



# First Discovery IQ System in South Korea Helps DCUMC Reduce Dose and Improve Image Quality

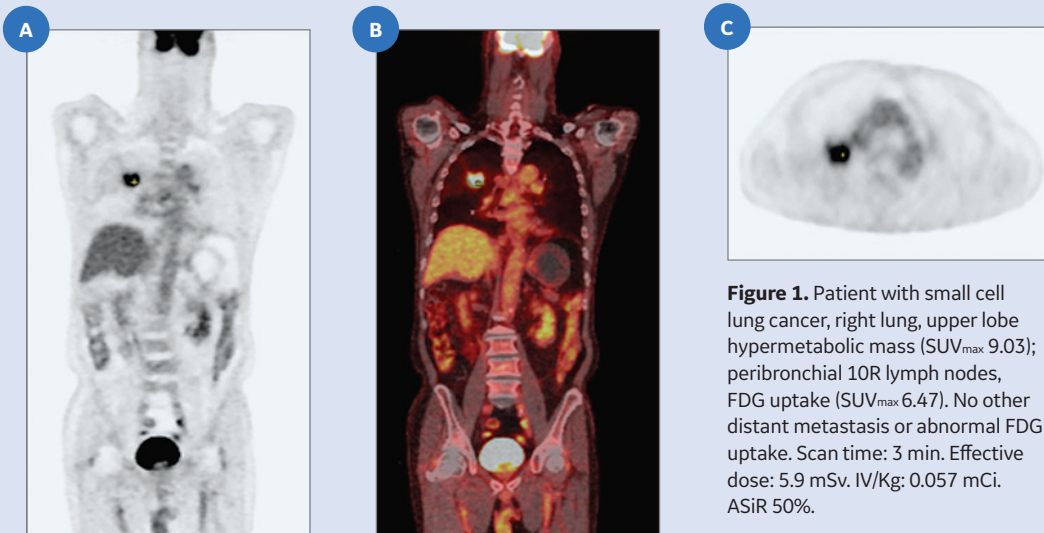
Founded in 1979, Daegu Catholic University Medical Center (DCUMC) is one of the premier hospitals in the Yeongnam region of South Korea. DCUMC has 30 medical departments with a renowned team of 200 professors, 200 medical experts and over 1,500 nurses who treat both local and international patients. The facility was ranked 1st in the national evaluation of medical institutes by the Ministry of Public Health and Welfare in 2004.

As part of the hospital's renewed mission to focus on patients and innovation, it felt the time was right to move beyond the Discovery™ ST system it had been using since 2004. To ensure better clinical outcomes, the new PET/CT scanner must deliver high image quality but also allow for reduced radiation exposure to patients—an objective of especially high importance since Japan's Fukushima nuclear accident in 2011, which raised concerns about the dangers of overexposure to radiation. Additionally, an innovative scanner that enabled reduced dose levels to patients would have the added benefit



of reducing the amount of tracer the hospital required, as it does not have an in-house cyclotron.

New guidelines and regulations also played a role in the hospital's decision-making process. The Korean Society of Nuclear Medicine recently updated their recommendations to regulate patient dose below 12 mSv for PET/CT scans. And, in 2015, the government began reducing reimbursements for PET/CT scans, prompting a significant decrease in PET/CT scans.



**Figure 1.** Patient with small cell lung cancer, right lung, upper lobe hypermetabolic mass (SUV<sub>max</sub> 9.03); peribronchial 10R lymph nodes, FDG uptake (SUV<sub>max</sub> 6.47). No other distant metastasis or abnormal FDG uptake. Scan time: 3 min. Effective dose: 5.9 mSv. IV/Kg: 0.057 mCi. ASIR 50%.

These driving forces led DCUMC to replace their Discovery ST with the Discovery IQ 4-Ring PET/CT system—the first Discovery IQ system in South Korea. The facility uses the new system primarily for oncology and neurology scans to manage



approximately 120 oncology and 30 Parkinson's Disease cases each month.

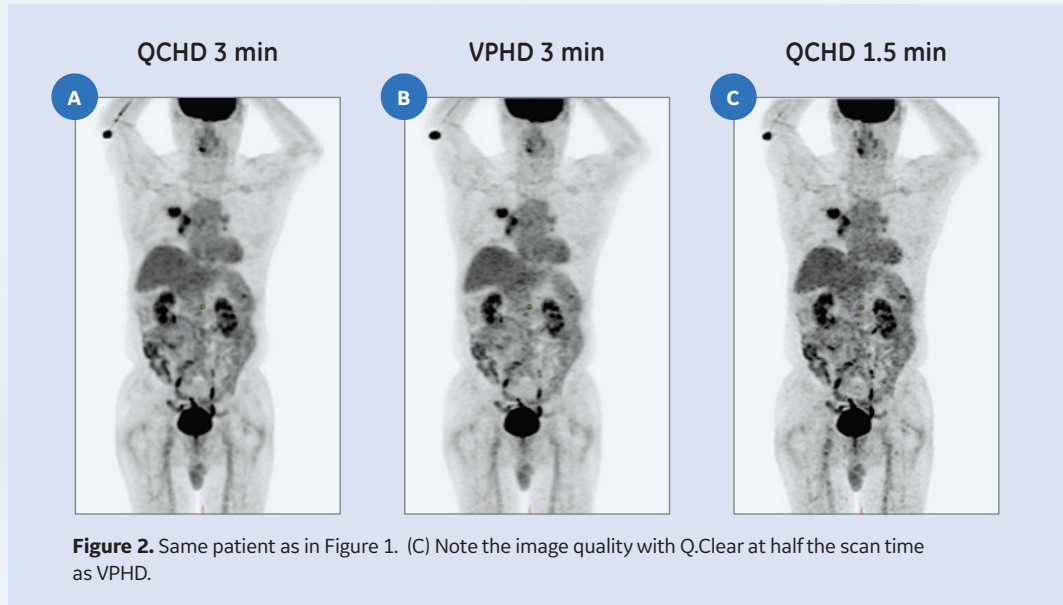
With Discovery IQ, DCUMC has achieved a low injection dose with a high sensitivity of 14 cps/kBq—without reducing scan times. They also now have a system with an extended axial field-of-view (FOV) up to 20.8 cm, a smaller overlap ratio of just 24% and high quantitative accuracy from both Q.Clear and fast electronics with dual acquisition channels.

One of the deciding factors in purchasing the Discovery IQ system was Q.Clear, GE's pioneering image reconstruction technology that provides up to two times the improvement in image quality (signal-to-noise ratio [SNR]) and quantitation accuracy ( $SUV_{mean}$ ).

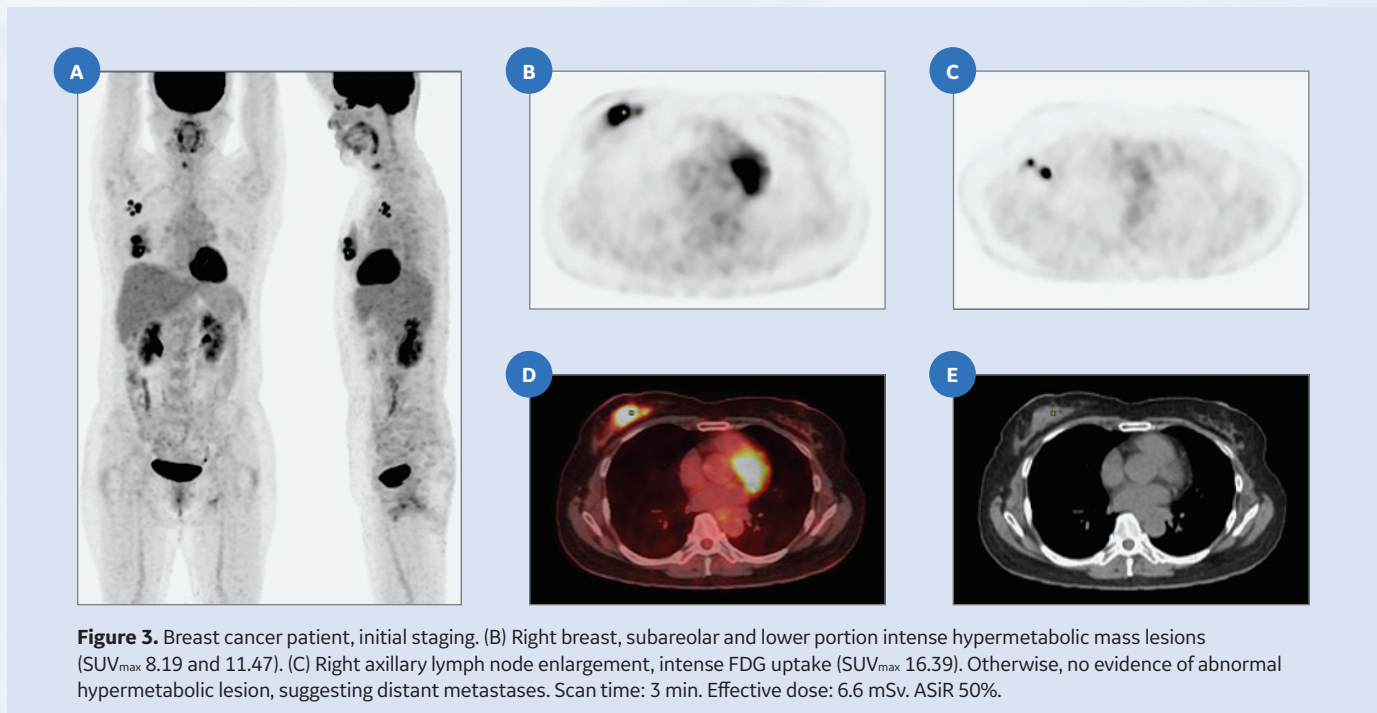
Sungmin Kang, MD, Chief of Nuclear Medicine Department, says the system is helping DCUMC get the best image quality

while delivering the lowest radiation dose. "I'm convinced that dual acquisition channel technology and Q.Clear reconstruction can make ultra-low dose PET/CT scans a reality without compromising image quality," he says.

Dr. Kang noted that he immediately saw an improvement in images over the Discovery ST system. "There's no comparison between image quality with Discovery IQ and Discovery ST," he says. "Now I have more confidence when reviewing the images.



**Figure 2.** Same patient as in Figure 1. (C) Note the image quality with Q.Clear at half the scan time as VPHD.



**Figure 3.** Breast cancer patient, initial staging. (B) Right breast, subareolar and lower portion intense hypermetabolic mass lesions ( $SUV_{max}$  8.19 and 11.47). (C) Right axillary lymph node enlargement, intense FDG uptake ( $SUV_{max}$  16.39). Otherwise, no evidence of abnormal hypermetabolic lesion, suggesting distant metastases. Scan time: 3 min. Effective dose: 6.6 mSv. ASiR 50%.



I noticed extremely reduced noise, so I can easily find small lesions and see the lesion's edge clearly."

While conventional SUVs are under converged, SUVs delivered by Q.Clear are fully converged, delivering more accurate and consistent quantitative data and images to help clinicians find and follow disease.

"At first, most of the Q.Clear SUV values were high over the conventional reconstruction method, so I measured SUV values both ways," says Dr. Kang. "But gradually I became convinced of Q.Clear's SUV because of its better resolution.

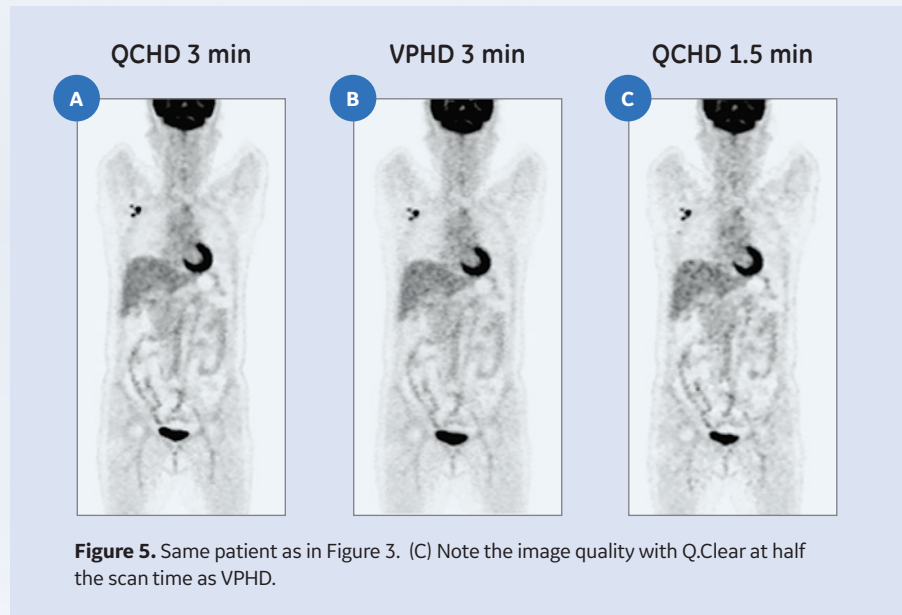
Now I'm used to reviewing images with Q.Clear. I can say it's the real, true image. The OSEM algorithm can't be run to full convergence due to the image noise increase."

DCUMC is also routinely applying the Q.Clear reconstruction method on all their neuro cases. "Brain image quality is remarkably increased by its high SNR contrast," he says. "As we became convinced of Q.Clear's accuracy and small lesion detectability, we decided to routinely apply Q.Clear to all of our neuro cases too."

Dose reduction at DCUMC has been dramatic as well. They also use GE's iterative reconstruction dose-reduction technology, ASiR™, to improve low-contrast detectability in lesions. By using ASiR in CT scans, they've seen reduced image noise and fewer beam hardening artifacts; Dr. Kang has discovered that applying ASiR 50% is the ideal dose optimization for interpretation at DCUMC.

For PET scans with Q.Clear, the high sensitivity has enabled DCUMC to reduce injected dose to from 0.13 mCi/kg to 0.06 mCi/kg at 3 min/bed. They've been able to maintain scan times of 2-2.5 minutes with exceptional image quality. Due to the large PET axial FOV of 20.8 cm, the normal torso range can be covered with 6 bed positions, which means a further reduction in scan times.<sup>2</sup>

Lesion detectability, lower dose and shortened scan times are all supported by GE's LightBurst PET Detector, which delivers the highest sensitivity<sup>1</sup> of any PET/CT system, enabling excellent image quality with fast scans at low doses for greater patient comfort and care. This uniquely configured detector has an



**Figure 5.** Same patient as in Figure 3. (C) Note the image quality with Q.Clear at half the scan time as VPHD.

unmatched 30 mm BGO scintillator that delivers the high sensitivity needed to capture the greatest number of counts.

The hospital has maintained throughput rates while advancing on their goal to lower dose for patients. Despite reimbursement limitations, Dr. Kang says he hopes this system will help the hospital increase their scan volume and expand their referral network.

Dr. Kang points to CortexID Suite as a critical link in this process. CortexID Suite delivers accurate, consistent quantitative neuro results that are easy to share with referring physicians and patients, giving the hospital an edge in a tight referral market. It also lets them compare images with a database of age-stratified patients to help with interpretation of disease progression and treatment effectiveness.

"The CortexID Suite software is a really powerful tool to diagnosis and compare scans," he says. "Its reporting tool is easy to access and to explain to patients or other physicians."

Overall, Dr. Kang is impressed with Discovery IQ both for clinical accuracy and patient comfort. "Discovery IQ provides the best image quality with the lowest radiation dose, helping minimize patients' fear." ■

#### Reference

1. Comparing Discovery IQ 5-Ring to other PET/CT scanners reporting in ITN online comparison charts (April 2014).
2. This represents a single user's experience and may not be representative of other clinical settings and use cases.