

Clinics in Diagnostic Imaging (70)

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Fig. 1 Frontal radiograph of the lumbosacral spine (coned to the sacrum).

CASE PRESENTATION

A 15-year-old boy presented with pain in his right knee for four months. It was worse in the morning. He could not recall a definite history of injury. On physical examination, range of knee movement was full. The anterior drawer test was negative. The upper end of the medial collateral ligament was tender. There was opening up of the medial joint line on application of valgus stress. Radiographs of the right knee were normal. Based on the diagnosis of medial collateral ligament tear, he was sent for a course of

physiotherapy consisting of short wave ultrasound and quadriceps muscle strengthening exercises. The patient also complained of pain in the lateral aspects of both buttocks, aggravated by climbing stairs. On examination of the spine, there was a full range of spine movements. Straight leg raising was full, and there was no tenderness over the sacroiliac joints. No neurological deficit was detected in the lower limbs. Radiographs of the lumbosacral spine were performed (Fig. 1). What does this show? What is the diagnosis?

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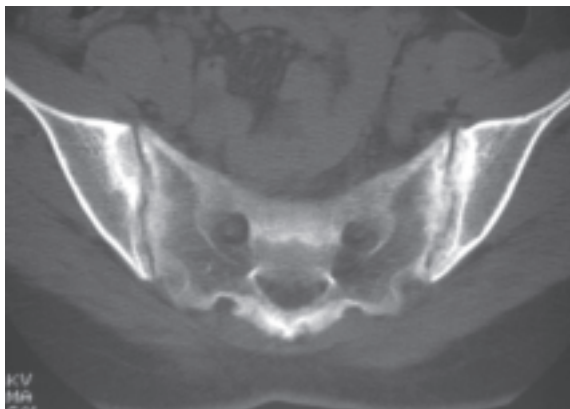


Fig. 2 Axial CT scan of a 29-year-old woman with ankylosing spondylitis shows bilateral sacroiliac erosions and subchondral sclerosis, typical of grade III sacroiliitis.



Fig. 3 Frontal radiograph of the sacrum of a 48-year-old man with ankylosing spondylitis shows bilateral grade III sacroiliitis. There are prominent erosions and subchondral sclerosis affecting both SI joints.



Fig. 4 (A) Right and (B) left oblique radiographs of a 39-year-old man with ankylosing spondylitis show grade IV sacroiliitis. There is complete fusion of both SI joints.

IMAGE INTERPRETATION

Frontal radiograph of the sacrum (Fig. 1) shows ill-definition of the margins of both sacroiliac joints, with loss of the normal sharp cortical outlines. There are multiple erosions at both joints, with adjacent subchondral sclerosis. The lumbar vertebrae and intervertebral disc spaces appeared normal (not shown).

DIAGNOSIS

Bilateral sacroiliitis due to ankylosing spondylitis.

CLINICAL COURSE

A variety of serological investigations were performed. The erythrocyte sedimentation rate (ESR) was raised

to 21 mm/hr. Human leukocyte antigen (HLA)-B27 was positive. Full blood count, uric acid and C reactive protein levels were within normal limits. Anti-nuclear factor and LE cells demonstration were negative. His knee pain subsequently improved with physiotherapy. On follow-up, his back remains pain-free to date.

DISCUSSION

Sacroiliitis refers to inflammation of the sacroiliac (SI) joints. The SI joints consist of a posterior ligamentous portion and an antero-inferior synovial portion. The hyaline cartilage on the sacral side of the joint is thicker (3-5 mm) than the cartilage on the iliac side (1 mm). This anatomical feature may explain the

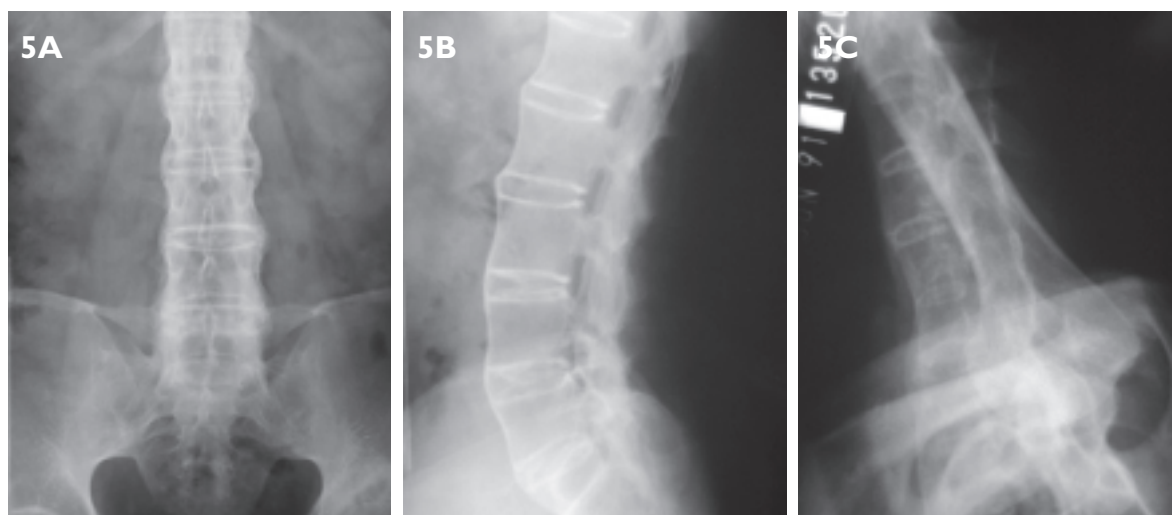


Fig. 5 (A) Frontal radiograph of the lumbosacral spine of a 37-year-old man with ankylosing spondylitis shows bilateral grade IV sacroiliitis as well as extensive syndesmophytes in the lumbar spine. (B) Same patient as fig. 5B. Lateral lumbar radiograph shows continuous syndesmophyte formation and facet joint ankylosis, giving a classical bamboo spine appearance. (C) Same patient as fig. 5C. Lateral radiograph of the cervicothoracic junction (Swimmer's view) shows solid spinal fusion.

Table I. Patterns of disorders causing or mimicking sacroiliitis.

A. Bilateral and symmetrical

- Ankylosing spondylitis
- Enteropathic arthropathies e.g. ulcerative colitis, Crohn's disease, Whipple's disease
- Psoriatic arthropathy
- Osteitis condensans ilii*
- Hyperparathyroidism*

B. Bilateral and asymmetrical

- Psoriatic arthropathy
- Reiter's disease
- Rheumatoid arthritis
- Depositional arthropathies e.g. gout, CPPD, ochronosis
- Osteoarthritis

C. Unilateral

- Infection

Key: * indicates conditions which may mimic sacroiliitis.

earlier erosive changes occurring on the iliac side of the SI joint in sacroiliitis. Clinically, patients with sacroiliitis have low back pain that persists, even at rest. On physical examination, local tenderness may be encountered during percussion over the SI joints, and a pain response may be evoked by springing the pelvis. The usefulness of the various stress and compression tests to discriminate patients with inflammatory low back pain from those with mechanical pain has however been disputed⁽¹⁾.

Radiographs are usually performed for confirmation of clinically-suspected sacroiliitis. The standard view is the anteroposterior (AP) projection. An AP projection with cephalad angulation of 23 degrees (Ferguson view) is ideal. In equivocal cases, the addition of oblique views may be useful. Computed

tomography may aid in cases with negative radiographs and contradictory clinical findings⁽²⁾ (Fig. 2). The role of bone scintigraphy in the evaluation of sacroiliitis remains controversial. Quantitative tracer uptake comparing SI joint uptake to sacral uptake is preferred to visual assessment⁽³⁾. Magnetic resonance (MR) imaging is more sensitive than either radiographs or CT in detecting inflammatory changes and bone marrow oedema, and is also sensitive for assessment of activity in relatively early disease⁽⁴⁾.

Sacroiliitis is usually graded according to the New York criteria⁽⁵⁾. Grade 0 indicates normal SI joints within thin sharp cortical margins and normal cartilage space. Grade I refers to non-specific "suspicious" findings. Grade II changes are due to minimal sacroiliitis and consist of loss of definition of the SI joint margins. There may be minimal sclerosis and erosions. There may or may not be joint space narrowing. Grade III or moderate sacroiliitis manifests as definite sclerosis on both sides of the joint, erosions, and loss of joint space (Fig. 3). Grade IV changes consist of complete bony ankylosis of the SI joints (Fig. 4). Changes are seen initially in the lower and middle thirds of the SI joint, with periarticular osteoporosis. Erosions and subchondral sclerosis progress to bony ankylosis. There is an eventual return to normal bone density.

A variety of disorders, particularly a group of inflammatory diseases classified as the "seronegative spondyloarthropathies", may produce sacroiliitis. These diseases include ankylosing spondylitis, enteropathic arthropathies, psoriatic arthropathy, and Reiter's syndrome. These disorders have certain common characteristics, namely, absence of rheumatoid factors, no subcutaneous nodules, presence of



Fig. 6 Frontal radiograph of the sacrum of a 41-year-old man with psoriasis shows right sided sacroiliitis. There is ill-definition of the right SI joint, with minimal erosions and sclerosis, consistent with grade II sacroiliitis. The left SI joint appears relatively normal.

peripheral arthritis, sacroiliitis that may be associated with spondylitis, systemic disease manifestations, and familial tendency. Although the radiographical appearances of sacroiliitis may appear similar, differences in symmetry and distribution, as well as other clinical manifestations, provide clues to the correct diagnosis⁽²⁾. The causes of sacroiliitis and mimicking conditions are summarised in the Table.

Ankylosing spondylitis is a chronic and progressive form of seronegative arthritis that is characterised by inflammation of multiple articular and para-articular structures. It has a predilection for the axial skeleton, affecting particularly the SI and spinal facet joints. The basic pathophysiological process is an enthesopathy that usually starts at the SI joints. The aetiology of ankylosing spondylitis is unknown. A strong family history is common. Approximately 90-95% of patients have the tissue antigen HLA-B27. Males are more frequently affected, with a male-to-female ratio of 4-10:1. The peak age of disease onset is 15-35 years, with a

mean of 26 years. Specific criteria for the diagnosis of ankylosing spondylitis were developed at rheumatic disease conferences in Rome and New York, and have hence been labelled as the Rome (1963) and New York (1968) criteria. Sacroiliitis is the hallmark of ankylosing spondylitis and is requisite for diagnosis using both criteria. Sacroiliitis is typically bilateral and symmetrical, although it may be asymmetrical in the early stages of the disease. A variety of changes occur in the spine, starting with small corner erosions, squaring of the vertebral bodies, and progressing to syndesmophyte formation, interspinous ligament ossification, apophyseal joint fusion, and complete vertebral fusion which produces the bamboo spine appearance. The disease typically ascends the spine, involving the cervical spine in the later stages⁽⁶⁾ (Fig. 5).

A number of inflammatory bowel diseases, including ulcerative colitis, Crohn's disease, Whipple's disease, Salmonella, Shigella and Yersinia enteritis, may be associated with sacroiliitis, and other axial and peripheral joint abnormalities⁽⁷⁾. Radiographically, sacroiliitis due to enteropathic arthropathies is identical to ankylosing spondylitis, and the clinical features of bowel and systemic involvement are important clues for diagnosis. Psoriatic sacroiliitis has been found to be present in up to 43% of patients with skin changes of psoriasis^(8,9). Sacroiliitis and spondylitis are typically found in patients with peripheral psoriatic arthritis. The majority of patients with psoriatic sacroiliitis have bilateral symmetrical involvement, although asymmetrical or unilateral disease (Fig. 6) may occur occasionally⁽²⁾. Reiter's syndrome consists of a triad of arthritis, conjunctivitis and non-gonococcal urethritis. Sacroiliitis in Reiter's syndrome occurs in 20-30% of cases, is more common than spondylitis, and is typically asymmetrical. SI joint abnormalities in gout tend to be asymmetrical, consisting of large cyst-like erosions with surrounding sclerosis⁽²⁾. In

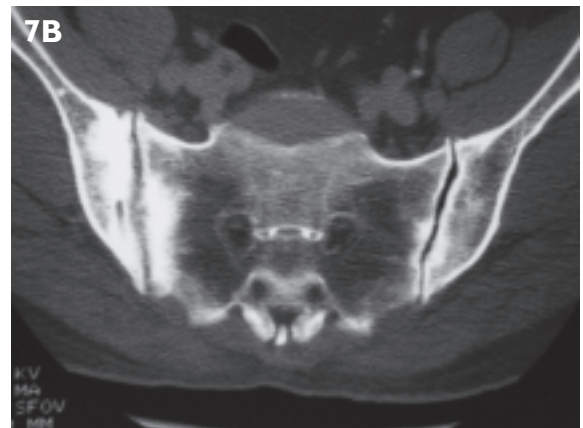


Fig. 7 (A) Frontal radiograph of a 59-year-old woman with tuberculous sacroiliitis shows unilateral involvement of the right SI joint. There are irregular erosions with prominent adjacent subchondral sclerosis. The left SI joint is normal. (B) Same patient as Fig. 7A. Axial CT scan confirms the presence of right sacroiliitis.



Fig. 8 Frontal radiograph of a 28-year-old woman with osteitis condensans ilii. There are triangular-shaped areas of sclerosis at the inferior aspect of the iliac side of both SI joints. The SI joints themselves appear regular with well-defined margins.

osteoarthritis, the articular margins are smooth and well-defined. Joint space narrowing, subchondral sclerosis and anterior osteophytes may be present. Rheumatoid arthritis is regarded to be a relatively rare cause of bilateral asymmetrical sacroiliitis, producing minimal sclerosis and no significant bony ankylosis⁽¹⁰⁾.

Septic arthritis characteristically involves a single SI joint. SI infection is usually due to haematogenous spread and there is often a pre-existing infection somewhere else in the body. Pyogenic infection, especially Staphylococci, occurs much more frequently than tuberculous sacroiliitis. Acute or subacute clinical features may be present. Pain is the most frequent complaint. Due to non-specific clinical features, the correct diagnosis and treatment may be delayed⁽²⁾. Radiographical manifestations of infective sacroiliitis are usually apparent two weeks after symptom onset. CT has a useful role in the detection of early erosions, demonstrating abscesses, and guiding aspiration of fluid collections or biopsy⁽¹¹⁾ (Fig. 7). Conditions that may mimic sacroiliitis include osteitis condensans ilii and hyperparathyroidism. Osteitis condensans ilii is most often seen in multiparous women aged 25 to 45 years. On radiographs, there is a triangular sclerotic area present at the inferior aspect of the iliac side of the sacroiliac joint. It is typically bilateral and symmetrical, and is associated with a well-defined joint margin and normal joint space (Fig. 8). In hyperparathyroidism, subchondral bone resorption leading to bilateral

symmetrical joint space widening may occur. Radiographical findings may include subchondral erosions and sclerosis, more marked on the iliac sides of the SI joints⁽¹²⁾.

ABSTRACT

A 15-year-old boy was incidentally found to have bilateral sacroiliitis. Radiographs showed erosions and subchondral sclerosis of both sacroiliac joints. His ESR was raised and HLA-B27 was positive. Presumptive diagnosis was ankylosing spondylitis. The clinical and imaging features, including the radiographical classification, of sacroiliitis are discussed. Knowledge of the patterns of distribution and correlation with clinical manifestations aid in differentiating among the various causes of sacroiliitis.

Keywords: Arthritis, ankylosing spondylitis, computed tomography (CT), psoriasis, sacroiliitis

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