Manifestation of Radiological Abnormalities in Psoriatic Arthritis

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Introduction
Psoriatic arthritis is a distinctive kind of arthritis in patients with psoriasis. This disorder has a wide radiological spectrum and should be recognised at early stage of the disease. The presence of articular abnormalities in psoriatic patients varies from 2% to 6%. The reported prevalence of psoriasis among patients with polyarticular arthritis ranges from 3% to 5%. Five varieties of psoriatic arthritis have been categorised by the work of Wright and Moll. They include polyarthritis with distal interphalangeal joint involvement; symmetrical seronegative polyarthritis simulating rheumatoid arthritis; monoarthritis or asymmetrical oligoarthritis; sacroiliitis and spondylitis; and arthritis mutilans. In certain cases, the diagnosis of psoriatic arthritis cannot be made solely based on radiological findings. Some patients have disease patterns that differ from the five classical types. In one group of patients, dactylitis or enthesitis are the predominant abnormalities.

Typical Sites of Radiological Abnormalities
Psoriatic arthritis involves the synovial and cartilaginous joints, as well as the attachment of tendons and ligaments to the bones in the appendicular and axial skeleton. It shows similar distribution of abnormalities as Reiter’s syndrome and ankylosing spondylitis, and differs from rheumatoid arthritis.

The most typical sites of abnormalities are the interphalangeal joints of hands and feet, metacarpophalangeal and metatarsophalangeal joints, calcaneus, sacroiliac joints and spine. Less frequently changes may be found in the knees, ankles, sternocalvicular, and costovertebral joints. The disease rarely affects the hip and glenohumeral joints.

The distribution of psoriatic arthritis can vary, with certain distinctive characteristics. An asymmetrical or unilateral joint involvement is more common in psoriasis than rheumatoid arthritis. The upper and lower extremity joints are involved in psoriasis, in contrast to Reiter’s syndrome with predominantly lower extremity involvement. The abnormalities in phalangeal tufts and calcaneus in psoriatic arthritis are characteristic.

In the axial skeleton, the abnormalities predominantly affect the spine and sacroiliac joints. The symphysis pubis and tendinous insertions at the pelvis may also demonstrate abnormalities.

Radiological Abnormalities at Peripheral Joints
The radiological abnormalities of psoriatic arthritis include erosive arthropathy at the distal interphalangeal joints of the hands. The erosion starts at the periphery of the articulation and extends into the centre. Asymmetrical involvement of the interphalangeal joints of the hands and feet are common. Irregular periosteal bony proliferation resulting in periostitis is a typical presentation. There is also presence of ankylosis of the joints, with lack of osteoporosis. The resorption of the tufts of the distal phalanx in the hands and feet is characteristic for psoriatic arthritis. The progressive osteolysis may progress to destruction of most of the phalanx. The eroded small bones are irregular in outline. The expansion of the base of the distal phalanx combined with the middle phalanx gives 'pencil and cup' appearance.

High-resolution ultrasound and ultrasound together with power Doppler are sensitive in diagnosing synovitis in the case of established psoriatic arthritis. Magnetic resonance imaging (MRI) is useful in assessing the synovitis in cases of psoriatic arthritis. The MR appearance of synovitis may be indistinguishable from that of rheumatoid arthritis even with dynamic imaging techniques. However, the type and site of the lesions, as well as other typical abnormalities like enthesitis can help to differentiate psoriatic arthritis from other arthritis. Other forms of MRI abnormalities include bone marrow oedema at the subchondral and diaphyseal regions; the latter one is relatively specific to psoriatic arthropathy.
Enthesitis

One characteristic feature of psoriatic arthritis is inflammation of the entheses, at the attachment sites of tendons, ligaments, fascia and joint capsule to bones. The locations include the posterior and inferior surfaces of the calcaneus, femoral trochanters, ischial tuberosities, medial and lateral malleoli, ulnar olecranon, and the anterior surface of the patella. Oriente et al have found peripheral enthesitis in 20% of their patients with psoriatic arthritis with a peak value of 30% in the spondylitic pattern. In calcaneus, the bone erosion at the plantar aspect results in sclerosis of bone with irregular and poorly defined enthesophytes at the attachment of the plantar ligament and aponeurosis. The enthesophytes will be sharply delineated in outline, and occasionally becomes eburnated.

Recently, ultrasound has been used as a sensitive imaging modality to assess the enthesitis. Lehtinen et al and Balint et al first described sonographic features in limb enthesitis, showing a high frequency of asymmetric abnormal findings. The abnormalities include loss of normal fibrillary echogenicity, with increased thickness and colour flow at Achille’s tendon insertion. Power Doppler can show abnormal hyperaemia and vascularisation in enthesitis. MRI with its fat saturation sequence can demonstrate early enthesitis, which presents as diffuse bone marrow and soft tissue oedema. The enthesis is characterised by extracapsular inflammation at the insertions of ligaments and tendons with bone marrow oedema at attachments. Enhancement of ligament and bursa after intravenous injection of gadolinium contrast is also present. MRI is also a more sensitive imaging tool in assessing the treatment response in enthesitis.

Vertebral Abnormalities

Sundaram and Patton have described paravertebral ossification, which was noted in 17% of psoriasis patients. The typical paravertebral ossification around the lower thoracic and upper lumbar vertebrae can be seen as an early manifestation of the disease. The ossification typically presents as fluffy and curvilinear radiodensity on the side of the vertebrae which is parallel with the vertebral body and intervertebral discs. The ossification can merge with disc tissues. Its location away from the vertebral column distinguishes the lesion from syndesmophytosis of ankylosing spondylitis. De Vlam and Mielant believe that the ossification shows less involvement of the apophyseal joint. The normal posterior spinal mobility leads to greater tensile forces anteriorly and promotes paravertebral inflammatory and bone formation. In ankylosing spondylitis, the involvement of the apophyseal joints reduces spinal mobility and leads to syndesmophytes formation.

The cervical spine may demonstrate discovertebral junction and apophyseal joint erosion, as well as bone ankylosis and atlantoaxial subluxation. The atlantoaxial subluxation changes in psoriatic arthritis may resemble rheumatoid arthritis.

Sacroiliac Joint Abnormalities

The reports on the prevalence and patterns of sacroiliac joint abnormalities in psoriasis show lots of discrepancies due to patient selection, techniques of radiological examinations, and image interpretations.

In plain radiographs, about 10 to 25% of patients with moderate to severe psoriatic skin diseases have sacroiliac joint abnormalities. Bilateral sacroiliitis are more common than unilateral involvement. The radiological abnormalities include sclerosis and erosions, first involving the ilial side. Joint space narrowing and ankylosis will happen in the late stage. However, the presence of ankylosis will be less than classical ankylosing spondylitis. Bone proliferation at the tendon insertion point including the iliac crests and ischial tuberosities is also frequently seen.

MRI is much more sensitive in the detection of early sacroiliitis. The changes include bone marrow oedema, sacroiliac joint erosion and sclerosis. Muche and colleagues confirmed that sacroiliitis was very common in psoriatic arthritis as revealed by MR. They most often involve the dorsocaudal part of the joint in early disease, with subchondral bone marrow oedema a frequent finding. Williamson showed that sacroiliitis was present in 38% of a group of patients, some with absence of symptoms.
Dactylitis

Dactylitis has been defined as one of the dominant clinical findings in psoriatic arthritis. In the past, the sausage-like appearance was thought to be due to the presence of concomitant flexor tenosynovitis and arthritis of the metacarpophalangeal and interphalangeal joints. Olivieri and his group had demonstrated dactylitis in fingers and toes with small joint synovitis uncommon (from 6% to 27% ). The same group also showed that peritendinous soft tissue oedema was causing the digital swelling, and bone marrow oedema was not seen at the enthesal insertions of the flexor and extensor tendons. They concluded that the dactylitis is due to flexor tenosynovitis and that distension of the joint capsule is not an indispensable condition for ‘sausage-like’ feature in dactylitis. They showed that clinical examination is a sufficient method for diagnosing tenosynovitis as it showed 100% sensitivity and specificity compared with MRI.

Bony proliferation with periostitis in metaphysis and diaphysis in the hands and feet is a late striking feature. Periosteal bone formation may cause significant cloaking of the phalanx, metacarpal or metatarsal bones. The changes are likely secondary to tenosynovitis.

Differential Diagnosis

The radiographic abnormalities in psoriatic arthritis are similar to other seronegative spondyloarthropathies, namely ankylosing spondylitis and Reiter’s syndrome. The Reiter’s syndrome shows less frequent ankylosis than psoriasis and ankylosing spondylitis. The osteolysis in the terminal phalanx is also characteristic for psoriasis.

In psoriatic arthritis, there is often asymmetrical involvement of the upper and lower extremities with predilection for small joints in the hands and feet. In Reiter’s syndrome, lower limb involvement is more common. For ankylosing spondylitis, axial involvement is more frequent.

For the spinal involvement, ankylosing spondylitis usually has symmetrical bilateral sacroilitis, with squaring of the vertebral body and apophyseal joint involvement which is not frequent in psoriasis and Reiter’s syndrome.

Asymmetrical joint involvement, absence of osteoporosis, and bony proliferation are typical features that distinguish psoriatic arthritis from rheumatoid arthritis. Paravertebral ossification and sacroilitis are rarely seen in rheumatoid arthritis.

Summary

Psoriatic arthritis possesses certain radiological features such as asymmetrical DIP joint involvement, enthesitis, dactylitis and periostitis. The involvement of synovial and cartilaginous joints is also a common finding. MRI is more sensitive in detecting early bone marrow oedema, bony erosion, synovitis, and sacroilitis. Ultrasound can also be used in the diagnosis of early enthesitis and dactylitis. Both MRI and ultrasound are useful imaging techniques to monitor the response in treatment of psoriasis.

References


