NEWSLETTER

A New Process for Attenuation Correction of Myocardial Perfusion Images: digital SPECT scanner technology with Deep Learning advanced applications

TruCorr

SPECT imaging has been the most commonly used technology for diagnosing coronary artery disease and guiding the appropriate therapeutic strategy for decades. However, its benefits have been tempered by image attenuation artifacts. When SPECT images are generated by the emission and detection of photons from a radiotracer, tissue encountered on its pathway to the detector is absorbed or scattered. This causes a portion of the detected photons to be attenuated, or weakened, causing artifacts in the image.

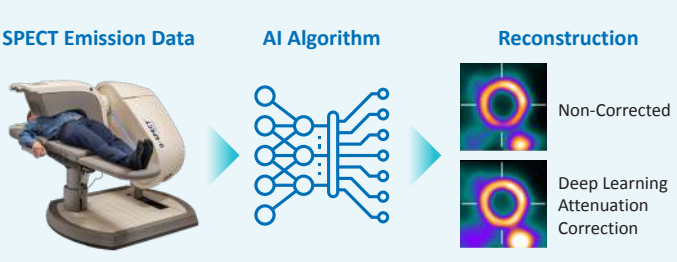
The attenuation correction process compensates for these artifacts, and it has been shown to increase the accuracy of interpretation and enable absolute quantification. However, using conventional Anger camera systems, attenuation correction requires a supplementary computed tomography (CT) transmission scan or two-position imaging, using upright and supine or prone, to mitigate attenuation artifacts. This multi-step process increases the procedure time for the patient and the imaging department, and requires additional radiation dose.

Spectrum Dynamics, the company that introduced the digital D-SPECT® CZT-detector dedicated cardiac system to the market in 2007, has continued its passion for nuclear cardiology innovations. Its most recent development is a new solution for attenuation correction that eliminates the need for a CT scan and additional radiation — TruCorr® Attenuation Correction.

Transforming Workflow and Patient Experience

TruCorr® is a new available technology applying a Deep Learning approach for attenuation correction of myocardial perfusion scans acquired in the D-SPECT scanner. It uses the SPECT data from a single acquisition, with no additional scan time beyond D-SPECT standard clinical protocols. Using the patient's emission data, TruCorr generates an attenuation map and reconstructs the data to create an attenuation corrected dataset.

TruCorr® Attenuation Correction technology is expected to increase the specificity of cardiac imaging and enable more accurate quantitative analysis. As it is a software approach, it can be applied within the typical workflow of any laboratory. TruCorr will be particularly beneficial for sites performing dual position scans, sites where there is no hybrid scanner available, or where staffing issues make it difficult to schedule time to scan and process an additional CT-based transmission scan. It creates workflow optimization possibilities, potentially eliminating the need for rest imaging in low likelihood patients.



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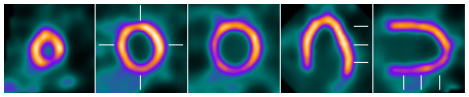
Applying Deep Learning to Diagnostics

TruCorr® technology is based on Deep Learning, a type of artificial intelligence that has brought significant advancements to health care in the areas of data analysis and image classification[i]. A particular benefit is that it requires less guidance from humans and is able to self-verify its decisions. In fact, some convolutional neural networks (CNNs) have demonstrated similar or superior accuracy to humans in diagnostic imaging studies[ii].

The TruCorr® algorithm is based on a CNN that was trained to assess reconstructed emission data and provide an attenuation map. The development of the deep learning attenuation correction algorithm involved thousands of slabs (input) extracted randomly from the reconstruction of myocardial perfusion SPECT imaging studies that also included a corresponding CT scan for comparison. The data analysis found TruCorr corrected images were similar to CT attenuation corrected images.



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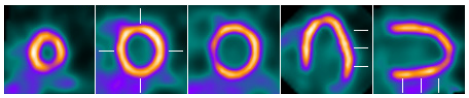
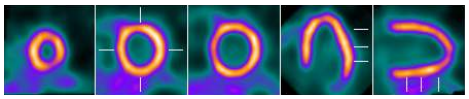
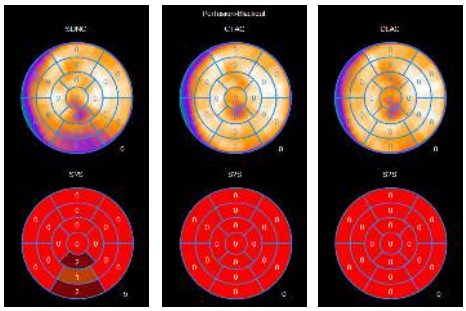


CTAC Corrected



TruCorr Corrected

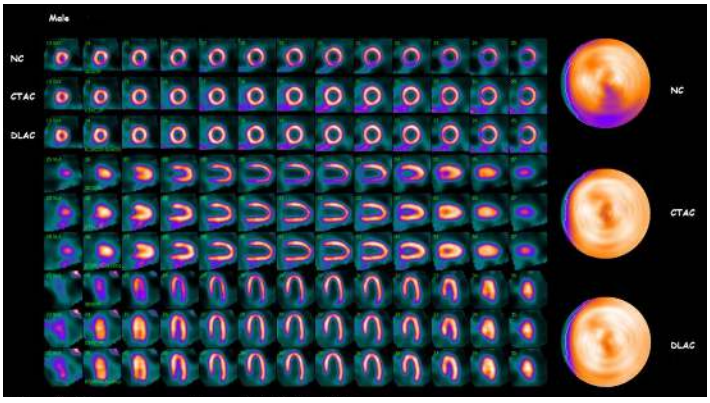


Non-Corrected | CTAC Corrected | TruCorr Corrected

Increasing Confidence

"In our experience, TruCorr has dramatically reduced the perceived necessity to proceed with a rest image," said Dr. Timothy Bateman, co-director of the Cardiovascular Radiologic Imaging Program at St. Luke's Hospital. "It creates greater uniformity in the images such that normal is easy to recognize and we can confidently determine the patient does not need to go on to have a rest image. I can imagine that for a typical patient, we would be seeing the whole test done on the order of 20 to 25 minutes, which is pretty powerful."

Practices that leverage TruCorr emission-based attenuation correction for D-SPECT myocardial perfusion image data will see improvements in quality and efficiency. Departments that implement TruCorr will benefit from more time and resources to dedicate where they are needed most. Clinicians will also have more accurate imaging to guide their care decisions. By providing the highest quality care as quickly as possible, they may also find they have more satisfied patients.



Inferior wall defect appears severe and is corrected by CTAC and DLAC

i. E. V. Garcia, "SPECT attenuation correction: an essential tool to realize nuclear cardiology's manifest destiny," *J Nucl Cardiol*, vol. 14, no. 1, pp. 16-24, Jan 2007.

ii. Bresnick, J. What is deep learning and how will it change healthcare? HealthItAnalytics. Nov. 30, 2018. *https://healthitanalytics.com/features/what-is-deep-learning-and-how-will-it-change-healthcare*

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