

Introduction Lecture

Using imaging to improve patient care in physiotherapy

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Physiotherapy Advanced Practitioners

Legislation & Competency

- IRMER (ionising radiation (medical exam) regulations)
- ICRP international commission radiological protection

www.icrp.org

- CSP & RCR (Clinical imaging requesting guidance)
- Royal Society and College of Radiographers
www.rcr.ac.uk
- Competency documentation and induction

Legal Aspects in Diagnostic Imaging IR(ME)R 2000

- Legal structure defining responsibility
- Employer carries the can- but delegates
- Referrer is responsible for providing adequate clinical details and must prove competence

The referrer shall supply the practitioner with sufficient medical data (such as previous diagnostic information or medical records) relevant to the medical exposure requested by the referrer to enable the practitioner to decide on whether the exposure can be justified

Reporting (RCR)

WHO?

- Appropriately trained radiology department staff
- Referring staff when responsibility for reporting specific categories of imaging examinations has been transferred by written agreement with the clinician(s) concerned and the approval of management.

"a clinical evaluation of the outcome of each medical exposure, is recorded in accordance with the employer's procedures" IRMER (2000)

Standards for the Reporting
and Interpretation of Imaging
Investigations

The future -
?extend your scope to report



Board of the Faculty of Clinical Radiology
The Royal College of Radiologists

SERIOUS PATHOLOGY PATHWAYS

'CODE RED'

2 week referral pathway

What do you have in place?
Who conveys to the patient?

Advanced Practitioner Framework document
Establish pathways

Primary care, secondary care and first contact
practitioner

CSP & RCR

“Clinical imaging requests for non-medically qualified professionals”
(2006 Chartered Society of Physiotherapy)

- HPC registration and CSP? (professional liability)
- IRMER training and additional local training
- Evidence of advanced practice
- Boundaries of knowledge and competence
- Continuing related CPD and IRMER updates
- Competent to understand significance of reported findings and ensure appropriate action is taken. KEY = ability to act
- Establish a means of auditing non-medical referrals, preferably annually.
- RCR refer training resource

Ionising Radiation



Radiation is bad for you

Worse for children

Even worse - foetus

Primary responsibility (?pregnancy?) = referring clinician

Very early (pre-implantation) = relatively radio-resistant

The most sensitive period is 8-15 weeks post conception

Diagnostic XR = largest avoidable source

Wasteful use of XR

- Repeating XR already done
- Investigations unlikely to affect management
- Investigating too often
- Doing the wrong investigation
- Not explaining the question clearly
- Over-investigating (clinician and patient led)

Typical effective doses XR radiation

Area	Effective radiation dose Msv	Equivalent no of chest x-rays	Equivalent back ground dose
Limbs and joints	< 0.01	<1	< 2 days
Chest	0.015	1	2.5 days
Thoracic spine	0.4	30	2 months
Lumbar spine	0.6	40	3 months
Pelvis	0.3	20	1.5 months

ABCs Systematic Assessment

XRAY

Peripheral Skeleton

A = Anatomy, Adequacy, Alignment

B = Bones

C = Cartilage and Joints

S = Soft tissue

MRI

- MR scanner - very strong magnetic field which produces an image by:-
 - 1. First randomly orientated tissue nuclei are aligned by a magnetic field producing a longitudinal magnetisation.
 - 2. Radiofrequency pulses tilt all or a portion of the equilibrium magnetisation into the transverse plane, and the nuclei relax.
 - 3. As the nuclei relax (recover equilibrium), radiofrequency signals are generated and can be measured at selected times.
 - 4. Different tissue nuclei recover at different rates
 - 5. Spatial encoding of the nuclei is allowed by altering the magnetic field in an orderly pattern.

Precautions and contraindications

- **T1**
 - gadolinium enhanced
 - fat suppressed
- **T2**
 - fat suppressed
 - fluid attenuated
 - susceptibility sensitive
- **proton density**
 - fat suppressed
- **diffusion weighted**

Sequences - very basic (radiopedia.org)

- high signal intensity = white
- intermediate signal intensity = grey
- low signal intensity = black

T1

Anatomical

Fluid: low signal (black)

Muscle: intermediate (grey)

Fat: high (white)

T2

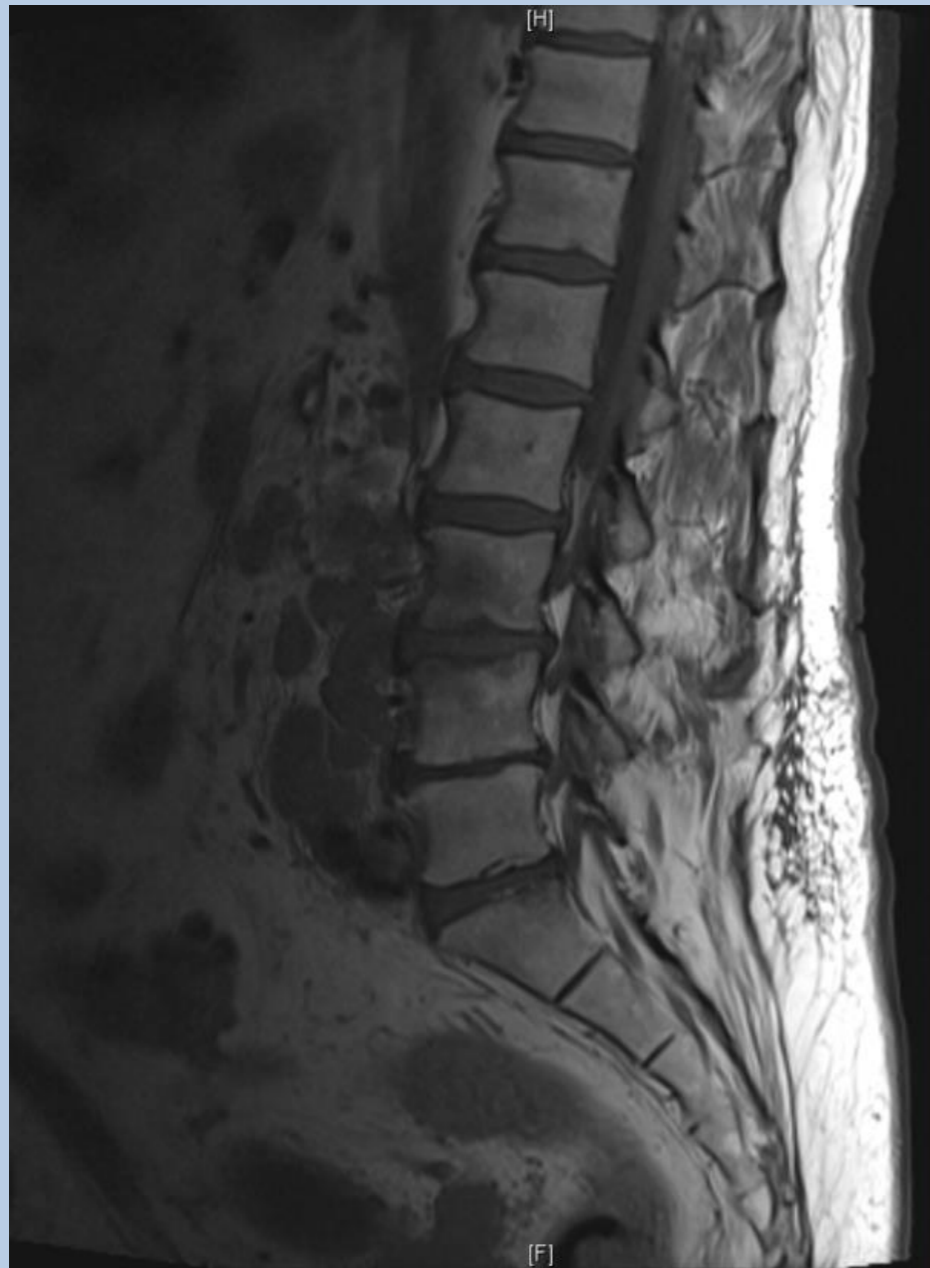
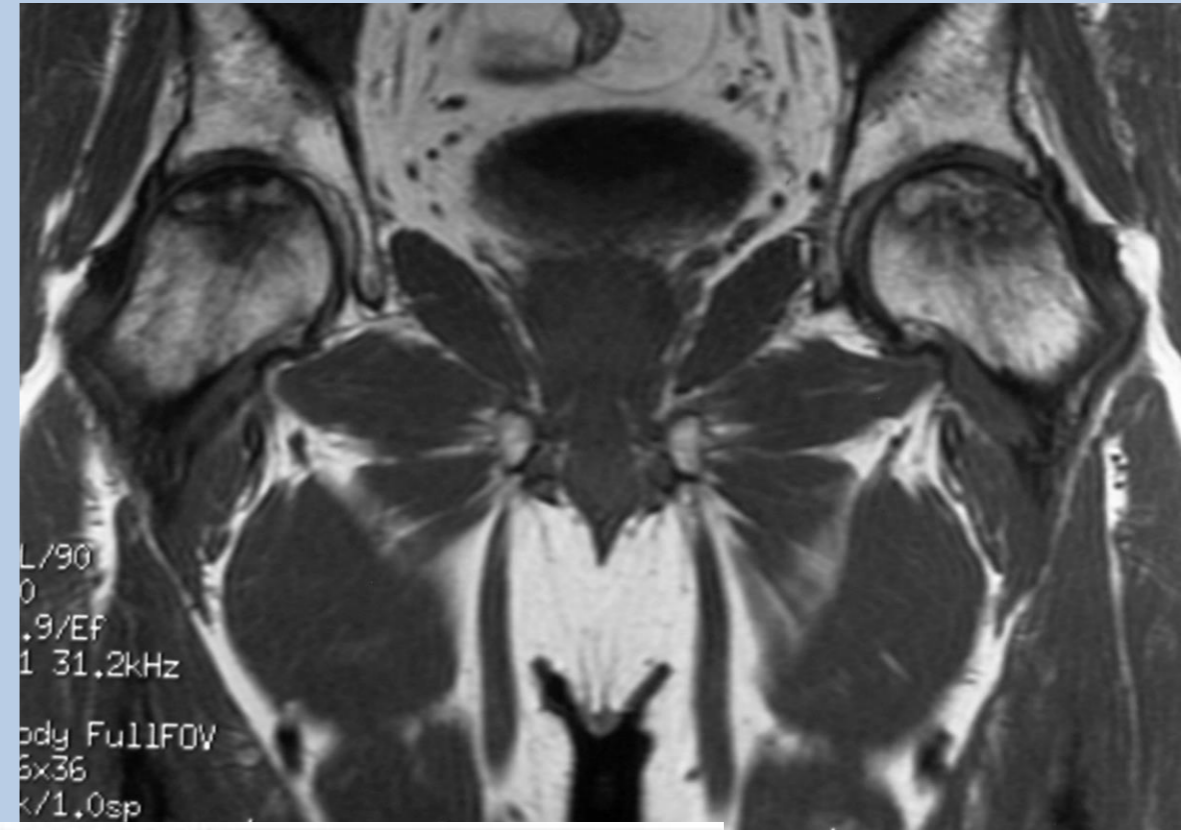
(no mods)

Fluid: high signal (white)

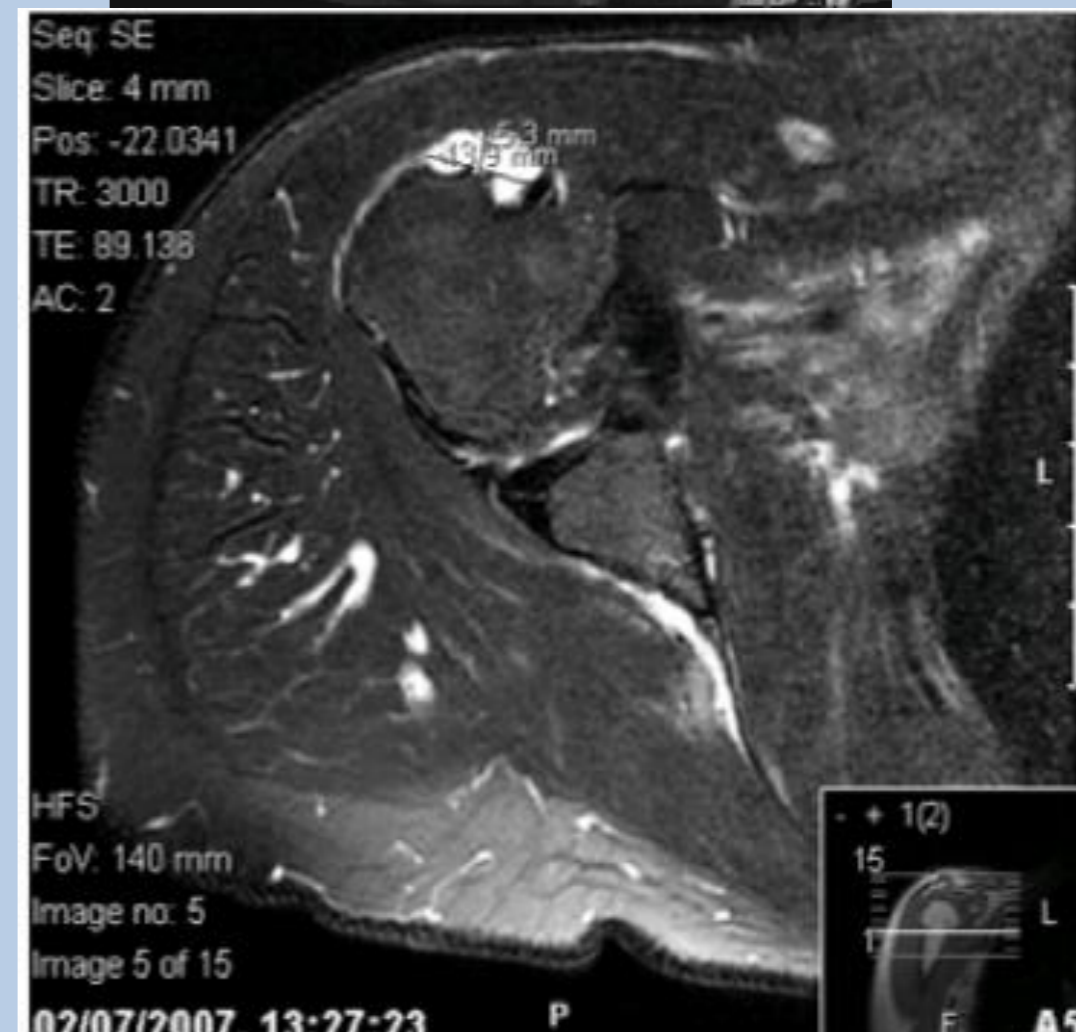
Muscle: intermediate (grey)

Fat: high signal (white)

- T1W image— 1 thing bright
- Fat is bright (high signal)
- Fluid is dark (low signal)



- T2W image-2 things bright
- Fluid is bright
- Fat is still quite bright (unless fat suppressed!)
- T2 fat suppression vs PD



Proton density

The dominant signal intensities of different tissues are:

- fluid (e.g. joint fluid, CSF): high signal intensity (white)
- muscle: intermediate signal intensity (grey)
- fat: high signal intensity (white)
- hyaline cartilage: intermediate signal intensity (grey)
- fibrocartilage: low signal intensity (black)

Proton Density Scans

Proton density

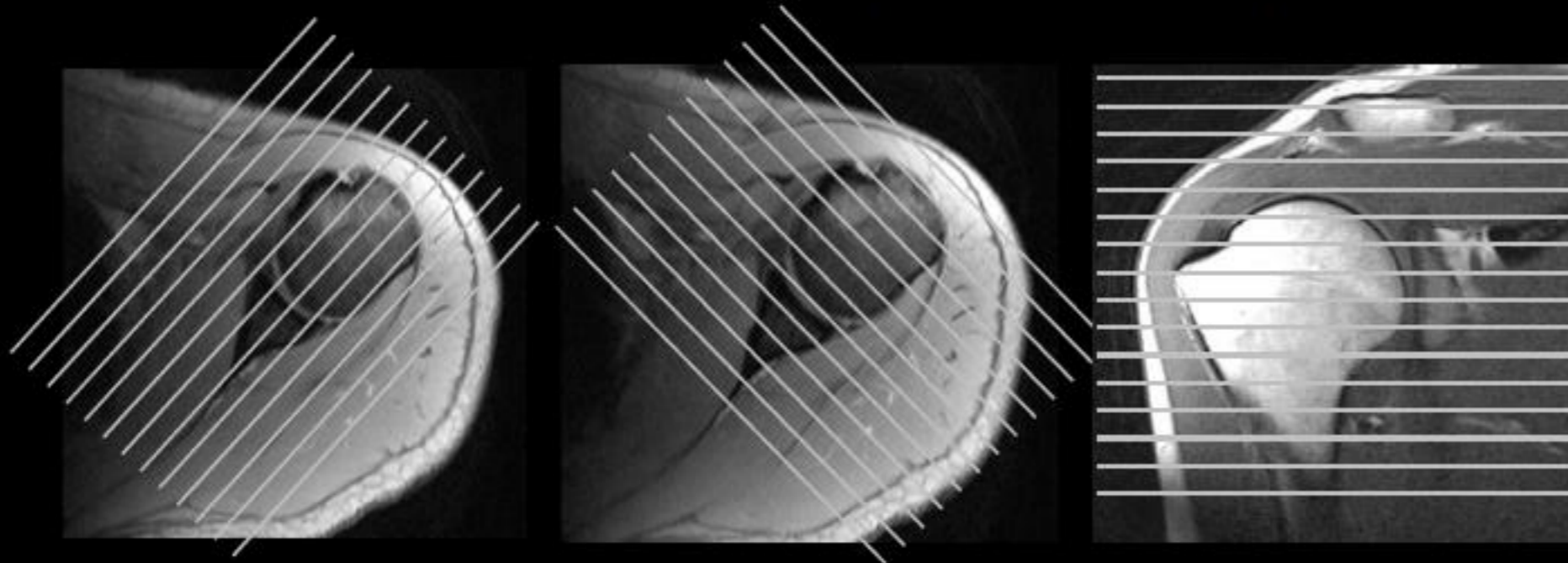
- TR long
- TE Short



Shoulder



- Patient in supine position with arm in mild external rotation
- Coronal obliques parallel to scapular body or parallel to supraspinatus tendon - include entire humeral head
- Sagittal obliques include volume lateral deltoid to scapular body
- Axials include volume from above AC joint to below axillary pouch



ABBREVIATIONS

- Ax = axial
 - Cor = coronal
 - Sag = sagittal
 - FOV = field of view
 - PD = proton density
 - TE = time to echo in milliseconds
 - FS = fat suppressed
 - Int = intermediate
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- Int FS: this is a fat suppressed sequence with a long TR and a TE between that of a traditional PD (e.g. TE= 10-20) and a traditional T2 (e.g. TE=80-100). The advantage of this sequence is that the TE is short enough to maintain sufficient signal for visualisation of the anatomy (like a PD) yet long enough to be more fluid sensitive (like a T2)