Overview of SPECT/CT Applications

way to “new & clear” medicine

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SPECT & CT - Definitions

- SPECT (Single Photon Emission Computed Tomography) – “tomographic scintigraphy where computer generated three dimensional images of radioactive tracer distribution are produced by detection of single photons from acquired multiple planar images”

- CT (Computed Tomography) – “tomographic imaging performed with an external x-ray source to derive three dimensional anatomic image data”
SPECT/CT - Definitions

Integrated SPECT/CT Systems

“that can perform both functions on one gantry and provide fused functional and anatomic data in a single imaging session”

“enables a direct correlation of anatomic information and functional information resulting in better localization and definition of scintigraphic findings”
SPECT/CT – pubmed search

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Hybrid SPECT/CT: the end of "unclear" medicine.
Patel CN, Chowdhury FU, Scarsbrook AF.

“Single photon emission computed tomography/CT (SPECT/CT) is a dual modality technique which increases the sensitivity and specificity of existing radionuclide imaging and helps characterize equivocal lesions detected by other imaging methods.”
SPECT/CT - References

**SPECT/CT.**

**SPECT/CT imaging: clinical utility of an emerging technology.**

**A review on the clinical uses of SPECT/CT.**
Current SPECT/CT Systems

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Gamma camera-mounted anatomical X-ray tomography: technology, system characteristics and first images.

“In order to produce anatomical images that are inherently registered with images of emission computerized tomography acquired with a gamma camera, an X-ray transmission system was mounted on the slip-ring gantry of a GEMS Millennium VG gamma camera.”
SPECT/CT imaging: clinical utility of an emerging technology.
Bybel B, Brunken RC, DiFilippo FP, Neumann DR, Wu G, Cerqueira MD.

“The attenuation map is then used by an iterative reconstruction algorithm to perform attenuation correction of the emission data”
Multislice SPECT/CT in benign and malignant bone disease: when the ordinary turns into the extraordinary.

Bone SPECT-CT with 99mTc-labelleled bisphosphonates.
Rasilla JM, Arboniés JC, Gutiérrez LL.
Case # 1 – Whole Body Bone Scan
Case # 2 – Whole Body Bone Scan
Case # 2 – Whole Body Bone Scan
Case # 3 – Whole Body Bone Scan
Case # 3 – Whole Body Bone Scan
Case # 4 – Three Phase Bone Scan
Case # 4 – Three Phase Bone Scan
**SPECT/CT in Imaging Infection**

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**Diabetic foot infection: usefulness of SPECT/CT for 99mTc-HMPAO-labeled leukocyte imaging.**
Filippi L, Uccioli L, Giurato L, Schillaci O.
Case # 5 – Leukocyte Scintigraphy
Case # 5 – Leukocyte Scintigraphy
Case # 6 – Leukocyte Scintigraphy
Case # 6 – Leukocyte Scintigraphy
Case # 7 – Leukocyte Scintigraphy
Case # 7 – Leukocyte Scintigraphy
Case # 8 – Leukocyte Scintigraphy
Case # 8 – Leukocyte Scintigraphy
Comparison of SPECT/CT, SPECT, and planar imaging with single- and dual-phase (99m)Tc-sestamibi parathyroid scintigraphy.

“These findings strongly suggest that dual-phase imaging, with early SPECT/CT whenever possible, should be part of the routine preoperative evaluation of patients with primary hyperparathyroidism in this new age of minimally invasive parathyroidectomy.”
Case # 9 – Parathyroid Scan
Case # 9 – Parathyroid Scan
Case # 10 – Parathyroid Scan
Case # 10 – Parathyroid Scan
Case # 11 – Parathyroid Scan
Case # 11 – Parathyroid Scan
Case # 12 – Octreotide Scan
Case # 12 – Octreotide Scan
Case # 13 – Octreotide Scan
Case # 13 – Octreotide Scan
Case # 14 – MIBG Scan
Case # 14 – MIBG Scan
## SPECT/CT in Thyroid Scintigraphy

Hybrid SPECT-CT and PET-CT imaging of differentiated thyroid carcinoma.

Incremental value of 131I SPECT/CT in the management of patients with differentiated thyroid carcinoma.

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Case # 15 – I-131 Whole Body Scan
Case # 15 – I-131 Whole Body Scan
Case # 15 – I-131 Whole Body Scan
Case # 16 – I-123 Thyroid Scan
Case # 17 – Prostascint Scan
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SPECT/CT in Lymphoscintigraphy

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**SPECT/CT for preoperative sentinel node localization.**
Vermeeren L, van der Ploeg IM, Olmos RA, Meinhardt W, Klop WM, Kroon BB, Nieweg OE.

**Evaluation and localization of lymphatic drainage and sentinel lymph nodes in patients with head and neck melanomas by hybrid SPECT/CT lymphoscintigraphic imaging.**
Mar MV, Miller SA, Kim EE, Macapinlac HA.
Case # 19 – Lymphoscintigraphy
Case # 21 – Sulfur Colloid Scan
Case # 21 – Sulfur Colloid Scan
Case # 22 – Hemangioma Scan
Case # 22 – Hemangioma Scan
Case # 23 – Hepatobiliary Scan
Hybrid SPECT-CT: integration of CT coronary artery calcium scoring and angiography with myocardial perfusion.
Mahmarián JJ.

“Hybrid imaging with SPECT and CT angiography may prove important from a diagnostic and therapeutic view point in several clinical scenarios, and it is likely that over the next decade fusion imaging may more precisely tailor therapy, reduce healthcare costs, and improve patient outcome.”
Case # 24 – Myocardial Perfusion Imaging
SPECT/CT in Pulmonary Embolism

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SPECT/CT in V/Q scanning.
Roach PJ, Gradinscak DJ, Schembri GP, Bailey EA, Willowson KP, Bailey DL.
Acute pulmonary embolism detected by perfusion SPECT/CT masquerading as an intermediate probability planar V/Q scan.
Lu Y, Fox JJ.
Acute pulmonary embolism detected by perfusion SPECT/CT masquerading as an intermediate probability planar V/Q scan.
Lu Y, Fox JJ.
Case # 26 – Lung Scan
SPECT/CT: Conclusions and Issues

- Improved Sensitivity and Specificity
- Excellent anatomical localization
- Morphological characterization

- More confident reporting
- Less indeterminate findings
- Biopsy assistance
- Dosimetry

- CT quality
- Reimbursement
- Radiation exposure
- Study time