MRI and metastases of PCa

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When imaging should be considered for detection of node metastases?

- One proposal in NOT correct
  1. PSA level ≥ 20 ng/ml
  2. c-stage ≥ T2b (palpable bilateral)
  3. Gleason score ≥ 7
  4. MRI stage ≥ T3a
  5. fast doubling time PSA level
When imaging should be considered for detection of node metastases?

- **EAU 2012**
  - PSA level ≥ 20 ng/ml
  - c-stage ≥ T2b (palpable bilateral)
  - Gleason score ≥ 7
  - MRI stage ≥ T3a
PCa staging
Lymphatic spread

• Gold standard: pelvic lymphadenectomy
  – most accurate test if extended (10-15 LNx2)
  – disadvantages for a diagnostic test:
    • invasive, morbidity
    • operating time, cost

• Imaging?
Common iliac lymph nodes

• Three groups
  – group 3 in the lumbosacral fossa

*McMahon et al., Radiographics, 2010*
External iliac lymph nodes

- Cranial to the inguinal ligament
  - group 3: obturator nodes
Internal iliac lymph nodes

• More posteriorly located in the pelvis
  – group 4: hypogastric nodes
Inguinal lymph nodes

- Caudal to the inguinal ligament
  - deep: in the femoral sheath
  - superficial: anterior to the inguinal ligament
LNM of prostate Ca

• **Incidence** *(Budiharto et al, Eur Urol, 2011)*
  – 5-20% of men with a clinically localised PCa
  • subsequent LNM within 10 years post-TT *(Ward et al, Curr Opin Urol, 2012)*
    – >50-70% of men with a locally advanced Ca
      • with a high probability of occult LNM

• **May vary a lot with**
  – the extent of LN dissection
  – the quality of histopathologic analysis
PCa staging
Lymphatic spread

• Unresolved challenge
  – normal size of many metastatic nodes

• Limited accuracy of conventional MRI
  – Se: 39%, Sp: 83% (Hoevels et al., Clin Radiol, 2008)
PCa staging

Lymphatic spread

- A positive node: short axis $\geq 8$mm

- Specificity increased by 18F PET CT
PCa staging
Lymphatic spread: DW-MRI

- DW-MRI ➤ conspicuity of any LN

- ADC value may be lower in metastatic LN*

*Eiber et al., Invest Radiol 2010
PCa staging
Lymphatic spread: DW-MRI

- Evaluated in high risk pts (newly diagnosed PCa)*
  - CT: no pelvic LN involvement (including<5mm)
  - extended dissection as the reference standard

- Results including microscopic invasion

<table>
<thead>
<tr>
<th>LN mets</th>
<th>Se (%)</th>
<th>Sp (%)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>PET-CT</td>
<td>20</td>
<td>89</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>MRI (T2+DW)</td>
<td>40</td>
<td>83</td>
<td></td>
</tr>
</tbody>
</table>

*Budiharto et al., Eur Urol 2011
PCa staging
Lymphatic spread

• Between 5 and 8 mm
  – false rate positive rate: 15-20% (Jager et al, AJR, 1996)
  – asymmetrical (Oyen et al., Radiology, 1994)

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<tr>
<td>CT</td>
<td>78</td>
<td>97</td>
</tr>
<tr>
<td>CT+FNAB</td>
<td>78</td>
<td>100</td>
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PCa staging
Lymphatic spread: unilateral 7 mm LN

- Indication of choline PET-CT
  - true Se, Sp, Accuracy not entirely known
PCa staging
Lymphatic spread: USPIO

before particles

after particles

normal LN
PCa staging
Lymphatic spread: USPIO

before particles

after particles

normal LN

metastatic LN
PCa staging
Lymphatic spread: DW-MRI and USPIO*

*Thoeny et al, 2011, Eur Urol
PCa staging
Lymphatic spread: USPIO*

- **Ferumoxtran**

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<th>Nodes 5-10mm</th>
<th>No USPIO</th>
<th>USPIO</th>
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<tr>
<td>Se</td>
<td>28</td>
<td>96</td>
</tr>
<tr>
<td>Sp</td>
<td>78</td>
<td>99</td>
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<tr>
<td>Acc</td>
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<th>Nodes &lt;5mm</th>
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<tr>
<td>Se</td>
<td>0</td>
<td>41</td>
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<td>Sp</td>
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<td>Acc</td>
<td>86</td>
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- **not currently commercially available**

*Harisinghami et al, NEJMED, 2003*
PCa staging
Bone metastases

• WB-MRI: routinely available thanks to
  – multiple coils, automatic table motion
  – T1W + DW-MRI (C1 to mid femur)
    • no contrast injection
    • evaluation of skeleton AND soft tissues
PCa staging
Bone metastases

- Protocol adapted to time constraints
  - three or four segments (C1-midfemur)
  - DW-MRI: 5 mm thick slabs (b 800)
  - T1W-MRI: ST 5mm
  - optional: STIR if focal abnormality

- Acquisition time: 25mn (no STIR)
Detection of bone metastases: results

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- Choline PET-CT may be considered a second-line exam**

**Picchio et al., Eur J Nucl Med 2012**
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- Choline PET-CT may be considered a second-line exam**

**Picchio et al., Eur J Nucl Med 2012
*Lecouvet et al., Eur Urol 2012
Detection of distant metastases during follow-up treatment

- Probable high negative value of WB-MRI
  - obviate further imaging if normal
- PET-CT may be a second line examination
  - to the specificity of a positive MRI
Conclusion

• N and M staging in selected patients

• WBMRI
  – excellent negative predictive value
  – many competitors: different PET CT

• Early results of PET-MRI
  – not easily evaluable
    • no valuable comparator
      – pelvic coil, 8 channels