DISCOVERY™ NM/CT 670 CZT

Bring theory to life with CZT

Discovery NM/CT 670 CZT

A DIRECT PATH TO NM PRECISION AND EFFICIENCY

The world's first general purpose, ultra-high resolution SPECT/CT imaging system for high-performance clinical work and Nuclear Medicine research

A powerful tool that improves how studies are performed today, enables new areas of exploration and accelerates advancements and breakthroughs in a wide range of practice areas.

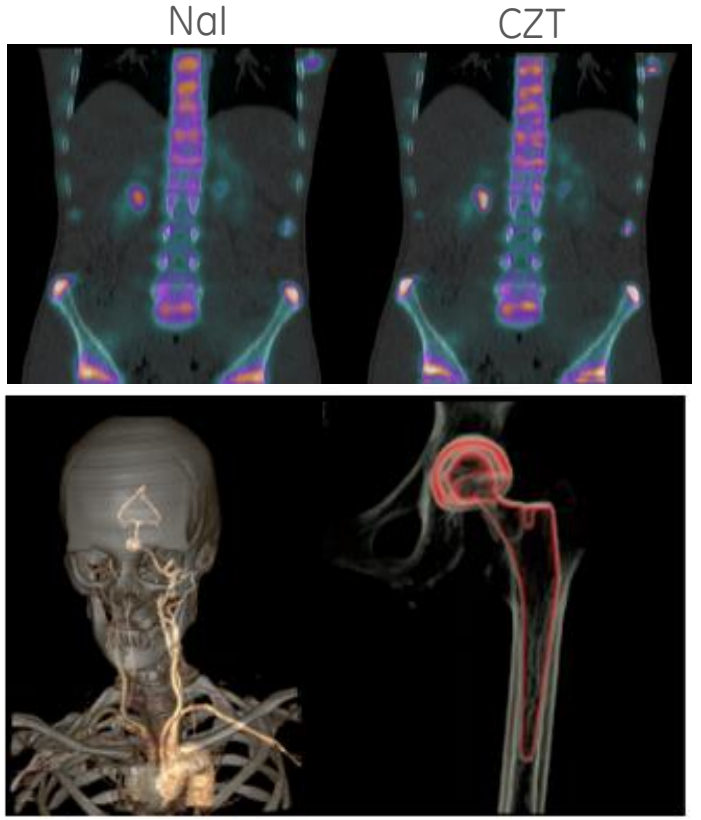
Achieve Clinical Excellence

Up to 75% reduction in injected dose[1]

Greater than 40% improvement in SPECT contrast to noise ratio, an important factor in lesion detectability[2]

Ultra-high resolution for improved lesion detectability[3] **and more accurate quantitation**[4] through improved spatial resolution of 2.8 mm versus 4.3 mm*

ASiR may allow CT scanning at lower dose[5]



"In some cases we noted that hardly detectable lesions were clearer on the CZT detector device" Prof. Keidar, Haifa, IL

*At detector surface

Increase Patient Satisfaction

Up to 75% reduction in scan time[1]

Less than 4min each for Bone SPECT and 4 min WB Planar [7]

Complete multiple exams in a single visit, and single instance on the bed with hybrid SPECT/CT and SDIS (Simultaneous Dual-Isotope Study) capabilities

67% DECREASE

Provide more tolerable exams such as reduced cardiac arm-raise angle and other less strenuous positions enabled by a 67% smaller detector frame (2.5 cm versus 7.5 cm)

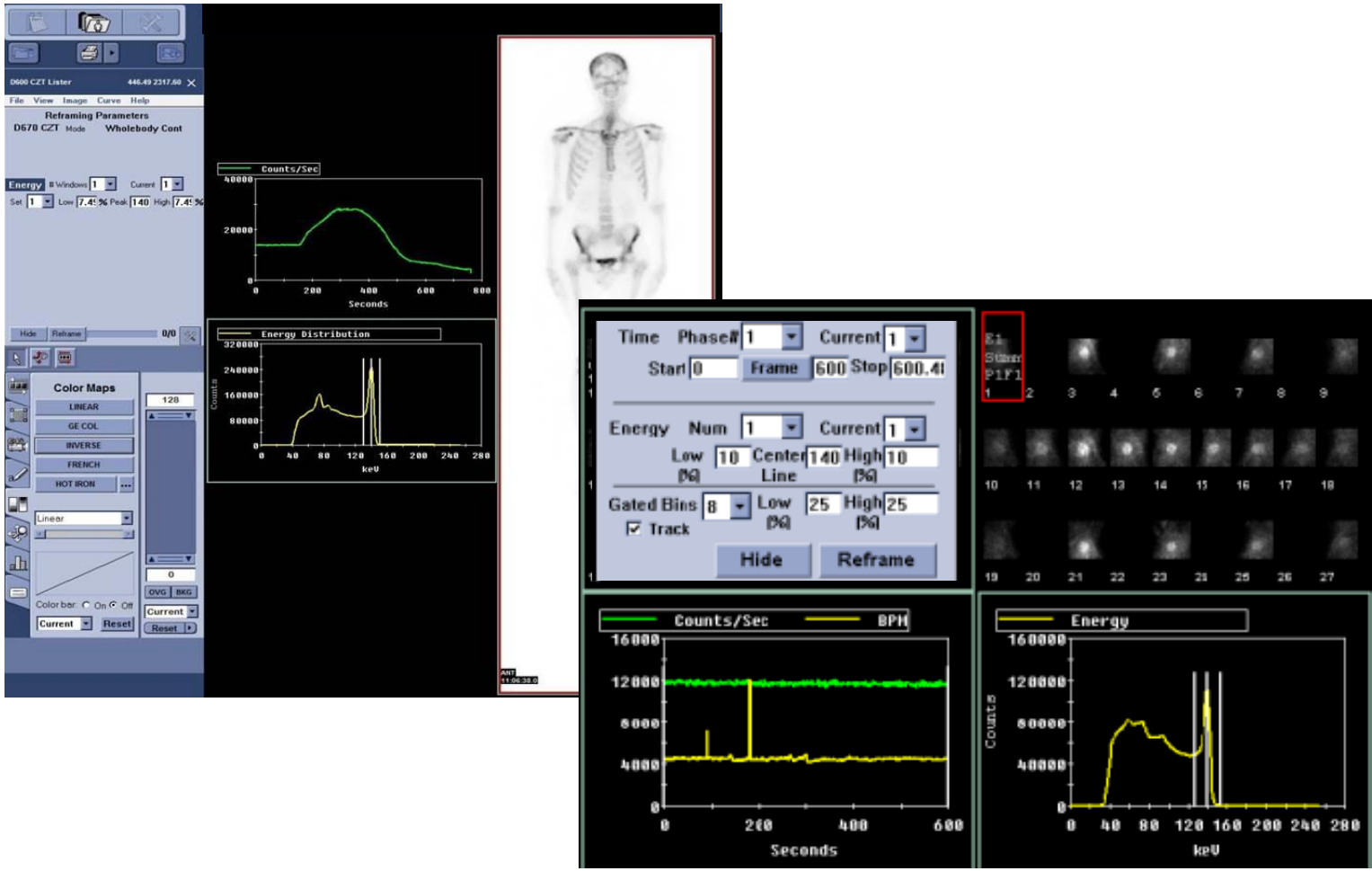
"Everyone likes using this system; it is patient and technologist friendly"
Prof. Scheiber, Lyon, France

Drive Strategic Growth

Research enabled by:

List mode for acquisition & processing

"Lister allows you to change the energy window and time per frame. 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"
Prof. Scheiber, Lyon, France

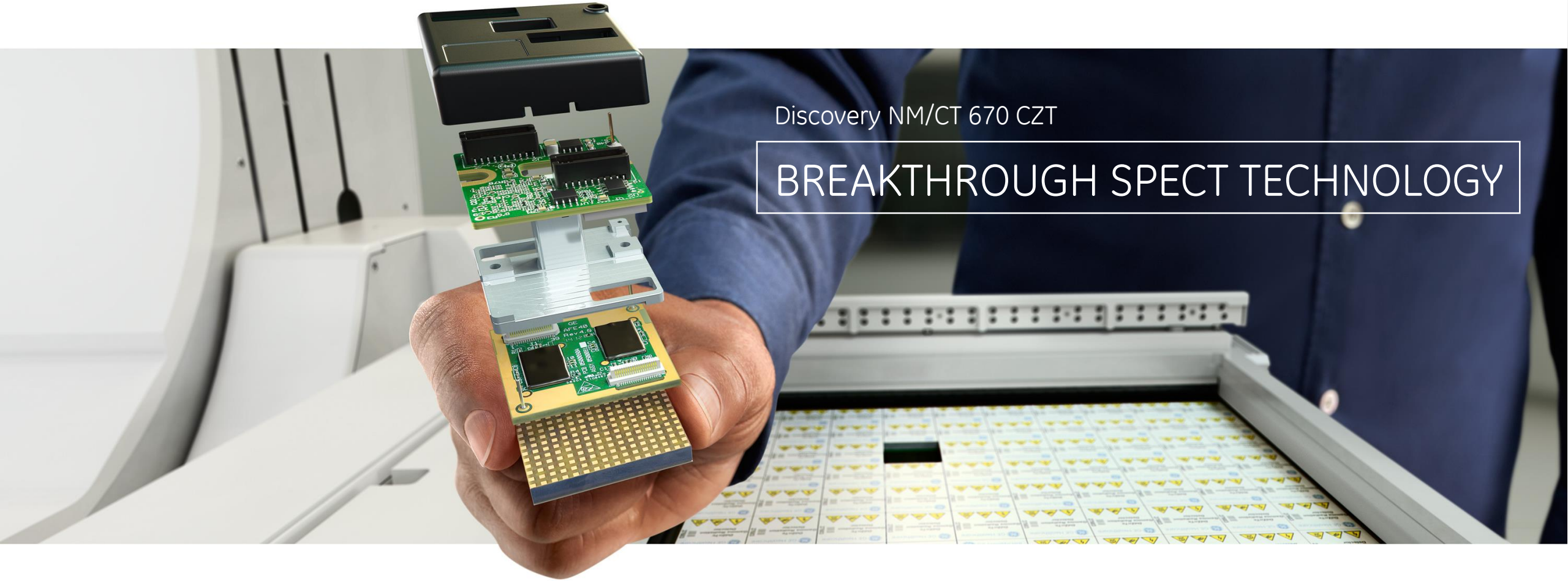


Improve capital planning

Your Future Well Within Reach

Modular design of Discovery 670 DR allows for an in-field upgrade to the Discovery NM/CT 670 CZT

"By using an existing installation, it was not only the right clinical decision, but one that is also most cost effective" Dr. Siegel, BJH, St. Louis



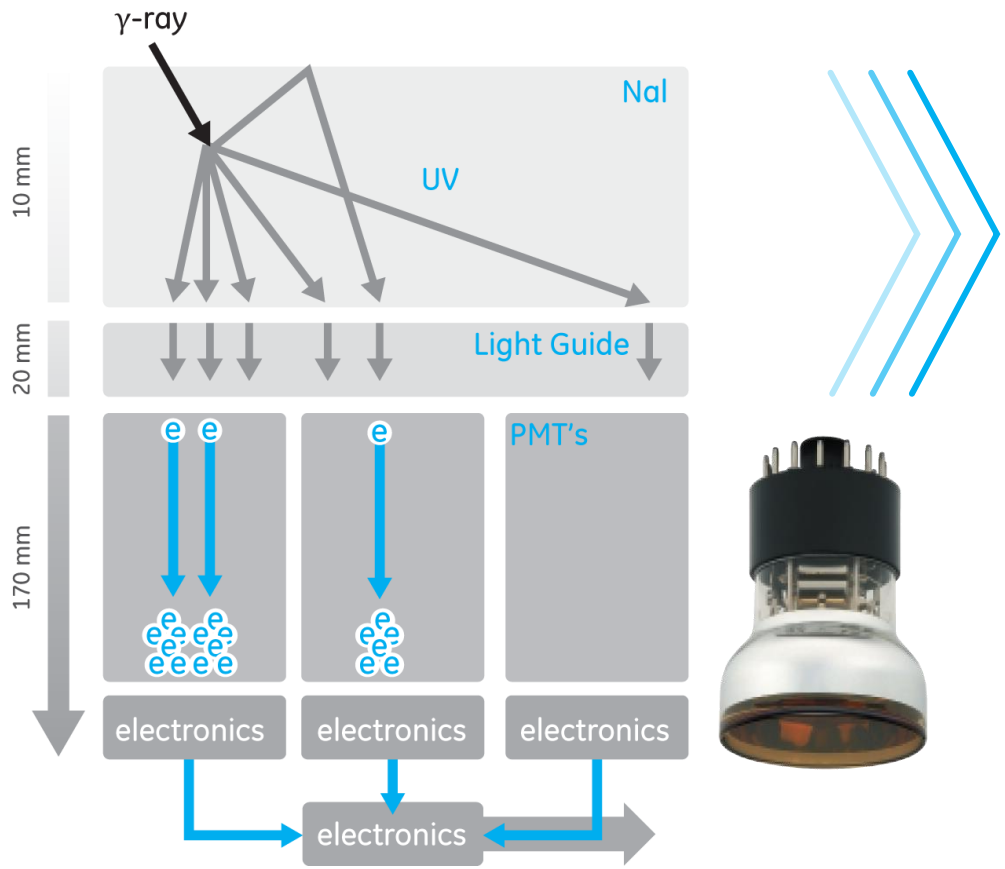
Discovery NM/CT 670 CZT

BREAKTHROUGH SPECT TECHNOLOGY

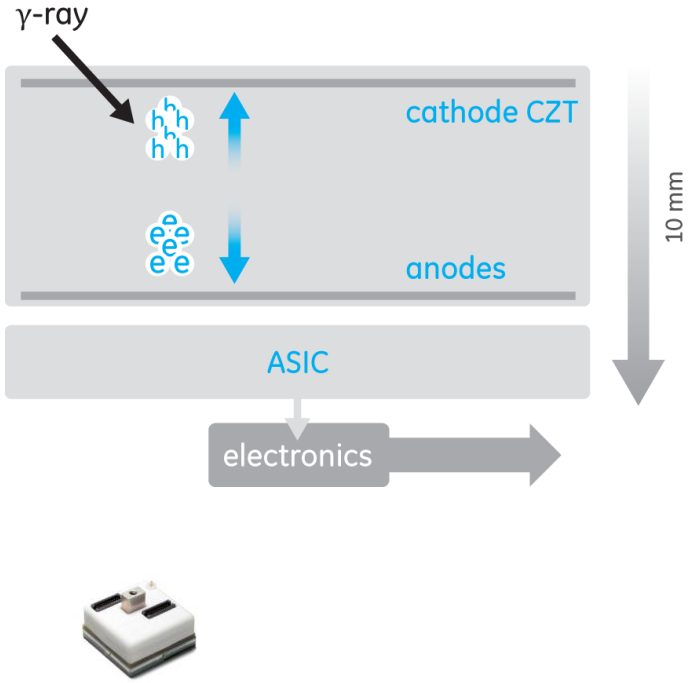
Nuclear Medicine Event Detection

Conventional vs. Direct conversion detectors powered by CZT technology

CONVENTIONAL TECHNOLOGY



CZT TECHNOLOGY

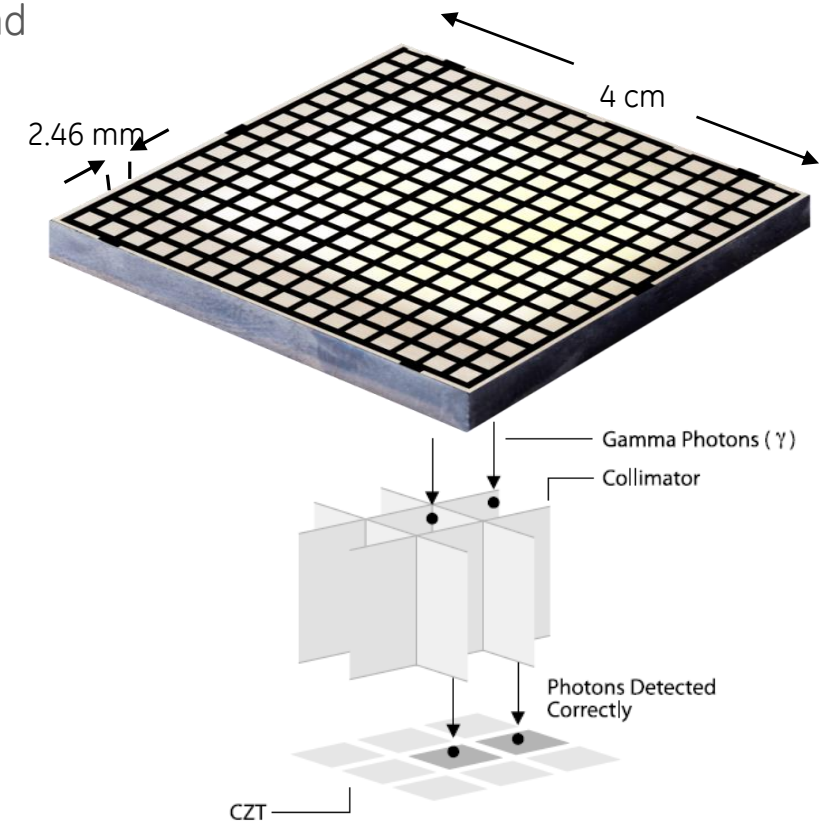


- 60x more photo-electrons, which improves energy resolution
- Elimination of analog noise
- Accurate event location

Breakthrough SPECT Technology

Introducing CZT (Cadmium Zinc Telluride) to the powerful SPECT/CT performance and hybrid workflow to deliver:

- **Pixelated detectors** with **registered collimation**
- **Spatial resolution of 2.8 mm versus 4.3 mm***
  yielded by pixelated detectors combined with registered collimation
- **25% greater** Optimal FOV than NaI detectors
- **67% reduction** in dead space (2.5cm vs 7.5 on conventional systems)
- **High up time** due to CZT module reliability, fast repairs
- **Optimized for low energy** isotopes: Tc^{99m}, Tl^{201}, I^{123}, Xe^{133}, Lu^{177} isotopes

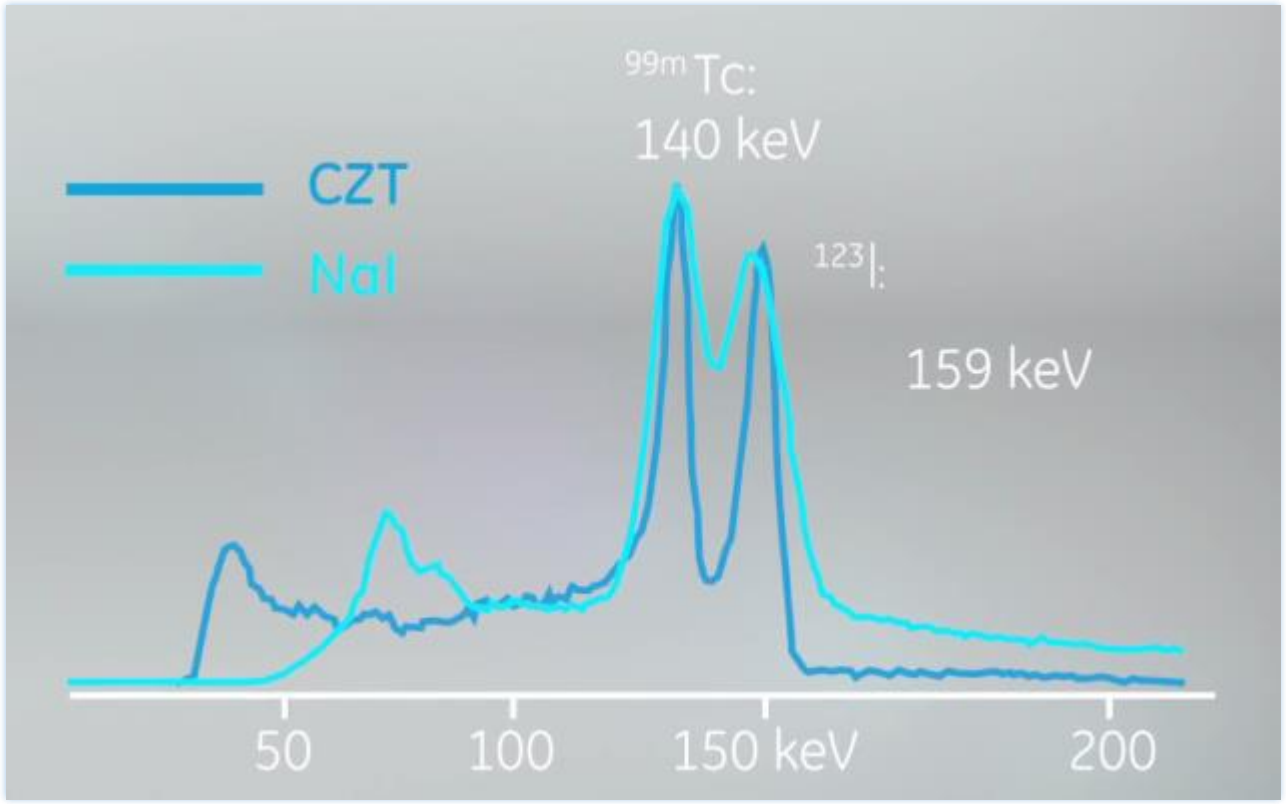


Registered Collimators

*At detector surface

Breakthrough SPECT Technology

Ultra High Energy Resolution of 6.3%



Improve IQ

Discriminate between low energy peaks and enable Simultaneous Dual Isotope Imaging (SDIS):

- Datscan & HMPAO scans
- Adreview & Myoview scans

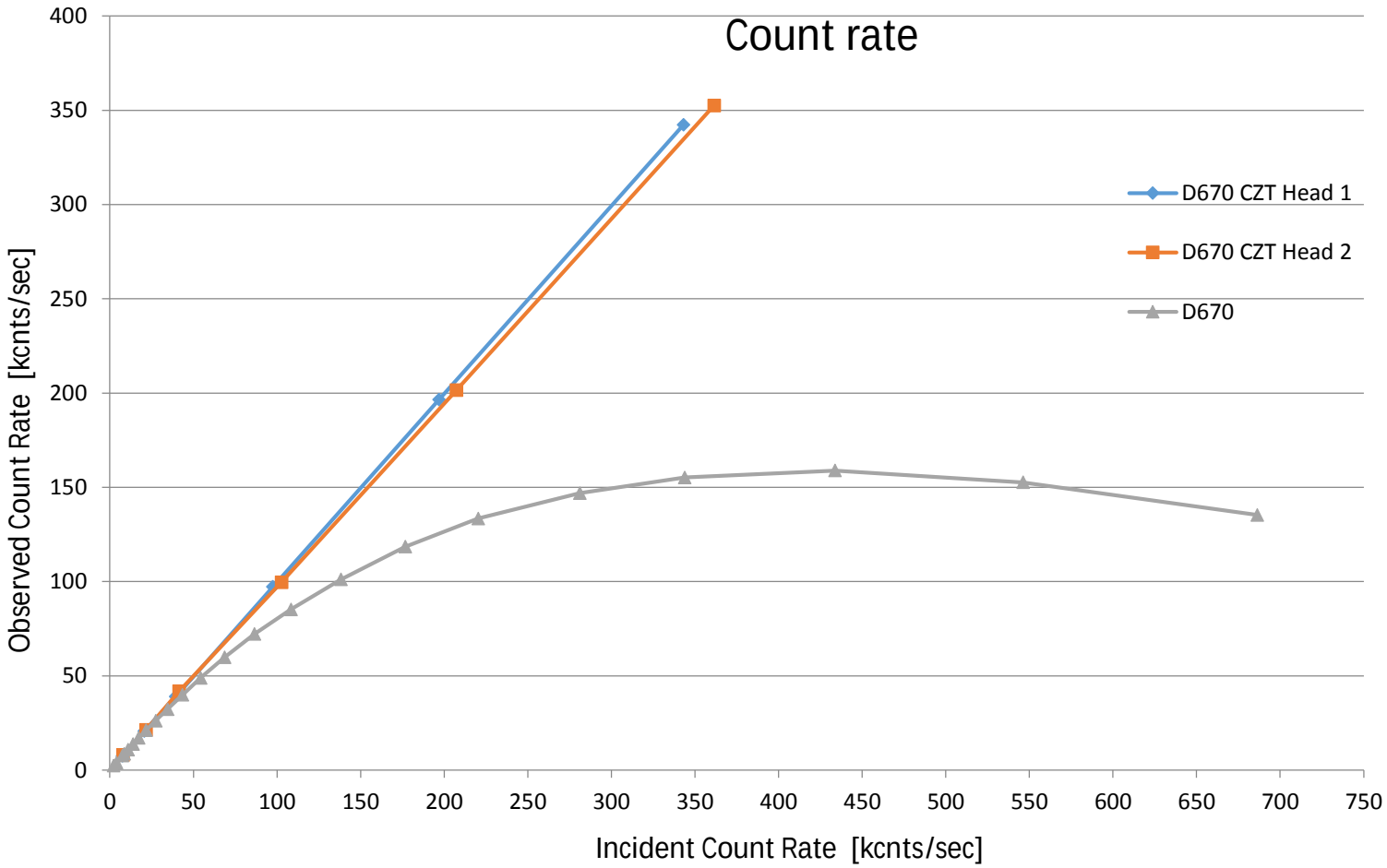
Breakthrough SPECT Technology

1.4x Count Rate

No dead time/detector saturation

Impact on high count rate isotope imaging such as Lu177

Maintain quantitative accuracy with high count rate tracers



Breakthrough SPECT Technology

Reduce Acquisition Time

Conventional Technology using Resolution Recovery

Bone WB*	x 1 SPECT**	AC + Anatomy
7.5 min	7.5 min	<1 min

Total Acquisition time^

<16 Minutes

Discovery NM/CT 670 CZT

Bone WB*,#	x 1 SPECT**	AC + Anatomy
<4 min	<4 min	<1 min

<9 Minutes

Discovery NM/CT 670 CZT

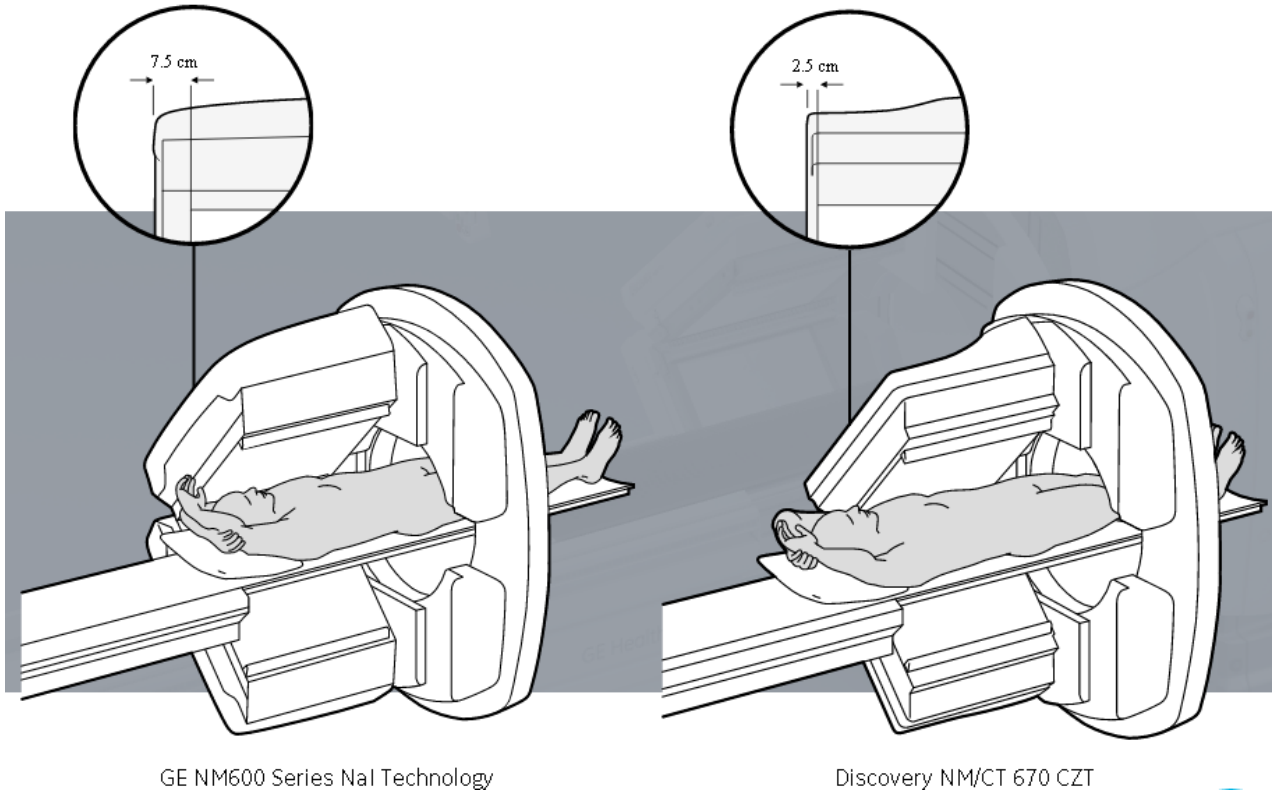
Whole Body SPECT**;&	AC + Anatomy
<16 min	<1 min

<17 Minutes

.
*EfB Planar option
**EfB SPECT option
#with Clarity 2D
&4 SPECT FOV exam
^Duration measured according to scan time (ex. transition movements are not factored)

Breakthrough SPECT Technology

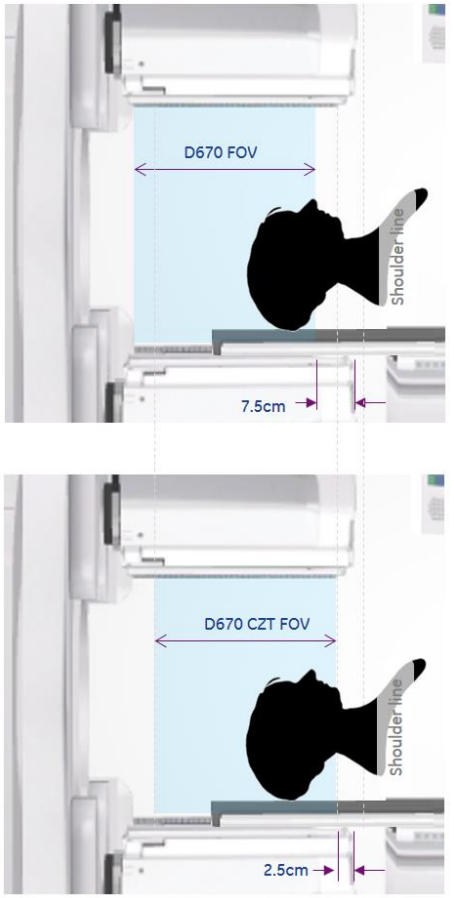
67% Reduction in Brain Reach



GE NM600 Series NaI Technology

Discovery NM/CT 670 CZT

Impact on Cardiac exam comfort



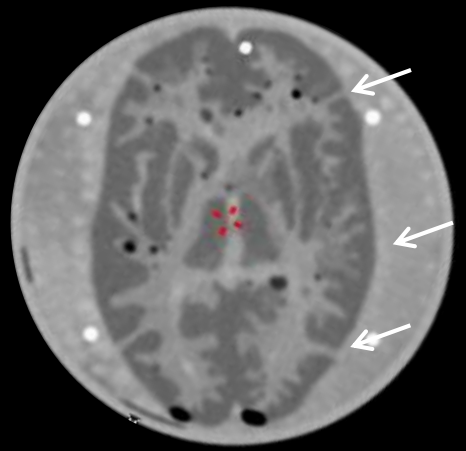
Impact on Brain scan exams

Breakthrough SPECT Technology

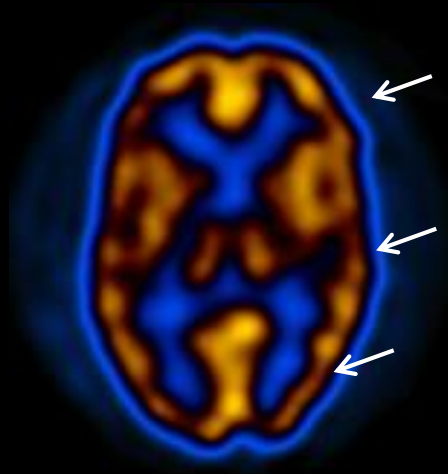
Reduced dead-space

Proximity to Patient – **Brain Reach** – 7.5 cm → 2.5 cm

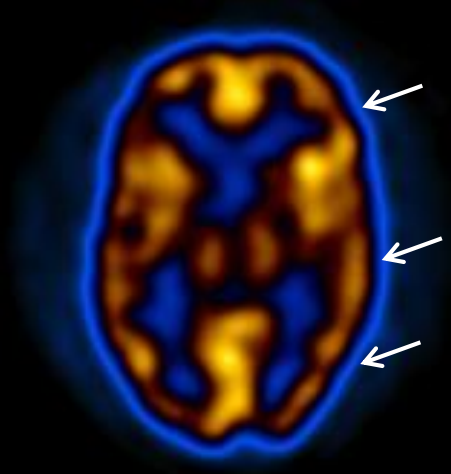
CT of phantom



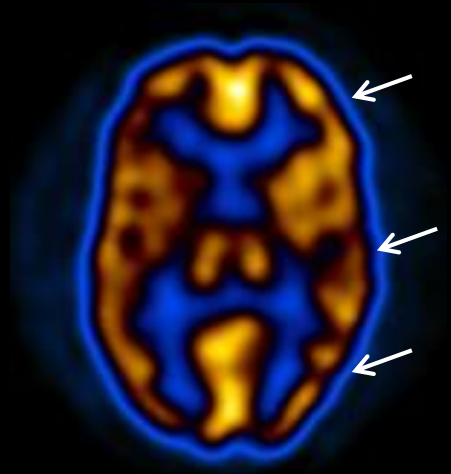
Discovery NM/CT 670
(R14 cm)



Discovery NM/CT 670
(R20 cm)

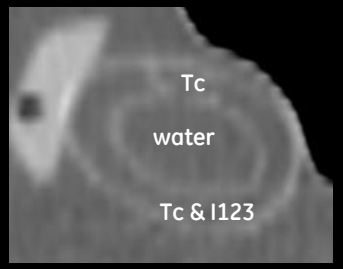


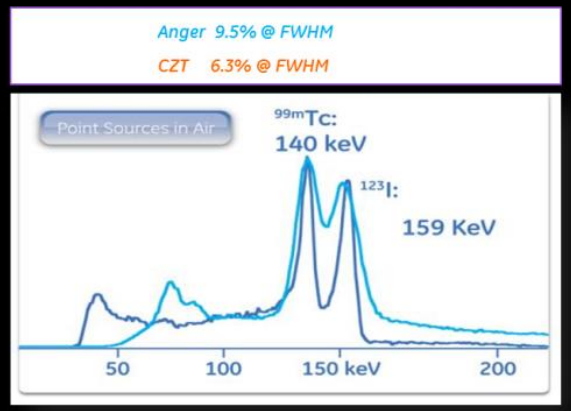
Discovery NM/CT 670 CZT
(R14 cm)



Breakthrough SPECT Technology

Improved energy resolution enables SDIS



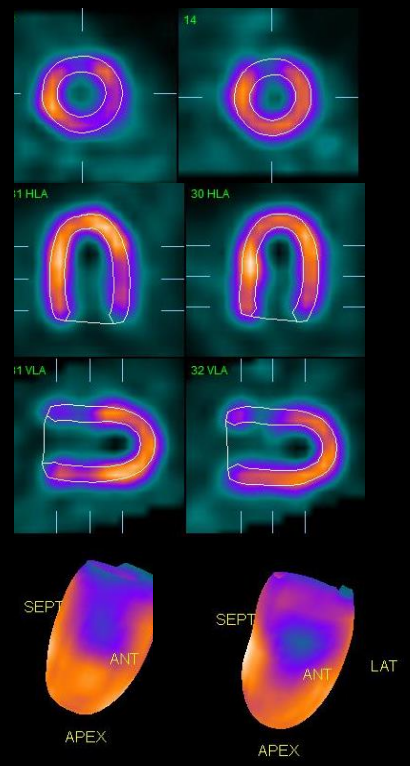


Defect: Tc
Myocard: Tc & I123
Cavity: water
Background: Tc & I123

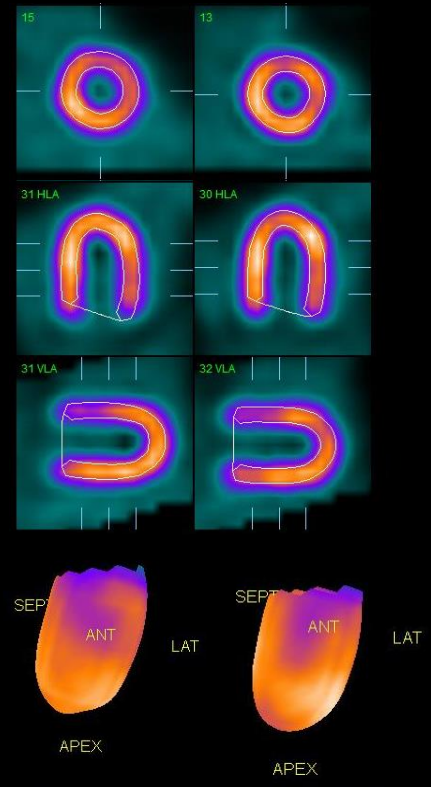
Crosstalk from the ^{99m}Tc into the I123 window typically reduces innervation deficiency detectability

A torso phantom experiment shows crosstalk elimination in Discovery NM/CT 670 CZT detectors due to the improved energy resolution (6.3% vs. 9.5%)

I123 (159 ± 6% Kev)



Tc^{99m} (140 ± 10% Kev)



Breakthrough SPECT Technology

A New Era of Quantitative Applications

DOSIMETRY TOOLKIT

Quantify changes in radiopharmaceutical uptake over time and calculate residence time per organ for Radio-Isotope Therapy (RIT) treatment planning purposes.

DATQUANT

Visual evaluation
and quantification
of DaTscan™ images.
May assist in detection of loss of functional dopaminergic neuron terminals in the striatum, which is correlated with Parkinson disease.

Q.LUNG

Diagnosis of PE, COPD, Emphysema and other lung deficiencies.

Assess the fraction of total lung function provided by a lobe or whole lung for Lung cancer resection.

Q.METRIX

Calculate regional activity concentrations.

Advance segmentation tools to provide 2D and 3D organ and lesion characterization.

Q.BRAIN

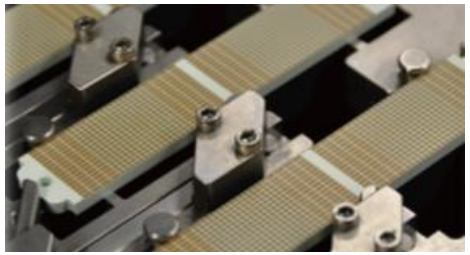
Visualize and quantify relative changes in the brain's metabolic function or blood flow activity which may be resulting from Epileptic seizures, dementia, inflammation, Traumatic Brain Injury, etc.

Discovery NM/CT 670 CZT

BREAKTHROUGH CT TECHNOLOGY

Breakthrough CT Technology

High Performance Imaging Chain - Based on Optima 540 technology



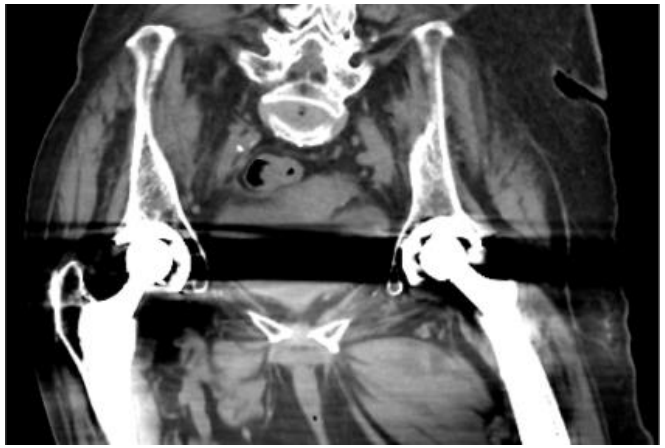
- 24 rows / 20 mm detector
- 0.625 mm slice thickness
- 21,888 detector elements
- 0.31 mm z-axis visual resolution

- 6.3 MHU anode heat capacity
- 0.5 second VariSpeed

- 53 kW generator power
- 440 mA in 10 mA increments

Breakthrough CT Technology

Access to High Image quality with Smart MAR



Without Smart MAR

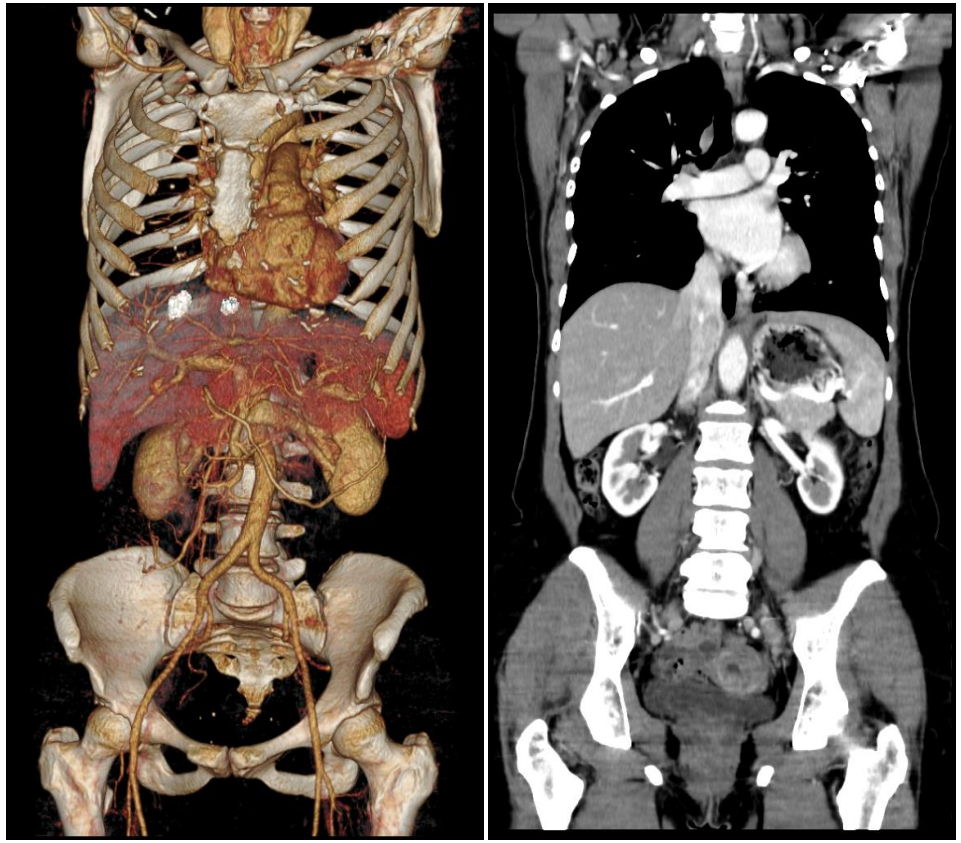
With Smart MAR

Smart MAR – metal artefact reduction*

** Smart MAR option on the Discovery NM/CT 670 CZT cannot be placed on the market or put into service until it has been made to comply with the Medical Device Directive requirements for CE marking or otherwise obtained all required regulatory authorizations.*

Breakthrough CT Technology

Maximize Speed & Coverage



Acquisition

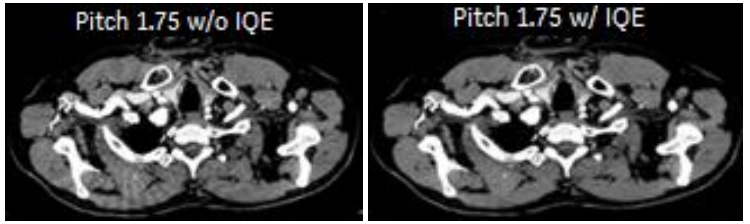
100kVp

Pitch 1.375

634mm in 11.52s

DLP
384mGy.cm
Equivalent dose 6.5mSv[&]

IQ Enhancement (IQE) may reduce helical artifacts[6] which would otherwise compromise image quality of thin-slice helical scans. Reduction in artifacts makes it possible to scan at faster helical pitches, enabling 70cm anatomy coverage in 10s.

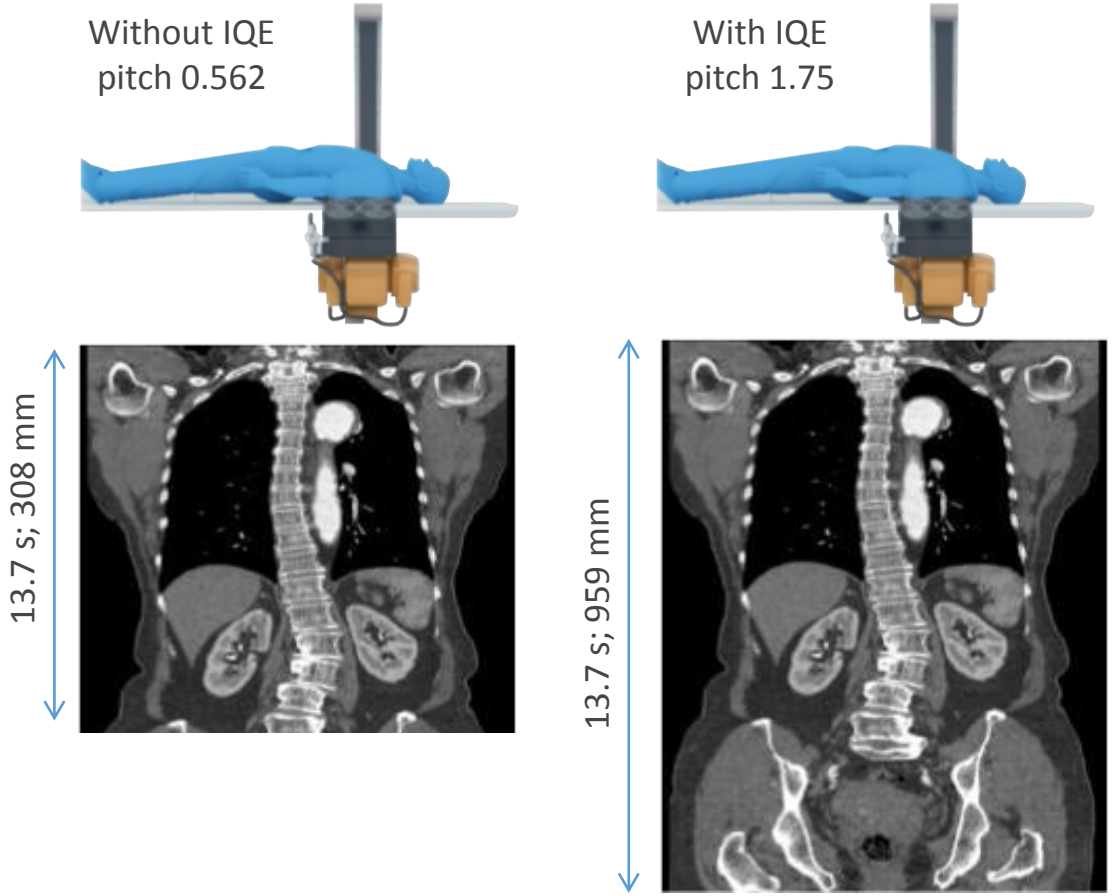


[&]Obtained by EUR-16262 EN, using an adult chest factor of 0.017*DLP, an adult abdomen factor of 0,015*DLP & pelvis factor of 0.019 *DLP

Courtesy of IMVOC – Ecully, France, Demonstrating Optima* CT 540 CT capabilities

Breakthrough CT Technology

Maximize Speed & Coverage



3x

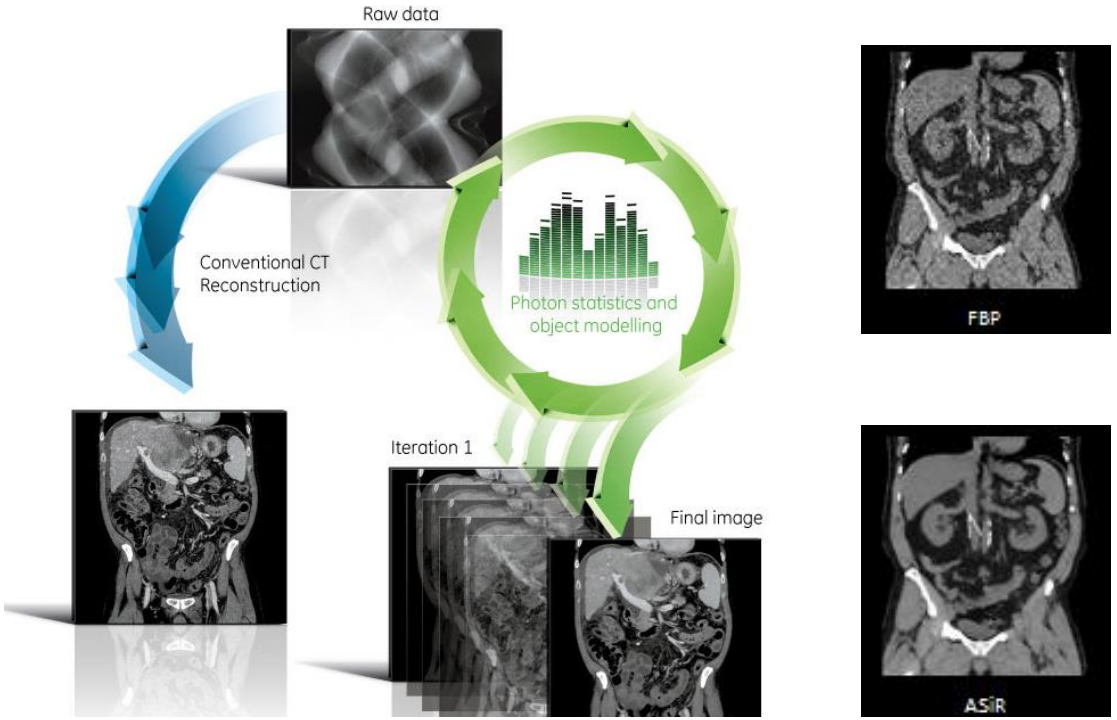
speed compared to pitch 0.562

Less

helical artifact than pitch 0.562

Breakthrough CT Technology

Leverage Advanced CT Dose Management with ASiR



A reconstruction technology that may deliver image pixel standard deviation equivalent to an acquisition with higher generator power[5]

Use of ASiR may allow for scanning at lower mA and less anode heat, thereby reducing tube cooling limitations[5]

Breakthrough CT Technology

Leverage Advanced CT Dose Management with ASiR

Raw data

FBP (direct reconstruction)	VISR	ASiR
Non accurate solution to complex problems Very sensitive to noise	Reduced noise Trade-off between noise and image detail	Accurate solution to complex problem Raw data noise modeling

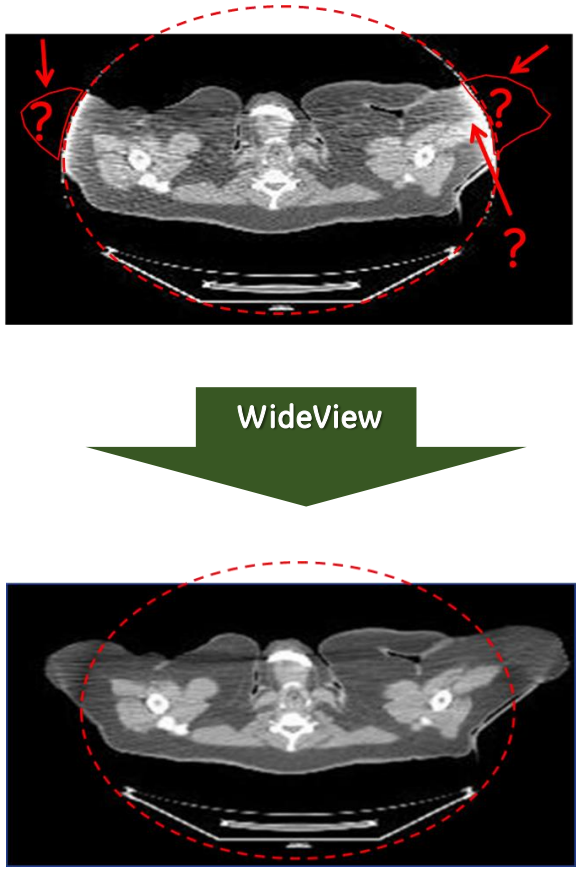
68,000,000 Exams using ASiR performed to date

5,600 GE CT systems running with ASiR worldwide

150 Papers and talks since RSNA 2009

Breakthrough CT Technology

Expand your CT FOV



WideView enables attenuation correction throughout the entire SPECT FOV

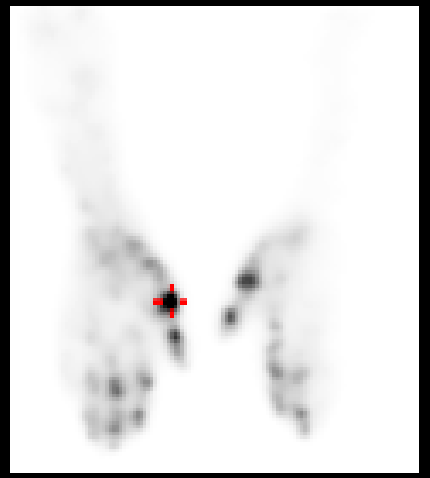
Objects outside the CT FOV are restored

Discovery NM/CT 670 CZT

CLINICAL IMAGES: SPECT & SPECT/CT

Planar Spot Time / Dose Reduction

4 min per FOV

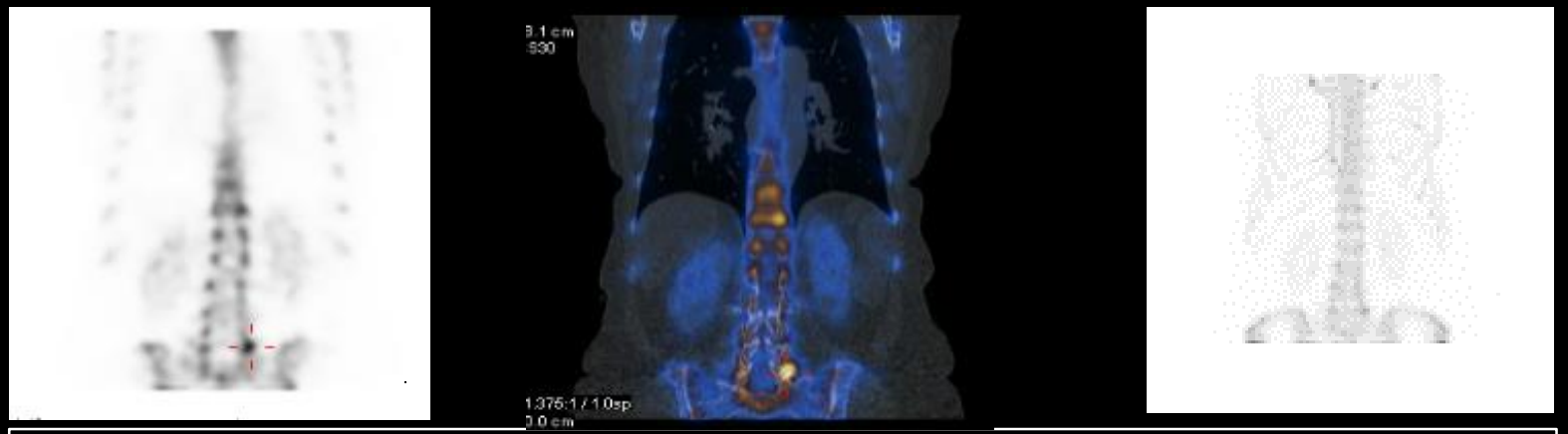


7.5min per FOV

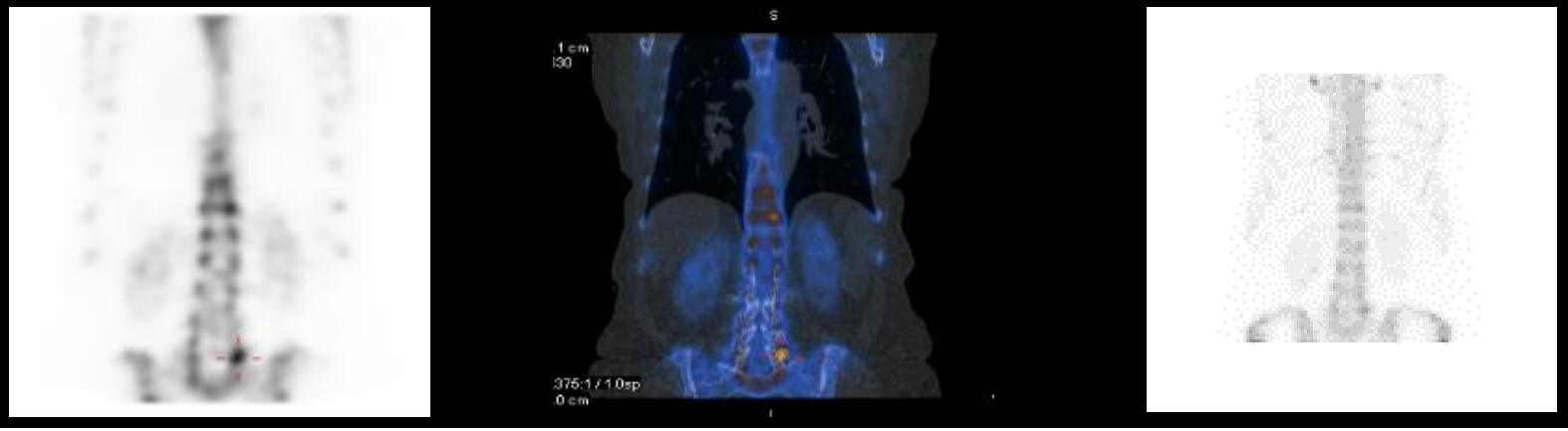
Courtesy of hospices civils de Lyon, France, Pf Scheiber

SPECT-CT Time / Dose Reduction - Torso

7.5min per FOV



4min per FOV



Courtesy of hospices civils de Lyon, France, Pf Scheiber

Whole Body Time / Dose Reduction

6 min

12 min

Courtesy of hospices civils de Lyon, France

Whole Body Time / Dose Reduction

History:
Child in her fifth year
Back pain on left side, cannot run, walk bent over.
Scoliotic attitude.
Normal radio. No effusion at echo.

Acquisition:
148 MBq Tc $_{99m}$
WEUHR collimator
360° SPECT, 60 steps of 16s , 128x128 zoom 1.0

CT : CTDIvol 0,73 mGy, DLP 22,72 mGy.cm

Findings:
Focal increase uptake of a left pars interarticularis fracture of L5 with peripheral sclerotic reaction. No uptake at level of a lytic lesion of right pars interarticularis L5.

Conclusion:
Beginning isthmic spondylolisthesis L5-S1 with sub acute fracture of left isthmus (Subtype C) and classic lytic lesion of the right isthmus (subtype A).

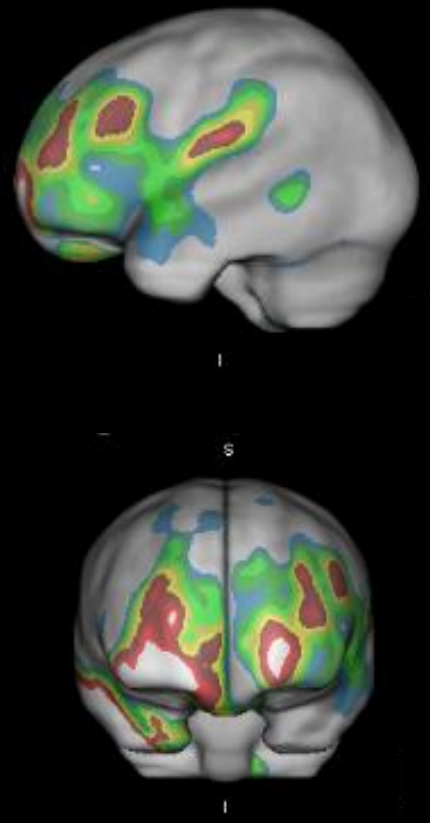
16sec/fr

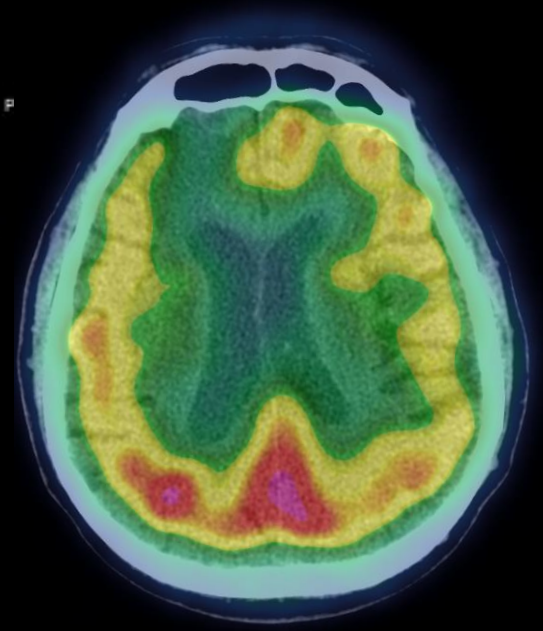
11sec/fr

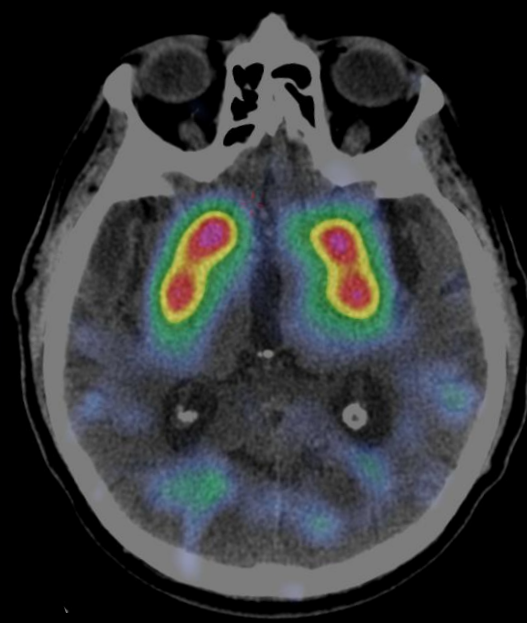
Courtesy of hospices civils de Lyon, France

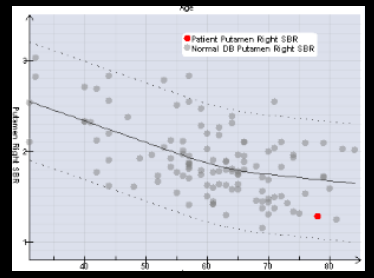
Simultaneous Dual Isotope Imaging : Datscan™ & Ceretec™

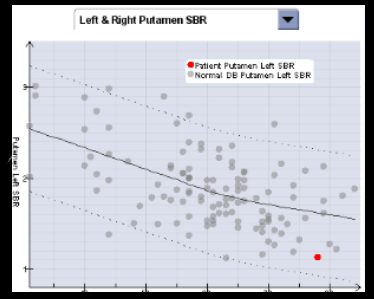
Cortical Region	Patient	Normal	Diff.	Z-Score
Prefrontal Lateral R	0.87	0.96	-0.09	-4.49
Prefrontal Lateral L	0.85	0.95	-0.11	-5.76
Prefrontal Medial R	0.84	0.95	-0.11	-3.53
Prefrontal Medial L	0.87	0.95	-0.07	-2.18
Sensorimotor R	0.98	0.94	0.03	1.26
Sensorimotor L	0.94	0.95	-0.00	-0.05
Anterior Cingulate R	0.85	0.93	-0.08	-1.53
Anterior Cingulate L	0.82	0.94	-0.12	-2.36
Posterior Cingulate R	1.01	0.99	0.02	0.54
Posterior Cingulate L	0.99	0.98	0.00	0.04
Precuneus R	1.13	1.00	0.13	3.99
Precuneus L	1.13	0.98	0.15	3.86
Parietal Superior R	0.99	0.91	0.08	1.92
Parietal Superior L	0.88	0.87	0.01	0.31
Parietal Inferior R	0.98	0.97	0.01	0.50
Parietal Inferior L	0.89	0.95	-0.06	-2.36
Occipital Lateral R	1.07	0.92	0.16	6.15
Occipital Lateral L	1.04	0.92	0.12	5.67
Primary Visual R	1.14	1.00	0.14	2.77
Primary Visual L	1.03	1.01	0.02	0.68
Temporal Lateral R	0.77	0.93	-0.16	-6.75
Temporal Lateral L	0.85	0.92	-0.07	-3.14
Temporal Mesial R	0.75	0.85	-0.10	-2.85
Temporal Mesial L	0.77	0.86	-0.09	-2.44
Cerebellum	0.95	0.93	0.02	0.69
Pons	0.83	0.87	-0.04	-0.70











Courtesy of hospices civils de Lyon, France,
Pf Scheiber

Whole Body SPECT / CT

Indication:

Search for bone metastasis in a 73-year-old patient with suspected solid cancer
With a left lateral-cervical mass.

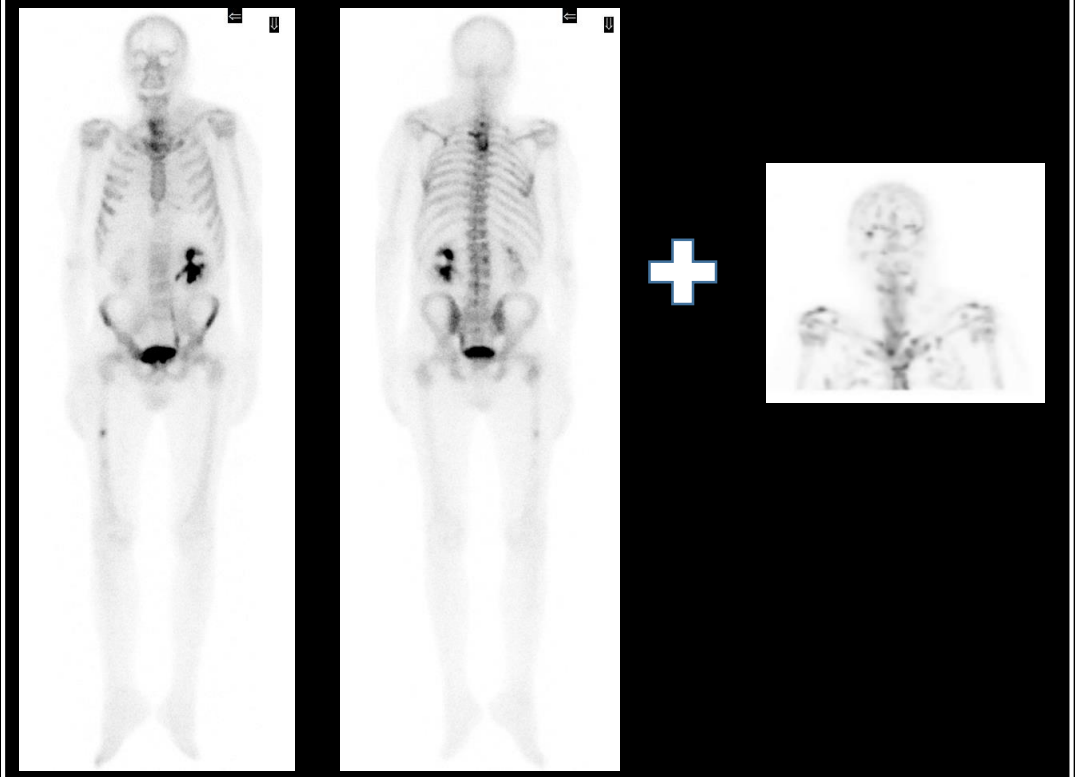
Technique:

Injection of an activity MBq /99mTc HDP.
2 hours delayed whole body scan performed in anterior and posterior views.
followed by 4 FOVs SPECT-CT acquisition.

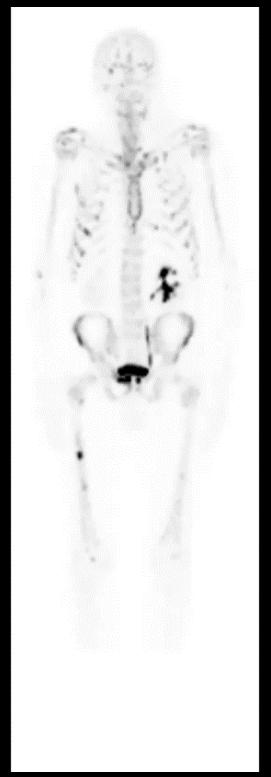
Conclusion:

Hyperosteoblastic lesions in relation to the vertebral bodies suspected of metastases Ti to T4 and the right femoral diaphysis. No scintigraphic translation of other osteolytic lesions suspected of metastasis.
Moreover, the presence of pulmonary parenchymal nodules and voluminous masses sus- ganglion and subdiaphragmatic sheathing in the aorta and providing a retractile effect on the left ureter with dilation calicielle left and left renal lesion to explore.

WB + 1 FOV SPECT
20minutes



4 FOVs SPECT
20 minutes



Courtesy of hospices civils de Lyon, France, Pf Scheiber

Whole Body SPECT / CT

Indication:

73y patient , Assessment of pain in the left shoulder in a patient who had surgery nine weeks prior to scan for tears in the rotator cuff of his left shoulder.
Search for infectious complication

Acquisition:

Injection of an activity of 744 MBq of HDP-Tc.
Static acquisitions centered on the shoulders, whole body scan in anterior and posterior views
followed by WB FOVs SPECT-CT acquisition

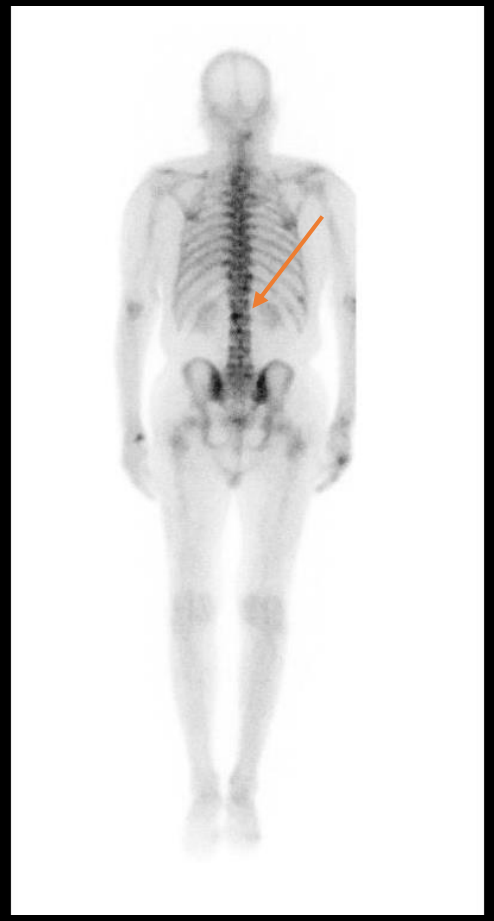
Conclusion:

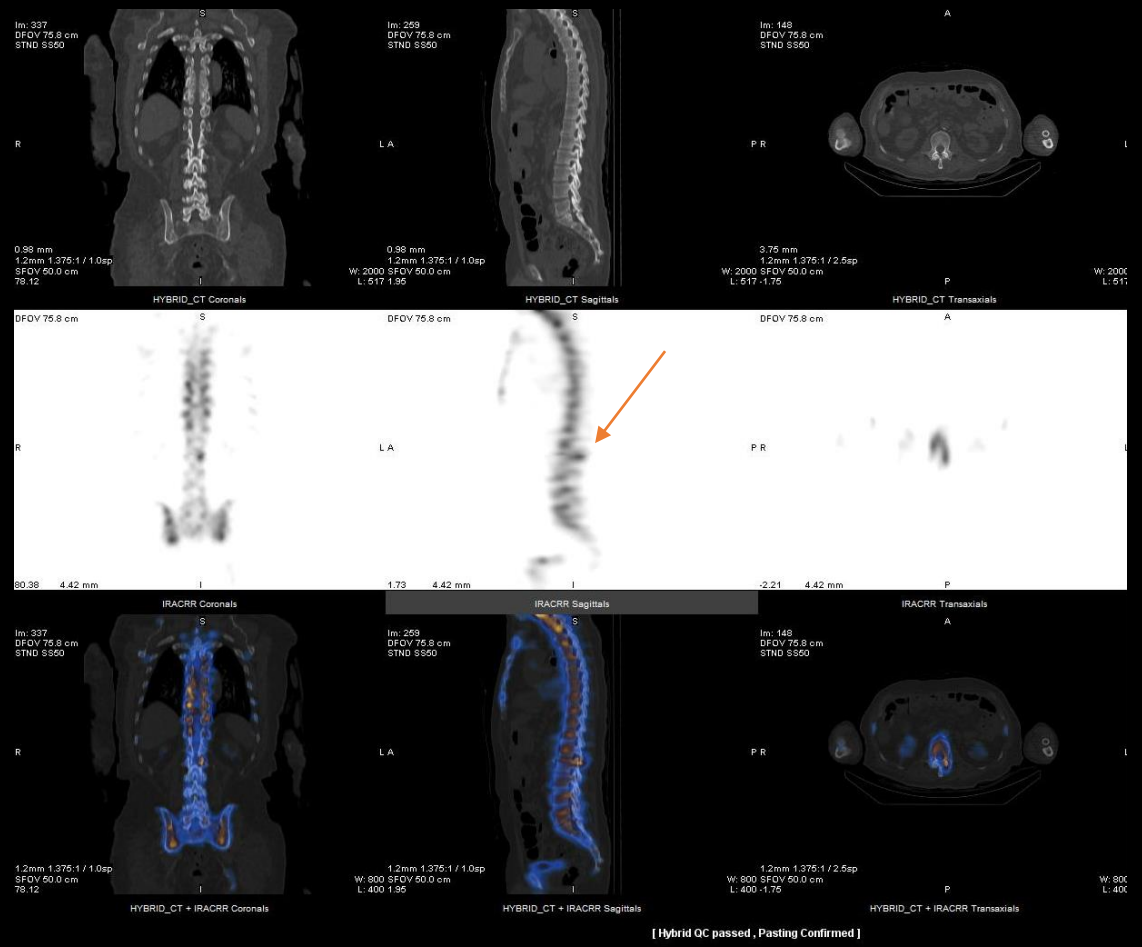
The scan is consistent with an articular inflammatory disease of the left shoulder, in particular, the left acromioclavicular joint, the humerus (the latter having a level of bone remodeling same intensity as that which exists on the left humeral diaphysis (Fixer screw?).
These findings provide little evidence for postoperative bone infection.

Courtesy of hospices civils de Lyon, France, Pf Scheiber

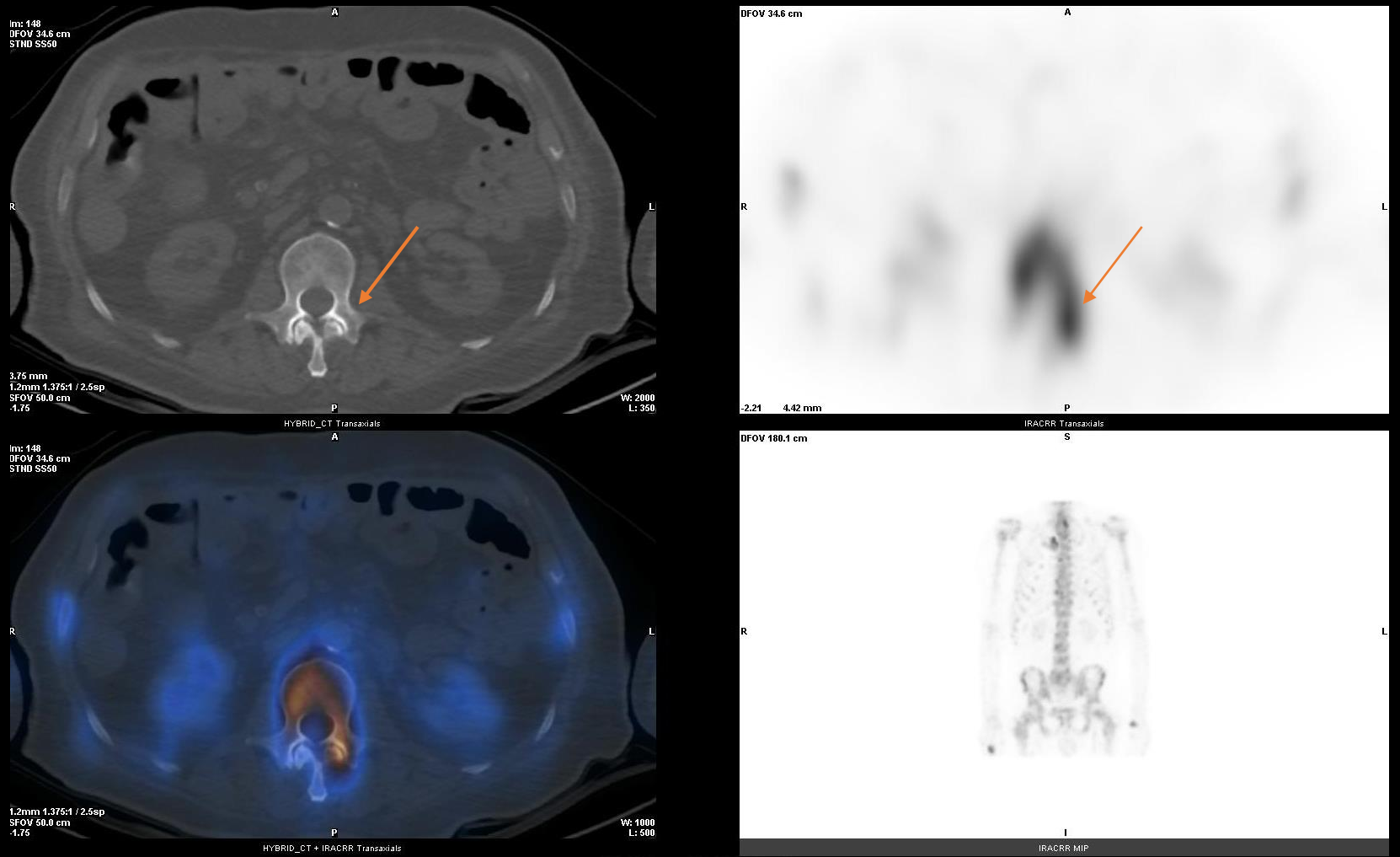
20 min WB SPECT CT

Discovery NM/CT 670 CZT -2.5min/ SPECT FOV





Discovery NM/CT 670 CZT -2.5min/ SPECT FOV



Courtesy of hospices civils de Lyon, France

Simultaneous dual-isotope brain imaging

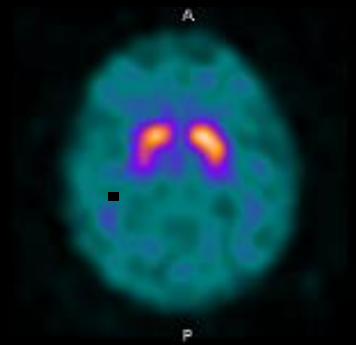
Patient with signs of cognitive impairment assessed for tremor suspicious of PD symptoms.
Patient tremor symptoms not attributed to potential PD

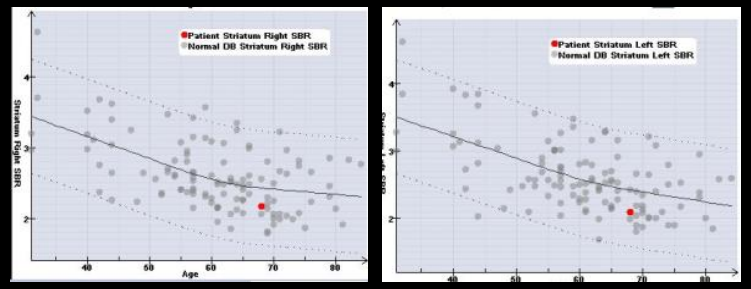
HMPAO (Tc99)

Cortical Region	Patient	Normal	Diff.	Z-Score
Prefrontal Medial R	0.79	1.02	-0.23	-4.85
Prefrontal Medial L	0.80	1.02	-0.22	-4.18
Sensorimotor R	0.96	1.01	-0.06	-1.24
Sensorimotor L	0.94	1.02	-0.08	-1.77
Anterior Cingulate R	0.70	1.00	-0.30	-4.63
Anterior Cingulate L	0.67	1.01	-0.34	-5.17

Perfusion data with Z-scores

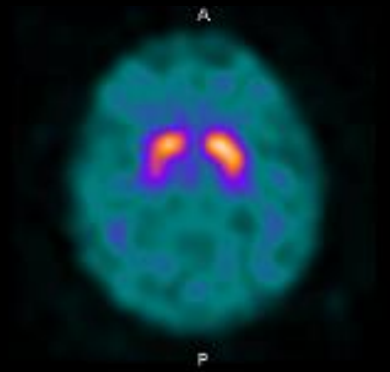
DaTSCAN (I-123)

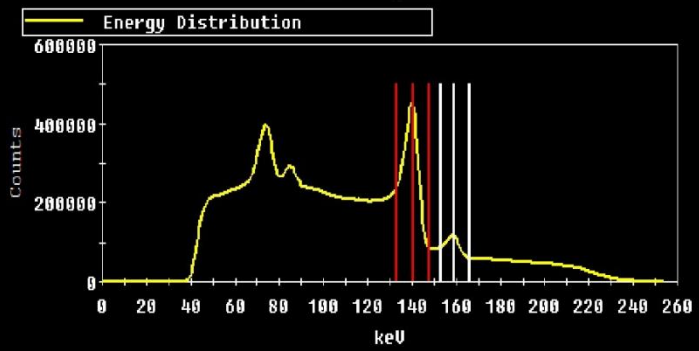




Negative result for PD assessment

Tc99/I-123 Images





Energy Windows adjustment enables clear separation of Tc99 & I-123 peaks

Courtesy of Prof. Keidar, Rambam Health Center, Haifa

Energy resolution translated into clinical outcome

THANK YOU