



Fully integrated SPECT/CT modernizes facilities to maximize abilities

Nuclear medicine experts on two continents describe how the new fully integrated SPECT/CT serves more patients and signals the beginning of a new era in nuclear imaging.

By Linda Brookes | Photography by Jonathan Browning and Scott van Osdol

Single-photon emission computed tomography (SPECT) combined with computed tomography (CT) was introduced as a hybrid SPECT/CT imaging modality almost two decades ago. Soon after the first commercially available diagnostic SPECT/CT system, Siemens' Symbia TruePoint™ system, was launched in 2004, researchers recognized the potential for improving image quality and incorporating quantitative image acquisition and reconstruction.

Alexander Hans Vija, PhD, who has been working in the field for more than 25 years and is currently head of SPECT research at Siemens Healthineers Molecular Imaging in Hoffman Estates, Illinois, USA, recalls that collaborative research led to Symbia Intevo™, which featured standardized quantification and the high-resolution xSPECT Bone™ reconstruction algorithm. "But from here, we wanted to have a more integrated solution and ultimately enable many more imaging departments to install a SPECT/CT system." This would allow more patients to access a wider range of services.

Symbia Pro.specta™ "brings closure to the era of the original Symbia TruePoint SPECT/CT," Vija says. For 20 years the aim has been to amalgamate the data and construct a system that is in reality "one system under the hood." Symbia Pro.specta is that system, he asserts. "It would be very exciting if it would motivate people who were holding on to their 15-year-old or older systems to upgrade. I believe this system moves the bar to a level where everybody can enter the SPECT/CT world," Vija says.

Transitioning from SPECT to SPECT/CT

Vija's hopes for Symbia Pro.specta have been realized at Baylor Scott & White (BSW) Medical Center-Temple in central Texas (USA), a part of the BSW Health, one of the largest not-for-profit healthcare systems in the US. "We had been wanting a SPECT/CT camera for many years," admits Michael L. Middleton, MD, director of the nuclear radiology division which employs three nuclear physicians and six technologists. Obtaining approval for purchase of a SPECT/CT system was challenging, however, due to

reimbursement issues. "Approval of parathyroid SPECT/CT opened the door," he recalls, but even then, installation of a SPECT/CT system was delayed for years. "We were left with just two Symbia™ SPECT-only cameras. We desperately needed a third nuclear medicine camera just to keep up with demand. So, Symbia Pro.specta was a godsend," he says. The center has now been working with the new system for one year, and it has been providing more capabilities to a much wider variety of patients.

Expanded clinical applications

"The Symbia Pro.specta system has been most useful for parathyroid imaging, which we do once or twice a day," Middleton notes. "We also schedule our larger (BMI >35) cardiac patients on the camera because it improves attenuation correction on the myocardial perfusion scans in these patients who have issues due to soft tissue, large breasts, and fat."

Women with breast cancer who have had axillary breast surgery and cannot raise their arms, causing attenuation,



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Siemens Healthineers Molecular Imaging, Illinois, USA

are also being moved to the Symbia Pro.specta system. Additionally, it is being used for octreotide scans where patients do not have access to PET, for MIBG scans, and imaging of ^{99m}Tc MAA particles and bremsstrahlung SPECT/CT for post-therapy imaging of ^{90}Y microsphere selective internal radiation therapy (SIRT) of liver cancer. Another advantage of the new camera and software is the improved visualization of lesions compared with planar imaging or SPECT alone, the BSW professionals add. "With Symbia Pro.specta, we have been able to start using the xSPECT Bone reconstruction algorithm, which helps us better localize and characterize bone disease," Middleton says.

Another noticeable effect after upgrading to SPECT/CT was the intelligent imaging experience that fully integrates SPECT and CT. Middleton noticed how the staff appreciates the automation of the workflow. "It reduces the time going from the control room to the camera room. They can basically run it from the control room." For lead nuclear medicine technologist Stephen Stoner, a big advantage of Symbia Pro.specta is streamlined design. "We don't have all the big computers that we used to have. That gives us more space within the control room itself," he says. "You just have the monitors and the keyboard on top of the table, with no big computer box underneath."

Middleton adds, "Any site acquiring one of these SPECT/CT cameras needs to schedule extra training time for the technologists to learn the new SPECT syngo[®] software platform. But then I think they will be happy with it." Middleton's team switched the software they used to read the scans to syngo.via. "It wasn't a hard transition, and it's been an improvement, especially on the cardiac reading," he comments. "Overall, it's been a positive learning curve."



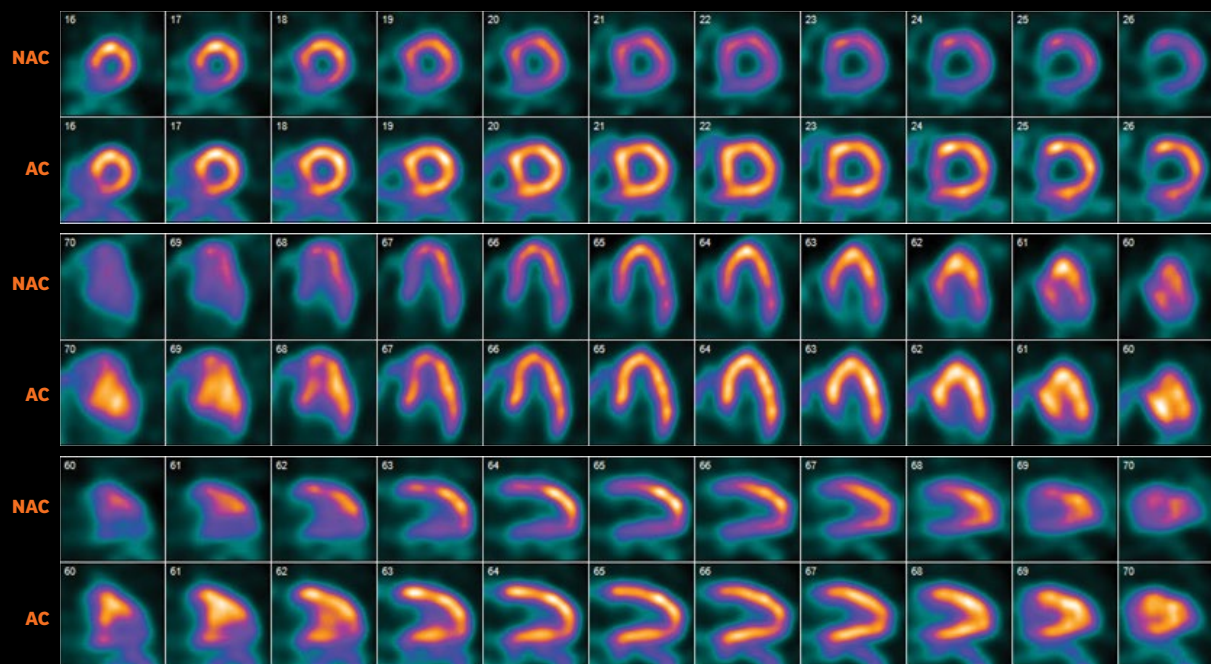
The Baylor Scott & White nuclear medicine team appreciates the automation of the workflow.



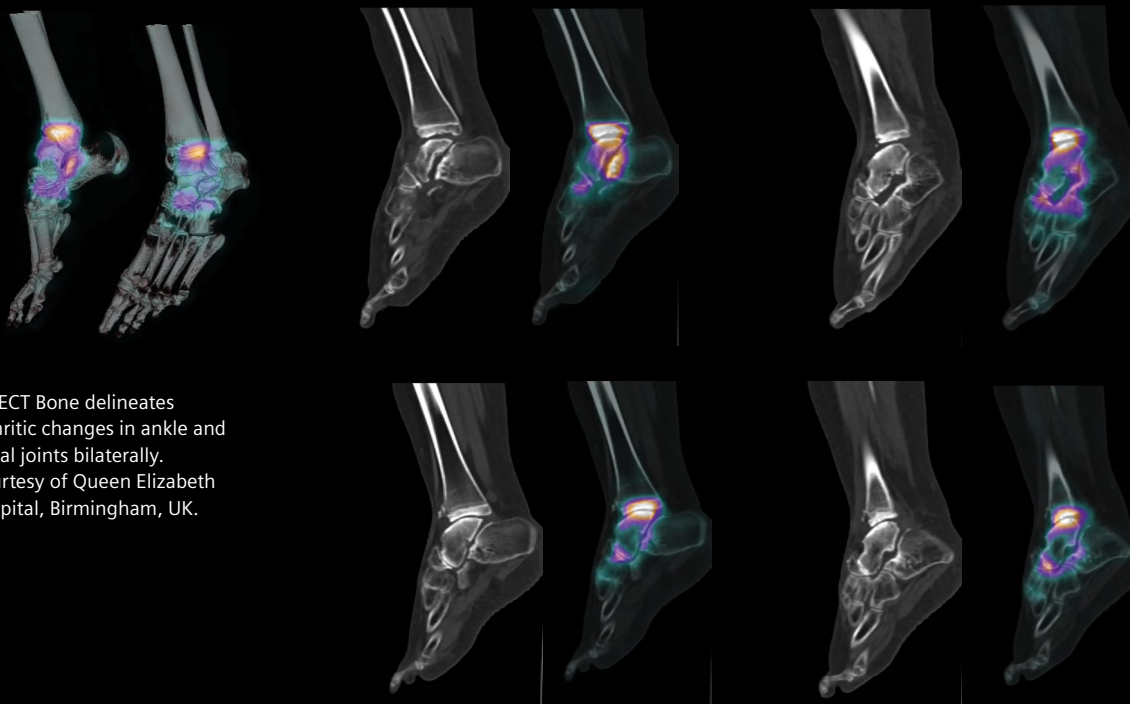
Dr. Middleton and lead nuclear medicine technologist Stephen Stoner examine scans on Symbia Pro.specta SPECT/CT acquisition workstation.



The streamlined design provides more space within the control room.



Improved inferior wall visualization by attenuation correction.
Courtesy of Queen Elizabeth Hospital, Birmingham, UK.



xSPECT Bone delineates
arthritic changes in ankle and
tarsal joints bilaterally.
Courtesy of Queen Elizabeth
Hospital, Birmingham, UK.



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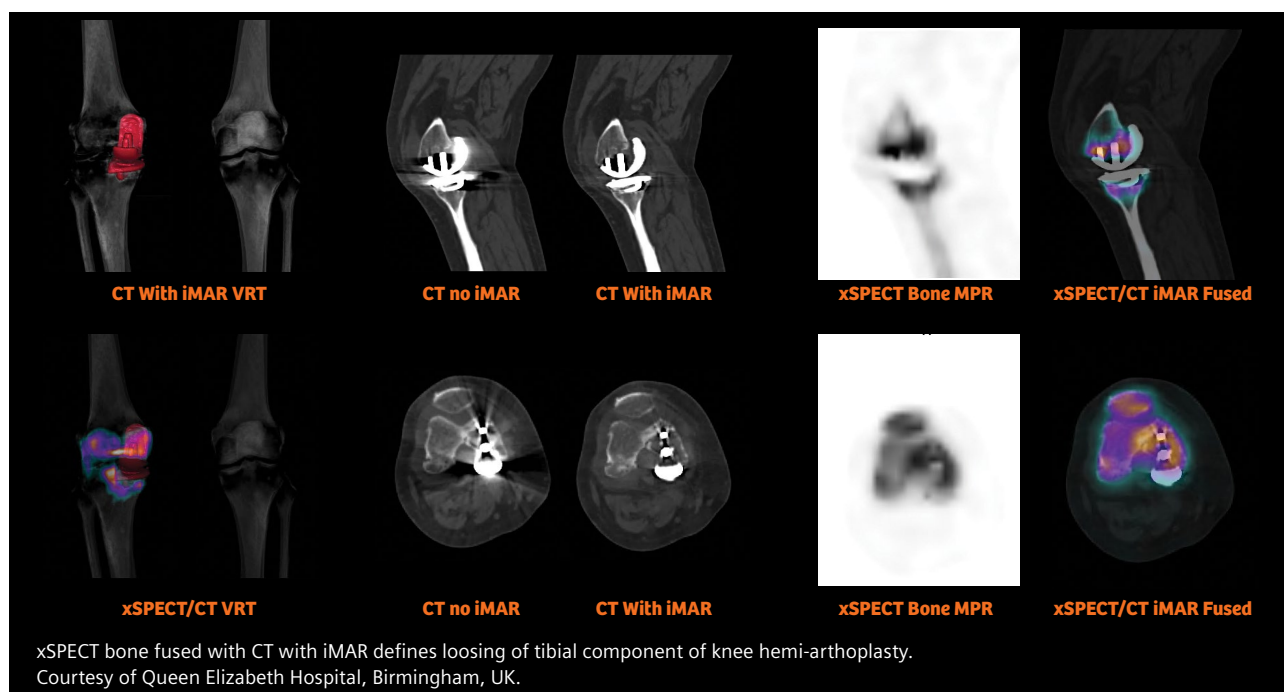
Upgrading for practiced SPECT/CT users

Across the Atlantic, in the United Kingdom, staff in the department of nuclear medicine at the Queen Elizabeth Hospital Birmingham (QEHB) in the UK Midlands have been using SPECT/CT for over 10 years. When the hospital opened as part of the University Hospitals Birmingham NHS Foundation Trust in 2010, the department had a Symbia S SPECT, Symbia T SPECT/CT, and a Symbia T16 SPECT/CT. The Symbia T16 has since

been replaced and the hospital now has a range of SPECT/CT scanners. In February 2020, a Symbia Pro.specta system was installed, which occupies the space where formerly a Symbia S SPECT camera was installed.

Erin Ross, PhD, consultant clinical scientist and deputy head of nuclear medicine at QEHB, recalls that when the hospital first opened, the radiologists had an open mind about using SPECT/CT. "As soon as they started using it, they embraced it and they kept putting everything

onto the Symbia T16 due to the higher quality of CT." For many years since, Ross and her colleagues have been asking for "better CT, the best images in the quickest time, a diagnostic "one-stop shop" to overcome "a real blockage in efficiency," she says. "Now we've got such a high quality of SPECT/CT with Symbia Pro.specta." Khalid Hussain, MD, consultant radiologist at QEHB, confirms that "because of the high quality of the SPECT, we have been able to reduce the dose, which is excellent." He adds that "the quality





Laura Whitehouse, senior clinical technologist specializing in nuclear medicine, manages the Scan&GO touchscreen gantry display.



Symbia Pro.specta offers a short tunnel and open design with a focus on accommodating patients.

of the CT as part of the SPECT/CT is “much higher” than they have ever seen before.

A new SPECT/CT feature for the QEHB staff is iterative reconstruction on the CT. “The SAFIRE (sinogram affirmed iterative reconstruction) algorithm has also helped us lower doses in the CT examinations,” Ross says. “Tin Filter has also significantly lowered CT doses as compared to the other machines.” The technologists also appreciate the iMAR (iterative metal artifact reconstruction) technique, which they are using for the first time.

Providing a comfortable experience is important for technologists who engage with patients directly. During patient transfer, patients are less worried about falling off because the bed is wider. In the scanning room, the position of the handset on the gantry display is popular. Laura Whitehouse, senior clinical technologist specializing in nuclear medicine, appreciates that the camera is smaller, quieter, and less bulky when it’s moving around the patient. “That’s really important for patients who are nervous,” she says. “They get a better experience, so they’re more relaxed.” She also praises the incorporation of the CT component. “It’s all within the casing, and we don’t have to bother



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Erin Ross, PhD, Consultant Clinical Scientist and Deputy Head of Nuclear Medicine,
Queen Elizabeth Hospital, Birmingham, UK



With its smart workflow, the Symbia Pro.specta system allows a greater number of scans to fit in their schedule.

with turning the CT on and off. Everything's more compact, clean, smart, and user-friendly," she says. "I love that I'm not kicking the hardware box underneath the control room desk any longer," Ross adds.

For principal clinical technologist Yasmin Wahid, a welcome new feature on Symbia Pro.specta is the pre-recorded breathing instructions in different languages for the patients. Whitehouse also likes the appearance of the new, one-color interface, which she believes is important for patients when they first enter the room. "It's really appealing. It's smaller, and it doesn't look so bulky and scary," she comments. For Wahid, it's simpler and easier, "It's literally just one button and we're ready to go."

Intelligent imaging experience at QEHB

Everyday operations in the exam room are streamlined with smart workflows. Whitehouse likes that the workflows themselves are easier to set up. "When you're on the fly, you can chop and change whatever you want," she notes. "So, if the patient tells you they have pain elsewhere and if they've already had their injection, we can simply just add another scan. With the old system, we would have one set workflow, and if you wanted to add extra images, you would have to complete that workflow and reload another." She adds that with the Plan&GO, an intuitive bedside ruler for scan range planning ("We call it 'the magic ruler'"), it is easier to identify landmarks and position the patient.

As the lead of the nuclear cardiology service, Wahid appreciates that the gantry display (Scan&GO) is a new touchscreen, so that it is easy to focus the heart in the central field of view instead of having to click through a series of tabs to see different positions. "If we want to change the collimator, and we want to see the patient's ECG, now we have everything on one screen," she enthuses. She also highlights the reduction in time needed for cardiac scans with Symbia Pro.specta, especially for ECG-gated scans to measure left ventricular function. This is particularly useful for monitoring cardiac side effects of chemotherapy and greatly improves the patient experience. "With some patients, like those with an irregular heartbeat (arrhythmia), it would take us absolutely ages to acquire the



The pre-recorded breathing instructions for the patients are provided in different languages.

Linda Brookes is a freelance medical writer and editor. She divides her time between London and New York, working for a variety of clients in the healthcare and pharmaceutical fields.

Symbia Pro.specta™ SPECT/CT is not commercially available in all countries. Due to regulatory reasons, its future availability cannot be guaranteed. Please contact your local Siemens Healthineers organization for further details.

The statements by Siemens Healthineers customers described herein are based on results that were achieved in the customer's unique setting. Since there is no "typical" hospital and many variables exist (e.g., hospital size, case mix, level of IT adoption), there can be no guarantee that other customers will achieve the same results.

The amount of metal artifact reduction and corresponding improvement in image quality depends on a number of factors including: composition and size of the metal object, patient size, anatomical location and clinical practice. It is recommended to perform reconstructions with iMAR enabled in addition to conventional reconstruction without iMAR.

In clinical practice, the use of SAFIRE may reduce CT patient dose depending on the clinical task, patient size, anatomical location, and clinical practice. A consultation with a radiologist and physicist should be made to determine the appropriate dose to obtain diagnostic image quality for the particular clinical task.

data," Wahid recalls. "Now we can do a quicker scan, so instead of being on the bed for about 35 minutes, it's now more like 15 minutes."

With Symbia Pro.specta and its smart workflow, QEHB nuclear medicine services can now be expanded, allowing greater numbers of SPECT/CT scans to be fitted into their schedule. These include post-therapy SPECT/CT for detection and characterization of radioactive ¹³¹I focal uptake in patients with thyroid cancer. Octreotide scans have been restarted in support of the PET service. Significant expansion of SPECT/CT scans being done post ¹⁷⁷Lu DOTATATE therapy for neuroendocrine tumors. Increased numbers of FLR (future liver remnant) scans are being done for preoperative assessment, having been moved from the Symbia T2. The SIRT service for colorectal cancer and hepatocellular carcinoma has also been moved from the T2, because of the higher quality of the CT with Symbia Pro.specta.

Even for practiced SPECT/CT technicians, change can be challenging—but worth it.

Whitehouse cautions that the Symbia Pro.specta interface is completely different from previous Symbia systems. "At first it can be a little daunting, but when you get used to it, everything is much more user-friendly," she says.

Reaching more patients through expanded use of Symbia Pro.specta SPECT/CT

The UK and USA medical facilities are looking forward to expanding their services with Symbia Pro.specta. "Our dream would be to get up and running with contrast-enhanced CT, for follow-up prostate or bone scans, and be able to go one-stop shop with that. That is our aim for next year," Ross says.

The positive experience of both the US and UK hospitals with the new Symbia Pro.specta reflects the culmination of Vija's vision of wider availability and easier use, but also demonstrates the potential for both nuclear medicine departments to expand their patient services even beyond those they envisaged when they first started using Symbia Pro.specta. ●