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2

Imaging in the diagnosis and management of axial spondyloarthritis

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A B S T R A C T

Magnetic resonance imaging (MRI) is the imaging modality of choice for diagnosing axial spondyloarthritis (SpA) when the pelvic radiograph is normal or equivocal. Subchodral bone marrow edema (BME) is the primary feature of early SpA, although structural changes, particularly erosions, may also be seen at an early stage. It is unclear whether incorporation of structural lesions enhances the classification performance of a positive MRI definition based on BME alone. Neither spinal imaging nor contrast-enhanced imaging are useful for routine diagnostic evaluation. Fat metaplasia is a key intermediary in the pathway from inflammation to ankylosis, although the histopathology remains to be determined. Both active and structural lesions can be reliably detected and quantified on MRI. Tumor necrosis factor inhibitor therapies ameliorate inflammation; however, it is unclear whether complete suppression of inflammation is necessary to prevent structural damage. Structural lesions on MRI require further validation using computed tomography and prospective follow-up to determine their prognostic significance.

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Introduction

Diagnosis of patients with axial spondyloarthritis (axSpA) covers both stages of the same disease: nonradiographic axSpA (nr-axSpA) and the "established" stage of ankylosing spondylitis (AS) [1]. AxSpA is a chronic rheumatic inflammatory disease that primarily affects the axial skeleton; however, patients may also suffer from peripheral involvement with arthritis, enthesitis, and dactylitis [1], in which case, it is classified as the so-called "primarily peripheral" SpA. Pathognomonic findings of axSpA include inflammatory, osteoproliferative, or osteodestructive changes in the sacroiliac joints (SIJs) and spine. Many of these findings are a result of inflammation at the entheseal structures. Clinically, axSpA is characterized by chronic back pain, which in the majority of the cases is identified as inflammatory back pain (IBP), whereas other patients report only increased stiffness of their back [2,3]. The group of SpA also shares other characteristic clinical symptoms such as anterior uveitis, psoriasis, and inflammatory bowel disease, which are considered as extra-articular manifestations of the disease. Other frequent comorbidities of SpA are osteoporosis and cardiovascular disease.

Sacroiliitis, spondylitis, aseptic spondylodiscitis, and inflammatory involvement of the posterior elements of the spine are the typical inflammatory manifestations in the axial skeleton in axSpA [4], which later lead to new bone formation, such as syndesmophytes and ankylosis. An estimated 15% of patients with established AS may later develop a so-called "bamboo spine" [5]. Although all these characteristic changes occur in many patients during the course of the disease, their prevalence and the velocity of progression and severity may vary among individual patients [6].

The detailed pathogenic process from the inflammatory stage to the stage with more prominent structural changes in axSpA is still incompletely understood. An outstanding aspect in this regard is the concomitant occurrence of inflammatory, osteodestructive, osteoproliferative, and osteoporotic changes in the vertebral column [7,8]. The involvement of the spine largely consists of new bone formation, whereas the involvement of the peripheral joints is clearly erosive.

Different imaging techniques are relevant for the diagnosis, classification, assessment of disease activity and structural damage, and prognosis of patients with axSpA; however, the capacity to detect the potential pathologies differs between the techniques. Despite technical developments, conventional radiographs (CRs) are still considered the gold standard for the assessment of structural changes in patients with axSpA [4,5]. Computed tomography (CT) is useful for the detection of structural changes, particularly in the SIJ, because of its superior sensitivity and specificity compared with CRs. Nevertheless, both CR and CT cannot visualize active inflammation., MRI is the best method for the detection of inflammatory changes. The use of scintigraphy is not recommended because of its very low specificity [9].

For the imaging of the peripheral joints, ultrasound is being increasingly used and represents the standard imaging technique for the assessment of inflammation of the soft tissue or even erosive changes; the knowledge in this field has grown extensively in the last decade [10].

Overall, the different imaging techniques available for the assessment of disease-related changes in axSpA should be used in a complementary fashion and according to individual indications (Table 1).

With respect to the current classification criteria for axSpA, only changes in the SIJ are considered relevant. However, some patients may show spinal involvement in the absence of pathology in the SIJ [4]. This topic is presently under investigation.

Table 1
Overview of the imaging techniques available for use in axSpA.

Techniques		Inflammatory/acute changes	Structural/chronic changes
CR		(+)	+
CT		(+)	+
Scintigraphy		+	−
MRI	T1W	(+)	+
	STIR/ T1/Gd-DTPA/ T2FS	++	(+)
Ultrasound		+	(+)