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Symbia Intevo

xSPECT, the difference between seeing and knowing.

Answers for life.

Overcoming Today's SPECT/CT Limitations

Conventional SPECT/CT is limited in its ability to deliver definitive and timely answers to clinical questions in the most effective and efficient way possible. Siemens is addressing these challenges with Symbia Intevo™*, the world's first xSPECT*— a new modality that completely integrates SPECT and CT data during image reconstruction.
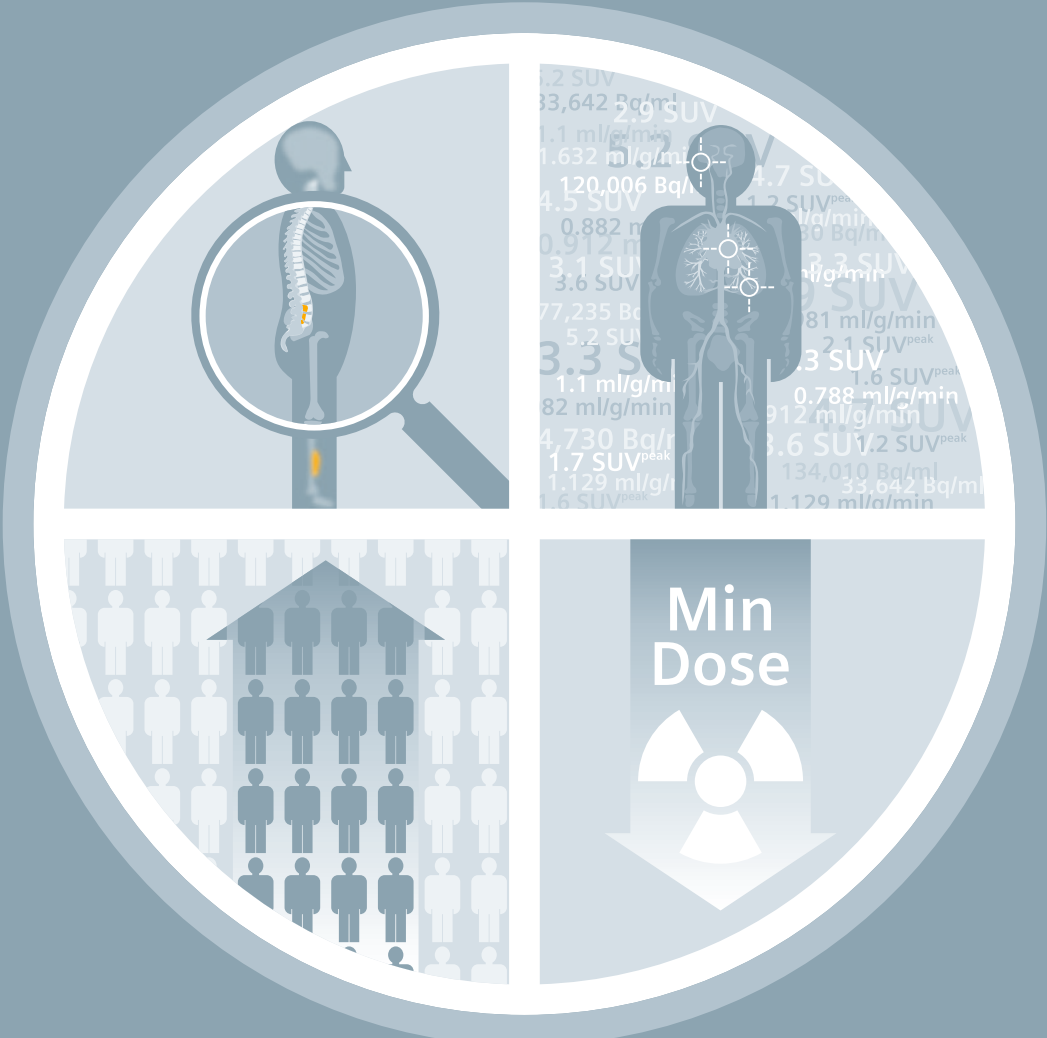
See the Unseen

Challenge   Conventional SPECT/CT image quality is limited by the minimal amount of CT data used during reconstruction.

Solution   xSPECT uses CT as the frame-of-reference for image reconstruction, preserving the 512x512 resolution of the CT matrix and elevating the SPECT resolution for accurate alignment of both data sets during reconstruction.
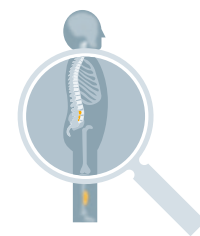
Benefit   The higher resolution and clinical detail of xSPECT supports physicians' ability to more confidently distinguish between degenerative disease and cancer, reducing the need for follow-up exams (e.g., MR, biopsies).

Quantify the Difference

Challenge   With conventional SPECT/CT technology, assessment of disease severity and response to therapy can only be quantified through a manual, multi-step process.

Solution   Through a new and simple proprietary calibration method, xSPECT generates quantitative measurements** of disease uptake that are both accurate and reproducible.

Benefit   Symbia Intevo's quantitative capabilities support physician therapy planning and early modification of patient treatment to reduce costs associated with ineffective therapies.
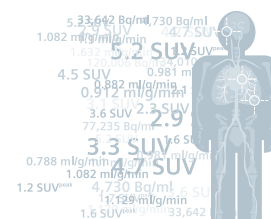
Adapt the Lowest Dose

Challenge   To achieve sufficient image quality or faster scan times, conventional SPECT/CT systems require high dose levels.

Solution   With Siemens CARE (Combined Applications to Reduce Exposure) features, lower dose levels can be achieved while maintaining high image quality and fast scan times.

Benefit   By offering unique dose reduction features, Symbia Intevo enables 74%*** lower CT dose radiation and up to 80%*** reduction in injected dose to minimize long-term patient radiation exposure.

Double the Throughput

Challenge   With conventional SPECT/CT systems, long exam times and routine manual procedures can limit workflow efficiency.

Solution   Symbia Intevo automates routine manual tasks with exclusive features, such as Automated Quality Control and Automated Collimator Changer. Additionally, scan times have the potential for great improvement with IQ•SPECT.

Benefit   With Symbia Intevo's unique productivity features, institutions can save up to 50%*** more time and have the potential to double patient throughput.

** For ⁹⁹ᵐTc and LEHR only.
*** Based on competitive literature available at time of publication. Data on file.

3

See the Unseen

By using the CT as the frame-of-reference for image reconstruction, xSPECT Bone* is able to extract a zone map with five different tissue segments (cortical bone, spongious bone, adipose tissue, soft tissue and air/lung) that is used to delineate the boundaries of the nuclear activity uptake during SPECT reconstruction. Through this deep integration of SPECT and CT data, xSPECT Bone is able to clearly identify post-transplant ossification disease that is not easily seen with conventional SPECT.
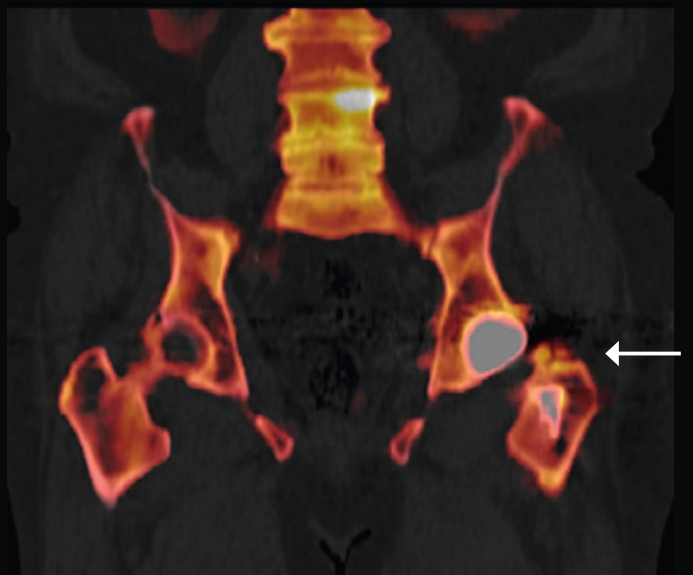
Conventional 3D Iterative Reconstruction

xSPECT Bone
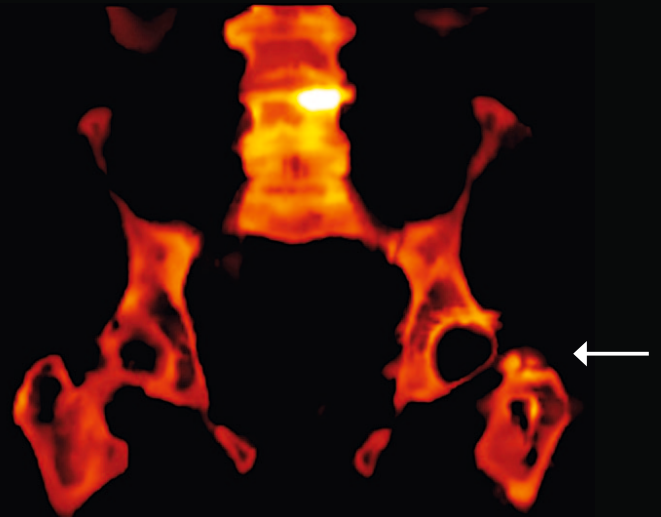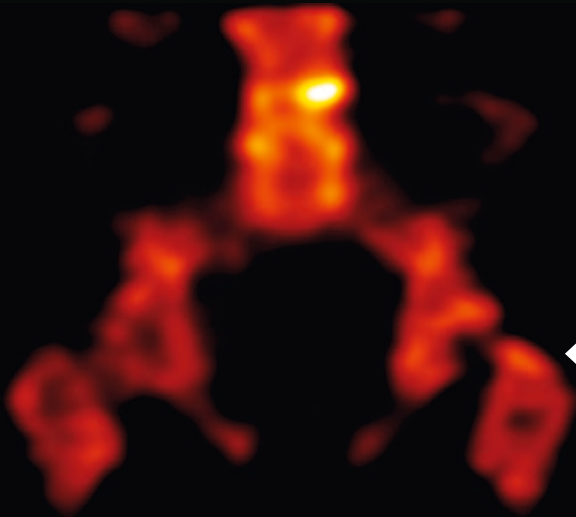
Conventional SPECT/CT

xSPECT/CT

Data courtesy of Friedrich Alexander University, Erlangen, Germany
Parameters: sex: male; weight: 93 kg (205 lbs); height: 168 cm (5' 5");
injected dose: 604 MBq (16.3 mCi); 40 mAs, 130 kV; slice thickness: 3.0 mm

Quantify the Difference

Symbia Intevo employs a proprietary quantitative quality control method using a high-precision ^{57}Co source that, when combined with xSPECT reconstruction, generates accurate and reproducible quantitative images. xSPECT improves visual assessment of disease, as seen in this patient with parathyroid disease, and enables for the first time absolute quantification with xSPECT Quant*.
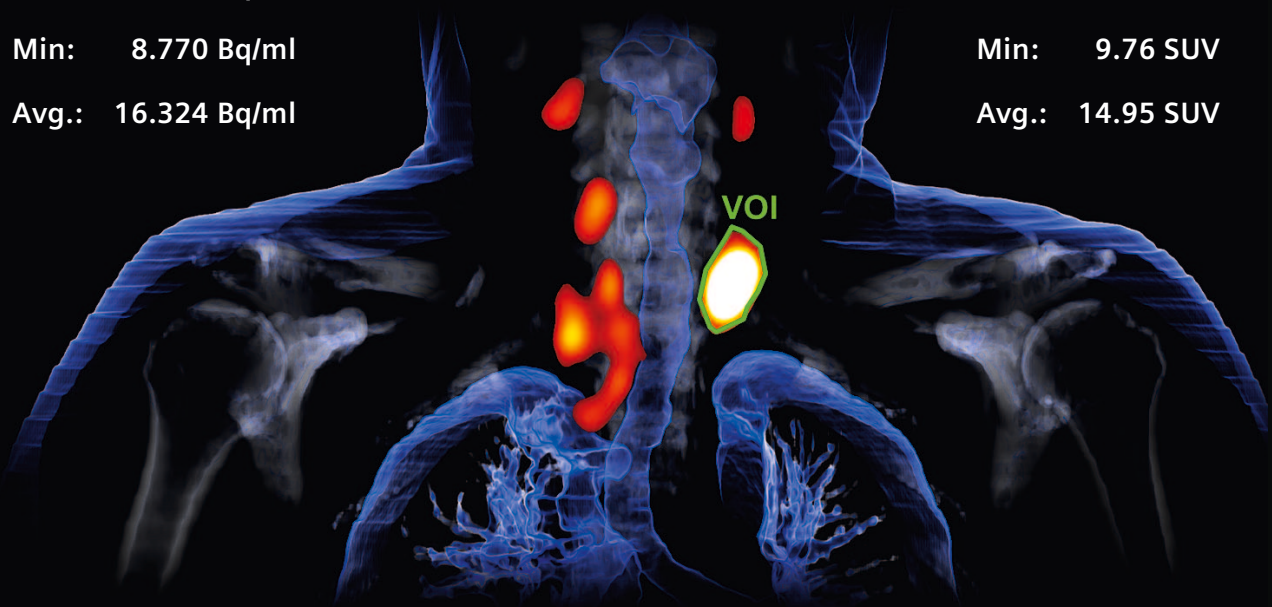
Max:	38.150 Bq/ml	Max:	25.68 SUV
Min:	8.770 Bq/ml	Min:	9.76 SUV
Avg.:	16.324 Bq/ml	Avg.:	14.95 SUV

VOI

Data courtesy of Friedrich Alexander University, Erlangen, Germany
Parameters: sex: male; weight: 92 kg (120 lbs); height: 172 cm (5' 8");
injected dose: 104 MBq (2.8 mCi); 43 mAs, 130 kV; slice thickness: 3.0 mm
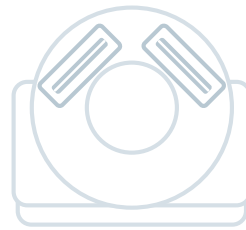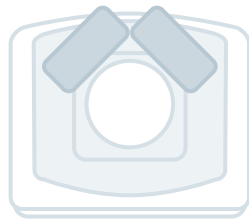
* xSPECT Bone and xSPECT Quant are not commercially available in all countries. Due to regulatory reasons their future availability cannot be guaranteed. Please contact your local Siemens organization for further details.

Adapt the Lowest Dose

Following principles such as ALARA (As Low as Reasonably Achievable) to help limit exposure to the lowest level possible, Siemens innovations significantly reduce dose compared to conventional SPECT/CT systems.
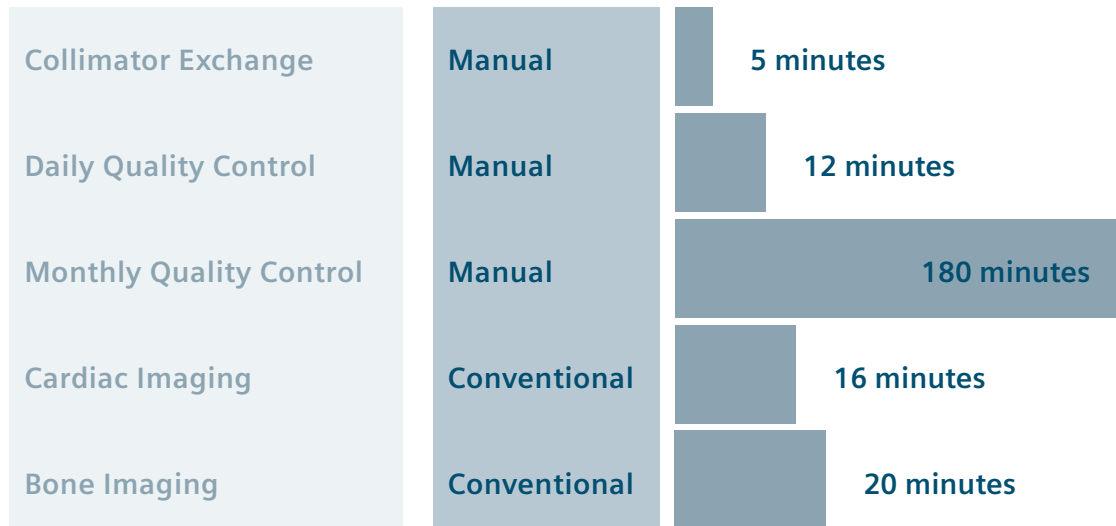
	Conventional SPECT/CT*			Symbia Intevo			% Lower Dose
SPECT	LEHR	160	cpm/µCi	LEHR	202	cpm/µCi	26%
				SMARTZOOM	810	cpm/µCi	80%
CT AC Abdomen	120 kV	4.35	mGy	130 kV	1.80	mGy	59%
				110 kV	1.16	mGy	73%
CT AC Cardiac	120 kV	1.59	mGy	130 kV	1.20	mGy	25%
				110 kV	1.00	mGy	37%
				80 kV	0.40	mGy	74%
CT AC WholeBody	120 kV	4.35	mGy	130 kV	1.20	mGy	73%

* Based on competitive literature available at time of publication. Data on file. Dose values compared are based upon factory default protocols from GE NM670.
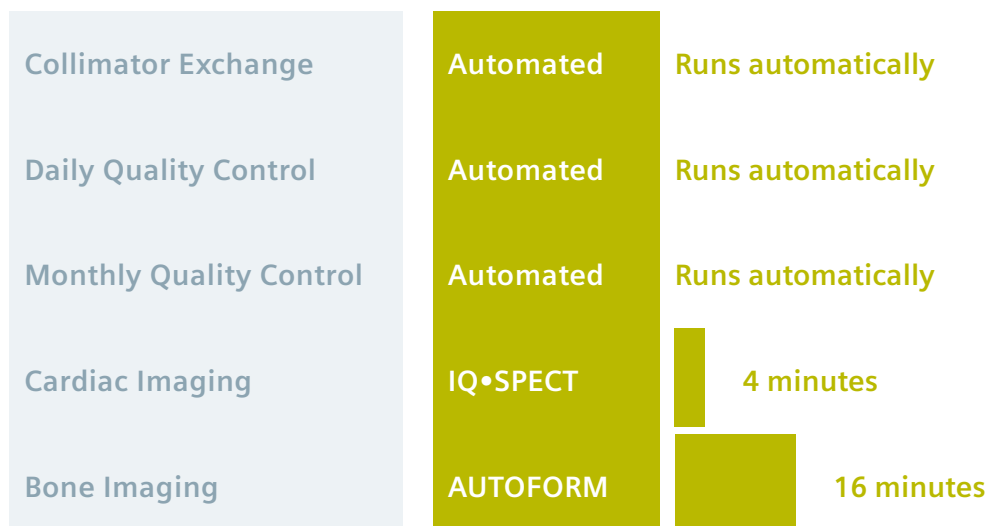
Double the Throughput

Manual tasks require time and resources that could be focused on patient preparation, scanning and processing. Siemens solutions optimize operational efficiency and increase utilization, while offering the potential to double patient throughput.

Conventional SPECT/CT

Task	Method	Time
Collimator Exchange	Manual	5 minutes
Daily Quality Control	Manual	12 minutes
Monthly Quality Control	Manual	180 minutes
Cardiac Imaging	Conventional	16 minutes
Bone Imaging	Conventional	20 minutes

Symbia Intevo

Task	Method	Time
Collimator Exchange	Automated	Runs automatically
Daily Quality Control	Automated	Runs automatically
Monthly Quality Control	Automated	Runs automatically
Cardiac Imaging	IQ•SPECT	4 minutes
Bone Imaging	AUTOFORM	16 minutes

Customer Testimonials

Clinical Benefits

"With the increased image resolution and anatomical clarity from xSPECT, we've been able to characterize patients with just this one exam.

With xSPECT the answers are in the images themselves, so I won't have to do additional studies outside of the department."*

Jerry Froelich, MD

Director of Nuclear Medicine and Molecular Imaging, University of Minnesota

Minneapolis, Minnesota, USA

"We have the potential to be more accurate in assessing disease severity through quantification.

And we will be able to quantify the response to therapy."*

Zsolt Szabo, MD, PhD

Professor of Radiology, The Johns Hopkins Hospital

Baltimore, Maryland, USA

Operational Benefits

"The system offers much improved spatial resolution. It has now become easy to precisely locate whether a focus of increased uptake is related to the cortex of the bone or to the bone marrow.

Putting images together in your mind is a nice exercise and might be intellectually very rewarding, but having them both in one image speeds up the diagnostic process."*

Torsten Kuwert, MD

Director of Nuclear Medicine and Molecular Imaging, University Hospital of Erlangen

Erlangen, Germany

Financial Benefits

"Prior to IQ•SPECT, we had cardiac exams running on two cameras. This freed four to five hours of camera time. Now, we have reduced our wait-time and can perform more patient scans."*

Guillaume Bouchard, MD

Nuclear Medicine Department, Hôpital de la Cité-de-la-Santé

Laval, Quebec, Canada

Base System Highlights

Diagnostic Spiral CT

2-, 6- and 16-slice CT configurations

Intuitive Hand Controller

Easy-to-use with descriptive controls

Autocontour

Infrared body contour system that minimizes patient-to-detector distance

Open Gantry

Patient-friendly integrated gantry design with 70 cm (27.5 in) opening for greater patient comfort

Detector Tilt

Wide variety of detector configurations adjustable to any study and patient type (e.g., gurney imaging, 76° cardiac)

SIEMENS

Symbia Intevo

HD Detectors

High-definition digital detectors that provide energy-independent performance

Patient Positioning Monitor

Self-guided, touch screen user interface with intuitive icons

Internal Electrocardiogram

Fully integrated ECG in patient bed for fast setup and less cumbersome cable

Innovative Bed Design

Low patient bed for easy access with ergonomic patient comfort accessories
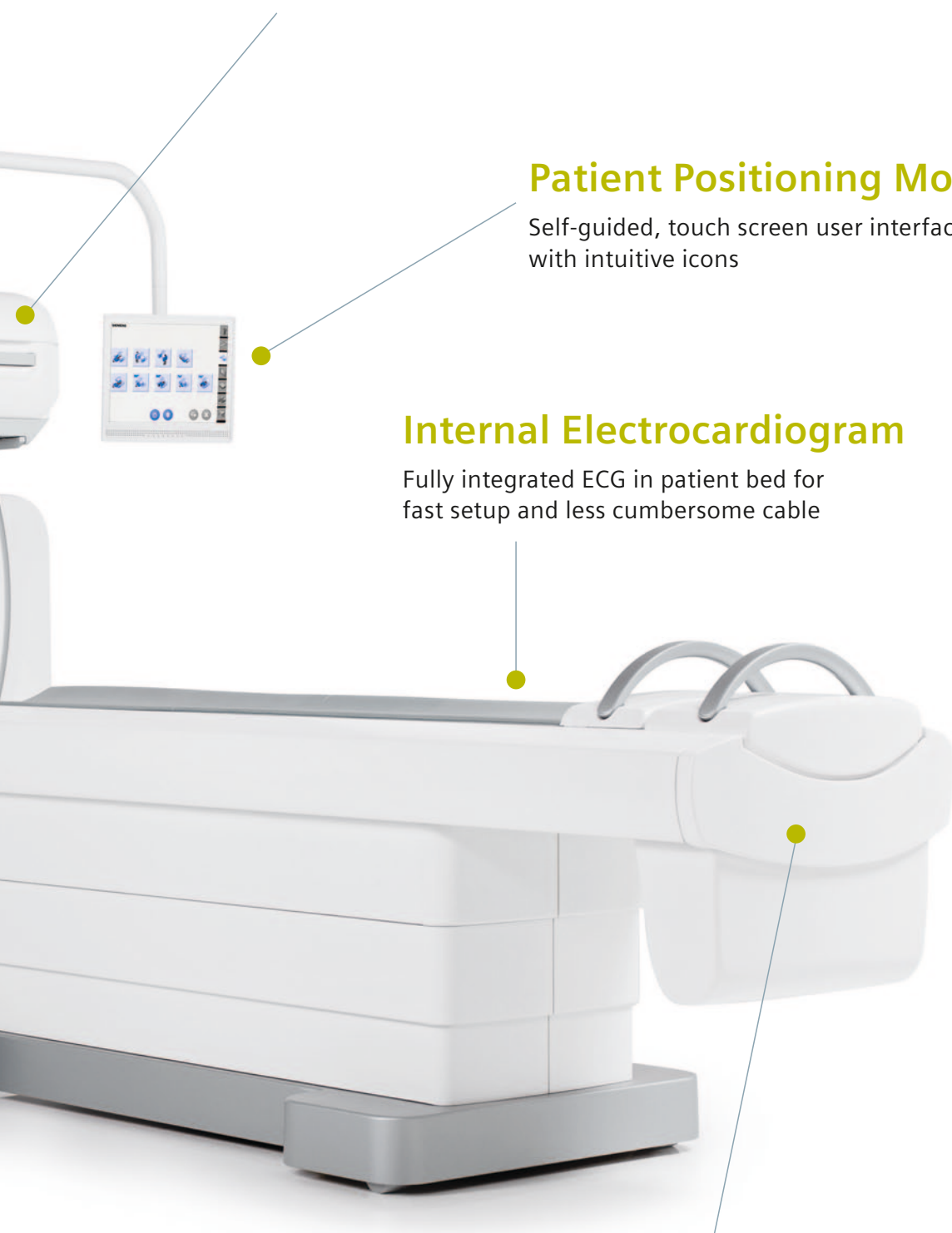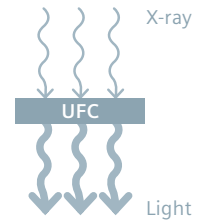
Standard Features

AUTOFORM

- Unique LEHR collimators
- 26%* higher sensitivity
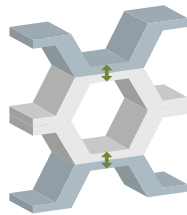
UFC Detectors

- Ultra-fast ceramic CT
- Short afterglow enables up to 30%* less dose

X-ray

UFC

Light

Detector Flexibility

- Gurney and hospital bed imaging
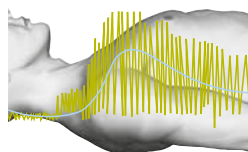- Detector tilt
- 76° cardiac configuration

Flash 3D

- 3D iterative reconstruction
- 50%* dose or time savings
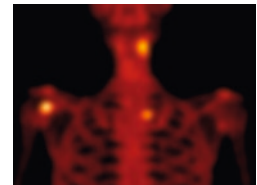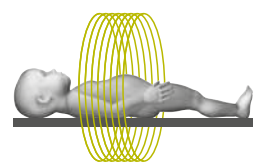
CARE Dose4D™

- Automated real-time dose modulation
- Up to 68%* dose savings

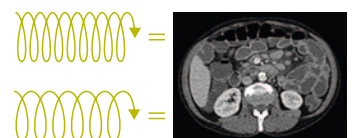## Pediatric Friendly

- Flexible kV settings
- 80 kV, 110 kV, 130 kV

Dose Monitoring

- Structured dose reports
- Definable patient dose alerts

DICOM
Structured
Report

CTDI
DLP

SureView

- Automated pitch selection
- Shorter scan times and up to 20%* dose savings

* Based on competitive literature available at time of publication. Data on file.

Optional Features

AQC

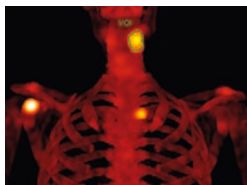- Automated Quality Control
- Saves up to 1 hour each day

ACC

- Automated Collimator Changer
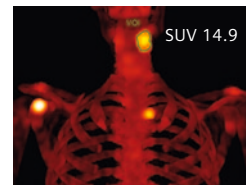- 4 collimators integrated into system bed

xSPECT Bone

- High-resolution bone imaging
- Up to 80%* higher diagnostic quality
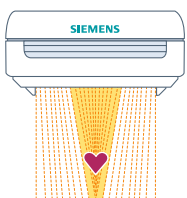

xSPECT Quant

- Quantitative imaging
- Measures activity concentration in units of Bq/ml or SUVs

SUV 14.9

IQ•SPECT

- Ultra-fast cardiac imaging
- Up to 80%* lower injected dose or faster imaging

SIEMENS

e.media

- Integrated entertainment solution
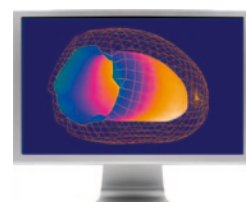- Helps keep patients still and comfortable

Specialty Pallets

- Pediatric
- Mammography
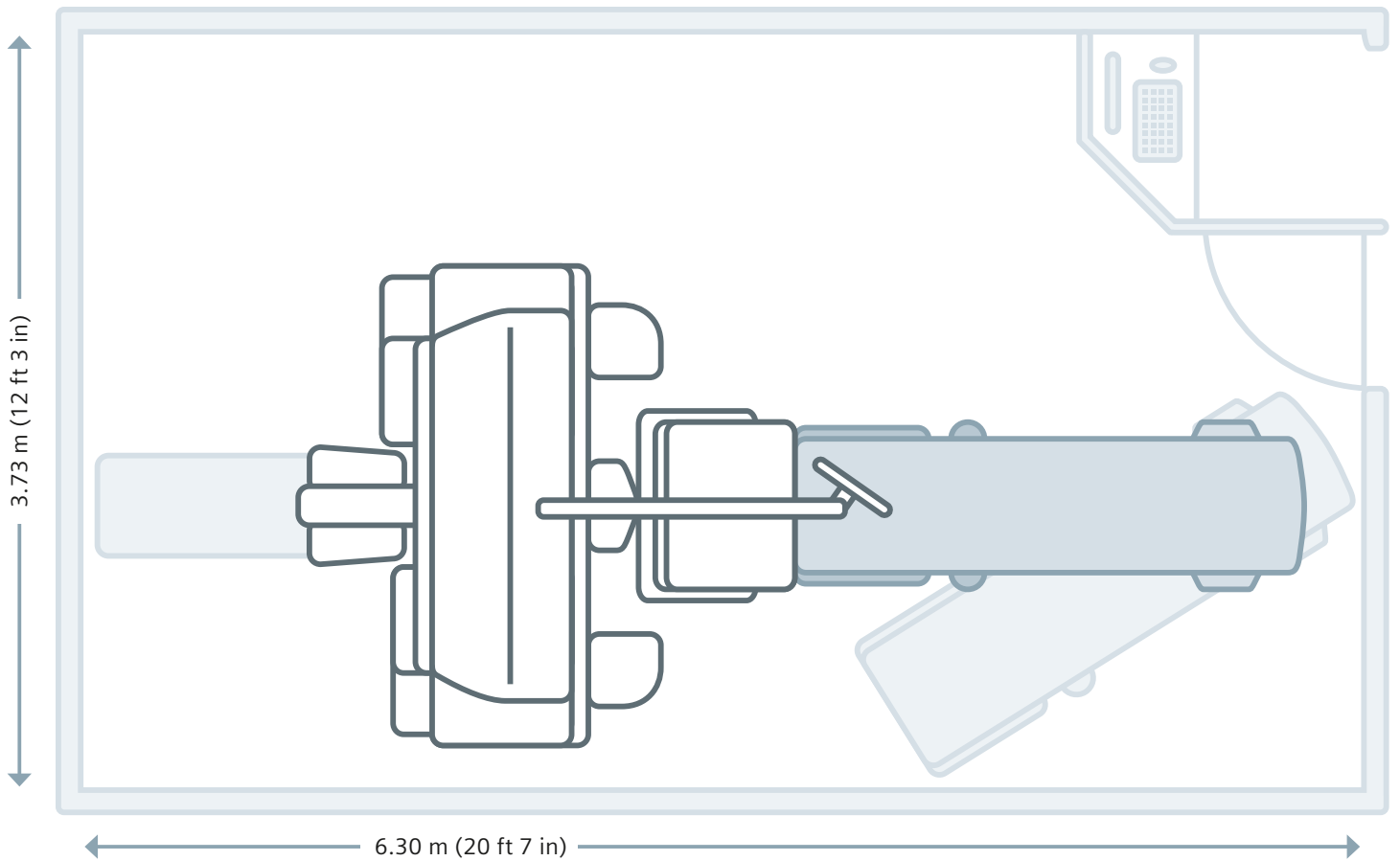

Symbia.net

- Anywhere**, anytime image processing and reconstruction solution

** Requires network connection and minimum hardware requirements. Server management with at least 1 client required for iPad access.

13

Minimum Room Size

3.73 m (12 ft 3 in)

6.30 m (20 ft 7 in)

Room Size	3.73 m (12 ft 3 in) x 6.30 m (20 ft 7 in)
Ceiling Height	2.44 m (8 ft 0 in)
Hung Ceiling Height	2.29 m (7 ft 5 in)

Technical Specifications

	Feature	Symbia Intevo 2, 6 and 16
See the Unseen	Reconstruction frame-of-reference	CT frame-of-reference
	SPECT reconstruction matrix size	256x256, 128x128, 64x64
	Advanced reconstruction	xSPECT Iterative or Flash3D Iterative
	Zone Map (tissue classification)	Yes, with xSPECT Bone
	Detectors rotational uniformity	Yes
	Detectors rotational accuracy	0.1°
	Detector caudal tilt	Yes, +16°/-16°
	CT focal spot size	Symbia Intevo 2: 0.8 x 0.7 mm/8°
		Symbia Intevo 6: 0.8 x 0.5 mm/7° and
		0.8 x 0.7 mm/7°
		Symbia Intevo 16: 0.8 x 0.5 mm/7° and
		0.8 x 0.7 mm/7°
	Diagnostic CT	Multi-slice spiral stand-alone diagnostic CT imaging capabilities
	Generator power	40 kW with 2-slice CT and 50 kW with 6- and 16-slice CT
	Collimators	Low Energy and High Resolution (LEHR), Low Energy and All Purpose (LEAP), Low Energy and Ultra High Resolution, (LEUHR), Low Energy Fan Beam (LEFB), Medium Energy (ME), High Energy (HE) and **SMART**ZOOM (IQ•SPECT)
	Table flex	Rear bed support prevents flex
	Reconstruction workstation	64-bit architecture
	CT continuous scan length	Symbia Intevo 2: 166 cm
		Symbia Intevo 6: 168 cm
		Symbia Intevo 16: 186 cm
	Gantry deflection matrix	Yes, 3D fully adaptive gantry deflection matrix
	Point spread function	Yes, 3D measured point spread function
	Collimator characterization	Yes, 3D measured collimator hole, shape and size
Quantify the Difference	Automated quantification	Yes, xSPECT Quant
	Quantitative volumetric analysis	Yes, in units of Bq/ml or SUV or HU units or counts-per-voxel
	Quantitative uncertainty %	<=10%*
	Reproducible quantification	Yes, with a unique monthly quantitative calibration
	Quantitative calibration source	Yes, NIST precision [57]Co source, unique to Siemens
Adapt the Lowest Dose	CT Dose modulation	Yes, 4D and fully automatic
	Flexible CT voltage settings	Yes, 80 kV, 110 kV, 130 kV
	CTDI Dose Values – Abdomen AC	1.20 mGy @130 kV
	CTDI Dose Values – Cardiac AC	1.56 mGy @130 kV or 1.00 mGy @110 kV or 0.4 @80 kV
	CTDI Dose Values – Parathyroid AC	1.80 mGy @130 kV
	LEHR collimator sensitivity @10 cm	202 cpm/µCi**
	SMARTZOOM collimator sensitivity @28 cm (recommended)	810 cpm/µCi at 28 cm*** (unique to Siemens)
Double the Throughput	Average Autocontour distance	1.1 cm (0.45 in)
	Quality control	Yes, fully automated with 2 shielded sources embedded in the patient bed
	Unique cardiac collimator	Yes, **SMART**ZOOM with 810 cpm/µCi***
	Collimator exchange	Fully automatic with integrated set of collimators

* Accuracy data validated using phantom studies for objects larger than 3 times system resolution.
** Values measured in accordance with NEMA Standards Publication NU-1 2007 using 3/8° crystal and a 5 cm diameter phantom.
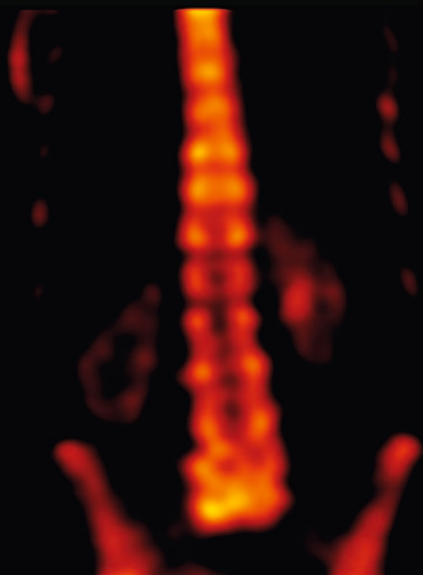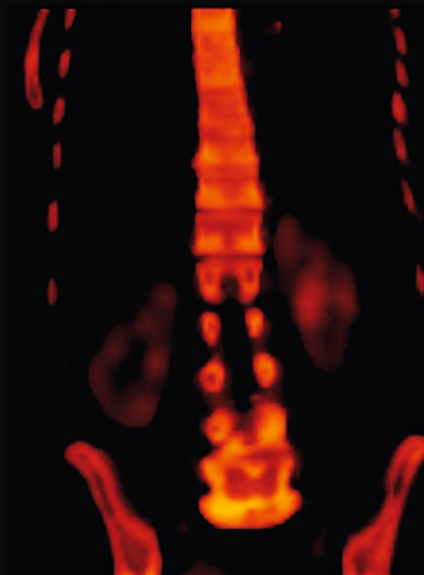*** Values measured in accordance with NEMA Standards Publication NU-1 2007 using 3/8° crystal.

15

xSPECT Bone

xSPECT offers easy differentiation between spongious bone and cortical bone
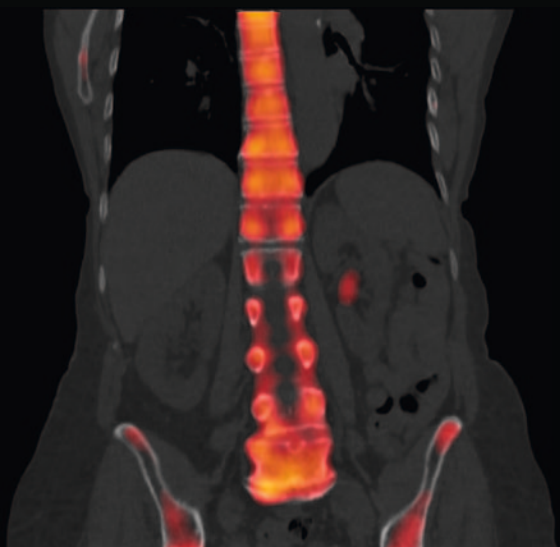in lumbar vertebra, enabling easy determination of lumbar disc degeneration.
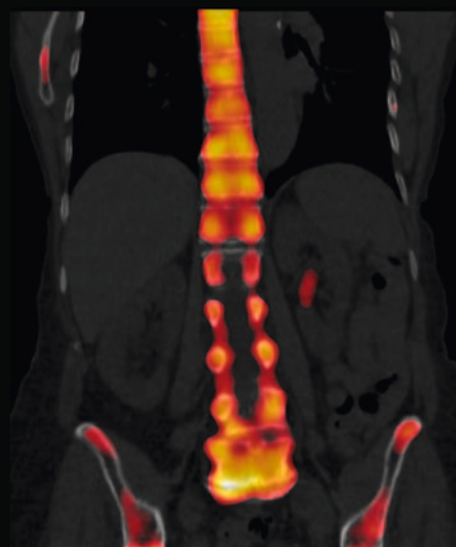
Conventional 3D Iterative Reconstruction



xSPECT Bone

Conventional SPECT/CT

xSPECT/CT

Patient complained of persistent pain following vertebroplasty implantation. xSPECT Bone shows sharp delineation of increased vertebral hypermetabolism around the hypointense cemented area within the vertebrae, as well as in the vertebral pedicles, compared to the conventional SPECT reconstruction.
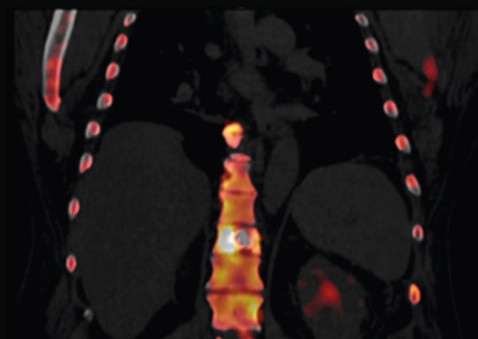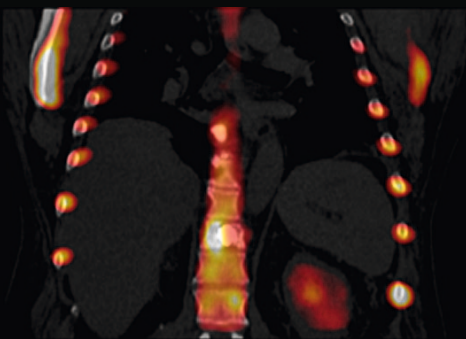
Conventional 3D Iterative Reconstruction
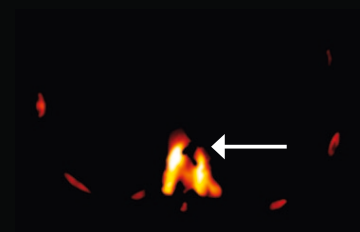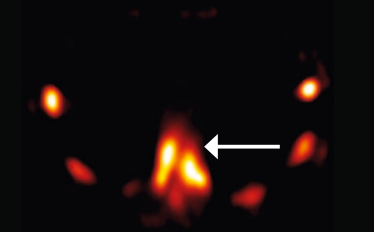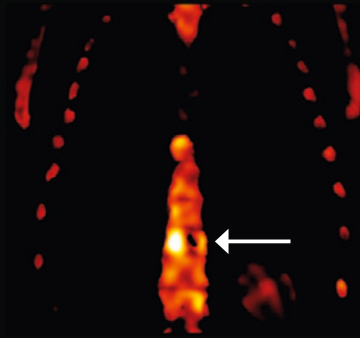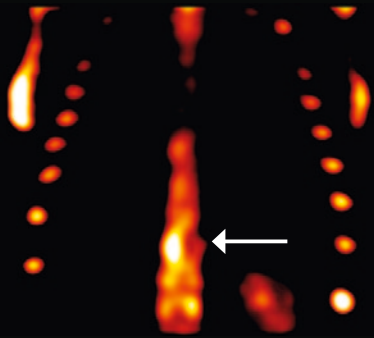
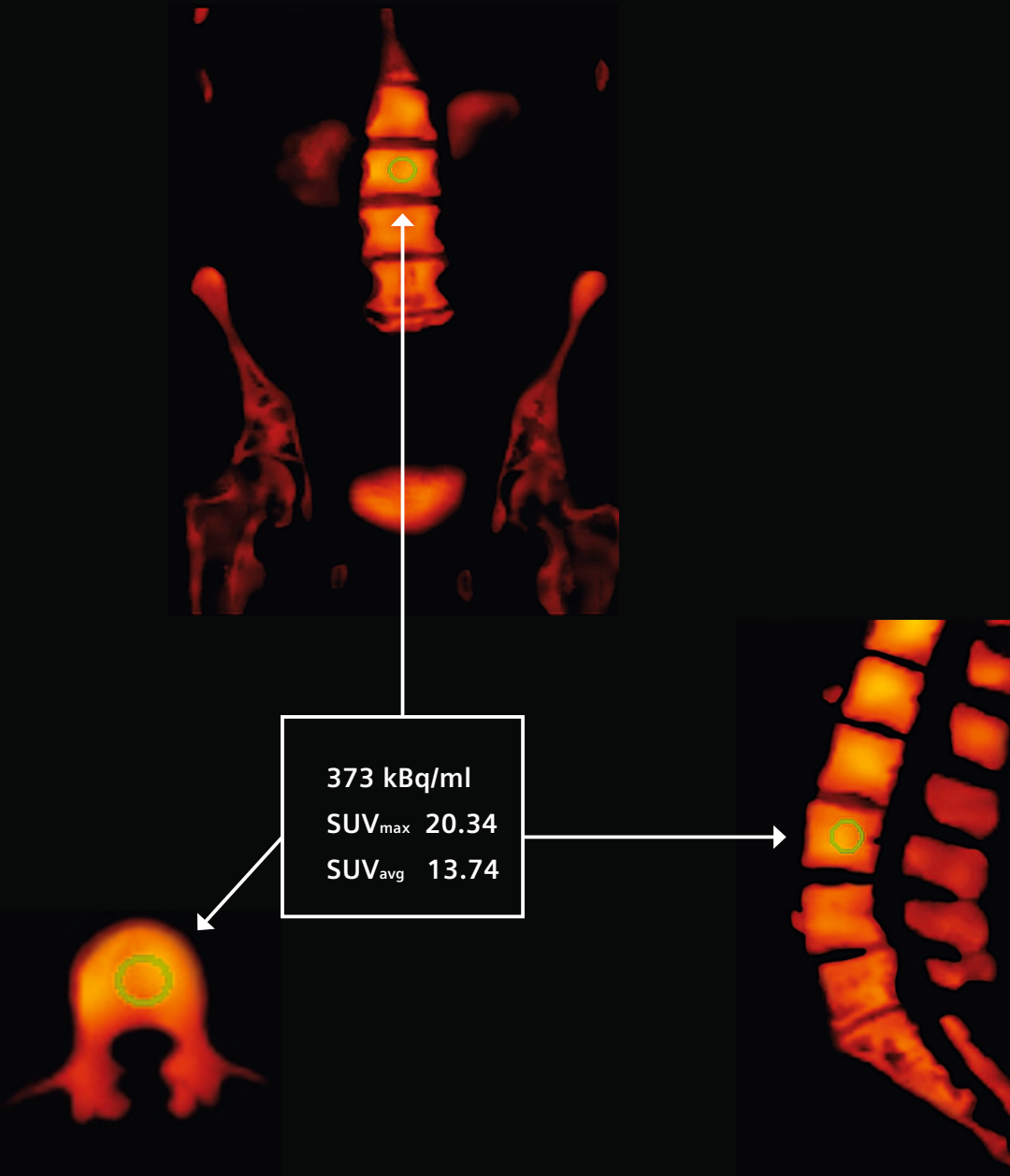## xSPECT Bone

Conventional SPECT/CT
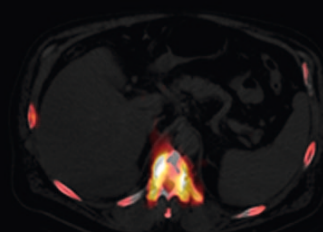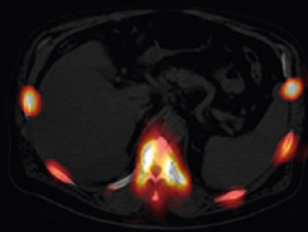
xSPECT/CT

xSPECT Quant

Lumbar vertebral metastases in a patient with lung cancer. xSPECT Quant reveals high SUV in metastatic zones with low SUV in uninvolved vertebrae, suggesting osteoporosis.
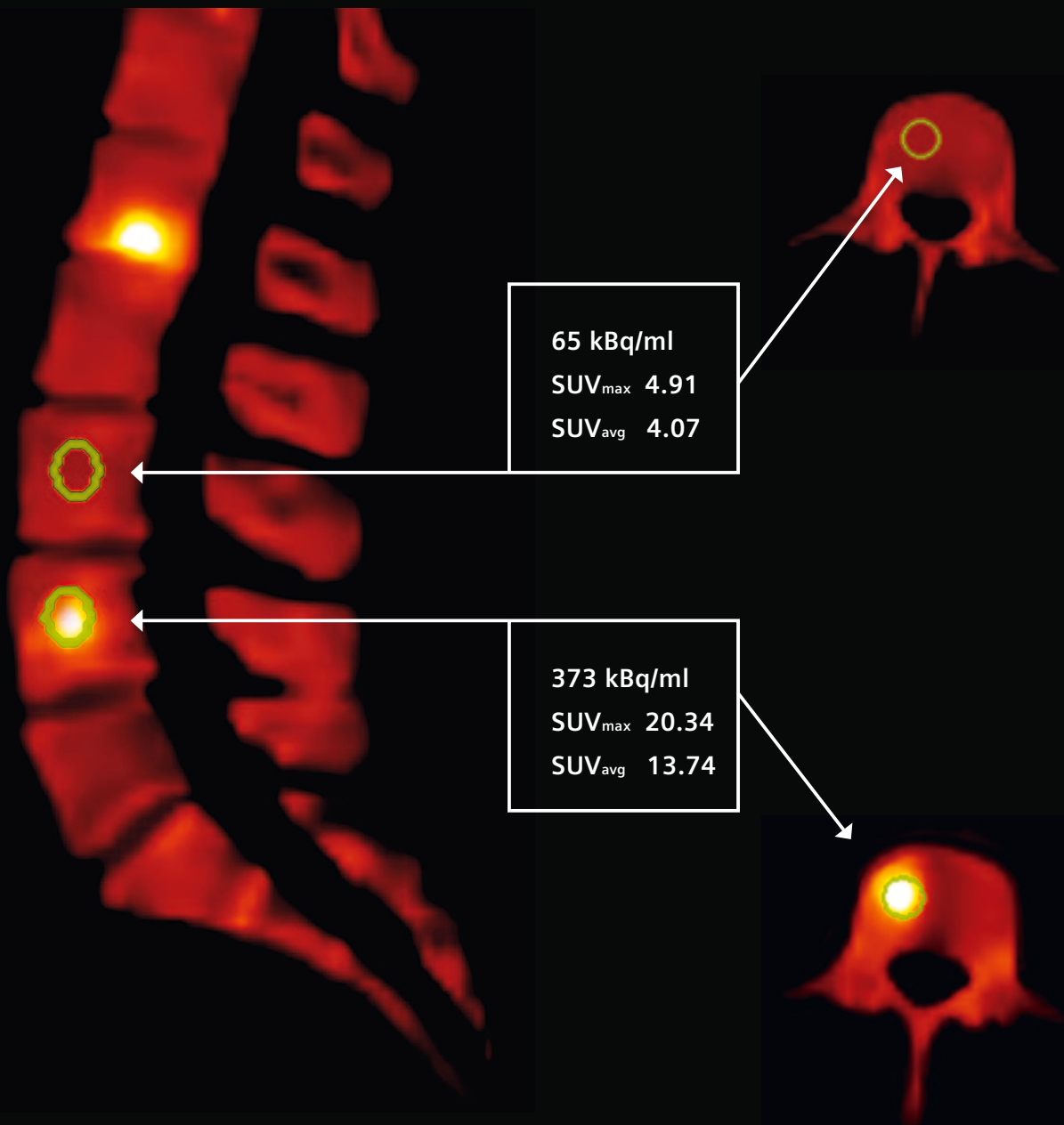
65 kBq/ml

SUV_{max} **4.91**

SUV_{avg} **4.07**

373 kBq/ml

SUV_{max} **20.34**

SUV_{avg} **13.74**

Lumbar vertebral collapse reconstructed with xSPECT Bone and xSPECT Quant. Quantification shows high SUV in the edge of collapsed vertebrae with high SUV related to expected high skeletal metabolism, but with normal SUV in spongious bone of the normal vertebrae. xSPECT Bone shows sharp delineation of spinal canal and posterior margin of collapsed vertebrae, suggesting spinal canal compromise with possible cord compression.

373 kBq/ml
SUV_{max} 20.34
SUV_{avg} 13.74