



## CUSTOMER SPOTLIGHT

# General Purpose CZT Enables Low-Dose, Simultaneous Dual-Isotope Imaging

Since August 2016, Christian Scheiber, MD, PhD, a nuclear medicine physician at University Hospital Lyon in France, has been using the Discovery™ NM/CT 670 CZT, the first commercially available general purpose SPECT/CT system powered by CZT technology. In eight months, the department has performed over 2,000 patient studies, with 90% of these related to oncology and neurology, including over 300 DaTscan exams. In addition to the brain, common areas of investigation are bones, lungs and endocrinology.

Almost immediately, Professor Scheiber saw the benefits of the CZT detector. In the first month of use (August 2016), by utilizing Lister he started to explore dose<sup>1</sup> or time reduction with a 30% elimination of counts obtained from routine protocols, without compromising diagnostic confidence.

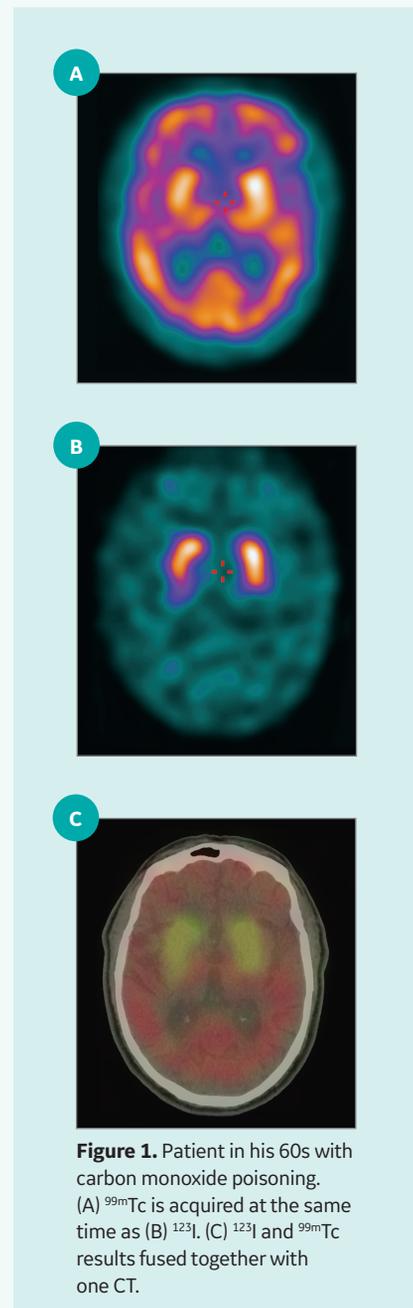
“Lister allows you to change the energy window and time per frame,” Professor Scheiber says. “You can improve the image quality but, more than this, you can reframe the image to have less counts and still maintain the diagnostic information.”

As one of the primary women and children’s hospitals in France, this is an important capability for Lyon. One of Professor Scheiber’s key goals with the new system is to perform more efficient SPECT studies than previously possible. Plus, with a large number of pediatric patients, he is very cognizant of the need to keep patient doses as low as possible.

“One objective is to completely replace planar imaging with SPECT,” Professor Scheiber adds. “Of course, for that we need a camera that is very efficient, possesses high resolution and has a very good contrast-to-noise ratio. So, system sensitivity and counting statistics are critical.”

He points to the registered collimation design that aligns each collimator with a single CZT detector pixel. The result is an improved contrast-to-noise ratio and spatial resolution at the detector surface down to 2.8 mm.

“We have better resolution with this system than with conventional nuclear medicine cameras,” Professor Scheiber says.



**Figure 1.** Patient in his 60s with carbon monoxide poisoning. (A)  $^{99m}\text{Tc}$  is acquired at the same time as (B)  $^{123}\text{I}$ . (C)  $^{123}\text{I}$  and  $^{99m}\text{Tc}$  results fused together with one CT.



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**Efficient SPECT imaging**

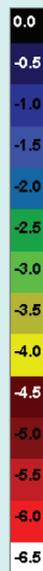
Speed and efficiency of imaging has made a noticeable difference in patient throughput. “An advantage of this camera is that the detector frame is reduced to 2.5 centimeters versus 7.5 centimeters for a normal gamma camera, which offers excellent workflow flexibility and patient comfort,” he says.

In bone SPECT studies, Professor Scheiber and colleagues simulated exam times, which traditionally take 15-20 minutes, to as low as 4-5 minutes with the use of Lister. They demonstrated that each step could be as low as 5 seconds compared to 10-15 seconds with a conventional system.

This potential scanning time reduction may also help the department implement whole-body SPECT for bone exams.

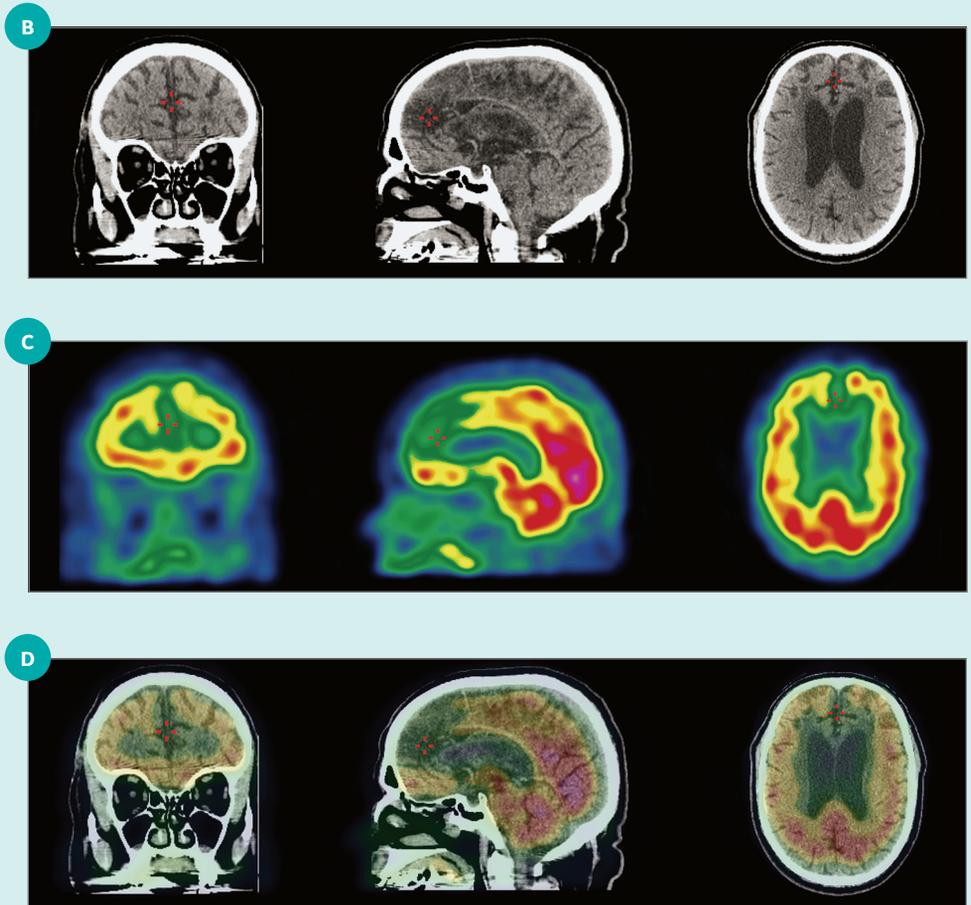
The system’s efficiency, particularly in DaTscan studies, is a real advantage when imaging elderly patients who may not be able to remain still for the entire study. He is particularly interested in using DaTscan to further investigate its ability to visually discriminate between the putamen and caudate nucleus in normal subjects. He is building a database of normal subjects that can be used in research studies and for comparisons.

With pediatric patients, the system design enables placement of the detector closer to their body, which further



**Figure 2.** Same patient as Figure 1. (A) Q.Brain results, (B) CT images, (C) <sup>99m</sup>Tc and (D) fused SPECT/CT images. Patient was diagnosed with frontal bilateral symmetric extended decrease uptake, slightly correlated with a discrete sign of atrophy. DaTscan results (not shown) were normal.

Acquisition parameters: 976 MBq <sup>99m</sup>Tc; 185 MBq <sup>123</sup>I; 360 degree SPECT, 120 steps of 30 sec., 128 x 128 zoom 1.0; CTD<sub>level</sub> 44.98 mGy, DLP 986.88 mGy-cm.





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facilitates high-quality imaging. In one case involving a child under three years old, the low-dose scan demonstrated that the diagnosis of iliac osteomyelitis did not involve the joint, which was important information for the referring physician.

Further, since the system provides an opportunity to explore dose reduction, Professor Scheiber believes it could help lower the overall cost of radiopharmaceuticals and deliver financial benefits for the department.

“We want to improve the workflow and at the same time reduce the pharmaceutical cost,” Professor Scheiber says.

### Dual-isotope imaging

The CZT detector also provides exceptional spatial and energy resolution for improved image quality and multi-isotope imaging opportunities.

“We can use the improved energy resolution of the camera to perform dual-isotope studies,” he says. “We get very good images from dual isotopes for the brain and we can use the Q.Brain software to analyze it.”

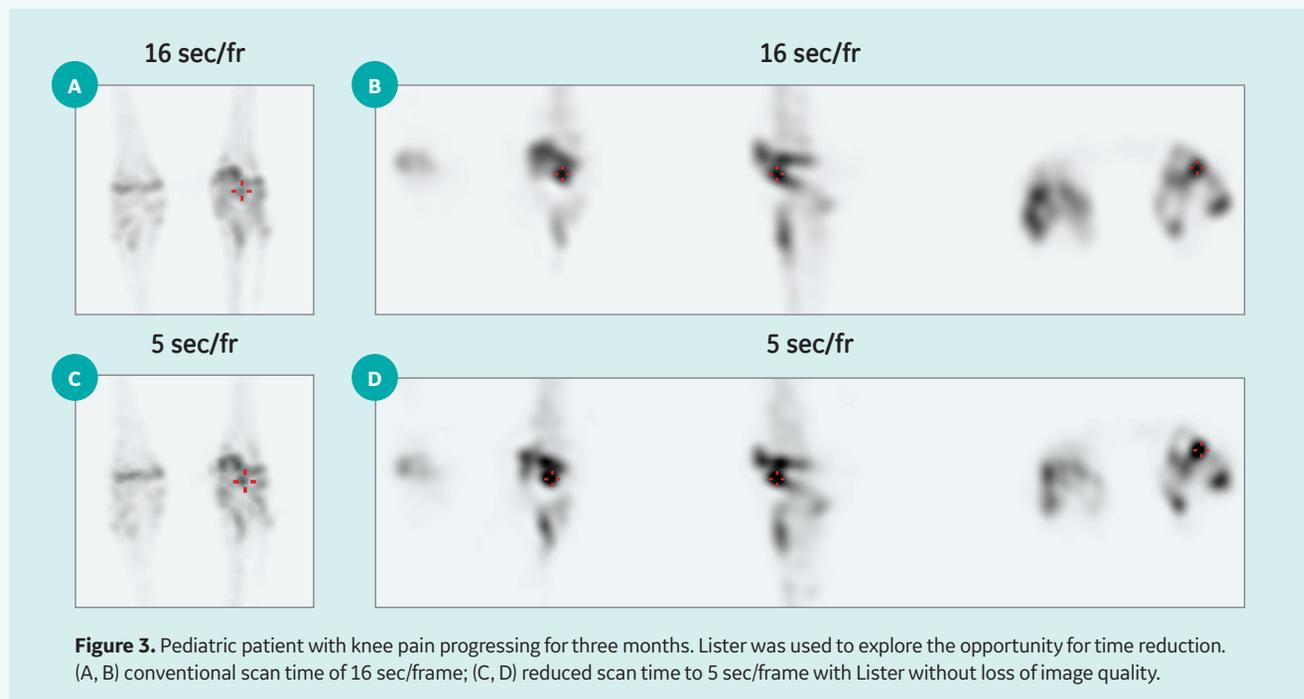
For example, Professor Scheiber can perform a brain perfusion and DaTscan in the same acquisition with two windows. As a neurology hospital, many disabled and elderly patients, some with Parkinson’s Disease, are often seen by clinicians. It is more comfortable and convenient for those patients to have both studies at one time.

“The Discovery NM/CT 670 CZT is very good with isotope separation so we can conduct two different investigations at the same time,” Professor Scheiber says. “We are beginning to order this double tracer investigation and that was not possible before we had this system.”

Overall, Professor Scheiber is impressed with the CZT technology and the Discovery NM/CT 670 CZT. He says, “Everyone likes using this system; it is patient and technologist friendly.” ■

#### Reference

1. In clinical practice, Evolution options (Evolution for Bone, Evolution for Cardiac, Evolution for Bone Planar) and Evolution Toolkit are recommended for use following consultation of a NM physician, physicist and/or application specialist to determine the appropriate dose or scan time reduction to obtain diagnostic image quality for a particular clinical task, depending on the protocol adopted by the clinical site.



**Figure 3.** Pediatric patient with knee pain progressing for three months. Lister was used to explore the opportunity for time reduction. (A, B) conventional scan time of 16 sec/frame; (C, D) reduced scan time to 5 sec/frame with Lister without loss of image quality.