SPECT/CT – protocols, applications, results

W. Römer, Passau (DE)

In general, molecular imaging modalities enable the detection of diseased areas with a high lesion-to-background contrast. However, as the tracers used are becoming more and more specific, anatomic details on scintigraphic images are usually not provided. For PET, this problem has been resolved by the introduction of PET/CT-scanners. In recent years, a hybrid camera combining a dual-headed SPECT camera with a low-dose non-diagnostic CT has been commercially available (1, 4, 5). However, more recently, hybrid-cameras combining single-photon emission computed tomography (SPECT) and spiral-CT offer the opportunity to perform a diagnostically sufficient CT of scintigraphically suspicious lesions in one session. Using these systems, the field of view of the CT scan can be adapted to the SPECT findings (SPECT-guided CT; 3). Thus, the additional radiation exposure by CT can be significantly reduced.

Hybrid imaging systems offer the opportunity to exactly correlate the functional information from scintigraphic studies using gamma emitters with morphology in one session. There opens a wide field of application. One of the main indications for SPECT/CT is bone scintigraphy. In bone scintigraphy, the differentiation between degenerative processes and bone metastases is still difficult. Therefore, additional radiological studies are regularly needed after bone scintigraphy. In our routine protocol, the results of the planar whole-body scans and the SPECT determine the decision whether and where to perform the additional CT scan and the field of view is limited to the area containing the suspicious focus of tracer uptake scanning 3 cm above and below. With this approach, the additional radiation exposure to the patient can be kept as low as possible. Since it is known that low-dose CT protocols are appropriate for the diagnosis of bone changes, the tube current can be reduced to 20 to 50 mAs depending on the patient's weight to minimise radiation exposure furthermore. By this way, metastases can be easily differentiated from degenerative changes on CT due to its characteristic morphology (3). Our experience shows that, in addition to an improved diagnostic accuracy, SPECT/CT considerably abbreviates the diagnostic process. With SPECT/CT, an improvement in diagnostic accuracy has also been shown for the tumour scintigraphies, e.g., using In-111 pentetreotide in neuroendocrine carcinomas, I-123-MIBG in neuroblastoma, I-131 in thyroid cancer (5), or Tc-99m-MIBI in parathyroid tumours (2). A further interesting application for SPECT/CT is the sentinel lymph node scintigraphy where it helps to exactly localise the first lymph node draining a tumour (1). Especially for more specific tracers the disadvantages arising from the lack of anatomic background can be compensated by hybrid scanning.

In summary, SPECT/CT is able to improve patients' perspectives by faster, more precise and more reliable diagnoses.

References

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