Seronegative spondyloarthropathies : A Pictorial Review

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Purpose

To provide an educational and pictorial review of seronegative spondyloarthropathies based on their radiological imaging features (using plain radiography, computed tomography (CT) and magnetic resonance imaging (MRI)). To classify seronegative spondyloarthropathies using clinical and radiological criteria.

Methods and Materials

INTRODUCTION

Inflammation in the spine may affect the ligaments, intervertebral disc, and synovial joints and result in osteitis of adjacent bone. The inflammation may subsequently cause mineralization and ossification of the ligaments and destruction of the joints, which in some conditions may also result in fusion.

The seronegative spondyloarthropathies comprise a group of related inflammatory arthritides, which are classified together because they primarily affect the ligaments and share many clinical, epidemiologic and imaging features. The principal clinical entities of this group include ankylosing spondylitis (AS), psoriatic arthritis (PA), reactive arthritis, enteropathic spondylitis (ES) and undifferentiated spondyloarthropathy.

ETIOLOGY

The etiology of the inflammatory spondyloarthropathies is unknown. There is a hereditary component that varies in importance between the different conditions comprising this group. HLA-B27 is present in 90% of patients suffering from AS, in 50% of patients with RA and in only 20% of patients with psoriasis.

The human immunodeficiency virus (HIV) may be an underlying predisposing factor for PA.

Reactive arthritis (Reiter's disease) occurs after infection with specific organisms associated with diarrheal illness or urogenital infection. The majority of individuals with symptomatic disease are either HLA-B27 positive or are infected with HIV.
CLINICAL FEATURES

The key feature of inflammatory spondyloarthritis is inflammatory back pain that is worse at night and in the early morning. AS also presents with early-morning stiffness that is eased by movement and exercise. The onset is usually insidious and with relapsing attacks of pain, which initially involve the lower back but eventually migrate up the vertebral spine. As the disease progresses, stiffness becomes the predominant symptom, with an increase in thoracic kyphosis and cervical movement.

Symptoms of reactive arthritis usually develop around 4 weeks following the gastrointestinal or urinary infection, although a triggering infection is identified only in up to 60% of patients. The predominant feature is an asymmetric lower-limb predominant oligoarthritis. This may be associated with conjunctivitis, uveitis and urethritis. The enteric form appears to affect the upper limb more frequently than the Chlamydia-associated form.

In psoriatic spondyloarthritis, the dermatological changes include erythematous maculas with silvery-white scale, nail changes and sterile pustules.

Results

IMAGING FINDINGS

Radiography should be the initial technique despite its relatively high false-negative rate in early disease. At this stage, MRI is useful.

APPENDICULAR SKELETON

The seronegative spondyloarthropathies are represented by psoriatic arthritis, reactive arthritis, ankylosis spondylitis, enteropathic arthritis, and undifferentiated spondyloarthropathies. Affected persons usually are negative for serum rheumatoid factor, but a significant percentage has the HLA-B27 antigen. These diseases frequently cause symptoms in the axial skeleton, but the appendicular skeleton may also be affected, in isolation or in combination. Radiographically, these diseases differ from RA by the absence or mild nature of periarticular osteoporosis, the involvement of entheses with erosions and with new bone formation, and asymmetrical involvement of the peripheral skeleton.
**PSORIATIC ARTHRITIS**

Psoriasis is a chronic, inflammatory, proliferative disease of the skin. It commonly affects Caucasians. Psoriatic arthritis, a chronic inflammatory arthritis, affects approximately 5% to 8% of the psoriatic population. The mean age at diagnosis of psoriatic arthritis is 40 years. The extent of arthritis does not correlate with the degree of psoriatic skin disease, and some cases, the skin manifestations may follow the arthritis by several years or may never develop.

Clinically, patients with psoriatic arthritis can be classified into three groups: (1) monoarthritis or oligoarthritis with enthesitis; (2) symmetric polyarthritis resembling RA; and (3) patients who have predominantly axial disease resembling ankylosing spondylitis with or without peripheral joint disease.

In descending order, the knee, PIP (hands and feet), MTP, ankle, MCP, and DIP (hands and feet) joints are involved at the time of diagnosis.

The process is characteristically asymmetrical. Involvement of the DIP joints of the hands and toes, usually in association with psoriatic changes of the nails, or involvement of one entire digit (MCP+PIP+DIP, "sausage digit") is very suggestive of psoriatic arthritis [Fig. 1 on page 7].

Radiology can suggest the diagnosis based on the presence of bone erosion and bone proliferation suggestive of enthesitis [Fig. 2 on page 7, Fig. 3 on page 8]. Bone erosion typically begins at the margins of the joint and erodes along the articular surface (surface erosion) or progresses along the joint capsule away from the joint (enthesitic erosion). Severe surface erosions may widen the joint space, resulting in the "pencil-in-cup" appearance. The enthesitic erosion along with bone proliferation may give an irregular outline to the metaphysis. Proliferative bony changes are the most prominent feature of psoriatic arthritis. Periosteal reaction along the diaphysis of the short tubular bones is commonly seen in psoriatic arthritis. Bony mineralization is typically preserved.

At an early stage, sonography and MRI may show synovitis, tenosynovitis, and bursitis, which are similar to those seen in RA. In addition, MRI may demonstrate extensive signal abnormality in the bone marrow and soft tissues far beyond the joint capsule, related to enthesitis [Fig. 4 on page 9 Fig. 5 on page 10].

**REACTIVE ARTHRITIS**
Reactive arthritis is an oligoarticular arthritis and enthesopathy that follows an infectious condition, usually of the genitourinary or gastrointestinal tract. The majority of individuals with symptomatic disease are either HLA-B27-positive or are infected with HIV.

In general, the radiographic manifestations are similar to those of psoriatic arthritis, except that the axial skeleton is not as commonly involved and changes in the upper extremity are exceptional. The most prominent involvement is in the lower extremities, particularly the feet Fig. 6 on page 14 Fig. 7 on page 13 Fig. 8 on page 12 Fig. 9 on page 11.

ENTEROPATHIC ARTHRITIS

Arthritis occurs in approximately 10% of patients with chronic inflammatory bowel disease. The most common manifestation is sacroiliitis, which is similar to but not as extensive as that in ankylosing spondylitis, with bilateral symmetrical involvement.

Peripheral arthritis is uncommon.

SACROILIITIS

A commonly used radiographic protocol for evaluating the sacroiliac joints includes anteroposterior and Ferguson views of the sacroiliac joints Fig. 10 on page 20. CT and MRI have also been used in an attempt to identify sacroiliitis for early diagnosis of AS or an undifferentiated spondyloarthropathy.

The demonstration of sacroiliitis is a fundamental part of establishing the diagnosis of AS but it is also relevant to the other spondyloarthropathies. In AS, it is bilateral but in psoriatic spondylitis and reactive arthritis it may be bilateral or unilateral. The radiographic features are those of erosions, which may be difficult to detect initially; sclerosis of the subchondral bone on either side of the joint; and bony bridging, which marks the beginning of ankylosis.

PSORIATIC SPONDYLOARTHROPATHY

As many as 50% of patients with severe psoriasis have sacroiliitis, which is usually bilateral and asymmetric. Unlike in AS, erosions are large. Reparative bone proliferation is prominent, although ankylosis of the sacroiliac joints is relatively uncommon Fig. 11 on page 15.
REACTIVE SPONDYLOARTHROPATHY (REITER’S DISEASE)

As in psoriatic arthritis, the sacroiliitis of the reactive arthritis is asymmetric but usually bilateral. Very early in the disease process, the sacroiliitis may be unilateral. Over time, however, involvement of both sacroiliac joints may become symmetric. Ankylosis is a late finding Fig. 12 on page 16.

ENTEROPATHIC SPONDYLITIS

Changes in the spine and sacroiliac joints progress independently and appear identical to those in AS Fig. 13 on page 17.

AXIAL SKELETON

PSORIATIC SPONDYLOARTHROPATHY

Spondylitis in psoriatic arthritis may occur with or without sacroiliitis.

There is a predilection for the upper lumbar spine but any level, including the cervical spine, may be involved. The typical feature is non-marginal syndesmophytes but marginal syndesmophytes may also be seen. Paravertebral ossification, which is usually large, non-uniform and asymmetric, is a characteristic feature but is seen at the late stage of the disease Fig. 14 on page 19 Fig. 15 on page 18. Apophyseal fusion and atlantoaxial subluxacion are common in patients with cervical involvement.

Romanus lesions are a feature of psoriatic spondyloarthropathy and discovertebral destruction may occur.

REACTIVE SPONDYLOARTHROPATHY

Radiographs of the spine may demonstrate asymmetric, coarse, thick paravertebral ossifications that are non-marginal and originate away from the vertebral-body endplates. They are most commonly seen in the lower thoracic and upper lumbar spine.

Romanus lesion is uncommon in reactive spondyloarthropathy.

ENTEROPATHIC SPONDYLITIS
Changes in the spine and sacroiliac joints progress independently and appear identical to those in AS.

Images for this section:

Fig. 1
PA radiograph of the hands in a patient with polyarthritic psoriatic arthritis shows marginal and surface erosions in the MCP (arrows), PIP (asterisk) and carpometacarpal joints (double arrow). There are also erosions at the ulnar styloid (arrowhead). Erosions are associated with bony proliferation.

Fig. 2
PA radiograph of the hands in a patient with polyartritic psoriatic arthritis shows marginal and surface erosions in the PIP and DIP joints. Erosions are associated with bony proliferation (arrows). There is also ankylosis of the PIP joint of the right third finger (asterisk) and soft tissue swelling.

Fig. 3
**PSORIATIC ARTHRITIS**

Anteroposterior radiograph of the right sternoclavicular joint in a patient with polyarthritic psoriatic arthritis shows erosions with subchondral sclerosis at the end of the clavicle (arrows).

Fig. 4
PSORIATIC ARTHRITIS

MRI study of the right sternoclavicular joint in a patient with polyarthritic psoriatic arthritis shows joint space widening, effusion (arrowhead), and erosions (arrows) with subchondral edema (asterisk).

Fig. 5
Coronal T1-w and coronal FS T2-w MR images of the left hip show symmetric narrowing of the left hip joint with small erosions at the right femoral head and acetabular roof (arrows), synovial hypertrophy (double arrows), and reactive subchondral edema (arrowhead).

Fig. 9
Frontal radiograph of the pelvis shows symmetric narrowing of the left hip joint with periarticular osteoporosis and small erosion at the left femoral head (arrow).
Longitudinal ultrasound images over distal Achilles tendon show erosions at the posterior aspect of the calcaneus (arrows) and hypoechoic swelling of the retrocalcaneal bursa (asterisk) deep to a thickened distal Achilles tendon (arrowhead).

Fig. 7
Lateral radiograph shows erosions with adjacent sclerosis at the posterior aspect of the calcaneus (arrow). Sagittal and axial MRI study demonstrate erosions and adjacent marrow edema at the posterosuperior aspect of the calcaneus (asterisk) with retrocalcaneal bursitis (arrowhead), thickened tendoachilles bursa (double arrows), and insertional Achilles tendinitis (double asterisk).

Fig. 6
Fig. 11

AP radiograph of the SIJ in a patient with polyartritic psoriatic arthritis shows bilaterally asymmetric nearly fused sacroiliac joints (arrows).
REACTIVE ARTHRITIS

AP radiograph of the SIJ shows mild erosive and sclerotic changes in the right sacroiliac joint (arrow).

Fig. 12
AP radiograph of the SIJ shows bilaterally symmetric mixed erosive and productive sacroiliitis (arrows). There is no fusion. Staples are also seen (arrowhead).

Fig. 13
Coronal computed tomography reconstructions of the lumbar spine show asymmetric syndesmophytes (asterisk). There are also endplate erosions and adjacent vertebral sclerosis at T12-L1 level (arrows).

Fig. 15
Anteroposterior radiograph of the lumbar spine demonstrates bulky syndesmophytes involving the L1-L2 level (arrows).

Fig. 14
Fig. 10

Anteroposterior (AP) radiograph of the sacroiliac joints (Su). The joint have a uniform width and cortical white line along its margins is intact (arrows).
Conclusion

Inflammatory disorders of the spine may affect the ligaments, intervertebral discs, and synovial joints, resulting in osteitis of adjacent bone. The initial examination should be radiographic. MRI can be useful in the early stages of disease.

References


Personal Information