



Discovery MI Delivers on the Promise of Digital PET

AZ-Sint-Jan Bruges is one of Belgium's largest hospitals and also one of the oldest, with roots dating back to the late 1100s. Today, for its PET imaging, it is part of a consortium of three hospitals serving the city's residents and those living throughout the province of West Flanders.

In 2016, Frank De Geeter, MD, Head of the Department of Nuclear Medicine, and his colleagues embarked on a project to bring a modern PET/CT system to the hospital. In Belgium, medical imaging acquisitions and patient imaging volumes are regulated as part of the public healthcare system.

Although patients can receive PET/CT imaging services at another hospital in the consortium, it is located 31 miles (50 km) away. Dr. De Geeter saw the need to provide this same service locally and to inpatients, many of whom are very ill and cannot be transported and, therefore, do not receive a necessary PET/CT imaging study.

As he began to investigate potential systems, one key factor was to acquire a digital solution. "I'm a strong believer in progress through technology," Dr. De Geeter says. "Digital technology is certainly the way to go."

At the time Dr. De Geeter began to investigate this new acquisition, only one company provided the right digital solution and could be delivered in the timeframe he required: GE Healthcare with its Discovery™ MI. Discovery MI is a next-generation PET/CT that brings together the sensitivity of digital detection with the most innovative reconstruction technology available—the combination of Time-of-Flight and Q.Clear.

AZ-Sint-Jan Bruges has the distinction of receiving the first worldwide installation of the 3-ring configuration of Discovery MI. GE Healthcare's entire implementation process took just over one week, from installation to clinical use. The support Dr. De Geeter received during the process convinced him that even if other options existed, he had made the right choice.

"It was delivered on a Thursday and by the second Monday, it was operational and fully tested," Dr. De Geeter says.

"We got all the possible support we needed for our technicians to best optimize the system parameters. With GE, I feel like I'm part of a family."

Providing the best possible care

Dr. De Geeter and hospital administration knew that a digital system would provide a platform for future technological advancements. It would also address the clinical need for advanced PET/CT imaging. According to Dr. De Geeter, the hospital had a waiting list for access to PET imaging prior to the implementation.

The majority of PET/CT scanning at AZ-Sint-Jan Bruges is for oncology. However, there has been a noticeable increase in utilization for infection and inflammation cases, particularly in patients with high fever—the type of patients that prior to installing Discovery MI would likely not have received a PET exam.

"That is really a key factor of the system installation, that very ill or elderly patients who are not likely to get transferred

“We got all the possible support we needed for our technicians to best optimize the system parameters. With GE, I feel like I'm part of a family.”
Dr. Frank De Geeter



Patient History

A 67-year-old male patient referred to PET/CT with suspicion of a tumor in the distal esophagus. Ultrasound revealed a uT3N+ stage.

Findings

Hypermetabolic lesions were detected in the distal part of the esophagus and also impacting two adjacent lymph nodes. One very small lesion, 2.9 mm, was detected in the lymph node retrosternally in the upper mediastinum and confirmed by CT. Total injected dose was 2.6 MBq/kg.

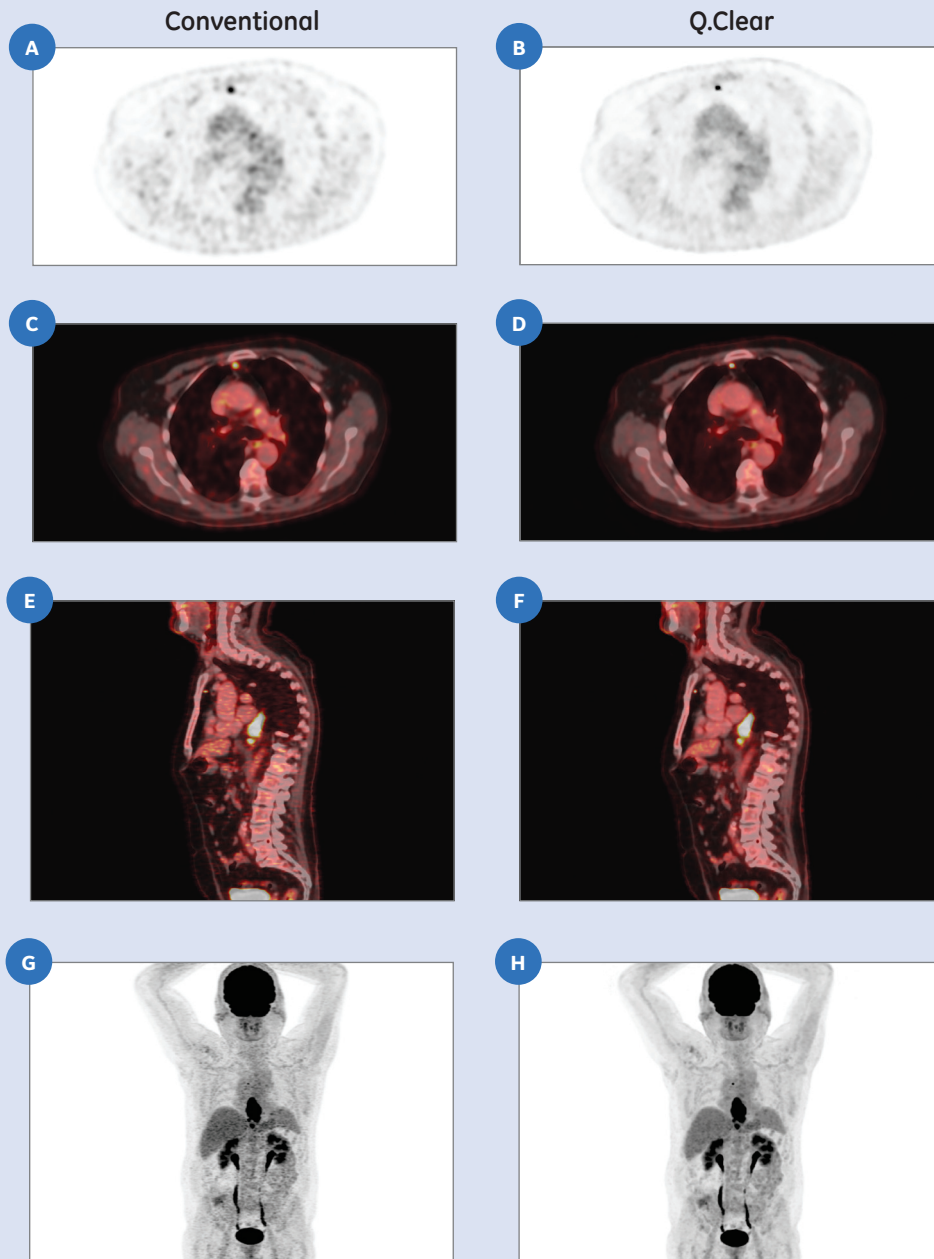


Figure 1. Axial PET acquired with 2 min/bed position; (A) conventional processing and (B) processed with Q.Clear. Fused axial PET/CT processed (C) without and (D) with Q.Clear. Fused sagittal PET/CT processed (E) without and (F) with Q.Clear. PET MIP (G) without Q.Clear and (H) with Q.Clear.



“We use Q.Clear all the time. In one patient, I saw a really tiny lesion—I measured it at 2.9 mm in diameter.”

Dr. Frank De Geeter

to the other hospital can now get the imaging study that is needed,” Dr. De Geeter says.

In Belgium, the number of reimbursed PET/CT studies is set by social services. In the hospital consortium that includes AZ-Sint-Jan Bruges, a maximum of 28 patients between the two PET/CT systems can be scanned each day. Before the installation of the new PET/CT, 23 patients were scanned at the other hospital. After the installation, that number quickly increased to 28, or 14 patients daily at AZ-Sint-Jan Bruges.

“Today, each day we are scanning 28 patients combined at both sites. So, that’s an additional five patients, which has gone a long way in reducing that patient wait time,” Dr. De Geeter explains.

Incredibly low dose

While the primary goal was to increase patient access to PET imaging services, another benefit has become apparent.

“We were happy to find out that the digital system would allow us to reduce patient FDG dose,” Dr. De Geeter says. FDG is expensive in Belgium and the hospital purchases it commercially; while there is an economic benefit, lower doses provide a benefit to both patients and technicians.

At AZ-Sint-Jan Bruges, for whole-body FDG-PET indicated for oncology or inflammatory/infectious diseases, the hospital is using 1.5 MBq per kg in patients with a BMI less than 20, 2.0 MBq per kg for patients with a BMI between 20 and 26.5, and 2.5 MBq per kg for patients with a BMI over 26.5. The maximum dose for any sized patient is 300 MBq. For brain scanning, the hospital uses a maximum of 125 MBq.

“Those FDG doses are really very, very low,” Dr. De Geeter adds. “Despite the low doses that we inject, and the modest scanning times of 2 minutes per bed position, image quality and lesion detectability are not compromised.”

During the start-up phase, some patients volunteered to undergo a second scan after they had been injected with FDG and scanned at the other hospital on its Discovery PET/CT

710. They then travelled to AZ-Sint-Jan Bruges and a second scan was performed on the same initial injected dose, which already decayed by a half-life.

“Nevertheless, the image quality and lesion detectability remained unchanged,” says Dr. De Geeter. While he’s not sure they’ve hit the lowest threshold for low dose, he will be cautious reducing it further. As he explains, “If I made the correct diagnosis at an even lower dose, then it would suffice. But we don’t know whether that is the case in all patients.”

Small lesion detectability

Since the other hospital in the consortium has a Discovery PET/CT 710, Dr. De Geeter was already familiar with Q.Clear, GE Healthcare’s innovative PET image reconstruction technology that delivers a 2x improvement in PET quantitation accuracy (SUV_{mean}) and also a 2x improvement in image quality (SNR).

Dr. De Geeter says that Q.Clear may take some getting used to with the new reconstruction algorithms. However, he and his colleagues found they could detect small lesions more easily with Q.Clear’s SNR gain and now use it routinely to guide clinical decisions.

“We use Q.Clear all the time,” Dr. De Geeter says. “In one patient, I saw a really tiny lesion—I measured it at 2.9 mm in diameter.”

Thanks to the addition of Smart MAR on the 64-slice CT system on Discovery MI, Dr. De Geeter notes that the reduction in metal artifacts is making a significant difference, particularly in the mouth and hips. When he compares imaging in the presence of metal with older reconstruction methods, he can see the difference it makes.

With Discovery MI, AZ-Sint-Jan Bruges is well poised to investigate the use of Gallium-based PSMA and octreotide tracers, as well as Tau PET imaging for Alzheimer’s disease. For now, Dr. De Geeter is very pleased with the results of his institution’s first PET/CT scanner and the impact it is having on patient access to advanced and low-dose PET imaging studies. ■