Role of new imaging techniques in diagnosing and staging of patients with Multiple Myeloma

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Staging systems

- Durie/ Salmon
- International Staging System (ISS)
- International Myeloma Working Group definitions of MGUS, smoldering myeloma, and multiple myeloma
IMWG Criteria: Role of imaging

• Confirm or exclude damage to mineralized bone
  – Osteopenia
  – Lytic bone lesions
  – (Extraosseous plasmacytomas)

• Asymptomatic multiple myeloma
  – Detect progression into symptomatic stage
  – Assess the risk for early progression

• Symptomatic multiple myeloma
  – Help preventing complications
  – Assess response and detect relapse
New imaging techniques

- Low-dose whole-body CT
- MRI
  - Spinal and pelvic
  - Whole body
- FDG-PET
CT: The facts

• More sensitive for lytic lesions than plain films
  – No superimposition
• Shows solid foci within fatty marrow
• Greater ease for patients
• Radiation dose comparable to plain films
Plain films and CT
Bone marrow lesions in CT
MRI: The facts

- More sensitive for lytic lesions than plain films
- At least as sensitive for focal lesions as CT
- More sensitive for diffuse bone marrow infiltration than CT
- Whole-body MRI not available everywhere
Plain films, CT, and MRI
CT and MRI
FDG-PET: The facts

• Shows solid nodules but not diffuse infiltration
• FDG uptake mirrors activity and treatment response
• Earlier detection of response than with MRI or CT
• Reimbursement and availability issues
Issues

• Osteopenia in early stage plasma cell disorders
• Whole-body assessment
• Response assessment
• Prognosis
Osteopenia in patients with MM or MGUS

- Caused by MM or age / menopause?
  - No specific criteria to differentiate
- Look at bone marrow between trabeculae!
  - Fat density -> Age / Menopause
  - Soft tissue density -> MM
- Use MRI to assess bone marrow
MM stage I + osteoporosis
Small lytic lesions
MM: Diffuse BM infiltration
Whole-body assessment

- Not to miss lesions
- Assess globally treatment response
Diffusion-weighted MRI
Diffusion-weighted MRI: Pre and post treatment
Prognosis
Prognostic significance of DCE-MRI

Residual lesions after autologous stem cell transplantation

Hillengass J et al., Haematologica 2012
How we do it

• MGUS and SMM
  – WB CT in high-risk patients to confirm absence of bone damage
  – Baseline WB MRI + follow-up MRI
  – CT only if progression in MRI

• Symptomatic MM
  – CT for assessing extent of bone damage
  – MRI and / or PET in individual cases
    » Predominant bone marrow involvement
    » Hyposecretory MM
    » Response assessment
New techniques, new problems…

• New imaging feature: Diffuse bone marrow infiltration
  – Seen mainly with MRI

• How to handle patients staged higher than with plain films?

• How to image in future?
  – WB-CT or WB-MRI only?
  – CT plus MRI?
  – Any x-rays if MRI is normal?
  – Role of PET?
  – DWI as poor man’s PET?