PHILIPS

The Point Source

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In this issue

Message from Executive Team

Welcome to the second edition of ***The Point Source***. I hope you enjoyed our introductory newsletter and that you will continue reading for the latest in new product innovations and industry trends.

I'm proud to announce the release of BrightView XCT, the first "no compromise" SPECT/CT system. The BrightView XCT addresses the need to keep patient dose low without sacrificing image quality and accuracy. It achieves these goals by integrating Philips advanced flat-panel CT, a proven technology that provides exceptionally high resolution CT at low patient dose levels. To improve registration confidence the BrightView XCT uses a unique co-planar design that allows SPECT and CT to be acquired in some cases with no table index between studies.

In addition, Philips Astonish and Astonish with attenuation correction reconstruction are now clinically proven to improve diagnostic accuracy, allowing you to interpret data with greater diagnostic certainty.

Also newly released is our Extended Brilliance Workspace for Nuclear Medicine (EBW NM) with SPECT, PET, and CT advanced applications in one system. The new Tumor Tracking application allows you to analyze sequential PET/CT studies to track disease progression.

Expanding the clinical utility of PET/CT in oncology was the inspiration for our GEMINI TF Big Bore PET/CT—also newly released. The first system designed to deliver the accuracy and workflow optimization demanded by imaging for radiation oncology applications, Big Bore offers the flexibility for premium imaging performance in diagnostic and radiation oncology procedures. Philips patented OpenView gantry provides greater patient comfort. The 85 cm bore diameter for both PET and CT helps to accommodate the patient positioning flexibility provided on leading radiation therapy systems.

Another addition to Radiation Oncology is our new SmartArc application, now available on Pinnacle³. SmartArc utilizes VMAT technology to generate plans with significantly reduced treatments times, benefiting the patient and providing more capacity for your clinic. Innovative SmartArc is vendor neutral, working with the major Linac vendors to seamlessly integrate with your department and deliver the best return on your efforts.

These are the latest examples of how Philips Nuclear Medicine will continue to lead in innovation by providing you with clinical contributions that matter. I hope you enjoy this edition of ***The Point Source***, and I hope to hear from you soon.

Jay Mazelsky
Senior Vice President and General Manager, Nuclear Medicine

Global molybdenum and technetium shortage

In May of 2009, the Chalk River nuclear reactor in Ontario, Canada was shut down after a leak was discovered. As a result of this shutdown, the nuclear medicine SPECT community is experiencing a significant reduction in the amount of Mo-99/Tc-99m produced. Chalk River, which produces most of the radioisotopes for the United States and approximately 30% of the worldwide supply, is not expected to go back online until spring 2010, at the earliest. The reactor in Petten, Netherlands (another of the world's leading isotope producers), has recently re-opened following repairs; however, it is reported to shut down again for another six months, in March 2010. If Petten does shut down in March and Chalk River is not back up by then, the expectation is that the worldwide supply of Tc-99m will be down to 10 or 20% of normal.

Nuclear medicine departments across the world are searching for alternative techniques and protocols to navigate around this problem. At Philips Healthcare, we are committed to helping you through this challenging time.

There are two strategies that can be used to tackle this shortage:

- Replace technetium-99m with a different isotope
- Explore ways to more efficiently use 99mTc-labeled radiopharmaceuticals

Replacement strategy

Since Cardiac SPECT or MPI constitutes 40% of the world-wide technetium-99m consumption, an alternative isotope that is widely used is thallium. ASNC has published recommendations for acquisition and processing protocols to use with thallium and Philips Healthcare's cardiac analysis tools, (AutoQUANT and 4D-MSPECT) have thallium databases available.

Our Customer Care Solution Center in Atlanta, or your regular point of contact for applications support, is prepared to assist you in modifying your acquisition and processing protocols for this alternative isotope.

Ways to more efficiently use 99mTc-labeled radiopharmaceuticals

In an effort to more efficiently use Tc-99m, Philips has developed an advanced reconstruction method termed Astonish*. Astonish provides more accurate reconstruction than filtered back-projection by incorporating physics into the reconstruction process. This method results in equivalent image quality even when the acquired counts are cut in half. The half-count data may be acquired either by reducing the scan times or the administered dose (not both). A recently published multicenter clinical trial for Cardiac Astonish and Cardiac Astonish with attenuation correction (AC) has shown the following results:

- **Half-time imaging** with Astonish improves laboratory efficiency without significantly sacrificing accuracy. By reducing patient imaging time, a higher throughput can be achieved.
- **Half-dose imaging** with Astonish allows you to inject half the dose and image at full-time without sacrificing diagnostic accuracy.
- **Stress-only protocol** is enabled by combining AC with Astonish due to improved specificity and increased diagnostic accuracy. This protocol can increase departmental efficiency even further by reducing the need for rest imaging in patients with normal stress studies.

* Note: Astonish is a purchasable software package. Astonish with vantage attenuation correction is available only on the EBW NM platform.

For more information on Astonish and the multicenter clinical trials, please refer to the Astonish article within this publication.

As always, our support team is here to help you. If you would like further assistance on the information provided, please contact the following: In the USA and Canada, call the **Philips Healthcare Customer Care Solution Center at 800-722-9377**. In other countries, call your local Philips contact for applications support.

New product updates

Pinnacle³ v9 with SmartArc

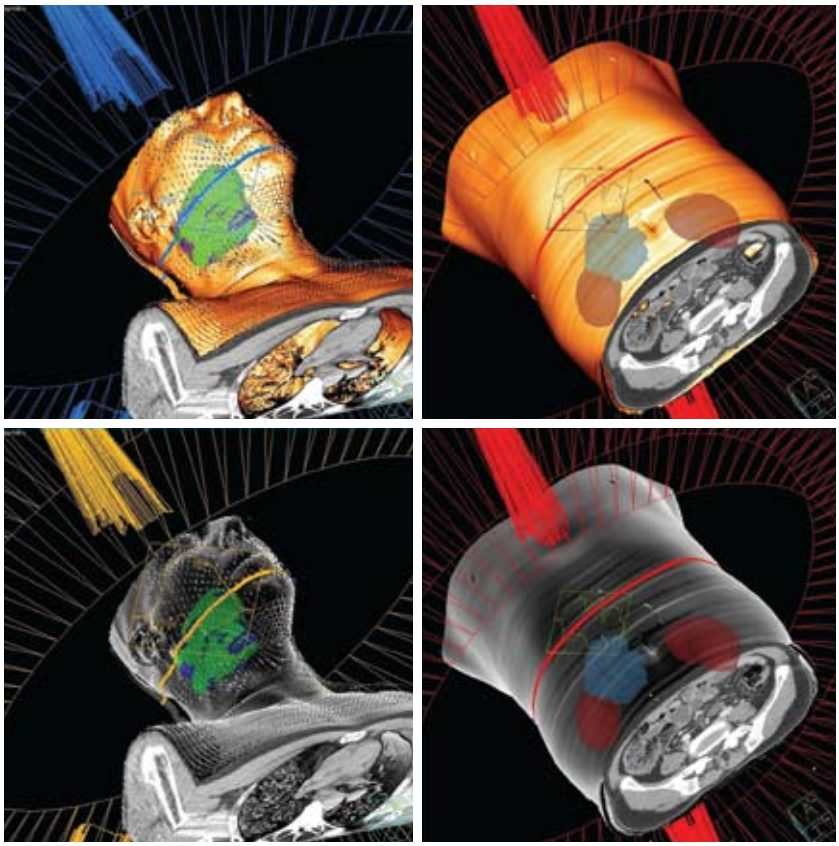
Flexibility, precision, efficiency

The integrated SmartArc module, available with Pinnacle³ Version 9, provides the tools to create rotational intensity-modulated radiation therapy (IMRT) plans using a conventional linear accelerator and a conventional multileaf collimator (MLC). SmartArc uses principles developed for both intensity-modulated arc therapy (IMAT)[1,2] and volumetric modulated arc therapy (VMAT)[1,3]. SmartArc is part of the Pinnacle³ treatment planning solution, in use by 79% of the top cancer centers in the United States. Top centers trust the flexibility, precision and efficiency of Pinnacle³.

Benefits of rotational therapy with the dose painting capabilities of IMRT

The basic promise of VMAT delivery is to significantly reduce treatment time per patient compared with traditional IMRT. VMAT can benefit the patient by offering these shorter treatment times, increasing accuracy and potentially sparing healthy tissue.

Philips SmartArc advanced treatment planning technology allows single- or multiple-user definable arcs and supports both constant and variable dose rate delivery. Constant dose rate delivery allows clinicians to explore the benefits of VMAT delivery without the expense and downtime associated with an upgrade to their linear accelerators. SmartArc is the first commercially released inverse planning solution designed for both Elekta and Varian linear accelerators. This flexibility allows clinicians the freedom to choose the delivery devices that best fit their clinical needs and department configuration.



Key advantages

- SmartArc plans are delivered while the gantry rotates around the patient.
- The intensity of the radiation is modulated and the shape of the beam is dynamically adjusted by moving the MLC leaves.
- The gantry speed and dose rates may also be changed during the rotation.
- This flexibility provides you with the potential to create plans that are comparable to your standard IMRT plans, but with a shorter treatment time.

Pinnacle³ v9 with SmartArc references

1 Bzdusek, K, et al., Development and evaluation of an efficient approach to volumetric arc therapy planning, *Medical Physics 36* (6), pp. 2328-2339, 2009.

2 Yu, CX. Intensity-modulated arc therapy with dynamic multileaf collimation: An alternative to tomotherapy. *Phys Med Biol.* 1995; 40; 1435-1449.

3 Otto, K. Volumetric modulated arc therapy: IMRT in a single gantry arc. *Med Phys* 2008; 35; 310-317.

PET Application Suite 2.0

Philips Healthcare is pleased to announce the release of **PET Application Suite 2.0** offering the latest, advanced visualization tools and clinical applications supporting the GEMINI product family, including the GEMINI TF with 4D Time-of-Flight (TOF). This new release is now available as a purchasable upgrade to your Extended Brilliance Workspace.

PET Application Suite 2.0 is also released on the Extended Brilliance Workspace software version 4.0 (minimum hardware requirements apply).

Philips is currently offering Extended Brilliance Workspace customers an exciting opportunity to upgrade to PET Application Suite 2.0. The combination of Extended Brilliance Workspace 4.0 software and the latest in PC and multicore CPU technology delivers significant performance enhancement when compared to some early generation systems while delivering the latest clinical applications and an array of new features to further improve ease of use and workflow.

Key new features

- Philips fusion viewer
- Automatic Registration Tool
- Emory Cardiac Toolbox 3.1
- NeuroQ 3.0

For more information on Philips fusion viewer, Automatic Registration Tool, Emory Cardiac Toolbox 3.1, or NeuroQ 3.0, or if you would like to purchase an upgrade for your EBW remote workstation, please contact your local Philips sales representative.

Philips fusion viewer

Philips fusion viewer provides a truly integrated, powerful yet simple, image review and analysis environment for clinical evaluation of multimodality examinations. The application offers interactive multimodality registration, the ability to add studies to the review list, and batch viewing. The slab viewer allows you to view oblique slices and change slice thickness on the fly. The application also offers tumor segmentation.

Other features include:

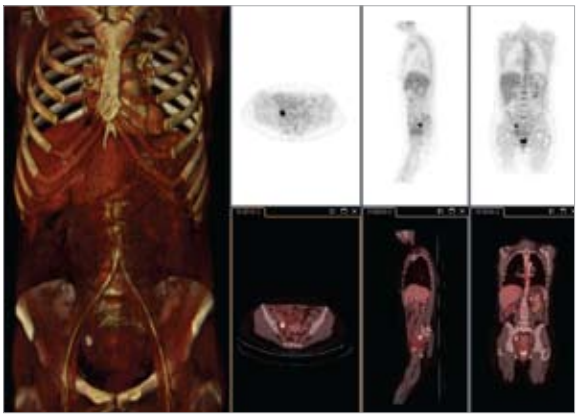
- Comprehensive and customizable environment ideal for fused multimodality visualization (PET/CT, SPECT/CT, CT, and MRI)
- Support for dynamic studies (time-activity curves)
- Customizable study information allowing any available DICOM information to be displayed
- Intuitive layout editor which allows creation of single or dual monitor layouts along with the ability to modify existing layouts
- Volume rendering modes including MPR, MIP, and fused 3D volume display

4D TOF visualization and analysis enhances the ability to delineate lesions by reducing motion blur. It also offers enhanced characterization and SUV quantification of small lesions in prospective and retrospective PET/CT gated studies.

The SUV computation methods offered with the fusion viewer application include:

- SUV body weight
- SUV lean body mass
- SUV body surface area
- SUV body mass index

Built upon the previously released PET/CT viewer, the Philips fusion viewer is available as a purchasable upgrade on the Extended Brilliance Workspace.



Automatic Registration Tool

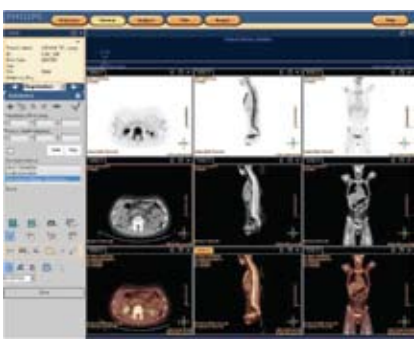
The Philips Automatic Registration Tool allows automated 3D registration of image data from multiple scanners (PET, SPECT, CT, and MR) or from a hybrid system (PET/CT or SPECT/CT). This optional tool for use with Philips fusion viewer application is part of an intuitive and workflow-focused user environment for comprehensive quantitative analysis, advanced visualization, and reporting.

Philips Automatic Registration Tool offers the following registration methods:

- Local correlation
- Cross correlation
- Normalized mutual information
- Semi-automatic method using match points
- Interactive method using image translation and rotation

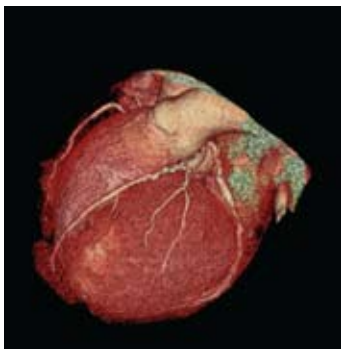
Key advantages

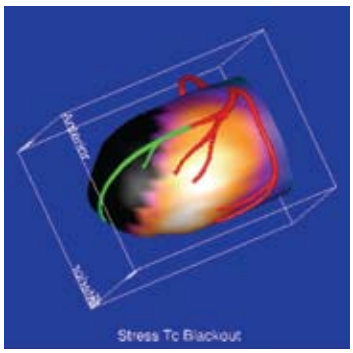
- Automatic image registration which reduces intra-user variability compared to interactive methods
- Enhanced workflow with simple reference or floating image selection using drag and drop tool from patient timeline
- Registration "save" options to match slice thickness, volume extent (or both) to a reference or floating series



Emory Cardiac Toolbox 3.1

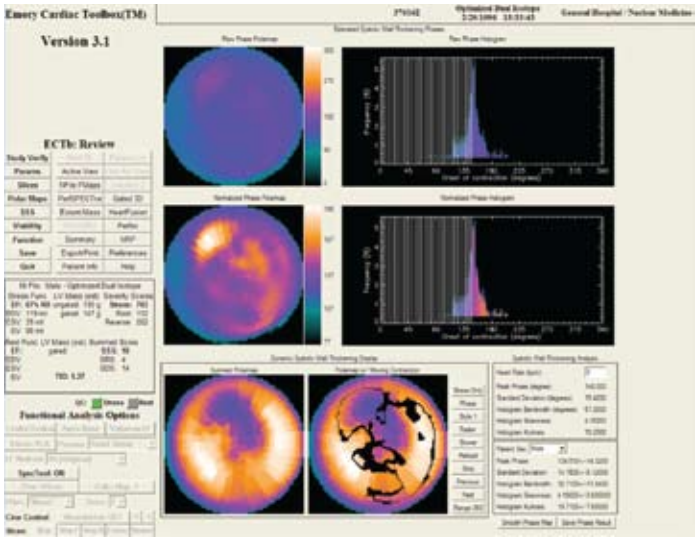
Emory Cardiac Toolbox 3.1* software provides advanced tools for comprehensive cardiac PET analysis, including fast and accurate assessment of myocardial perfusion and viability with minimal operator interaction. The toolbox includes tools for evaluation of wall motion and thickening.





Key advantages

- Normal limits for rubidium, ammonia, and FDG protocols
- Ability to display endocardial and epicardial edges on gated images
- Ability to add user-defined normal files to the toolbox
- Multiple language choices for the user interface



Optional tools:

- HeartFusion tool which allows fusion of a patient's coronary tree from Cardiac CT angiography with PET perfusion images
- SyncTool which provides assessment of LV dyssynchrony using phase analysis. The SyncTool review screen includes phase polarmaps, phase histograms, and a summary of systolic wall thickening analysis including:
  – Peak phase
  – Standard deviation of the phase distribution

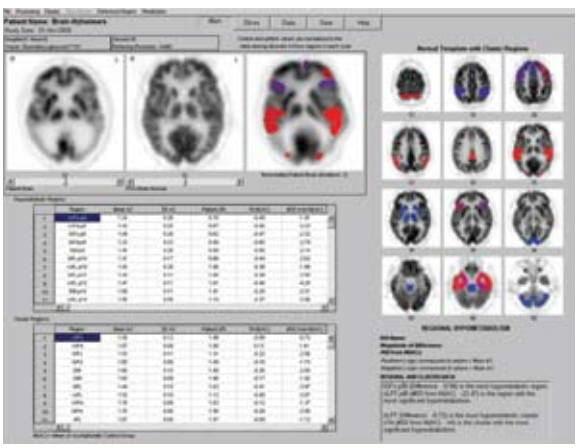
* Emory Cardiac Toolbox, HeartFusion and SyncTool are registered trademarks of Emory University.

NeuroQ 3.0

NeuroQ 3.0 is a powerful tool to assist clinicians with interpretations of brain PET scans. This user-friendly clinical tool helps with the differential diagnosis of dementia, allows a physician to monitor the progress of a patient's disease, and can automatically identify and quantify differences between two FDG-PET studies of the same patient.

Key advantages

- Region overlay on reformatted images
- Ability to save tables of regions and clusters to disk, and to color code regions and clusters in tables
- Automatically analyze and detect abnormalities of regional brain metabolism
- Rigid registration tool
- Fused PET/CT display

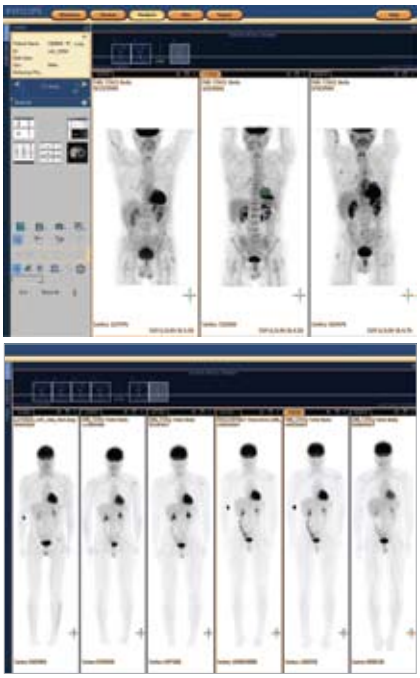


EQuAL, available as an option to NeuroQ 3.0, provides an analysis tool for brain PET imaging of temporal lobe epilepsy.

*NeuroQ is a registered trademark of Syntermed, Inc, and was developed in collaboration with Dr. Daniel Silverman, UCLA Medical Center.

Tumor Tracking

Philips Tumor Tracking application provides efficient tools to assist clinicians in monitoring tumor progression, or response to therapy, using sequential PET or PET/CT scans. This optional analysis tool can perform semi-automatic segmentation of tumors and quantitative measurements to track changes in tumor metabolic activity and volume, helping to simplify disease management and treatment monitoring.



Key advantages

- Capability of analyzing and comparing serial images from multiple modalities including PET, CT and MR
- Trend analysis for up to six studies at one time
- Several display formats to customize to your workflow
- Results that can be exported to a spreadsheet or reporting tool

The Tumor Tracking application is a purchasable option with the new EBW NM workstation (pending release as an upgrade for installed systems).

Clinical update

JETStream Workspace Comprehensive Renal application

Philips Healthcare Nuclear Medicine Customer Support has recently seen a sharp increase in questions about renal T1/2 calculations from the JETStream Workspace (JSWS) Comprehensive Renal application. Many of the inquiries reference one of the two following issues:

1. Results are not comparable with other nuclear medicine workstations, including Philips own Pegasys and Odyssey.
2. Numerical values provided by JSWS do not correlate with curve data provided.

The reasons for these issues can be explained as follows:
To calculate T1/2 values, the Comprehensive Renal application will perform the following steps:

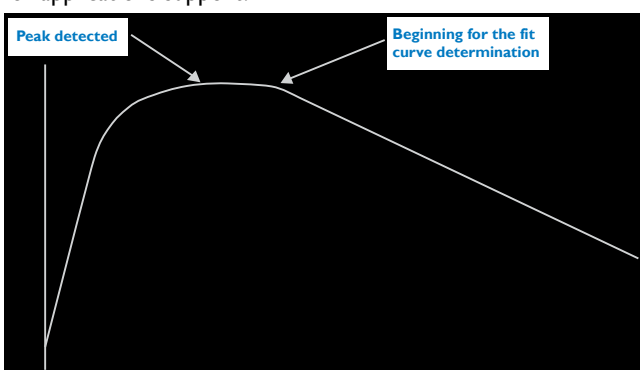
- The application determines the peak of the renal background corrected time-activity curves.
- From this peak the renal curve is fitted with an exponential curve on the next five minutes after the peak.
- From this exponential curve a T1/2 is calculated.
- There is a search for the minimum T1/2 time by shifting the beginning point (the peak point) and iteratively recomputing an exponential curve. The fit with the minimum T1/2 time is stored for display.

This shift of the beginning of the fit is to assure the steepest slope for the definition of the exponential fit. In some cases, you can have a peak with a very slow slope around the peak, so the application needs to go a little further to find the good fit of the exponential fit.

A limit for this search at is set at 1 minute and this is a minute forward from the peak (3 minutes in this example diagram, peak detected) to one minute later (4 minutes, beginning for the fit curve determination). This is a standard method of calculating T1/2.

A more commonly used method of calculating T1/2 for some customers is to calculate the time required for the renal activity to fall to one half of its initial value (from peak counts). This time is called the half-life, and often denoted by the symbol T1/2. The half-life can also be written in terms of the decay constant, or the mean lifetime, as: T1/2 = ln 2 / (slope of exponential curve).

If you have any questions on how T1/2 is calculated on JETStream Workspace, please contact the following: In USA and Canada, call the **Philips Healthcare Customer Care Solution Center at 800-722-9377**. In other countries, call your local Philips contact for applications support.



Astonish

Myocardial perfusion imaging is a useful tool to help diagnose patients suspected of having coronary artery disease, or to assess patients with known disease. There has been significant growth in the number of these procedures with about 8.9 million performed in 2007. The laboratories performing these procedures are under pressure to reduce costs, improve image acquisition efficiency, reduce absorbed radiation dose, and improve diagnostic accuracy. Additionally, the recent shortages of Tc-99m have further increased the call for more efficient use of Tc-99m-labeled radiopharmaceuticals.

To address these needs, Philips has developed an improved reconstruction method termed Astonish. Astonish improves reconstruction accuracy and makes more efficient use of acquired counts by incorporating imaging physics into the reconstruction process. Astonish also provides for scatter and attenuation correction which can mitigate artifacts in the imaging process that can reduce lesion contrast or mimic perfusion defects.

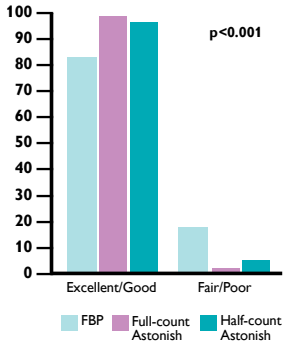
Clinical trials

The clinical imaging performance of Astonish and Astonish with scatter and attenuation correction was evaluated in a published, multicenter trial.1,2 Both catheterization and normalcy were used as the gold standards. Image quality, diagnostic confidence and diagnostic accuracy for detection of coronary artery disease was evaluated on data from 187 consecutive patients undergoing clinically-indicated myocardial perfusion SPECT studies.

Astonish trial results in half-count imaging

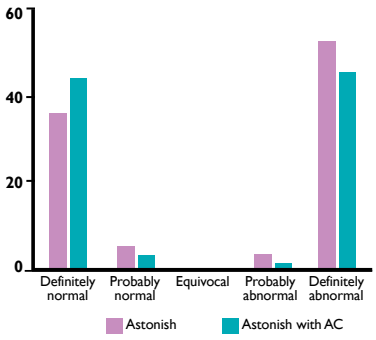
Image quality

There was a statistically significant improvement in image quality for both full-count and half-count images reconstructed with Astonish in comparison with those reconstructed with filtered back projection (FBP).



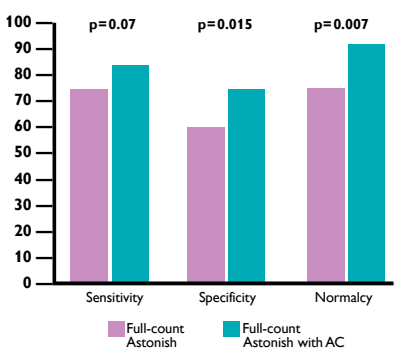
Interpretive certainty

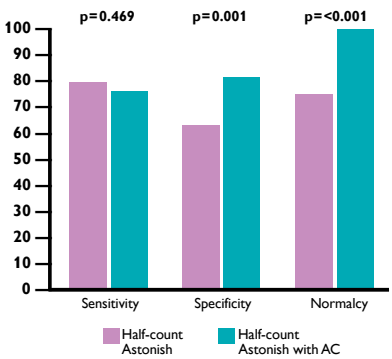
There was no statistical difference in the interpretive certainty of full-count and half-count images reconstructed with Astonish, p=0.18. This demonstrates the ability of Astonish to achieve good image quality with half the counts.

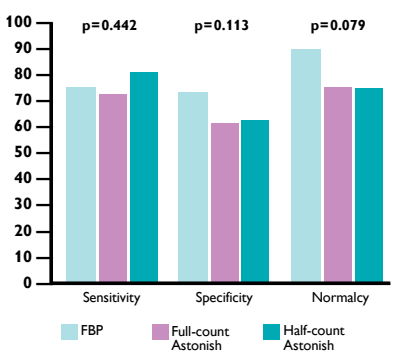


Diagnostic accuracy

There was not a statistical difference in the diagnostic accuracy of full-time data reconstructed with filtered back projection or full-count or half-count imaging using Astonish. However, there was a statistically significant improvement in specificity and normalcy when myocardial perfusion data was corrected for scatter and attenuation. This was true for both full-count and half-count data.







Astonish trial results in stress only imaging

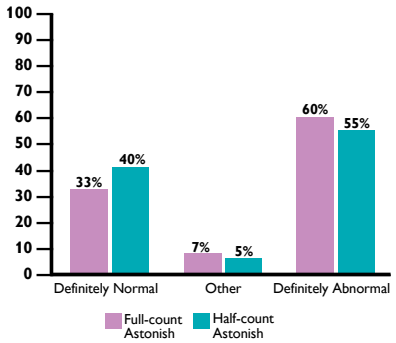
In the stress only portion of the trial, patient studies were interpreted without using the rest images of the studies.

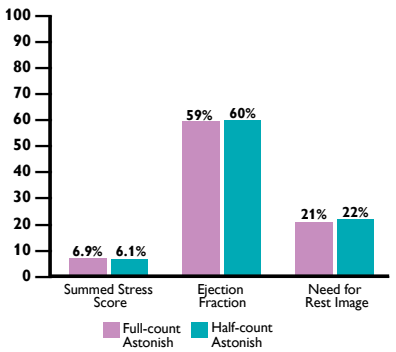
Interpretive certainty

The stress-only data provided a high level of diagnostic confidence for both the full-count and half-count data, and a high degree of diagnostic accuracy was obtained.

To test the robustness of results derived from full-count and half-count images other stress only comparisons were performed. There was no statistical difference for summed stress scores, ejection fraction, or the need for resting images between the full-count and half-count data. There was a desire for resting data in approximately 20% of the images interpreted with stress-only images.

Finally, a comparison was performed between stress-only half-count Astonish with scatter and attenuation correction and traditional rest/stress FBP SPECT. The same diagnostic accuracy was found despite using only a single image set (stress-only) and with half the counts in the images reconstructed using Astonish with attenuation correction.





Conclusions

When images were reconstructed using Astonish without attenuation correction, this study demonstrated statistically significant improvements in perfusion image quality. Furthermore, diagnostic certainty was unchanged and there was no loss in diagnostic accuracy when half-count data was reconstructed using Astonish. Note normalcy and cardiac catheterization were used as the gold standard.

When full-count and half-count data were reconstructed using Astonish with scatter and attenuation correction, this study demonstrated a significant increase in normalcy and specificity with no significant loss in sensitivity.

These data demonstrate that the use of Astonish technology, with or without attenuation correction, improves image quality and may be applied to reduced acquisition time studies. The ability to reduce imaging times can help lead to reduced patient discomfort, reduced likelihood of patient motion, and improved laboratory throughput and improved laboratory efficiency. Alternatively, absorbed radiation doses can be reduced by injecting less activity and imaging for standard imaging times.

The trial results on stress-only imaging demonstrate that perfusion and gated imaging can be performed on half-count data with high diagnostic accuracy and acceptable image quality. Stress only imaging can increase laboratory efficiency by eliminating the need for rest imaging. Performing studies using stress-only can increase patient acceptance, further reduces radiation doses (compared to stress/rest half dose imaging), and improves laboratory efficiency.

Astonish references

1. Carmelo CV, Heller GV, Bateman TM, et al. A multicenter evaluation of a new post-processing method with depth-dependent collimator resolution applied to full-time and half-time acquisitions without and with simultaneously acquired attenuation correction. *JNucl Cardiol* 2009: 16 #5: 714-725
2. Bateman TM, Heller GV, McGhie AI, et al. Multicenter investigation comparing a highly efficient half-time stress-only attenuation correction approach against standard rest-stress Tc-99m SPECT imaging. *J Nucl Cardiol* 2009; 16 #5: 726-735

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