Ultrasound in Rheumatology

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Lancaster September 2012
Objectives

- Introducing arthritis
- RA
- Technique
- Ultrasound appearances
- Pitfalls
- Other kinds of inflammatory IA
- Role of ultrasound in early disease
- Role of ultrasound in disease management
- Hints and tips
Introducing arthritis

‘Acute or chronic inflammation of one or more joints, usually accompanied by pain and stiffness, resulting from infection, trauma, degenerative changes, autoimmune disease, or other cause’

The American Heritage® Science Dictionary
Introducing arthritis

Osteoarthritis

- Cartilage thins
- Extra bone forms
- Hips, knees, hands commonly affected
- 2 million people/yr in UK seek treatment from GP
Inflammatory arthritis/Rheumatic disease
Many different types!
Inflammatory Arthritis

People seeking help from GP/year

- Rheumatoid arthritis – 350,000
- Gout – 250,000
- Ankylosing spondylitis – 115,000
- Juvenile Idiopathic arthritis – 12,000
- Rarer disorders – Lupus, polymyalgia rheumatica
Rheumatoid Arthritis

- Chronic, progressive autoimmune disease affecting around 600,000 people in the UK
- Commonly starts between the ages of 40 and 60
- Three times more women are affected than men.
- Produces an inflammatory response of the joint capsule or tendon sheath
- Causes swelling, effusion and synovitis
- Leads to destruction of the articular cartilage and erosion of the bone surface

www.nras.org.uk
Common sites

- Wrists
- Metacarpophalangeal joints (MCPjs)
  - Index and middle fingers
- Elbows
- Knees
- Ankles
- Metatarsophalangeal joints (MTPjs)

www.nras.org.uk
Technique: Hand

- Patient/Sonographer comfort
- Systematic approach
- Flexible and dynamic capability, specific for each individual
- Each joint and tendon should be scanned in longitudinal and transverse planes, from one aspect to the other
Technique: Foot

- Ankle joint assessed from anterior aspect
- Transducer moved from medial to lateral in order to assess the whole width of the joint.
- Medial and lateral tendons assessed in both longitudinal and transverse planes.
- MTP and IP joints assessed in both longitudinal and transverse planes.
Ultrasound Appearances
‘Synovitis’
Synovial Hypertrophy and Synovitis

- Synovial proliferation and resulting hypertrophy is the primary event in rheumatoid arthritis that is visible on imaging, but is also common in OA

  ‘Abnormal hypoechoic (relative to subdermal fat, but sometimes may be isoechoic or hyperechoic) intraarticular tissue that is nondisplaceable and poorly compressible’ OMERACT 7 SIG

- When inflamed, synovial hypertrophy becomes active synovitis and is a sign of active inflammatory arthritis

  ‘Synovial hypertrophy which may exhibit Doppler signal’ OMERACT 7 SIG

- The level of synovial hypertrophy and synovitis is related to the grade of activity of disease and grading systems are now widely used by rheumatologists
Grading of synovitis

Grade 0  no synovial thickening
Grade 1  minimal synovial thickening without bulging over the line linking tops of the bones
Grade 2  synovial thickening bulging over the line linking tops of the periarticular bones
Grade 3  synovial thickening bulging over the line linking tops of the periarticular bones with extension

Power Doppler signal.
Grade 0  no flow in the synovium
Grade 1  single vessel signals
Grade 2  confluent vessel signals in less than half of the area of the synovium
Grade 3  vessel signals in more than half of the area of the synovium.

BERNER HAMMER 2011
Be careful.....
Always use Doppler…
Erosions

‘An intraarticular discontinuity of the bone surface that is visible in 2 perpendicular planes.’

OMERACT 7 SIG
Tenosynovitis

‘Hypoechoic or anechoic thickened tissue with or without fluid within the tendon sheath, which is seen in 2 perpendicular planes and which may exhibit Doppler signal.’ OMERACT 7 SIG
Pitfalls - Equipment settings

- Doppler sensitivity – PRF/wall filter and gain

- Light transducer pressure with plenty of coupling gel

- Slow methodical transducer movements to avoid compression of tiny vessels and obliteration of Doppler signal
Pitfalls - Current treatment

- Steroids – oral, intramuscular or infusion - either for the treatment of joint disease or concurrent problems will temporarily reduce inflammation and hyperaemia

- Decrease in inflammation is associated with an decrease in Doppler signal, the use of steroids prior to a scan may mean that a scan appears normal when in fact, there is significant inflammatory arthritis

- Image A shows the joint before steroid treatment, B, 4 weeks after steroids and C, 12 weeks after treatment when the symptoms and Doppler signal are returning
Other kinds of inflammatory arthritis…
Psoriatic arthritis - PsA

- Psoriasis sufferers or family history of psoriasis
- Common presentation of enthesopathy
  Abnormally hypoechoic (loss of normal fibrillar architecture) and/or thickened tendon or ligament at its bony attachment seen in 2 perpendicular planes that may exhibit Doppler signal and/or bony changes including enthesophytes, erosions, or irregularity.

OMERACT 7 SIG
PsA – common sites

- Wrists - synovitis
- Hand/wrist tendon/sheaths – tenosynovitis
- Extensor enthesitis proximal interphalangeal joints (PIPJs)
- Achilles enthesitis
- Plantar fasciitis
- Interdigital bursitis
Gout

Elevated levels of uric acid in the blood
- Synovitis
- Erosions
- ‘Double contour’

Deposition of uric acid crystals on the surface of cartilage

Tophi

Deposition of uric acid crystals in joint capsules or soft tissues
Common sites

- 1st MTPj/knees – synovitis, erosions, DC sign
- Dorsum of foot - tophi in/around tendons
- Achilles/posterior tibial tendons – tophi
- Elbows - bursitis
Pseudogout

- Causes attacks of inflammatory arthritis like gout
- Pseudogout is caused by the collection of salt called calcium pyrophosphate dihydrate (CPPD) within the cartilage instead of uric acid deposits on the surface of cartilage.
- Among older adults, pseudogout is a common cause of sudden (acute) arthritis in one joint.
- Pseudogout mainly affects the elderly.
- Can be difficult to diagnose on ultrasound
Role of US in early diagnosis

- Nice Guidelines
- Early referral to rheumatology
- Early synovitis clinics
- Accurate diagnosis - US
- Alternative diagnoses
Managing inflammatory arthritis

- Early diagnosis
- Aggressive treatment
  - DMARDs
  - Anti TNF
  - Biologic therapy
- Clinical monitoring - DAS score
Role of ultrasound in disease management

- Ultrasound monitoring
  RA patient, on MTX, normal ESR, no pain but mild swelling…

- US DAS?
  RA patient, on Anti TNF, normal ESR, pain but no swelling…
Guided injections/aspirations

- To relieve pain
  - Steroid
  - Local anaesthetic
- To enable mobility
  - As above
  - Hyaluronic acid
- For diagnosis – gout, infection
Hints and Tips

- GP requests – NICE guidelines
- Discuss with Rheumatology
- Revise anatomy – bone and soft tissue
- Ask questions
- Consider associations
- Suggest Rheumatology referral
- Expect the unexpected…
Wrist
Achilles
Associations
But....

Psoriatic arthritis - ? Peroneal tenosynovitis
The aim

To avoid this…

Thank you

Any Questions?
Useful references


Wakefield RJ et al. Musculoskeletal Ultrasound Including Definitions for Ultrasonographic Pathology OMERACT SIG. Journal of Rheumatology 2005