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Laboratory and Radiographic Findings in Some Rheumatologic Diseases

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Abstract: Inflammatory arthritis causes periarticular osteopenia, marginal erosions, and uniform joint space narrowing. Noninflammatory, degenerative arthritis causes sclerosis, osteophytes, nonuniform joint space narrowing, and cysts. Chronic tophaceous gout typically causes erosions with a sclerotic margin and overhanging edge in peripheral small joints.

Keywords: arthropathy, gout, arthrit, psoriatic arthrit, reactive arthrit, lesion.

Introduction

The accurate diagnosis of specific arthritis or arthropathy depends on many factors; however, the most important is to understand the patterns of symptoms and the mechanism of disease. The clinical manifestations and laboratory data, in conjunction with the imaging findings, are of significant help in making the diagnosis of a specific arthritic process. The various arthritides, for example, have different frequencies of occurrence between the genders. Rheumatoid arthritis is much more common in females, and erosive osteoarthritis is seen almost exclusively in middle-aged women. Psoriatic arthritis, reactive arthritis (formerly known as a Reiter syndrome), and gouty arthritis are more common in males. Clinical symptoms are of further assistance. Patients with reactive arthritis, for example, usually present with urethritis, conjunctivitis, and mucocutaneous lesions, and those with psoriatic arthritis may present with swelling of a single finger, the so-called sausage digit as well as changes in the skin and fingernails. Patients with gouty arthritis may exhibit soft tissue masses, representing chronic tophi, on the dorsal aspect of the hands or feet. Patients with inflammatory arthritis commonly exhibit swollen joints and alignment deformities.

Laboratory data are also essential. Gouty arthropathy, for instance, is associated with elevated serum uric acid concentrations, and examination of synovial fluid reveals monosodium urate crystals. The synovial fluid of patients with calcium pyrophosphate dihydrate (CPPD) crystal deposition disease contains calcium pyrophosphate crystals. Findings of ragocytes with cytoplasmatic inclusions of ingested aggregated IgG immunoglobulin within the synovial fluid of patients with rheumatoid arthritis can be a significant diagnostic feature. The detection of autoantibodies is another important aid in the diagnostic workup. Rheumatoid factor (RF) is a typical finding in rheumatoid arthritis. Patients lacking the specific antibodies represented by RF are said to have “seronegative” arthritis. Anti–cyclic citrullinated peptide antibodies are also specific for RA. Patients with lupus arthritis have a positive lupus erythematosus cell test. The presence of a positive ANA is one of the most important abnormalities detected in patients with SLE, although it may be positive in some other autoimmune conditions. The presence of anti-dsDNA, anti-Sm, and anti-RNP antibodies is another highly specific factor for the diagnosis. Lastly, identification of the antigens of the major histocompatibility complex, particularly human leukocyte–associated antigens HLA-B27 and HLADR4, has in recent years become the crucial tests in the diagnosis of arthritic disease. It has been reported that 95% of patients with ankylosing spondylitis, 86% of patients with reactive arthritis, and 60% of patients with psoriatic arthropathy test positively for antigen HLA-B27, whereas a majority of those with rheumatoid arthritis exhibit the HLA-DR4 antigen. This is helpful in differentiating certain types of arthritides, as well as distinguishing psoriatic arthritis from rheumatoid arthritis in cases in which the radiographic presentation of these conditions may be very similar.

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The true or diarthrodial joint consists of cartilage covering the articular ends of the bones forming the joint; the articular capsule, which is reinforced by ligamentous structures; and the joint space, which is lined with synovial membrane and filled with synovial fluid. Because of its physicochemical constitution, articular cartilage absorbs only a minimal amount of x-rays, thus appearing radiolucent on a radiographic film. The radiolucent articular cartilage, together with the joint cavity filled with synovial fluid, creates the so-called radiographic joint space. The abnormality of the joint in arthritis usually consists of destruction of the articular cartilage, which appears on radiographs as a narrowing of the radiographic joint space, usually accompanied by subchondral erosion; narrowing of the joint is the cardinal sign of arthritis. It should be kept in mind, however, that in some arthritic processes, the joint space may not become narrow, appearing instead slightly expanded. This happens, for example, in the early stages of some arthritides, when joint effusion and ligamentous laxity cause distention of the joint with fluid, but the articular cartilage has not yet been destroyed. It may also be seen in rare instances when granulation pannus erodes the subchondral bone without destroying the articular cartilage. Other radiographic signs specific to different types of arthritis include periarticular soft tissue swelling, periarticular osteoporosis, and, in the more advanced stages of some arthritides, complete destruction of the joint with subluxation or dislocation and ankylosis (joint fusion). The radiographic presentation of arthritis depends on the type and stage of the disease, as well as the site of the original insult characteristic for the various forms of arthritis or arthropathy—whether it is the articular cartilage, as in osteoarthritis; the synovial membrane, as in inflammatory arthritis; the synovial membrane, subchondral bone, and periarticular soft tissues, as in infectious arthritis; or the synovial membrane, articular cartilage, subchondral bone, and periarticular soft tissues, as in some metabolic arthropathies. The radiographic diagnosis of arthritis, as Resnick observed, is based on the evaluation of two fundamental parameters: the morphology of the articular lesion and its distribution in the skeleton. If these findings are combined with the history, physical examination, and relevant laboratory data in a given case, then the accuracy of the diagnosis is markedly improved.

Morphology of the Articular Lesion. The various arthritides and arthropathies exhibit morphologically distinct features, as observed radiographically in the large and small joints. In the degenerative form of the disease known as osteoarthritis (osteoarthrosis), thinning of the articular cartilage results in localized narrowing of the joint space; there is also subchondral sclerosis and osteophyte and cyst formation, but generally osteoporosis is absent. Erosive osteoarthritis is characterized by central articular erosions and marginal proliferation of bone assuming the so-called gull-wing deformity. Inflammatory arthritides, such as rheumatoid arthritis, are characterized by a diffuse, usually multicompartmental narrowing of the joint space associated with marginal or central erosions, periarticular osteoporosis, and symmetric periarticular soft tissue swelling; subchondral sclerosis is minimal or absent, and formation of osteophytes is lacking. In a metabolic arthropathy such as gout, well-defined osseous (articular or periarticular) erosions, displaying a so-called overhanging edge, are usually associated with preservation of part of the joint space and localized, asymmetric soft tissue nodules; osteophyte formation and osteoporosis are absent. Infectious arthritis is characterized by the complete destruction of both articular ends of the bones forming the joint; all communicating joint compartments are invariably involved, with diffuse osteoporosis, joint effusion, and periarticular soft tissue swelling. Neuropathic arthropathy is marked by destruction of the articular surfaces, which leaves bony debris, and a substantial joint effusion; osteoporosis is usually lacking. Depending on the amount of destruction, varying degrees of joint instability are present.

Analysis of the morphologic features of an arthritic lesion at certain sites other than the diarthrodial joints may be of further assistance in differentiating the various arthritides and reaching a correct diagnosis. Two such sites that are frequently affected are the heel and the spine. In the heel, degenerative changes are usually manifested by a traction osteophyte (enthesophyte) at the posterior and plantar aspects of the calcaneus. Rheumatoid arthritis produces erosive changes in the area of the retrocalcaneal bursa secondary to inflammatory rheumatoid bursitis. Psoriatic arthritis, reactive arthritis, and ankylosing spondylitis all produce a characteristic “fluffy” periostitis that results in a broad-based osteophyte at the site of attachment of the fascia plantaris on the plantar aspect of the

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calcaneus, associated with erosions of the plantar surface and the posterior aspect of this bone. Similarly, the morphology of arthritic lesions in the spine offers important indications of the disease process at work. Among the inflammatory arthritides, for instance, rheumatoid arthritis causes a characteristic erosion of the odontoid process. Moreover, as a result of inflammatory pannus and erosion of the transverse ligament between the anterior arch of the atlas and C2, there may be subluxation in the atlantoaxial joint. This is usually manifested by an increase to more than 3 mm in the distance between the arch of the atlas and the dens, as demonstrated on a lateral view of the cervical spine in flexion. Erosions of the apophyseal joints of the cervical spine, sometimes leading to fusion, are frequently seen in juvenile idiopathic arthritis, formerly known as juvenile rheumatoid arthritis.

Arthritic lesions involving other segments of the spine also exhibit distinguishing features that help in differentiating the disease process. Degenerative changes may manifest in the cervical, thoracic, or lumbar spine by the appearance of marginal osteophytes, narrowing and sclerosis of the apophyseal joints, and narrowing of the disk spaces. In ankylosing spondylitis, in the early stages of the disease, there is a characteristic “squaring” of the vertebral bodies associated with sclerotic changes at the anterior aspect at the site of anterior longitudinal ligament due to osteitis (anterior spondylitis) and secondary reactive bone formation, as well as small erosions at the corners of the vertebral bodies, at the site of attachment of the annulus fibrosus to the vertebral endplate, surrounded by reactive sclerosis and osseous proliferation, so-called shiny corners or Romanus lesion. This follows the formation of delicate syndesmophytes arising from the anterior aspects of the vertebral bodies, which differ morphologically from degenerative osteophytes. In the later stages of this condition, inflammation and fusion of the apophyseal joints lead to the appearance of what has been called “bamboo” spine; the sacroiliac joints are also invariably affected. In psoriasis and reactive arthritis, one can occasionally see a single, coarse osteophyte/syndesmophyte in the lumbar spine, frequently bridging adjacent vertebral bodies, as well as paravertebral ossifications; there are also associated inflammatory changes in the sacroiliac joints.

All in all, if the degenerative changes involve only one joint, consider traumatic arthritis. If multiple joints are involved, consider a metabolic or endocrine disorder that has caused the cartilage to degenerate in several joints. Note that the end stage of an underlying inflammatory arthritis that has destroyed the cartilage can result in degenerative changes superimposed on the inflammatory radiographic features.

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