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Investigations in Osteoarthritis

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ABSTRACT

Osteoarthritis (OA) also known as degenerative arthritis, degenerative joint disease and osteoarthrosis, is a group of mechanical abnormalities involving degradation of joints, including articular cartilage and subchondral bone. It is among the most frequent diseases in the population and a common cause of pain and disability in adults. The principal disease hallmarks for assessment of OA are still clinical observation and radiographic aspects. This review highlights the different diagnostic modalities used in OA, with the emphasis on radiographic findings of different joints.

KEYWORDS : Osteoarthritis, radiograph, investigation

INTRODUCTION:

Osteoarthritis (OA) is one of the most common forms of arthritis. It is a chronic condition in which the material that cushions the joints, called cartilage, breaks down. This causes the bones to rub against each other, causing stiffness, pain and loss of joint movement. The diagnosis of OA is made with reasonable certainty based on history and clinical examination.[1,2] There is no single sign, symptom, or test that can diagnose OA. Instead, the diagnosis is based on a consideration of several factors, including the characteristic symptoms of osteoarthritis and the results of laboratory tests and imaging.

RADIOGRAPHIC INVESTIGATION

Radiographic investigations are still the main diagnostic tools for OA. However arthroscopy, ultrasound, MRI, CT scan etc. are used specially for experimental/diagnostic studies and not recommended for routine clinical use. Plain radiographs can show joint space narrowing, osteophytes, sclerosis and subchondral radioluscencies. Other features like effusions, loose bodies, joint alignment, subluxation, chondrocalcinosis, and collapse due to avascular necrosis are also noticed. Modified radiographic techniques with higher magnification and resolution may detect early subchondral bone abnormalities by stereoscope reconstruction. Radionuclide studies may detect abnormalities before radiographic signs are identified. Arthrocentesis and laboratory testing may help identify an underlying cause of secondary OA.

Radiological findings of specific joints:

Hand:

The hand can be evaluated with postero-anterior view and oblique views. Magnification views are particularly helpful in evaluating the soft tissues and the finer details of specific bone. The most commonly involved joints in the hand and wrist are the first carpometacarpal joints, the trapezionavicular joint and the proximal interphalangeal and distal interphalangeal joints. Joint space loss is nonuniform and asymmetric. Erosive changes are not seen in primary OA. Only erosive OA has erosions and ankylosis which are seen in post-menopausal OA. Changes are bone sclerosis; focal narrowing and lateral subluxation accompanied by erosions and in case of erosive OA, all changes of OA plus subchondral bone erosion-gullwing appearance may be noticed.

Knee:

A) Joint space narrowing: Osteoarthritis causes deterioration of the joint structures. Wearing away or deterioration of articular cartilage leads to narrowing of the joint space (i.e., the space between the ends of bones in a joint). Progressively smaller joint space suggests worsening of osteoarthritis. Joint space loss is usually not uniform within the joint. "Bone-on-bone" suggests there is no joint space left.

B) New subchondral bone formation: Osteophytes called bone spurs are protrusions of bone and cartilage. The bony projections are commonly seen in areas of a degenerating joint and can be seen on radiographs. Osteophytes, which typically develop as a reparative response by the remaining cartilage, cause pain and limited range of motion in the affected joint.

C) Tibial lateral subluxation: Subluxation can also be seen on radiograph as a possible consequence of OA. Subluxation is a partial dislocation of a bone.

D) Subchondral sclerosis: Subchondral bone is the layer of bone just below the cartilage. Sclerosis means that there is hardening of tissue. Subchondral sclerosis is seen on x-ray as increased bone density, frequently found adjacent to joint space narrowing. The degeneration of bone which occurs in OA causes bone to turn into a dense mass at the articular surfaces of bone.

E) Subchondral Cyst Formation: Subchondral cysts are fluid-filled sacs which extrude from the joint. The cysts contain thickened joint material, mostly hyaluronic acid. Traumatized subchondral bone undergoes cystic degeneration. Anteroposterior (AP) and lateral radiographs allow an adequate evaluation of the medial and lateral joint spaces.

To adequately assess the joint space, the AP view should be obtained with the patient in a standing position. The lateral view also allows evaluation of the patellofemoral joint; however, an additional view, known as the sunrise view, can offer even more information about this joint space.

Hip:

The true synovial joint space of the sacroiliac joint occurs anteriorly and inferiorly. In OA, bridging osteophytes develop and extend from the ilium to the sacrum. Sclerotic changes are also noted, but ankylosis or erosions do not usually develop as they do in spondyloarthropathies such as ankylosing spondylitis, psoriasis or Reiter's syndrome. Single non-weight bearing AP view of pelvis is satisfactory and has advantages of incorporating both hips on same radiograph.

Foot:

Posteroanterior radiograph of foot: In the foot, AP and lateral radiographs are adequate to assess OA changes, but oblique and magnified views may be required. The most common joint involved is the first metatarsophalangeal joint. Again, subchondral sclerosis, osteophyte formation and cystic changes are common. Lateral subluxation of the great toe results in a hallux valgus deformity. Osteoarthritic changes elsewhere in the foot, such as the subtalar joint, are usually caused by altered mechanics from congenital or acquired abnormalities (e.g.: pes planus, fusion of two bones) or are secondary to another underlying arthropathy (e.g.: psoriasis, Reiter's syndrome).

Spine:
Occurrence of OA is more in lower cervical and lumbar spine and may be seen in facet joints (cervical region). Lateral, AP lumbosacral and cervical views are appropriate. Lateral and AP lumbar spine radiographs are adequate to allow identification of osteoarthritic changes in the apophyseal joints. Decreased joint space is noted between the superior and inferior facets. Sclerosis and cyst formation occur in OA of the spine. Neural foraminal narrowing may result from the osteophyte formation. These changes can be seen on computed tomographic (CT) scans and radiographs. Similar changes are seen in the cervical spine. Primary osteoarthritic changes are not commonly seen in the thoracic spine. Osteoarthritis of the spine is often associated with degenerative joint disease.[3-5]

ARTHROSCOPY
Arthroscopy is one of the most commonly performed procedures to help diagnose problems in the knee and shoulder, including arthritis. It's a minor surgical procedure and performed on an outpatient basis. Arthroscopic examination allows direct inspection and visualization of damaged joint surfaces.[6]

ULTRASOUND
The use of ultrasound is becoming increasingly common in osteoarthritis research. Ultrasound can be used to visualize effusion, synovitis, erosion and osteophytes in osteoarthritis-affected hand joints. Koutroumpas et al.[7] showed that ultrasound detected more joints with inflammation than clinical examination in patients with erosive osteoarthritis. Wittoek et al.[8] showed a high frequency of synovitis in erosive osteoarthritis joints, but inflammatory findings appeared to be common in both erosive and nonerosive osteoarthritis.

MRI and CT scan
MRI and CT scan help to diagnose subchondral cysts, osteophytes.[6] In contrast to x-ray, MRI can visualize all tissues in the joint involved in OA: cartilage, menisci, bone, and soft tissue. In addition, MRI causes no ionizing radiation exposure. While it does not have the distortions and magnification problems inherent in radiographs, MRI does have its own motion and susceptibility artifacts. MRI also requires several different pulse sequences to visualize specific tissue types, and its use requires determining the best sequences for various features. Since 1988, numerous studies have examined the use of MRI in imaging synovial inflammation, meniscus pathology, cartilage morphology alteration, bone marrow lesions, osteophytes, cartilage composition, and other markers along with their correlation with clinically defined OA.[9]

MRI has become the imaging method of choice for degenerative disk disease, spinal stenosis, infection, and neoplasia of the lumbar spine.[10] CT has been largely replaced by MR imaging for these diagnoses. The role of MR imaging in the evaluation of facet joint degeneration is less clear. Grenier et al.[11] have shown that MR imaging accurately demonstrates abnormalities of the posterior spinal structures. However, for routine clinical use MR imaging is not usually considered to be equivalent to CT for the evaluation of facet joints. Due to its more precise demonstration of bony details CT is still preferred for this indication.[12]

BONE scan
A radioactive bone scan, used to rule out inflammation, a tumor, infection, or a small fracture. With a bone scan, the radioactive 'tracer' material is injected intravenously and then is concentrated by the body where there is high metabolism or bone turnover. Bone scan shows increased uptake of technetium 99m**.[6]**

CONCLUSION
Osteoarthritis is a long-term condition and can't be cured, but it doesn't necessarily get any worse over time and it can sometimes gradually improve. A number of treatments are available to reduce the symptoms. Diagnosis can be made by proper history and clinical examination. Use of investigatory modalities will help in confirming the clinical diagnosis.

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