Whole Body Diffusion Weighted MRI in Multiple Myeloma

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Traditional view of myeloma

New view of myeloma

Why?  
How?  
When?
1. Patients with more than one lesion >5mm on MRI should be considered as having symptomatic disease requiring therapy.

2. Whole body MRI: work up of solitary bone plasmacytoma and all patients suspected of having asymptomatic or smouldering multiple myeloma. (spine+pelvis MRI if WB not available)
Imaging for people with suspected myeloma

1.3.1 Offer imaging to all people with a plasma cell disorder suspected to be myeloma.

1.3.2 Consider whole-body MRI as first-line imaging.

1.3.3 Consider whole-body low-dose CT as first-line imaging if whole-body MRI is unsuitable or the person declines it.

1.3.4 Only consider skeletal survey as first-line imaging if whole-body MRI and whole-body low-dose CT are unsuitable or the person declines them.

1.9.6 For people with myeloma and serological relapse or disease progression, consider one of the following (taking into consideration previous imaging tests):

- whole-body MRI
- spinal MRI
- fluorodeoxyglucose positron emission tomography CT (FDG PET-CT)
**Why WB MRI?**

Why WB DW MRI?

- Miss 50% lesions imaging spine alone
  Bauerle 2009

- DWI more sensitive than conventional MRI

- DWI more sensitive than FDG PET/CT for diffuse and small volume disease

- Combined functional and anatomical data-risk of cord comp and benign vs malignant fractures

- Better differentiation of active vs treated disease than conventional MR

- Quantitative

- Prognosis and Identifying disease and treating early gives a survival advantage

- No ionising radiation
  No iv contrast and ? more cost effective

- Well tolerated by patients

- Why WB MRI?
Asymptomatic Patients

Asymptomatic patients with positive MRI have a shorter time to progression. Hillengass 2010, Moulopoulos 1995, Kastritis 2013...

Patients with high risk SMM randomised between lenalidomide + low dose Dex vs observation, treatment gave a sig OS advantage (Mateos 2013)

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High sensitivity DWI
Pearce et al. BJR 2012
Wu et al. JMRI 2011
Lecouvet et al. Eur Rad 2012

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P< 0.02. Pawlyn et al. *Leukaemia* 2016

MULTIFOCAL

DWI

FDG PET/CT

DIFFUSE

DWI

FDG PET/CT

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Giles et al Radiology 2014
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36 myeloma patients.
Q. Would you have the examination again?
Yes 93%
No 3%
Not sure 4%

Q. How did you find the length of the scan?
Fine 71%
A little too long 25%
Far too long 4%

Otero et al ICIS 2015

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Prognosis and Identifying disease and treating early gives a survival advantage
Patient Preference

107 patients completed questionnaires in the streamline study

Over half of patients undergoing staging scans for suspected colorectal or lung cancer would prefer to have a WB-MRI than CT/ PET-CT

Awareness that WB-MRI does not impart a radiation dose was the item that predicted patient preference for WB-MRI yet only 42% of patients were aware of this attribute.
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Why WB-DWI?

- Early diagnosis
- Preventing SCC
- Early intervention

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Why? ✔

How to perform WB-DWI for patients with myeloma

When
Minimum Protocol

Mechanical complications

Screen 1

T2W

T1W

Screen 2

Trephine sampling

Quantitative

Sensitive staging focal and diffuse disease

Extramedullary disease

45 minutes
When to perform WB-DWI for patients with myeloma - cases not on web version.
Image Guided Theranostics in Multiple Myeloma

Prospective Observational Study

Can we detect very small volume residual disease post auto and how does this relate to outcomes?

Response adapted strategies
Can we use WB-DWI to escalate treatment and improve outcomes?

Diagnostic
WB DWI vs FDG PET/CT vs CT
A non-invasive, sensitive imaging tool designed to provide a package of information tailored to the needs of patients with myeloma

Sensitivity - diffuse and focal disease
Mechanical complications
Quantitative
Acceptable to patients

Providing tools which enable precision and personalized medicine everyday

First line imaging at diagnosis and relapse in UK
Standard of care - trial costs
Future proofing clinical trials

Aligned with other tumour type developments and technologies ie MR-Linac
? PET/MRI

EDUCATION
Royal College of Radiologists ASM - 2015, 2016 and 2017
Royal Marsden Whole Body MRI course - 2015
BIR Hands on Whole Body MRI in Myeloma Course - 2017
International Cancer Imaging Society - 2017
Hands on Royal Marsden Whole Body MRI course 2017
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