

**Occult hip fractures : using MRI in diagnosis and patient management**

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**Published version**

STRAKER, Kirsty and WRIGHT, Chris (2015). Occult hip fractures : using MRI in diagnosis and patient management. In: UKRC Conference, Liverpool, 29th June - 1st July 2015.

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**What are we up against?**  
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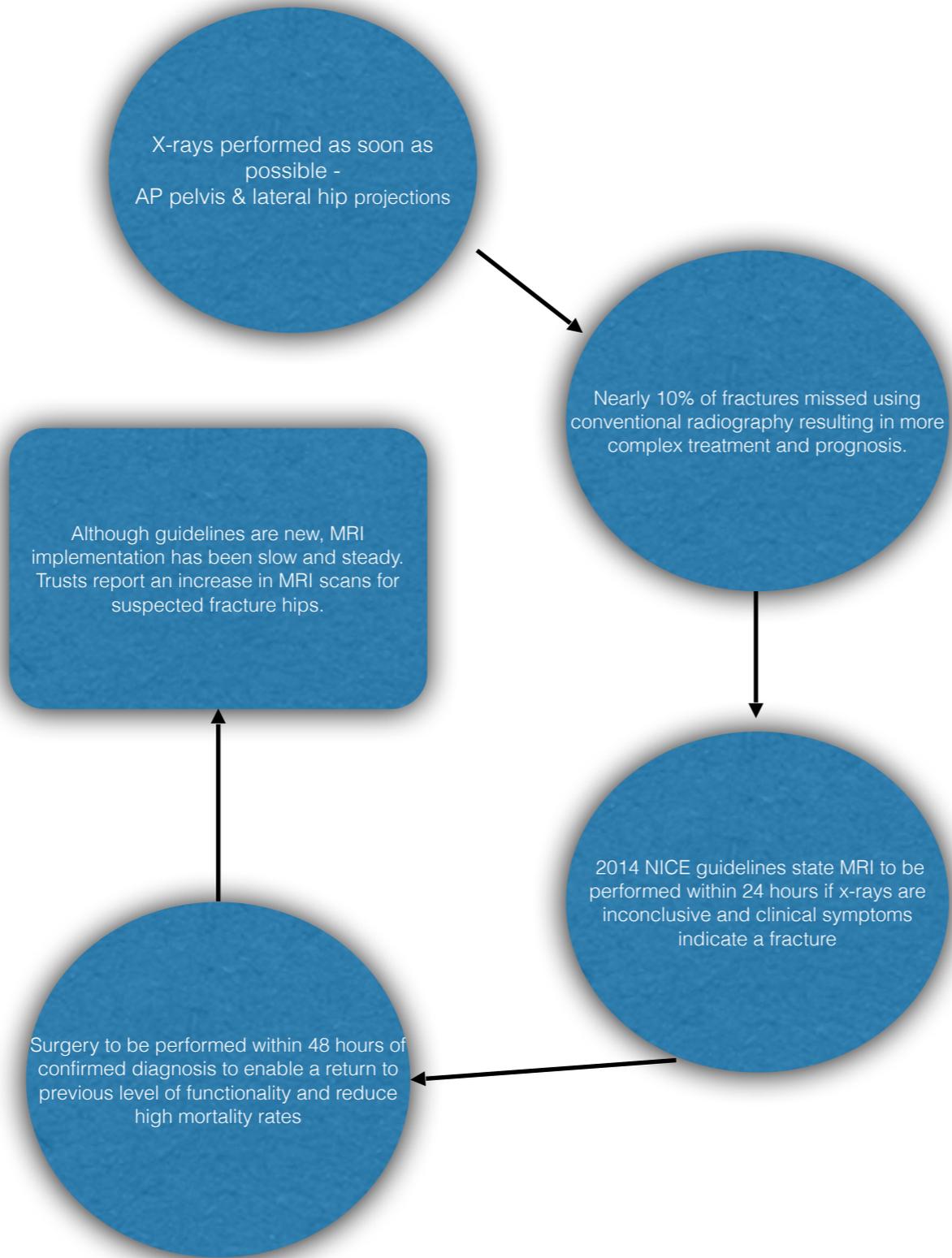
**So why is MRI better?**  
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**Which MRI sequence should be used?**

**Why wouldn't we use MRI?**  
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**What about CT or RNI?**

The key element is that MRI may not show the fracture directly but will show the surrounding oedema



AP hip view of a hip fracture where a subtle fracture is indicated - this could be easily missed. A coronal STIR was performed and the fracture is easily seen. The fracture is worse than expected and the patient had to have a different form of treatment.



# What are we up against?

BACK 

- Hip fractures - a real concern particularly with an ageing population
- 80% of patients are female - average age is 80
- National Hip Fracture database recorded 64,000 hip fractures in 2013 - a figure which is set to double this year
- Worldwide, hip fractures have an average mortality rate of 20-25% primarily due to pre-existing conditions
- NICE data confirms 10% of patients die within a month and a 1/3 within the year
- International Osteoporosis Foundation state 40% of patients are unable to walk independently
- Early diagnosis is critical due to the high dependence on the integrity of the hip
- Cost to the NHS is currently £1.4bn per year
- Sooner treatment is performed - the more positive outcome

# So why is MRI better?

BACK 

According to NICE (2011), MRI has:

- The highest accuracy of 100% sensitivity
- 93% specificity for detecting occult fractures.

MRI is considered the primary choice because of its:

- High diagnostic accuracy
- Superior contrast when applying the appropriate pulse sequences
- Intrinsic spatial resolution
- Ability to image in multiple planes

MRI can detect muscle oedema, bursitis, haematoma and infection which all have impact on patient management. MRI uses radio frequencies instead of ionising radiation. (Verboten 2010)

# Which MRI sequence should be used?



BACK

Selecting the right MRI sequence is crucial as scans take 30 mins which can be difficult for patients experiencing pain as they are unable to remain still, causing the image to degrade.

Performing a coronal T1 weighted image has a sensitivity of 100% - enabling a diagnosis to be made on one sequence (excluding possibility of other injury) - Iwata (2012).

The American College of Radiology (2014) advise performing coronal and axial T2 weighted images. Additional sequences include a SPIR (fat saturation pulse) or STIR (suppresses signal from fat tissue to prevent it obscuring other pathologies). These increase the scan time. ACR recommends using a spin echo (SE) or fast speed echo (FSE) to obtain T1 weighted images. SE improves signal strength yet reduces artefacts - creating a higher resolution but increased scan time. FSE is faster but causes edge blurring and long TR - appropriate for a T2 weighted scan.

Overall, the consensus is that a coronal SE T1 weighted, FSE T2 weighted coronal with either a SPIR or STIR and a T1 and T2 weighted image.

## Why wouldn't we use MRI?

- MHRA guidelines require patients to complete a safety questionnaire due to the risk magnetic fields have on implantable devices. Therefore MRI cannot be used on confused or unconscious patients unless their full medical history is available
- Claustrophobia is a real problem in MRI. 15% of people suffer from claustrophobia and are unable to have their scan (Enders 2011) resulting in financial loss and a waste of a slot.
- Cost, lack of availability (especially out of hours) and long scan times are contraindications for MRI, compared with other modalities e.g. CT. As MRI is increasingly becoming the gold standard, it is difficult to prioritise

## What about CT or RNI?

- CT detects occult hip fractures but has limitations in the resolution of osteoporotic and is unable to illustrate bone marrow oedema
- The Clinical Decision Group recommends CT as an alternative to MRI if it has similar reliability and accuracy to MRI.
- Research shows CT can miss significant fractures that are detectable by MRI, therefore diagnosis cannot be excluded on a negative CT scan and MRI would still be needed. CT also uses ionising radiation and patients also suffer from claustrophobia.
- RNI detects increased uptake in the hip but this can be attributed to arthritis, synovitis and tumour which are pathologies more common in ages 70+. It is common practice to defer the scan for 72 hours after injury to avoid false negatives, which is not appropriate if surgery should be performed within 48 hours. It doesn't provide precise information for surgical planning but does have high sensitivity and specificity at detecting occult hip fractures.

# References

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X-rays performed as soon as possible - an AP pelvis AP centred hip view lateral projection

Nearly 10% of fractures missed using conventional radiography resulting in more complex treatment and prognosis.

2014 NICE guidelines state MRI to be performed within 24 hours if x-rays are inconclusive and clinical symptoms indicate a fracture

Surgery to be performed within 48 hours of confirmed diagnosis to enable a return to previous level of functionality and reduce high mortality rates

Although guidelines are new, MRI implementation has been slow and steady. Trusts report an increase in MRI scans for suspected fracture hips.

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