Seronegative Spondyloarthropathies: A Radiological Persepective

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Learning objectives

- To demonstrate the skeletal manifestations of seronegative spondyloarthropathies and to illustrate typical appearances on conventional radiography and magnetic resonance (MR) imaging.

- To highlight the emerging role of MR imaging in identification of early spinal involvement and to illustrate the changing radiological features with disease progression.

Background

Seronegative spondyloarthropathies is a term used to describe a group of chronic inflammatory arthritides which test negative for serum rheumatoid factor and do not feature rheumatoid nodules. They share many clinical, radiological and epidemiological features and comprise the following subtypes: psoriatic arthritis (PA), ankylosing spondylitis (AS), enteropathic arthritis (EA), reactive arthritis (RA) and undifferentiated spondyloarthropathy (US). Although not formally listed, SAPHO (synovitis, acne, pustulosis, hyperostosis and osteitis) may also be considered a subtype.

Findings and procedure details

In this section we will review the seronegative spondyloarthropathies and discuss radiological features, using radiographs and cross-sectional imaging to illustrate.

Psoriatic Arthritis

(Figures 1-3)

A Predominantly seronegative inflammatory arthritis associated with up to 30% of patients with psoriasis. The condition affects males and females equally and is most prevalent between ages 20-40. The appendicular as well as the axial skeleton is involved.
Dermatological features of psoriasis precede arthritis in 90% of cases and up to 60% are HLA-B27 positive.

Radiological features:

> In the hands and feet, the pattern of distribution may be that of a symmetric polyarthropathy, or asymmetric oligoarthropathy. The distal interphalangeal joints are predominantly involved with soft tissue swelling commonly preceding bone changes. Soft tissue swelling of the whole finger sometimes occurs and is referred to as "sausage digit". Erosions first appear at the joint margins resulting in widened and irregular joint spaces, followed by marginal new bone formation or periosteal reaction. In severe cases tapering of the distal head of the middle phalanx occurs exhibiting a "pencil in cup" appearance. Nail changes may also be evident. Extreme resorption and erosion of the metacarpals and phalanges with shortening digits and telescoping fingers is termed arthritis mutilans. Another unique sign is an "ivory phalanx" which is increased radiodensity of an entire phalanx that results from periosteal and endosteal bone formation. Enthesitis, joint subluxation or interphalangeal ankylosis may also be present.

> Sacroiliac joints are involved in 30-50% of patients whereas up to 25% have spine involvement. Sacroiliac joints are affected bilaterally and symmetrically however the spine is characterised by coarse assymetrical non-marginal syndesmophytes, paravertebral ossifications and relative sparing of the facet joints.

Reactive Arthritis

(Figure 6)

Formerly known as Reiter’s syndrome and classically defined by a clinical triad consisting of conjunctivitis, urethritis and arthritis that is transmitted either through epidemic dysentery or sexual intercourse. All three components, however, are rarely seen at initial presentation and arthritis may be present without the other clinical symptoms. The condition affects mostly males between age 15-35 and 80% of patients are HLA-B27 positive.

Radiological features:
It affects the peripheral skeleton similarly to psoriatic arthritis but differs in its distribution affecting mostly the lower extremities (MTP>calcaneus>ankle>knee) typically asymmetrically and sparing the hands and wrists. The classic features it shares with psoriatic arthritis include ill-defined erosions, enthesopathy, bone proliferation, early juxta-articular osteoporosis, uniform joint space loss and fusiform soft tissue swelling.

The Sacroiliac joints can also be affected usually bilaterally and asymmetrical. Involvement of the spine is relatively rare.

**Ankylosing Spondylitis**

(Figure 5)

A chronic, progressive inflammatory disease of unknown aetiology. It mostly affects adults in their third decade and has a male predilection of 3:1 or more. 90% of patients affected have HLAB27 histocompatibility. The sacroiliac joints and spine are predominantly affected but can involve peripheral joints in 20% of cases.

**Radiological features:**

> Sacroiliitis is usually the first manifestation and is most commonly symmetrical and bilateral although in the early stages of the disease, the process may appear asymmetrical and unilateral. The initial finding is the blurring of the iliac side of the joint. Subchondral erosions result in a widened and irregular joint space. This leads to reactive, reparative bone sclerosis and ultimately ankylosis. Similar lesions can develop at other sites around the pelvis giving rise to the typical "whiskered" appearance.

> Spinal involvement generally begins in the thoracolumbar spine and progresses cranially. Spinal changes consist of early small erosions adjacent to dense repair sclerosis at the anterior corners of vertebral bodies (Romanus lesions of the spine: shiny corner sign) resulting in vertebral body squaring. Ossification of spinal ligaments, joints and discs can accompany or follow the erosive changes and when seen on radiographs are referred to as sydesmophytes. Diffuse syndesmophytic ankylosis can give a "bamboo" spine appearance. Erosion, sclerosis and bone ankyloses can also occur in the apophysial and costovertebral articulations.
The appendicular skeleton may become involved simultaneously or shortly after the involvement of the axial skeleton. The joints involved in decreasing order of frequency are hips, shoulders, hands and wrists and knees and feet.

**Enteropathic Arthritis**

(Figures 4 & 7)

A chronic, inflammatory arthritis associated approximately 20% of people with Crohn's disease or Ulcerative colitis. Other gastrointestinal diseases, such as Whipple disease, celiac disease, and intestinal bypass surgery can also be associated with an enteropathic arthritis. Axial skeletal involvement occurs more frequently than appendicular involvement. Peripherally, the knees are most commonly involved, followed by the ankles, elbows, wrists, shoulders, and the small joints of the hands and feet.

**Radiological features:**

- The axial manifestations mimic ankylosing spondylitis with syndesmophyte formation.

- In the peripheral form, periarticular osteopenia, joint space narrowing and recurrent mild synovitis is seen.

**Undifferentiated Spondyloarthropathy**

Undifferentiated spondyloarthritis is unique as it is diagnosed in cases with no definite radiologic signs of sacroiliitis. Approximately 25% of patients with this diagnosis are HLA B27 positive. Clinical manifestations include inflammatory back pain, enthesitis, peripheral arthritis, dactylitis and fatigue.

**Radiological features:**

- Radiographic features are very similar to those of ankylosing spondylitis with the absence of sacro-iliitis.
SAPHO

(Figures 8 & 9)

SAPHO (synovitis, acne, pustulosis, hyperostosis and osteitis) syndrome is a rare condition affecting all ages that manifests itself in both the musculoskeletal and dermatological systems. The clinical course is variable and the bone and skin lesions may not necessarily coexist. Affected individuals usually present with pain, swelling, and limitations of movement in the affected joints.

Radiological features:

> The most common site of involvement is the sternoclavicular joint followed by the spine and sacroiliac joints. The sternoclavicular, costochondral and manubriosternal joints are involved in decreasing order of frequency.

> The sternocalvicular joint may undergo sclerosis with erosions, ultimately leading to ankylosis.

> Osteosclerosis of the vertebral bodies and sacroiliac joints may also be seen in SAPHO.

Images for this section:
Fig. 1: Radiograph of left foot showing extensive fluffy new bone formation along the terminal phalanges (blue arrow) and soft tissue swelling in a case of Psoriasis.

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**Fig. 2:** Radiograph of a hand showing an advanced case of Psoriatic arthropathy with classical pencil in cup deformities (blue arrows).

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**Fig. 3:** Magnified radiograph of right hand with Psoriatic arthropathy - Swollen middle finger with fluffy new bone formation along the phalanges which shows some sclerosis.

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**Fig. 4:** Figure A: MRI STIR Coronal pelvis: Marrow oedema and cortical irregularity at the greater trochanters (blue arrows) in keeping with acute enthesitis in a case of Crohn’s. These changes on MRI are seen much before the radiographic changes. Figure B: STIR Coronal for Sacroiliac joints-Marrow oedema bilaterally along the SI joints (blue arrows), prominent along the iliac aspects of the synovial portions of the SI joints.

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Fig. 5: Figure A. "Shiny corners" due to marrow oedema at the vertebral corners (blue arrow) on this STIR lumbar spine image of a case of Ankylosing spondylitis. Figure B. These later on become sclerotic and manifest as triangular sclerosis at the vertebral corners on the radiographs (Romanus lesions-blue arrow)

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**Fig. 6:** Reactive arthritis: Fluffy new bone formation and enthesopathic changes at the calcaneal insertion of Achilles tendon on radiographs and MR image.

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**Fig. 7:** Coronal and sagittal CT images demonstrating ankylosed SI joints and syndesmophytes in a case of Chron’s.

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**Fig. 8:** Axial and coronal CT images showing SAPHO-Sclerosis and erosions around the sternoclavicular joints which later progressed to ankylosis.

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Fig. 9: SAPHO: MR images of the spine - T1W and STIR Sagittal. Multifocal osteitis involving the vertebral corners.

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Conclusion

Familiarisation with the typical and differentiating appearances on axial and extra-axial imaging and correlation with symptoms will increase diagnostic confidence in seronegative spondyloarthropathies enabling prompt treatment.

Personal information

References


