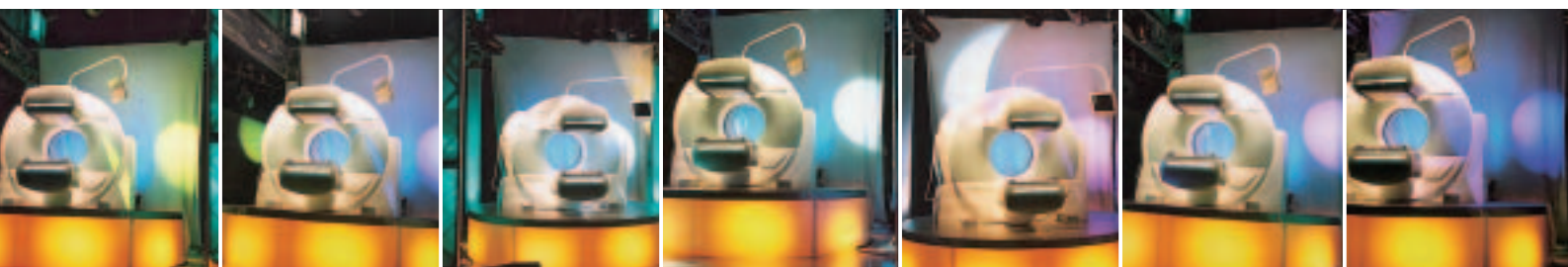


SPECT and CT Come Together – A Siemens Breakthrough

Siemens introduces TruePoint SPECT·CT, a technology that merges state-of-the-art SPECT with the precision of diagnostic multislice-CT, with immediate potential in oncology and cardiology.

By Joanna Downer, Ph.D.



THE UNVEILING of a new technology: TruePoint SPECT·CT.

The June 20th introduction of Siemens' TruePoint SPECT·CT brought over a thousand people to Philadelphia's National Constitution Center to witness the unveiling of a system that is expected to change the way nuclear medicine is used – and what it can be used for. Housed in a shapely, compact product, TruePoint SPECT·CT technology is built on the company's 30-plus years of leadership in CT and SPECT imaging. TruePoint SPECT·CT seamlessly integrates Siemens' diagnostic-

quality CT and its top-of-the-line e.cam SPECT system in a scalable, upgradable package that fits in a room just 21 feet by 11 feet. TruePoint SPECT·CT's imaging modalities, SPECT, SPECT·CT and multislice CT, can be used independently or together. Used in combination, TruePoint SPECT·CT will provide the first contemporaneously acquired, co-registered SPECT and diagnostic CT images, an advance with immediate benefits for oncology and cardiology, experts say.



I A SYMBIOSIS of technologies that will change nuclear medicine: Symbia – TruePoint SPECT-CT technology.

“With SPECT, you have high specificity of tracer uptake in tumors, but poor anatomical resolution,” says Professor Dr. Torsten Kuwert, M.D., Chairman of the Department of Nuclear Medicine at the University of Erlangen in Germany. “By combining SPECT and CT, it is possible to combine high biochemical resolution with high anatomical resolution to really localize neoplastic lesions, which would be expected to add to the quality of diagnosis.” Hybrid PET/CT imaging systems have already proved the diagnostic benefit, and most believe it’s not too much of a stretch to expect the same from SPECT-CT. “Experience from PET/CT tells us that there is an advantage to having a diagnostic CT along with the nuclear medicine study to aid in tumor localization and surgical planning,” says Dr. Homer Macapinlac, M.D., Deputy Chairman of nuclear medicine and Director of the PET facility at the University of Texas M.D. Anderson Cancer Center in Houston.

“And with the improved corrections and reduced artifacts possible by using TruePoint SPECT-CT in oncology, one potentially could achieve, finally, reasonable accuracy in measuring absolute uptake of radiopharmaceuticals,” Macapinlac says. TruePoint SPECT-CT may make it possible to extract such information from SPECT images by improving the acquired data as well as the mathematical and computer algorithms used to correct for radioisotopes’ high energies, characteristics of the detector crystals and collimators, biological attenuation, and other confounding factors. Never have scientists been as close to quantification of SPECT as they can expect to get with TruePoint SPECT-CT. “The fact is, we’re going to have much better anatomical maps to perform the attenuation correction, we’ll be able to do scatter correction, and we can also begin to correct for partial volume effects,” says Dr. Edward Ficaro, Ph.D., an assistant research

“By joining SPECT and CT, it is possible to combine high biochemical with high anatomical resolution.”

Torsten Kuwert, M.D., Chair of the Department of Nuclear Medicine, University of Erlangen-Nuremberg, Germany



Experts Homer Macapinlac, M.D., (above) and Torsten Kuwert, M.D., (below) expect that tumors will be easier to localize using TruePoint SPECT-CT.

"I'm pretty excited," he says. Ficaró works closely with cardiac specialists and says that TruePoint SPECT-CT should allow them to do something else they've never done before – register SPECT and CT images of the heart.

New Ground for SPECT-CT

"Registering these images isn't even being done routinely because it's so difficult," says Ficaró. "The problem is that the thorax isn't a rigid structure. So registration is not just a six-point rigid transformation, it's often an actual morphing of the body based upon known landmarks. To my knowledge, the tools don't exist to do this accurately and with minimal user intervention on a routine clinical basis."

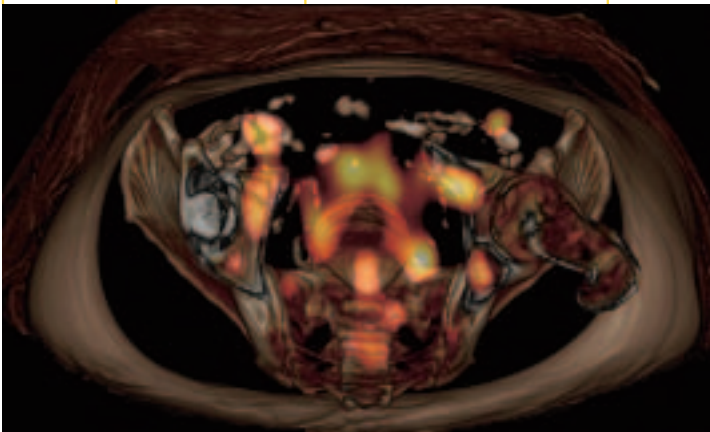
Because of easy co-registration and rapid acquisition (< 30 seconds) and improved attenuation correction, TruePoint SPECT-CT should enable yet another cardiac first – examination of function and perfusion of the right ventricle, which at just 1 to 4 mm it is obscured by traditional SPECT studies, says Ficaró. TruePoint SPECT-CT also is likely to permit detection of three-vessel disease and other hard-to-detect cardiac conditions that carry the highest risk of myocardial infarction and death, he says.

Similarly, cervical metastases of thyroid are hard to localize using separate SPECT and CT studies because of the tiny size and great mobility of structures in the neck, but TruePoint SPECT-CT should bring clarity, both Macapinlac and Kuwert say.

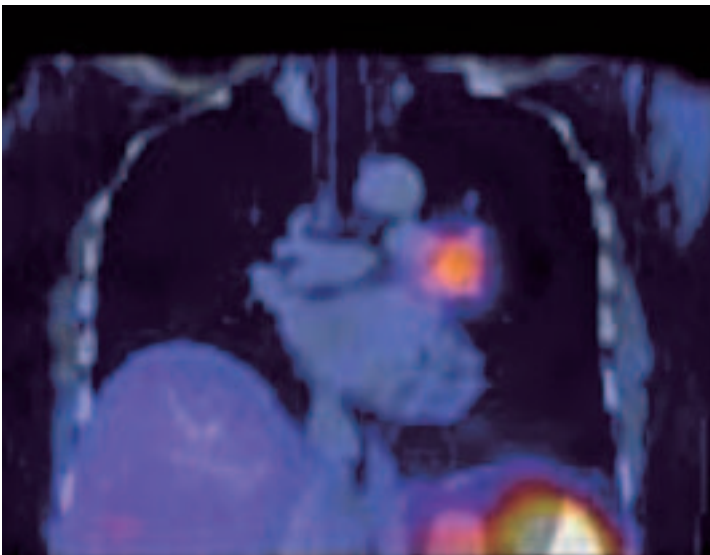
"Because of poor resolution, SPECT images of abnormal uptake in the neck can only be matched to a CT scan with great difficulty. Registration and localization may still be very difficult, especially when using I-131," Kuwert explains. "A hybrid scan with high resolution CT, however, would give the exact fusion of the SPECT and CT, and you could precisely show the surgeon where the lesion is."

Experts also believe that TruePoint SPECT-CT technology will take nuclear medicine in new directions. Its greater accuracy will more efficiently reveal distribution and localization of radiopharmaceuticals currently in development, speeding the agents' evaluation.

scientist in the Department of Radiology at the University of Michigan Medical Center. Ficaró has spent more than a decade working to improve the accuracy of SPECT data from acquisition through physician review.



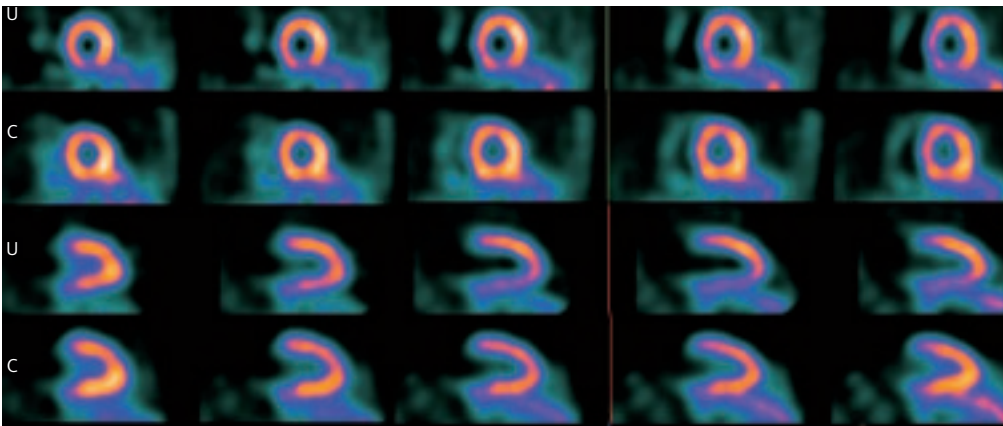
PROSTATE CANCER – In-111-Prostascint and CT. Slight increase of activity within apex of prostate extending into left aspect of the mid-prostate consistent with prostatic carcinoma. Co-registration with CT demonstrates a lesion in the left apex extending into the mid-prostate and base.
(Data courtesy of University Hospital Cleveland)



ACTH-PRODUCING TUMOR – In-111-SMS and CT. Focal increase of tracer uptake in the left lung. After registration with a CT-scan, the lesion could be localized in the left pulmonary hilus.
(Data courtesy of University Hospital Erlangen-Nuremberg)



PARAGANGLIOMA – I-123-MIBG, Tc-99m-DPD and CT. Multiple MIBG-positive lesions. Bone scan reveals multiple skeletal metastasis.
(Data courtesy of University Hospital Erlangen-Nuremberg)



REST MYOCARDIAL perfusion study with CT attenuation correction (Comparison of uncorrected (U) and corrected (C) images).
(Data courtesy of University of Michigan)



James Corbett, M.D., Edward Ficaro, Ph.D. and Jean Luc Urbain, M.D., Ph.D. (from left to right) expect the advance in technology brought about by Siemens' TruePoint SPECT·CT to change the way nuclear medicine is used.

“Experience shows the advantages of having a diagnostic CT as well as the nuclear medicine study.”

Homer Macapinlac, M.D.,
Director PET Facility,
University of Texas M.D.
Anderson Cancer Center, Houston

“For these evaluations, we will start to think that SPECT images alone are like looking at a textbook without your glasses: You can tell there is text, but you can't read it,” suggests Professor Dr. Jean Luc Urbain, M.D., Ph.D., Chair of Nuclear Medicine at the University of Western Ontario and city-wide Chief of Nuclear Medicine for London, Ontario. “Adding high resolution CT to SPECT will be like using a magnifying glass. Everything will be clear. That will be the benefit of TruePoint SPECT·CT.”

TruePoint SPECT·CT will also speed tracer innovation, experts say. They are hoping for new agents that can highlight specific gene expression, detect additional conditions, or establish dosimetry for radiation treatment planning. Given advances in technology and biology, there has never been a better time for this work.

A Catalyst for Change

“People come up with new ideas when the technology is around,” says Kuwert of Erlangen. “Molecular imaging with SPECT will depend on having new radiopharmaceuticals, but the process is stimulated by having good cameras. There's no point in having new radiopharmaceuticals if you don't have a good camera.”

Many expect TruePoint SPECT·CT's availability – in Siemens' Symbia system starting this November (see sidebar) – to shake things up clinically. Nuclear medicine physicians, radiologists, and treating physicians will have to work together to establish new diagnostic and treatment planning procedures to capitalize on the technology's potential to improve workflow efficiency, reduce radiation doses, and accelerate diagnoses.

For example, TruePoint SPECT·CT's attenuation correction – done with multislice-CT using ultrafast ceramic detectors in 30 seconds – leaves no need for a lengthy transmission scan. Whole-body high-resolution anatomic imaging takes under two minutes. Right now, hours or days might pass between a patient's nuclear medicine scan and CT study; with TruePoint SPECT·CT, that will be a thing of the past.

“SPECT and CT are each very powerful modalities, and together there is synergy and the possibility to improve diagnosis and therapy for the patient,” says Macapinlac of M.D. Anderson. “The CT is data-rich and adds accuracy to the SPECT study, and the SPECT shows you where to look more closely on the CT image. The introduction of this new technology offers the chance to re-examine how the diagnostic process works – the order in

which studies are performed and how the whole care pathway is constructed.”

Fortunately, delays between CT and SPECT studies stem from departmental scheduling, and administrative problems rather than any inherent need for temporal separation. “These are logistic problems, so they should be solved by logistic means,” says Kuwert. “They aren’t principles. It’s not the truth behind the process.”

And so Dr. James Corbett, M.D., Head of Cardiovascular Nuclear Medicine at the University of Michigan Medical Center, expects TruePoint SPECT·CT to have a major impact on business as usual. “When you’re doing cardiac nuclear medicine studies and can do other cardiac studies using CT – coronary calcium, coronary angiogram – and have the various imaging studies be perfectly matched spatially, I think it’s going to be important,” he says. “It will probably change the way we do everything within the next few years.”

Change doesn’t come easy, though, and Siemens is ready to help institutions make the most of TruePoint SPECT·CT technology. Siemens Life is a comprehensive customer care program that offers assistance with education for technologists, physicians, and others using the new system (and a new modality), provides a user forum to share experiences, and guarantees uptime – a firm promise to have the system back online by a certain time if problems are encountered (see also page 46).

Additionally, integration with *syngo*, Siemens’ unique software platform, enables multi-modality *e.soft@LEONARDO* workstations to easily access all patient data from anywhere with a common, intuitive user interface.

But enhanced clinical workflow, increased patient capacity, and simplified registration of images from different modalities, while important benefits of TruePoint SPECT·CT technology, may pale in comparison to the technology’s benefits to patients.

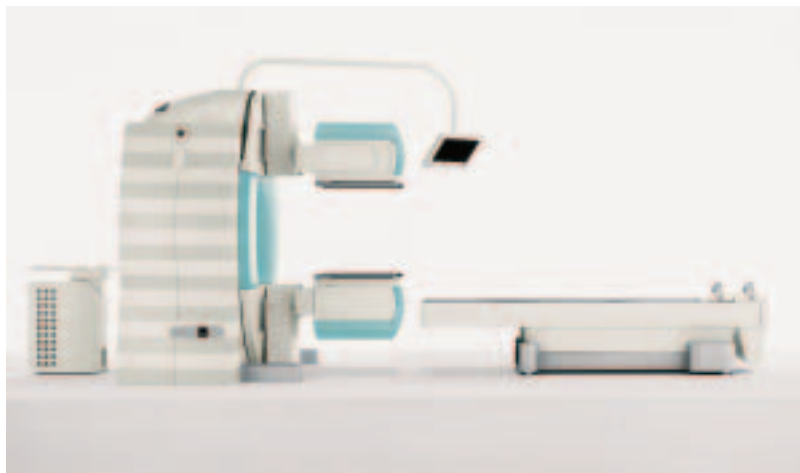
Kuwert notes that by speeding the diagnostic process – providing both diagnostic CT and SPECT studies in a single visit and sitting – and improving the accuracy of diagnoses, TruePoint SPECT·CT could ease patients’

Symbia: The first TruePoint SPECT·CT System

At a June 20 event coinciding with the annual meeting of the Society of Nuclear Medicine in Philadelphia, cheers, whistles, and applause greeted the introduction of Symbia. This sleekly designed, compact hybrid system is the first product line to offer Siemens’ new TruePoint SPECT·CT technology.

The Symbia product family is the only SPECT·CT built on a flexible, scalable platform, one that’s easily upgradable as clinical needs expand. Symbia can perform SPECT, SPECT·CT, and CT studies with a single system, while offering automatic acquisition programs for the most common applications of SPECT, CT, and SPECT·CT. Symbia’s bed is supported as it passes through the CT scanner, and the SPECT cameras can be positioned out of the patient’s visual field, which enhances comfort and reduces feelings of claustrophobia. *e.media* can entertain patients during their studies, the Combined Applications to Reduce Exposure (CARE) program keeps patients’ radiation dose to a minimum without sacrificing image quality, and a breath-holding indicator lets patients track the time until they can “breathe easy.”

Did you just buy an *e.cam*? Don’t worry. Siemens offers upgrade and “trade-in” packages, so when you’re ready for Symbia, it will be ready for you.



EASING patients’ anxiety: The sleek and compact design of Symbia.

anxiety and prevent days or weeks of uncertainty as they await the answer to “Is it, or isn’t it?”

And, clearly, better patient care is the true point.

Author: Joanna Downer, a science writer living in Baltimore MA, holds a doctorate in nuclear chemistry from Washington University in St. Louis.