Arthritis Research UK | primary care centre

Keele University

Ultrasound in Rheumatology

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Lincoln Musculoskeletal Ultrasound study day November 2017

The Queen's Anniversary Prizes
For Higher and Further Education
2009

Objectives

- Introducing arthritis
- Inflammatory arthritis
- Rheumatoid arthritis
- Other inflammatory arthritides
- Role of US in early diagnosis
- Role of US 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

- Osteoarthritis
- Inflammatory arthritis

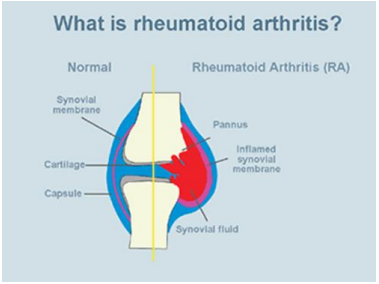
Inflammatory Arthritis

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 (RA)

- Chronic, progressive auto immune disease
- Affects around 600,000 people in the UK, most commonly women and between 40 and 60 years of age
- Primarily affects synovial joints producing an inflammatory response
- Causes swelling, effusion, synovitis and can lead to bone destruction
- Common sites: Wrists, MCPjs 2&3, elbows, knees, ankles, MTPjs



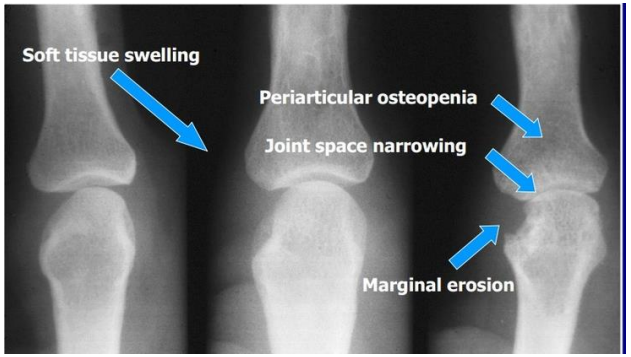
www.nras.org.uk

Treatment for RA

- Early diagnosis
- Aggressive treatment
  - DMARDS
  - Anti TNF
  - Biologic therapy
  - Steroid

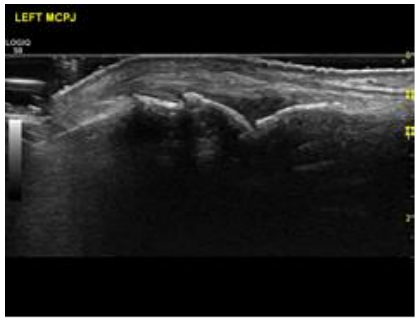
Diagnosis of RA

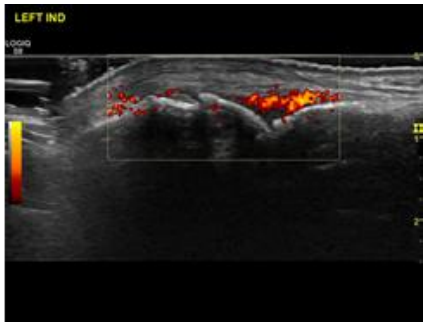
- Can be difficult
- Combination of symptoms, family history, lab tests and imaging
- Blood tests may be negative or inconclusive
- X rays show damage already done



Ultrasound

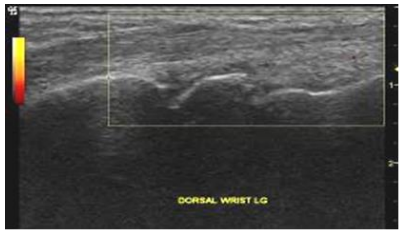
- Safe
- Well tolerated
- Relatively cheap
- Reproducible
- Shows early stages of ‘inflammation’

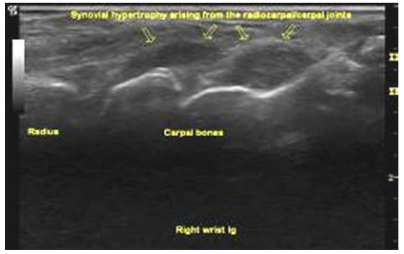


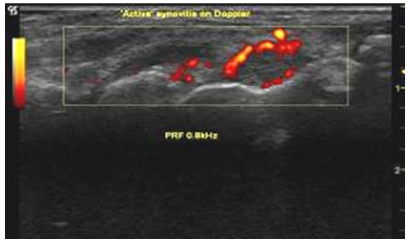


Ultrasound appearances
Synovial hypertrophy/synovitis

- Synovial hypertrophy – primary event visible on imaging
- Hyperaemia- sign of active disease
- Grade of hypertrophy/activity equates to the level of disease/activity

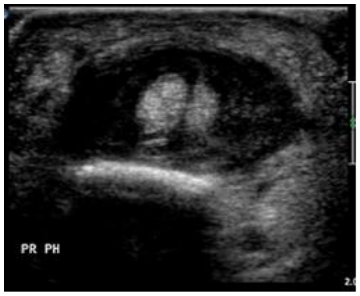


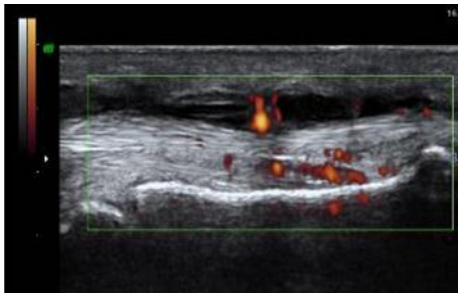




Ultrasound appearances Tenosynovitis

- Inflammation of the sheath lining
- Hypoechoic, hyperaemic lining
- Effusion

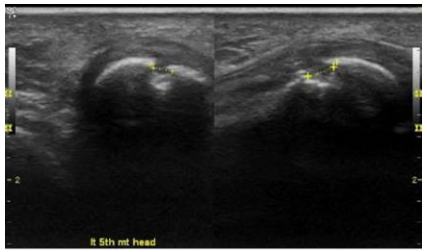


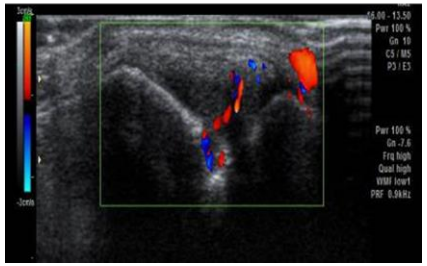


- Know your anatomy….

Ultrasound appearances
Bone erosion

- Progressive destruction
- Targets articular cartilage
- May be seen earlier on US than
  x ray
- Detection of flow within erosion
  a sign of active destruction





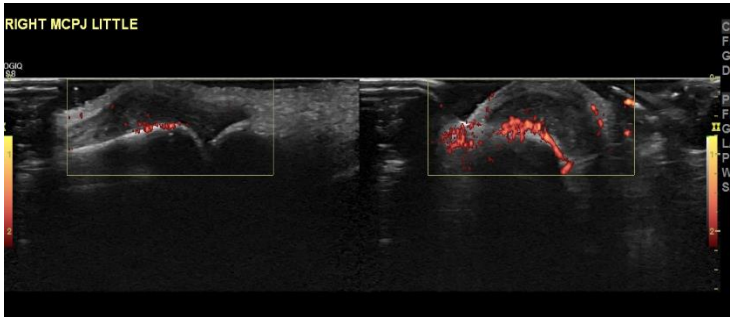
Ultrasound technique

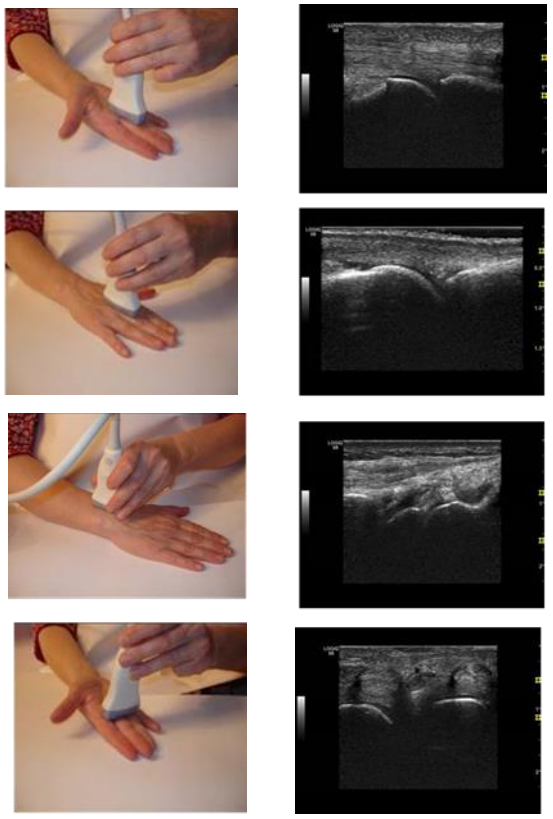
- Equipment
  - Mid to high end machine
  - High frequency transducers
  - Doppler sensitivity to low flow (PRF etc)
  - Thick gel, light pressure

Protocol

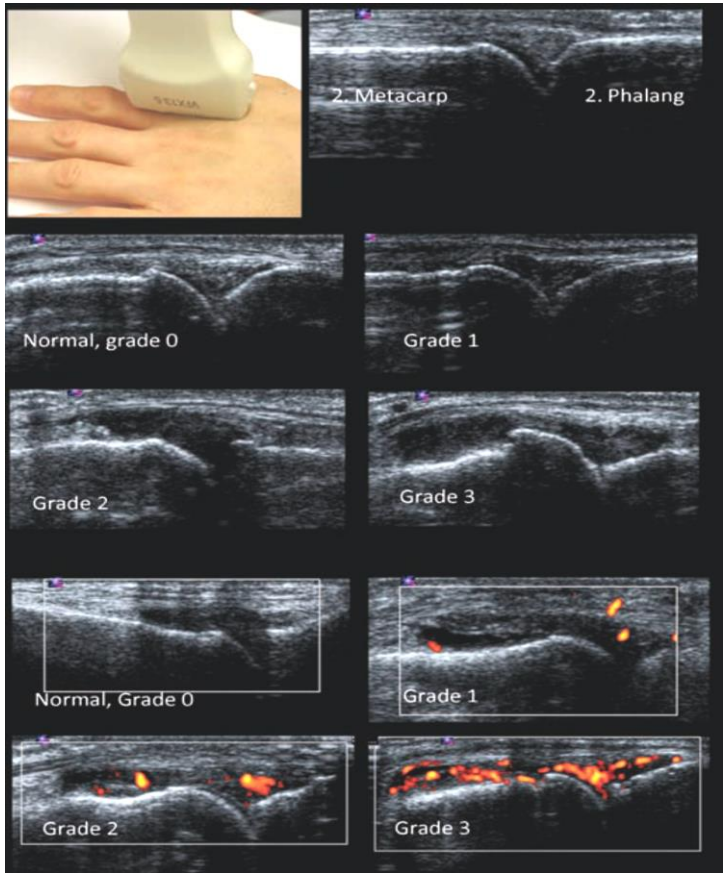
- Small joints and tendons
  - hands
  - feet
  - symptomatic joints?
  - large joints?
- Scan in two planes –

  Find activity in LS, grade in TS





Grading of synovial hypertrophy on grey scale and synovitis on Doppler



Berner Hammer 2011

Normal

Grey scale grading

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 grading

Grade 0 - no flow in the synovium

Grade 1 - single vessel signals

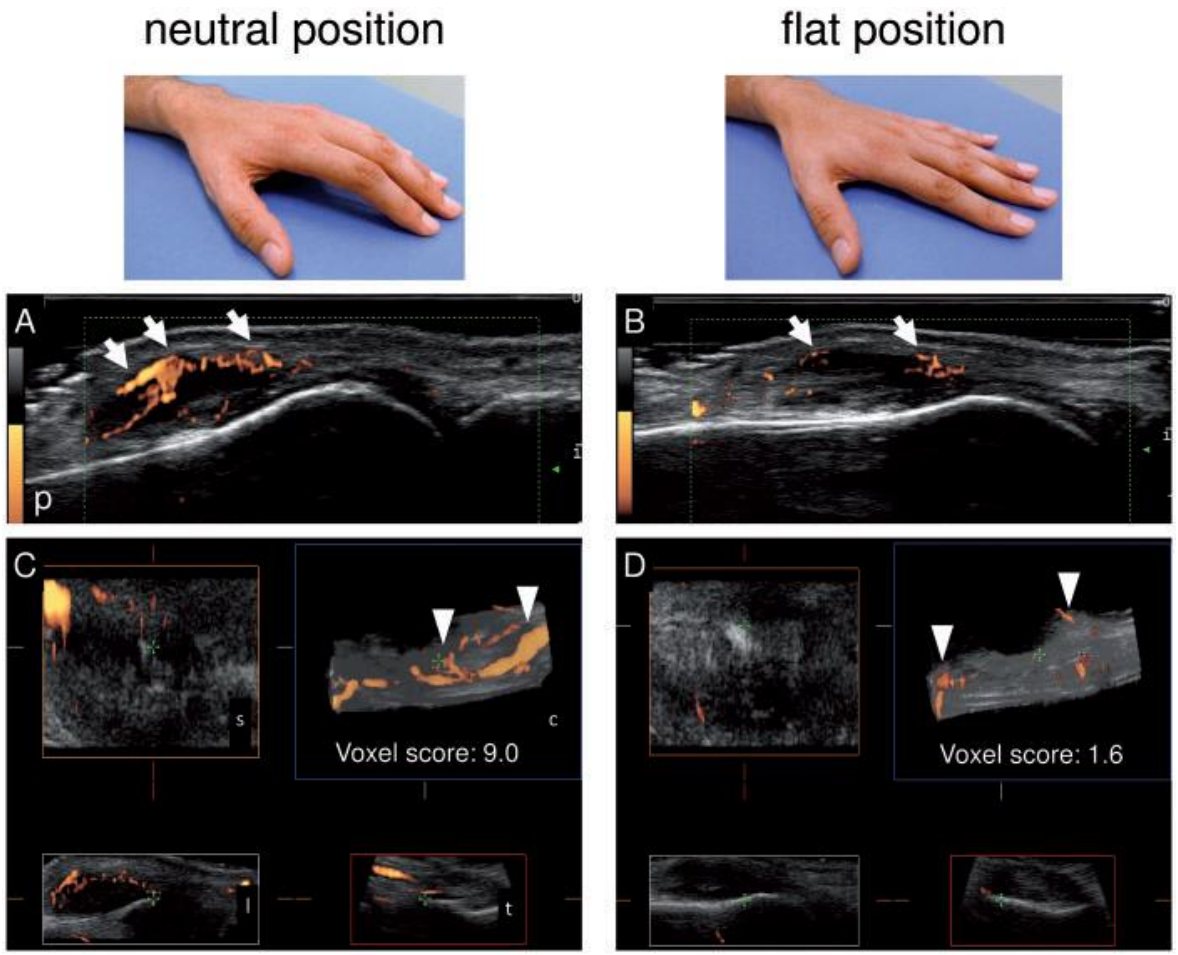
Grade 2 - confluent vessel signals in less than half of the area of the synovium

Grade 3 - vessel signals in more than half of the area of the synovium.

Patient position

- Comfort
- Stability
- Ergonomics

Pitfalls – patient position



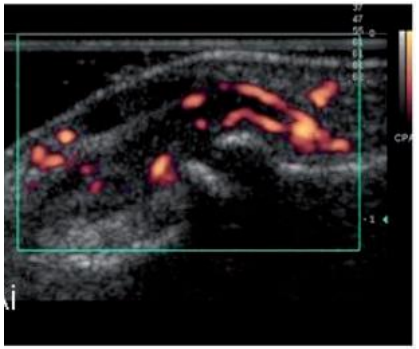
Husic et al 2017

Pitfalls - steroids

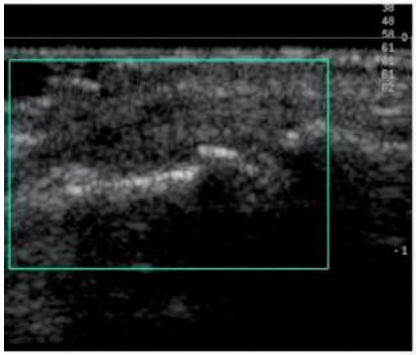
- Oral, intramuscular or infusion will temporarily reduce inflammation and hyperaemia.
- Decrease in inflammation is associated with an decrease in Doppler signal
- Use of steroids prior to a scan may mean that a scan appears normal when in fact, there is significant inflammatory arthritis.

A. Active synovitis before steroid treatment,
B. 4 weeks after steroids
C. 12 weeks after treatment

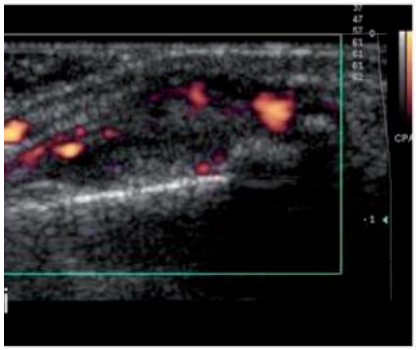
A



B

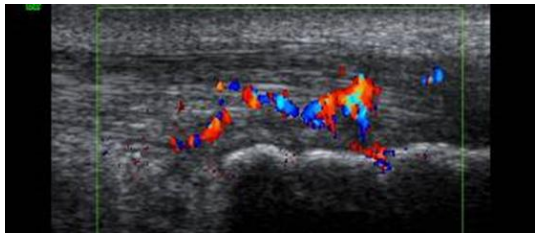


C



Other inflammatory arthritides

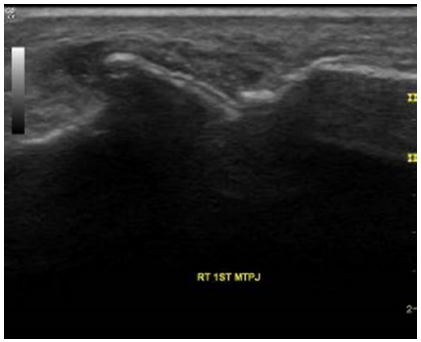
- Seronegative spondyloarthropathy
  - Psoriatic arthritis
  - Ankylosing spondylitis
  - Enteropathic arthritis
- Common sites
  - Wrists - synovitis
  - Hand/wrist tendon/sheaths – tenosynovitis
  - Extensor enthesitis proximal interphalangeal joints (PIPjs)
  - Achilles/plantar fascia enthesitis
  - Interdigital bursitis
  - Subacromial bursitis

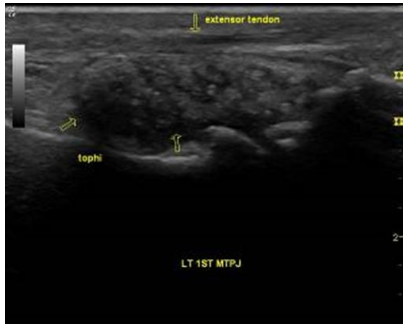


Achilles enthesitis

Crystal arthropathy - Gout

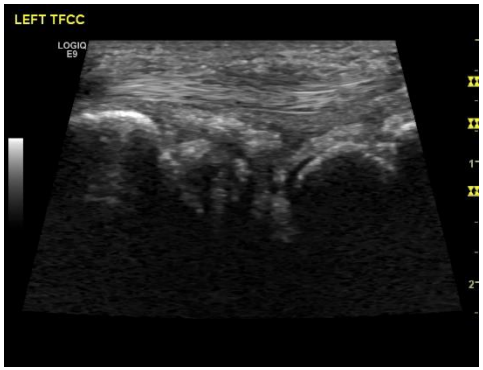
- Acute attacks
- Elevated levels of uric acid
- Deposited on cartilage (double contour) and within soft tissues (tophi)
- Common sites
  - 1st MTPj
  - knees





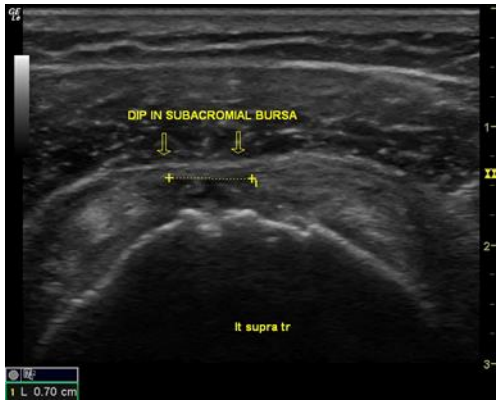
Crystal arthropathy - Pseudogout

- Acute attacks
- Calcium pyrophosphate dehydrate crystals
- Deposited within cartilage
- Common sites
  - Wrist - TFCC
  - Knees - menisci



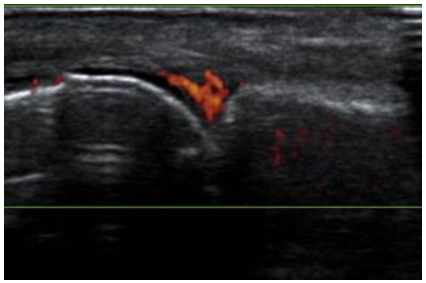
Role of US in early diagnosis

- Nice Guidelines
- Early referral to rheumatology
- Early synovitis clinics
- Accurate diagnosis
- Alternative diagnoses



Role of ultrasound in disease management

- RA patient, on Anti TNF – no clinical signs, ‘asymptomatic’



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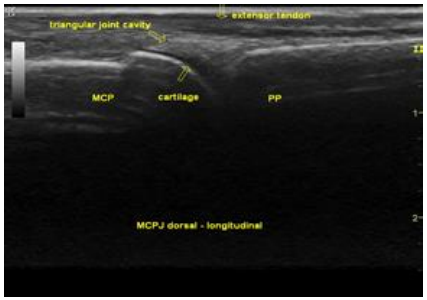


Ultrasound guided aspiration/injections

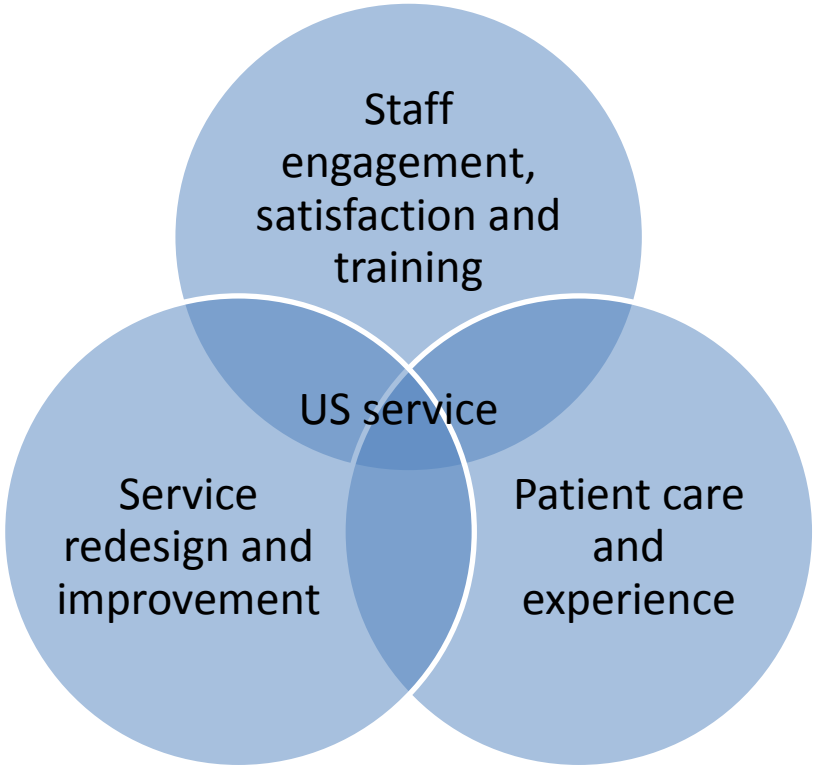
- Increase accuracy – confirm effusion
- Increase safety
- Increase patient satisfaction
- Reduce procedural pain scores

Sibbett 2009

- Improve patient outcome?

Who should image/inject these patients?

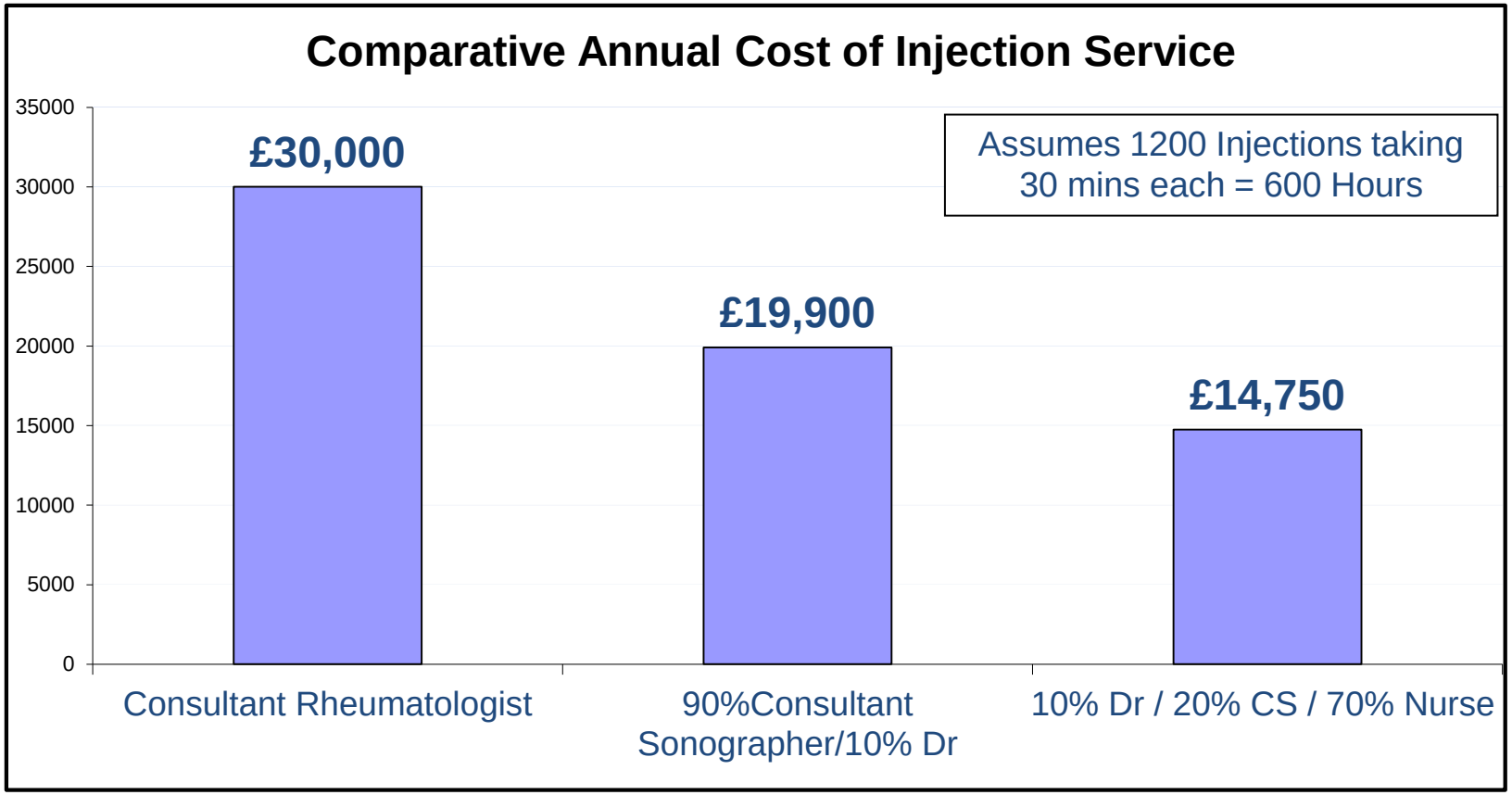
- Radiology
  - Radiologists
  - Sonographers
- Rheumatology
  - Rheumatologists
  - Rheumatology nurses
  - Physiotherapists
  - Occupational therapists
  - Podiatrists



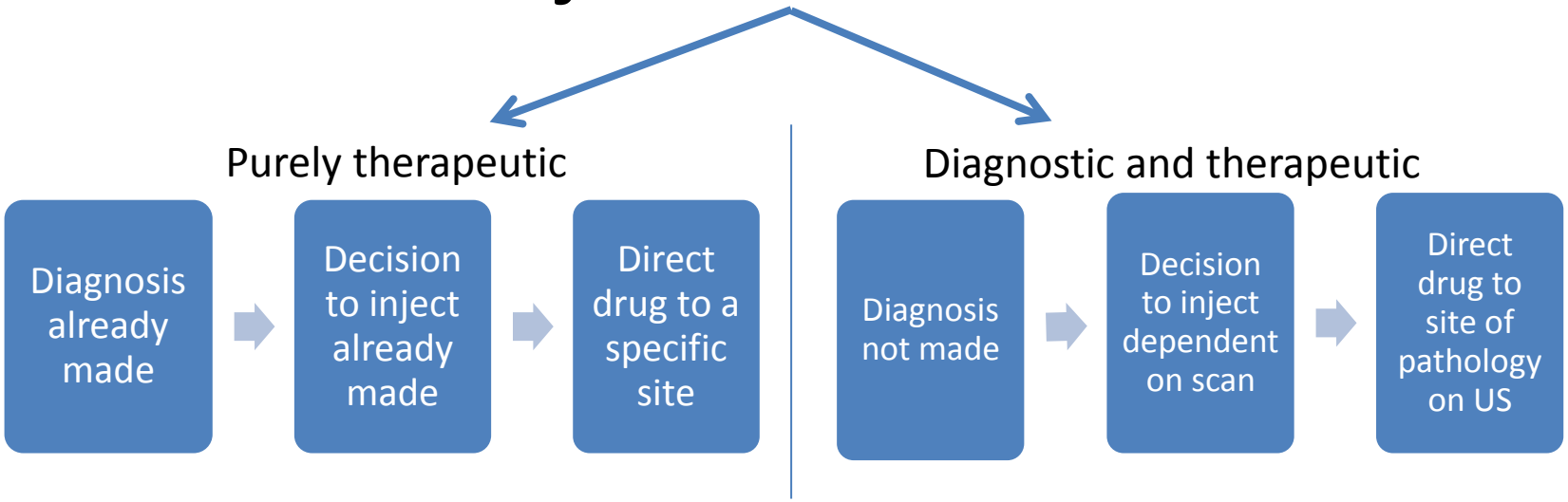
Advantages of a Multidisciplinary team

- Robust service
- Skills used appropriately
- Financially viable

RWT Musculoskeletal ultrasound team


Comparative Annual Cost of Injection Service
35000
30000
25000
20000
15000
10000
5000
0
£30,000
£19,900
£14,750
Assumes 1200 Injections taking
30 mins each = 600 Hours
Consultant Rheumatologist
90%Consultant
Sonographer/10% Dr
10% Dr / 20% CS / 70% Nurse

Who injects? - the choice



Pre requisite: Skills in 'blind' joint injections
Requires training in:
US instrumentation, US anatomy, needle guidance

Pre requisite: Skills in diagnostic MSK ultrasound
Requires training in:
Joint injections

Our model of training for those with injecting skills:

Certificate in focused Ultrasound Practice

- 5 mandatory study days - Principles of ultrasound
- Self directed study- 120 hours
- 2 assignments - Ultrasound physics based
- Portfolio – Reflective diary, case report, practice log book
- 1 area – 30 hours mentored clinical training, 30 patients

Our model of training for those with ultrasound skills:

Principles and Practice of Joint and Soft Tissue Injection

- 4 mandatory study days – techniques, asepsis, management of anaphylactic shock, pharmacology, precautions, professional issues
- Portfolio – critical thinking, evidence of formal training, 10 cases, experiential learning, reflection.
- Assignment in topic related to joint injections

How?

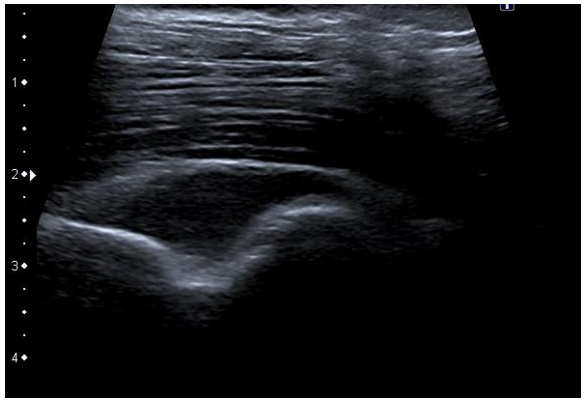
- Mentor
- Core subject assessed/achieved
- Ongoing training – each area assessed separately
- Allows ‘stepped’ approach

Clinical Governance

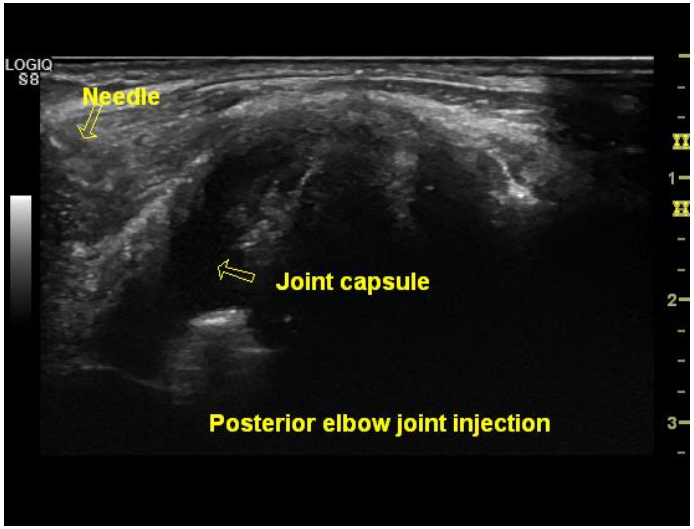
- Medical lead with ultrasound competency
- Contact with Radiology
- Providing a constant service
- Competency
- Machine/Images/Reports
- Protocols – training and delivery
  - RCR publications and guidance
  - Clinical competency

Ultrasound diagnosis + injection

- RA patient with elbow pain
- Request
  - ? Synovitis. If so, for steroid injection

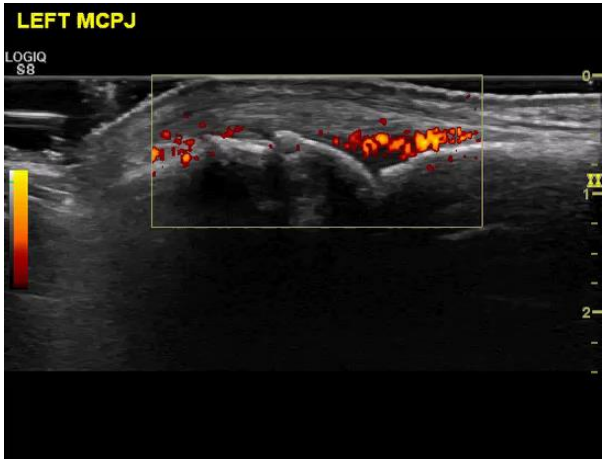


Ultrasound guided elbow injection



Ultrasound diagnosis

- New patient
- Request
  - ? Synovitis MCPjs



  - Refer to rheumatology nurse for IM steroids

In conclusion

- GP requests – NICE guidelines
- Discuss with Rheumatology
- Revise anatomy – bone and soft tissue
- Ask questions
- If in doubt..raise the possibility of an inflammatory condition

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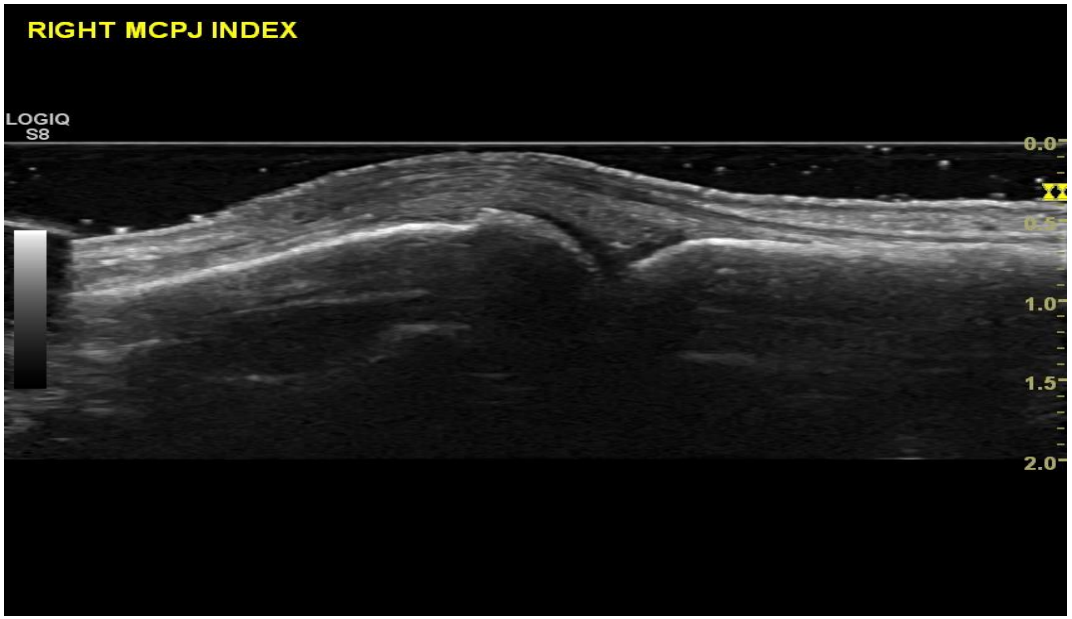
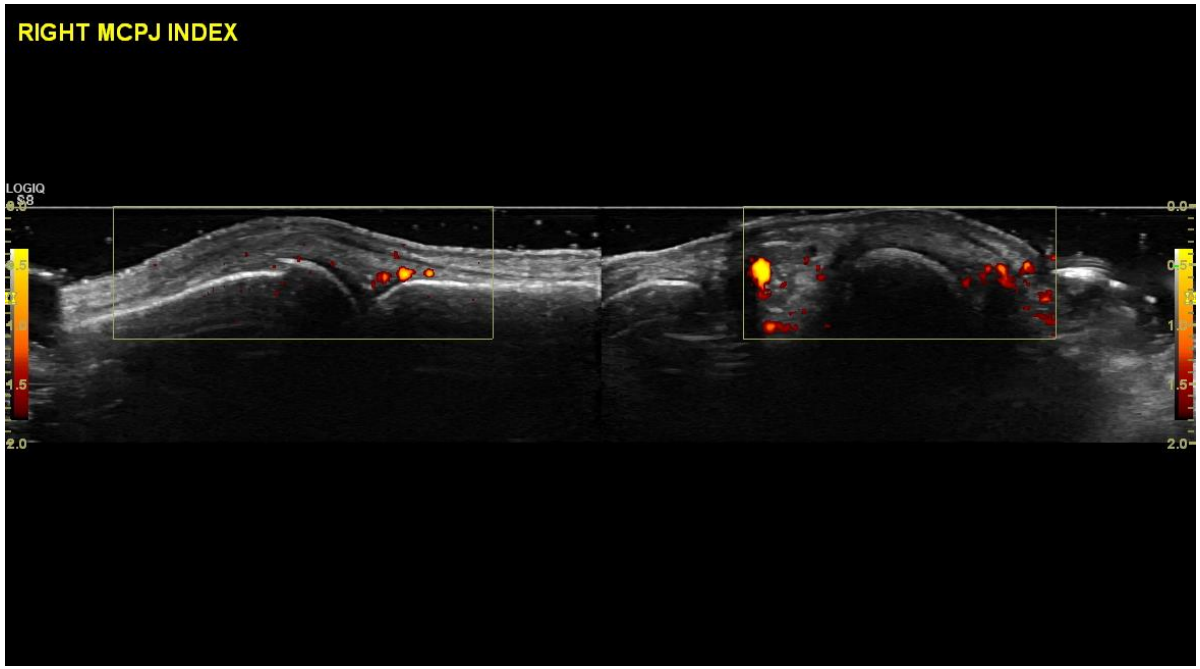
Be careful.....



Always use Doppler…



The aim

To avoid this..

Thank you

Any Questions?

Useful references

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Arthritis Research UK

Providing answers today and tomorrow