



# Quantitative SPECT Builds Diagnostic Confidence

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SPECT imaging plays an important role in patient diagnosis, staging and therapeutic management by providing metabolic and functional information. The introduction of SPECT/CT systems now enables observation of functional information from SPECT, along with anatomic information from CT on the same cross section for a more precise evaluation. It has also been reported that the diagnosis of bone metastasis is significantly improved by utilizing SPECT/CT.<sup>1,2</sup>

In addition, by performing CT-based attenuation correction, it is possible to obtain SPECT images that accurately capture the distribution of radioactivity in the body. For SPECT/CT absolute quantitative evaluation, advancements in software development are indispensable.

Our facility recently began using Q.Metrix, quantitative software for SPECT/CT with Discovery™ NM/CT 670 and we are investigating its use with <sup>123</sup>I-MIBG in neuroblastoma and liver cases and with <sup>99m</sup>Tc-HMDP in bone cancer cases.

## Case 1 Patient history

A pediatric patient with neuroblastoma.

## Acquisition

### SPECT

<sup>123</sup>I-MIBG, 74.1 MBq

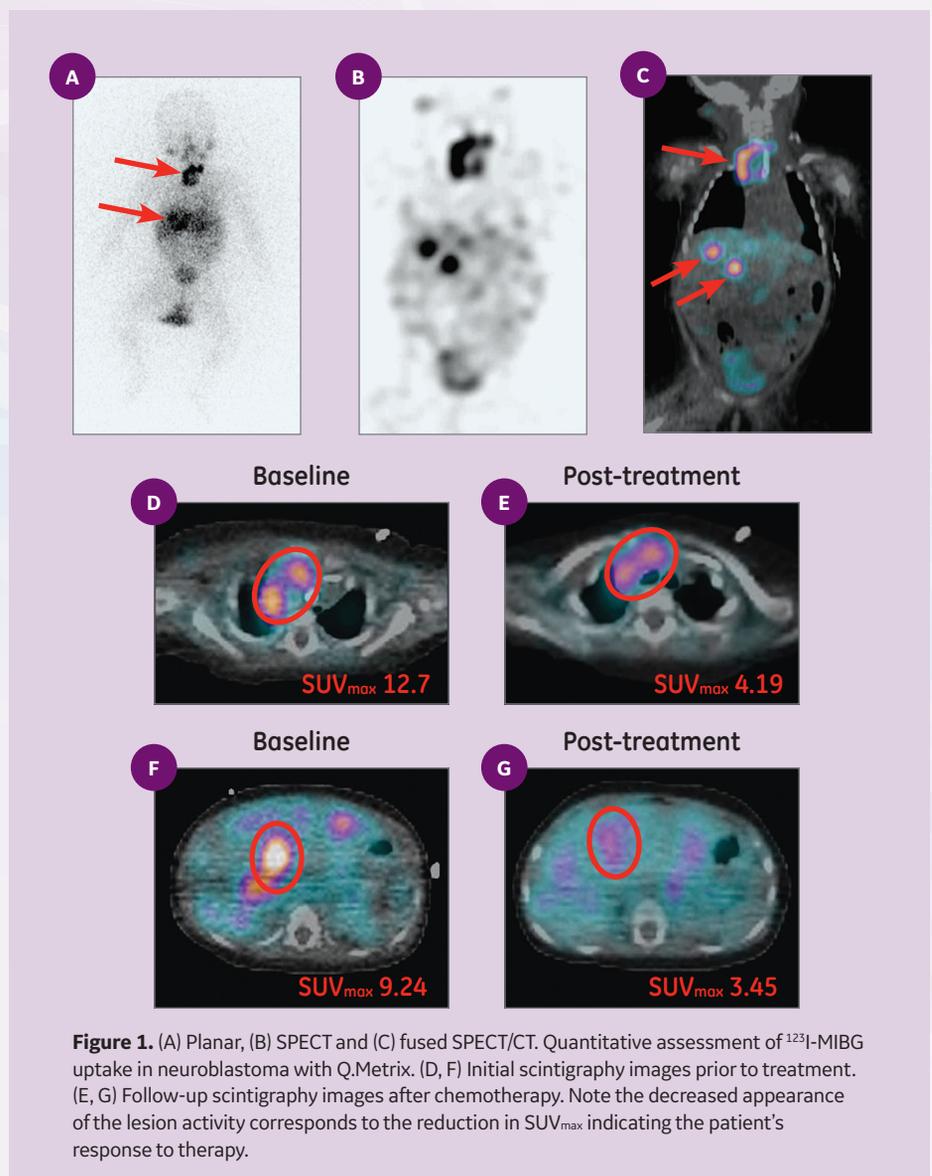
LEHR collimator, 60 steps, 18 sec/step,

128 x 128 reconstructed by OSEM (iteration, 2; subset, 10) with AC, SC and Evolution.

### CT

10 mA, 100 kVp, pitch 1.375

ASiR™ 50%, CTDI<sub>vol</sub> 0.20 mGy





## Findings

On  $^{123}\text{I}$ -MIBG scintigraphy, primary tumor was present in the cervical region of the mediastinal space and the hepatic lesions considered to be metastasis were also seen. (Figure 1)

It was difficult to accurately evaluate the extent of the lesion in the planar image. With SPECT, we were able to detect multiple lesions in the liver, which we could localize with the addition of CT. Patient was subsequently referred to MRI.

## Discussion

In the  $^{123}\text{I}$ -MIBG study, we can qualitatively detect a reduction in the primary liver tumor; however, it is difficult to state the extent of diminished physiological accumulation of activity with a level of certainty based solely on the visual interpretation of SPECT images.

With Q.Metrix, we are evaluating if we can assess the lesion objectively with SPECT SUV.<sup>3</sup> When measuring the SUV of the lesion with Q.Metrix, it is indicated that the degree of accumulation is considerably reduced after treatment (Figure 1E, 1G). In this case, the patient's therapy is working.

## Case 2

### Patient history

A high BMI patient with known breast cancer complaining of lower back pain.

### Acquisition

Whole-body planar followed by 3 SPECT/CT FOVs.

#### SPECT

$^{99\text{m}}\text{Tc}$ -HMDP, 880 MBq  
LEHR collimator, 60 steps,  
15 sec/step, 128 x 128  
reconstructed by OSEM  
(iteration, 2; subset, 10) with AC,  
SC and Evolution.

#### CT

100 mA, 120 kVp, pitch 1.375  
ASiR 50%, CTDI<sub>vol</sub> 3.4 mGy

## Findings

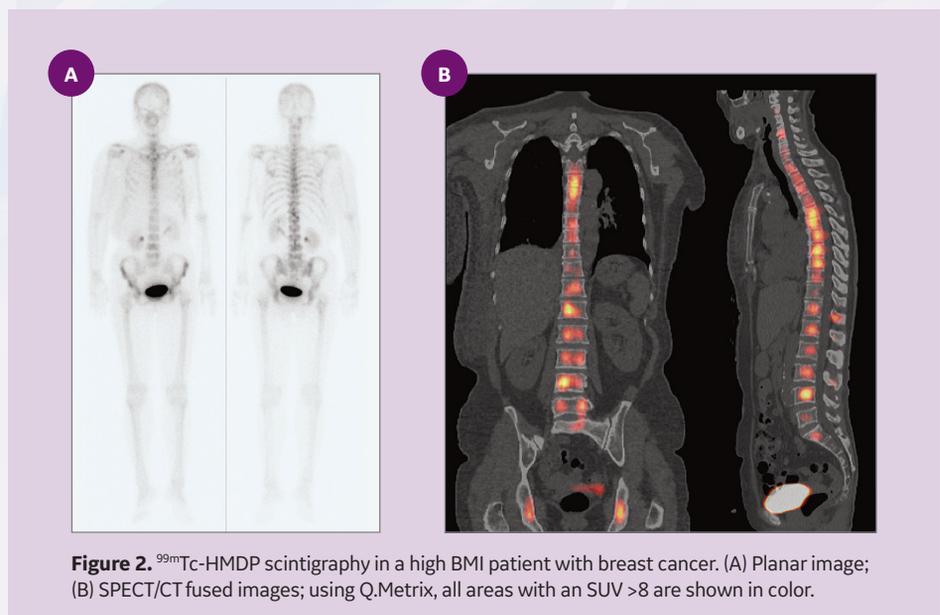
Using Q.Metrix for a quantitative assessment, we examined normal bone accumulation. ROIs were placed in the cervical vertebra, the lumbar vertebra and the thoracic vertebra. In normal bones, the SUV<sub>max</sub> rarely exceeds 8; values higher than 8 are judged to be abnormal. Using 8 as the SUV cut off helps support the clinical diagnosis. In this case, quantitative evaluation with Q.Metrix showed multiple regions with an SUV<sub>max</sub> higher than 8. Thus, it indicated multiple bone metastases with diffused accumulation (Figure 2).

## Discussion

In addition to the diagnostic value of using SPECT/CT imaging, we recently began evaluating the prognostic outcome based on SPECT SUV results. In a retrospective analysis of 41 prostate cancer patients, we have noted a lower survival rate in cases with multiple lesions having an SUV<sub>max</sub> of 8 or higher, excluding cases with obvious degeneration. This will help us determine the appropriate course of treatment and improve progression-free survival rates. ■

#### References

1. Utsunomiya D, Shiraishi S, Imuta M, et al. Added Value of SPECT/CT Fusion in Assessing Suspected Bone Metastasis: Comparison with Scintigraphy Alone and Nonfused Scintigraphy and CT. *Radiology* 2006;238:264-271.
2. Palmado H, Marx C, Ebert A, et al. Whole-body SPECT/CT for bone scintigraphy: diagnostic value and effect on patient management in oncological patients. *EJNMMI* 2014;41:59-67.
3. Various studies have illustrated that SPECT SUV may be clinically important. The clinician is ultimately responsible for the final interpretation and diagnosis based on standard practices and visual interpretations of all SPECT data.



**Figure 2.**  $^{99\text{m}}\text{Tc}$ -HMDP scintigraphy in a high BMI patient with breast cancer. (A) Planar image; (B) SPECT/CT fused images; using Q.Metrix, all areas with an SUV >8 are shown in color.