SPECT-CT of the skeleton

Ilona Kulakiene
Nemira Jurkiene
Hospital of Lithuanian University of Health sciences Kaunas clinics
Background

- MRI and CT offers precise evaluation of structural changes.
- Skeletal scintigraphy still offers sensitive depiction of functional changes of bone and quick overview of the metabolic integrity of the whole skeleton.
- However, difficulties in precise localization of abnormalities of bone metabolism relative to the complex anatomic features of the skeleton have greatly weakened the clinical role of scintigraphy.
- SPECT/CT overcomes these problems by precisely matching images of body structure and metabolism in one imaging session.
Added value of SPECT-CT

- Helps to distinguishing benign from malignant lesions
- Helps in diagnosis and localization of great variety of bone disorders
- Especially useful in anatomically difficult areas – spine, pelvis, joints
- Evaluates bone pathology not clearly identified on planar bone scan
- Accurate anatomical localization of the lesion helps in guiding additional radiological investigations, tissue biopsy or surgical treatment
The diagnostic confidence increased with fused SPECT/CT images compared with separate sets of scintigraphic and CT images in differentiating malignant from benign bone lesions.

From Utsunomiya D. Added Value of SPECT/CT Fusion in Assessing Suspected Bone Metastasis: Comparison with Scintigraphy Alone and Nonfused Scintigraphy and CT. Radiology 2006
## Combined confidence ratings by scanning modality

<table>
<thead>
<tr>
<th></th>
<th>Benign</th>
<th>Probably benign</th>
<th>Probably malignant</th>
<th>malignant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planar scan</td>
<td>18</td>
<td>45</td>
<td>27</td>
<td>10</td>
</tr>
<tr>
<td>SPECT</td>
<td>33</td>
<td>24</td>
<td>26</td>
<td>17</td>
</tr>
<tr>
<td>SPECT/CT</td>
<td>68</td>
<td>4</td>
<td>4</td>
<td>24</td>
</tr>
</tbody>
</table>

From Heylar V. The added value of multislice SPECT/CT in patients with equivocal bony metastasis from carcinoma of the prostate. EJNMMI 2010
Is the lesion benign or malignant?
Solitary focus of uptake in patients scanned for metastases
Osteoblastic metastasis in the sacrum
Osteoclastic metastases
Osteoclastic metastasis in humerus
Osteoclastic metastasis
After surgery
8 months later
Mixed type metastases in the sternum
Mixed type metastasis in the sacrum
Mixed type metastasis in the ileum
Mixed type metastasis in the vertebra
Mixed type metastasis in the ischium
Metastasis in the ileum and degenerative changes in sacroiliac joints
Osteopoikiliosis
Osteopoikilosis and mets
Horseshoe kidney and intravertebral osteochondrosis
Pseudoarthrosis in the rib
Compressive bone fracture
Schmorl's node
Osteoarthrosis of the facetic joints
Sacroileitis
Psoriatic sacroileitis
Intervertebral osteochondrosis
Met without structural changes on CT
Enchondromatosis
Primary bone tumours
Primary bone tumours
Primary bone tumour 2010.12.10
Post chemotherapy 2011.02.23
Follow up 2012.05.09
Primary bone tumour
Benign bone tumour
Bone infection and inflammation
Osteomyelitis of vertebra
Spondylodiscitis
Osteomyelitis of ileum
Chronic osteomyelitis
$^{99m}$Tc-Scintimun 1 & 4 hours post injection
$^{99m}$Tc-Scintimun
Summary

• SPECT-CT increases specificity and accuracy of the bone scan

• With the use of SPECT-CT in more than 80% of case the diagnosis is done in one step, therefore, decreasing the number of other diagnostic procedures and guiding the priority of test when necessary

• Radiation burden of SPECT-CT is higher than planar bone scan, but lower than additional diagnostic CT