The diagnostic value of SPECT-CT in foot and ankle surgery – a comparison with MRI

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  German Foot and Ankle Society
Background

There are different tomographic imaging options in foot and ankle surgery.

- **MRI** allows a detailed illustration of soft tissue and cartilage.
- **CT-scan** shows best bony structures.

Nonetheless, neither MRI nor CT-scan allow analysis of morphological structures in combination with pathologic bone metabolism.

- **SPECT-CT** is capable to provide functional information via illustrating bone metabolism combined with detailed illustration of anatomical topography.

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**MRI**  
CT-scan of the same foot  
SPECT-CT
Background

► In foot and ankle surgery exact diagnosis can be difficult due to proximity of anatomical structures.

► SPECT-CT provides a high spatial resolution with additional functional information.\(^{(1)}\)

► SPECT-CT has a high inter- and intrarater reliability in a study consisted of 20 patients.\(^{(2)}\)

► The additional information of SPECT-CT leads to a changed diagnosis and treatment decision.\(^{(3+4)}\)

► The aim of this study was to evaluate the impact of SPECT-CT on the treatment decision compared to MRI alone and in combination.
Material and methods

► We performed a **retrospective study** considering **charts and imaging**
► **49 patients** between January 2011 and August 2013
► 26 female, 23 male, age 50.3 ± 13 years
► Indication for SPECT-CT: **complex cases** with diagnostic uncertainty after thorough clinical examination, x-ray and MRI
► Evaluation of **diagnosis and treatment decision** through **three foot and ankle surgeons** analyzing MRI (Evaluation 1), SPECT-CT (Evaluation 2) and MRI + SPECT-CT (Evaluation 3).

<table>
<thead>
<tr>
<th>Evaluation</th>
<th>Procedure</th>
<th>Imaging</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation 1</td>
<td>Clinical examination + x-ray</td>
<td>MRI</td>
</tr>
<tr>
<td>Evaluation 2</td>
<td>Clinical examination + x-ray</td>
<td>SPECT-CT</td>
</tr>
<tr>
<td>Evaluation 3</td>
<td>Clinical examination + x-ray</td>
<td>MRI</td>
</tr>
</tbody>
</table>
## Results

### Interrater agreement

<table>
<thead>
<tr>
<th>Evaluation</th>
<th>Agreement</th>
<th>Cohens kappa</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRI</td>
<td>42.9%</td>
<td>0.38</td>
<td>fair</td>
</tr>
<tr>
<td>SPECT-CT</td>
<td>70.7%</td>
<td>0.68</td>
<td>good</td>
</tr>
<tr>
<td>SPECT-CT + MRI</td>
<td>73.0%</td>
<td>0.71</td>
<td>good</td>
</tr>
</tbody>
</table>

- The **interrater agreement was higher** in SPECT-CT and MRI + SPECT-CT evaluation compared to MRI alone.
- Cohens kappa indicates a **good correlation** in SPECT-CT and MRI + SPECT-CT evaluation compared to a fair correlation of MRI alone.
Results

Agreement between evaluation of SPECT-CT + MRI compared to evaluation of MRI alone or SPECT-CT alone

<table>
<thead>
<tr>
<th>Evaluation</th>
<th>Agreement</th>
<th>Cohens kappa</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRI vs. SPECT-CT + MRI</td>
<td>49.0%</td>
<td>0.35</td>
<td>fair</td>
</tr>
<tr>
<td>SPECT-CT vs. SPECT-CT + MRI</td>
<td>81.6%</td>
<td>0.70</td>
<td>good</td>
</tr>
</tbody>
</table>

► Treatment decision would have been changed from evaluation of MRI alone to MRI + SPECT-CT in **51.0%** of all cases (**fair** correlation).
► In only **18.4%** of all cases the treatment decision would have been changed comparing SPECT-CT vs. MRI + SPECT-CT (**good** correlation).

► Sensitivity 0.92
► Specificity 0.60
► Positive predictive value 0.90
► Negative predictive value 0.67
Conclusions

► We found a high interrater agreement for SPECT-CT and a high agreement of SPECT-CT compared to treatment decision of SPECT-CT + MRI.

► SPECT-CT has a high sensitivity and positive predictive value.

► The availability of SPECT CT would have led to a high rate of changed diagnosis and treatment decision in complex cases of foot & ankle surgery.

► SPECT CT is a helpful diagnostic tool in patients with bony pathologies and clinical uncertainty.
References:


Authors: