Evaluation of the Number of Iterations Needed for Convergence with Astonish Reconstruction

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Abstract:
A reconstruction artifact has been identified in the septal and lateral walls of the ventricular myocardium when using the Astonish reconstruction protocol of 8 iterations and 8 subsets, as recommended by Philips corporation on our Philips Brightview and Philips Precedence at Fletcher Allen Health Care, when compared with MLEM reconstruction. Astonish reconstruction is an advanced algorithm that provides patient specific and collimator specific correction for resolution recovery, giving better image quality. We are also seeing a reconstruction artifact associated with patient motion. Our belief is that in the presence of breathing motion in the anterior and inferior wall, the artifact appears to be canceling out the septal and lateral wall artifact, making the image appear normal. We acquired images of a Quasar programmable Tc^{99m} fluid filled cardiac phantom and performed multiple reconstructions to determine the number of iterations needed to eliminate the artifact. We reconstructed images of the cardiac phantom using 4, 8, 16, 30, and 60 iterations, with 8 subsets on each, to determine the appropriate iterations needed for complete convergence. We found that at 16 iterations the septal and lateral wall artifact decreased on the still phantom as well as the anterior and inferior wall artifact that was seen to cancel out the septal and lateral wall artifact on the motion phantom. Due to this we also tested how many iterations would be needed when using a phantom that simulated breathing motion to eliminate the canceling out of the artifact, and before the anterior and inferior wall artifact took over. These results led us to conclude that 16 iterations are needed for complete convergence of the data due to the added Resolution Recovery, scatter correction, and attenuation correction.