Arthritis

By DR. Marwa Majid Al-adhab

Imaging modalities

- Plain radiography
- Magnetic resonance imaging
- Magnetic resonance arthrography

MRI is particularly useful in

*Meniscal and ligamentous tears in the knee

*Rotator cuff tears of the shoulder

*Avascular necrosis of the hip

*Septic arthritis

Imaging signs indicating the presence of an arthritis

Joint space narrowing

Due to destruction of articular cartilage. It occurs in practically all forms of joint disease, except avascular necrosis.

Soft tissue swelling

Occur due to joint effusion or whenever periarticular inflammation is present. It is, therefore, a feature of inflammatory, and particularly infective, arthritis

Osteoporosis

Osteoporosis of the bones adjacent to joints occurs in many painful conditions. Underuse of the bones seems to be an important mechanism, but is not the only factor

Articular erosions

An erosion is an area of destruction of the articular cortex and the adjacent trabecular bone, usually accompanied by destruction of the articular cartilage

Osteophytes, subchondral sclerosis and cysts

Alteration in the shape of the joint

e.g. developmental dysplasia of the hip and avascular necrosis in its later stages

Osteoarthritis (O.A)

O.A is a degenerative arthropathy, resulting from wear and tear of the articular cartilage, it's the most common type of arthritis, and it's either primary or secondary.

- Primary O.A is a degenerative arthropathy with no apparent underlying or predisposing cause.
- Secondary O.A refers to degenerative changes complicating underlying arthropathy, like rheumatoid arthritis, trauma or Paget's disease.

Primary OA is an asymmetric process involving the large weight-bearing joints, hips and knees, lumbar and cervical spine, distal interphalangeal, first carpometacarpal and lateral carpal joints

The fundamental pathological process in OA is loss of articular cartilage this results in joint space narrowing and abnormal stresses on joint margins; these abnormal stresses lead to the formation of bony spurs (osteophytes) at the joint margins

Radiographic changes of O.A

Joint space narrowing: maximal in the weight bearing portion of the joint, e.g., in the hip maximal in the superior part of the joint whereas in the knee usually at the medial compartments.

Osteophytes: bony spurs, often quite large, which occur at the articular margins.

Sclerosis of joint surfaces: subchondral sclerosis usually occurs on both sides of the joint, often worse on one side.

Periarticular cyst formation: subchondral cysts seen beneath the articular cortex often in association with the sclerosis.

Loose bodies in joints due to detached osteophytes and ossified cartilage debris.

Rheumatoid arthritis (RA)

*The fundamental pathological process in RA is inflammation of synovium.

*Synovial inflammation leads to joint swelling and formation of synovial inflammatory masses (pannus).

Pannus may cause bone erosions and lead to joint deformity

*RA is usually symmetrical in distribution, and affects predominantly the small joints, especially metacarpophalangeal, metatarsophalangeal, carpal, and proximal inter phalangeal joints. Spinal involvement is rare, apart from erosion of the odontoid peg.

*Physical activity lead to more severe form of the disease.

Radiographic signs of RA

Soft tissue swelling overlying joints due to edema of periarticular tissue and synovial inflammation, may also follow joint effusion.

Reduced bone density seen after loss of 25-50% of minerals, its either adjacent to joints (periarticular osteoporosis) believed to be due to combination of disuse and synovial hyperaemia, it's the precursor for erosive changes or generalized due to steroid or limitation of movement, generalized type occur late in disease process,.

Joint space narrowing due to destruction of articular cartilage by pannus.

Bone erosions occur in the feet and hands, best demonstrated in the metatarsal and metacarpal heads, articular surfaces of phalanges and carpal bones, later extensive erosion may disrupt joint surface. it classically occurred at the "bare areas" of bone between edge of articular cartilage and attachment of joint capsule

Supplementary view like “ball-catcher” view (supine 25 oblique), may be need to detect early erosions in hand

Intraosseous cysts (geodes) may be seen beneath joint surfaces (2 to 3 cm in diameter) when these collapsed mark deformity result.

Abnormalities of joint alignment may result from local synovitis weakening the capsule and tendinitis preventing normal musculotendinous action, the subluxation of metacarpophalangeal joints causing ulnar deviation of fingers, and subluxation of metatarsophalangeal joints producing lateral deviation of toes. Another deformities are boutonniere and swan-neck.

With severe disease there may be subluxation at the atlantoaxial joint due to laxity of transverse ligaments which hold the odontoid peg against anterior arch of atlas

This may only demonstrated in film taken with the neck flexed, however it’s well demonstrated on MRI

It’s important to be aware of its existence if the patient is to have a general anesthesia.

Septic arthritis

*Inflammation of a synovial membrane with purulent effusion into the joint capsule followed by articular cartilage erosion by bacterial and cellular enzymes.

*Usually mono-articular

*Usually bacterial (e.g. Staph aureus, Streptococcus, Neisseria gonorrhoeae)

*Is a surgical emergency, can have a rapidly deteriorating course with destruction of the joint.

Source of organism

Direct invasion through penetrating wound, intraarticular injection, arthroscopy or surgery

Direct spread from adjacent bone abscess

Blood spread from distant site

Risk factors: prosthetic joint, joint surgery, IV drug user, diabetes, immunosuppression, elderly, RA

Radiographic features

Imaging generally plays an adjunct role to arthrocentesis in the diagnosis of joint sepsis.

*Distention of the joint due to synovial thickening and effusion lead to displacement of fat plane

*Demineralization (due to hyperaemia and immobilization)

*Joint narrowing: when the inflammation begins to destroy the articular cartilage.

*Erosion of articular cortex both peripherally and centrally

*Destruction of subarticular bone on both sides of the joint.

(Both due to proteolytic enzymes released by the inflamed synovium).

*Sever cases are characterized by massive destruction, separation of bone ends, subluxation and dislocation

*During recovery, bones recalcify and in severe cases fibrous and bony ankylosis may result.

Other imaging modalities

Ultrasound: useful in superficial joint and in children in demonstration of joint effusion, increased peri-synovial vascularity and as a guide for joint aspiration.

CT scan: similar to radiograph

MRI: sensitive and more specific for early cartilaginous damage, enhancement of the synovium and the presence of a joint effusion have the best correlation with the clinical diagnosis of a septic joint.