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## Imaging the Patient With Sacroiliac Pain

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### Abstract

Sacroiliac (SI) region pain is a common clinical presentation and is often due to pathology involving the SI joints, usually of inflammatory, infective, neoplastic, or post-traumatic etiology. The SI joints have a unique anatomic layout and composition and can be imaged with a variety of techniques including conventional radiographs, computed tomography, isotope bone scintigraphy, and magnetic resonance imaging. This article reviews a range of common SI joint conditions, illustrated by multimodality imaging findings. We also discuss strategies for choosing the optimal imaging modality, pearls, and pitfalls of imaging and discuss an algorithm for approaching the patient with suspected inflammatory back pain.

### Résumé

La douleur sacro-iliaque est un tableau clinique courant, souvent attribuable à une pathologie de l'articulation sacro-iliaque d'origine inflammatoire, infectieuse, néoplastique ou post-traumatique. La disposition anatomique et la composition de l'articulation sacro-iliaque sont uniques, et diverses techniques d'imagerie peuvent être utilisées pour examiner cette région, notamment la radiographie classique, la tomographie assistée par ordinateur, la scintigraphie osseuse et la résonance magnétique. Dans cet article, nous passons en revue diverses affections courantes de l'articulation sacro-iliaque, illustrées à l'aide de résultats d'examens d'imagerie multimodale. Nous examinons également les stratégies à appliquer pour choisir la modalité d'imagerie la plus appropriée, ainsi que différents pièges et astuces de l'imagerie. En outre, nous expliquons une façon d'aborder les patients chez qui une douleur lombaire d'origine inflammatoire est soupçonnée.

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Low back pain not uncommonly arises secondary to pathology in the sacroiliac (SI) joints, which can include inflammatory, infective, neoplastic, and post-traumatic conditions. Many patients with lower back or SI region pain will present to their primary care physician, specialist rheumatologist, or orthopaedic surgeon. The initial challenge for the physician is to confirm origin of symptoms from the SI joint. The criterion standard for confirmation of SI pain is relief of symptoms after image guided SI joint injection [1]. Clinical evaluation of the SI joint should include the posterior superior iliac spine distraction test,

pelvic compression and distraction, Gaenslen's test and the flexion, abduction, and external rotation test [2]. SI joint pain can be differentiated from discogenic lower back pain by the lack of neurological features and a normal straight leg raising test. Piriformis syndrome can also cause similar posterior thigh and buttock pain but can be differentiated by application of the passive flexion, adduction, and internal rotation test. Following a thorough clinical assessment and appropriate laboratory investigations, imaging forms the next major step in the investigation of patients with suspected inflammatory back pain (IBP) or SI joint pathology and various imaging modalities are available to the clinician [3,4]. Increasingly, advanced imaging modalities such as magnetic resonance imaging (MRI) are being used to detect early changes of sacroiliitis and expedite diagnosis in

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patients with IBP, allowing prompt commencement of disease modifying therapy [3,5,6].

### Imaging Technique

The SI joints have a unique anatomical composition and layout, consisting of cartilaginous and ligamentous components similar to a secondary cartilaginous joint but with a synovial joint component on the iliac side of the distal third of the joint [7]. The sigmoid shape and oblique orientation of the SI joints also pose challenges to planar imaging techniques such as conventional radiography or planar isotope bone scintigraphy due to the overlap of adjacent osseous structures surrounding the joints, which can render interpretation of subtle changes difficult. Nevertheless, many patients presenting with SI pain would have undergone initial imaging with conventional radiographs of the lumbar spine, pelvis, or SI joints. Radiographic features such as erosions, sclerosis, and ankylosis are typically seen in advanced inflammatory sacroiliitis and are graded from 0 (normal) to 4 (ankylosis) according to the modified New York criteria (Figure 1) [8]. However, many of these radiographic changes lag considerably behind symptoms, often only manifesting years after initial presentation. Recent guidelines strongly recommend further imaging with MRI in patients with suspected IBP but who have no radiographic changes, due to its superior sensitivity in detecting early inflammatory changes [3,4].

### Advances and Developments in Imaging Techniques

Cross-sectional modalities such as MRI, computed tomography (CT), or single-photon emission computed tomography (SPECT) have many advantages over conventional radiography in imaging the SI joints. The ability to image the SI joints in different planes allows complete visualization of the joint and images can be acquired or reconstructed along axial or coronal planes relative to the orientation of the sacrum (Figures 2 and 3) [4]. Of these modalities, MRI has emerged as the preferred imaging modality for SI joint pathology due to multiplanar imaging capability and superior soft tissue and bone marrow contrast on short tau inversion recovery (STIR) and fat-saturated T2-weighted sequences, which are essential for detecting early inflammatory changes [4–6]. The use of intravenous contrast, although not essential, helps increase sensitivity for detection of active inflammation or soft tissue involvement in suspected cases of infection. Technical advances in musculoskeletal MRI, including more robust fluid sensitive sequences with higher resolution, better fat suppression techniques and metal artifact reduction sequences for postoperative imaging have also been beneficial to imaging SI joint pathology. More recently, dual-energy CT techniques for detecting bone marrow oedema at acute fracture sites have been described and can identify areas of acute pathology such as sacroiliitis in a similar manner to fluid sensitive MR sequences [9].

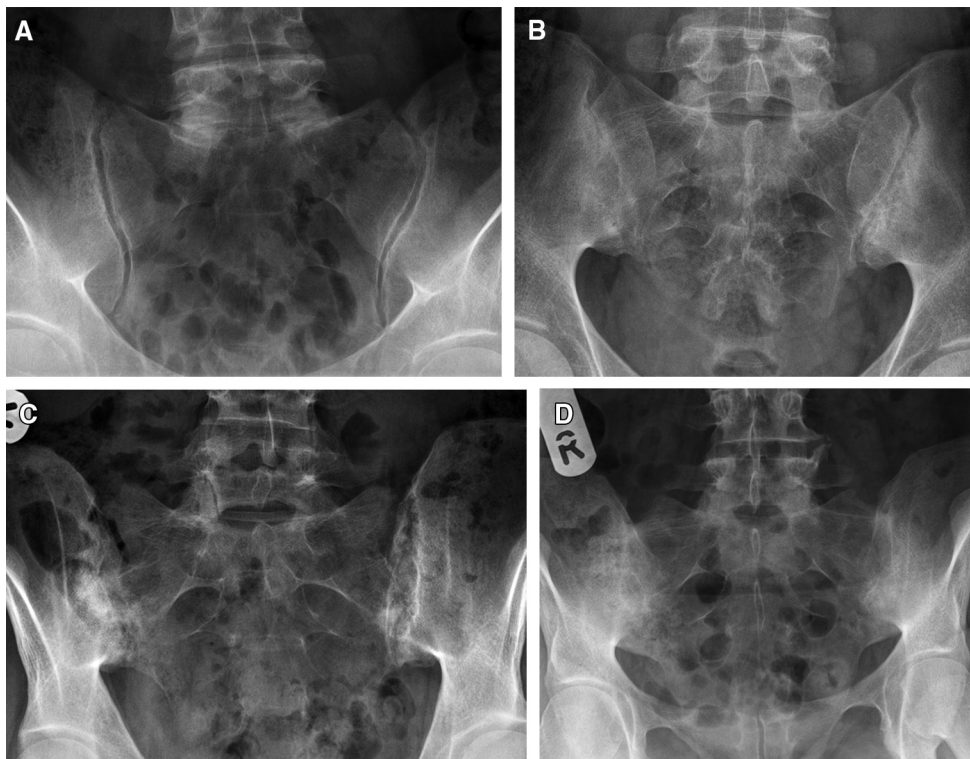


Figure 1. Spectrum of sacroiliitis severity on radiographs graded according to the New York criteria. (A) Grade 1 changes with subtle blurring of the joint margins. (B) Grade 2 changes in left sacroiliac joint with erosions and mild periarticular sclerosis. More severe Grade 3 changes are present on the right with partial ankylosis evident. (C) Grade 3 changes bilaterally with severe joint erosions, sclerosis, and joint space widening. (D) Grade 4 changes demonstrating complete ankylosis of both sacroiliac joints.

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