P, Burch T. Population studies of the rheumatic diseases. Amsterdam: Excerpta Medica Foundation; 1968. p. 456–7.

### **MRI**

The standard MRI orientation that has been used in most studies so far for quantification of SIJ changes is the semicoronal orientation (parallel to the axis of the sacral bone), although in some scoring systems the semiaxial orientation has also been proposed (Table 2). For the assessment of inflammatory lesions, the use of short-tau inversion recovery (STIR) MRI sequences has been recommended (Fig. 2), and contrast-enhanced fat-suppressed T1-weighted images can also be used for this

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