

AbstractID: 10541 Title: COPDGene Study Quality Assurance Phantom

Purpose: Image characteristics of a quality assurance phantom designed for the COPDGene Study were evaluated. The COPDGene Study is a multi-center genome wide association study of COPD and COPD related CT phenotypes.

Methods and Materials: COPDGene Phantoms were imaged using all the vendor CT scanners involved in the Study to determine the scanners' uniformity. The inspiration protocol was used: a tube potential of 120 kVp and an effective mAs of 200. The phantom consists of an elliptical foam region (250 mm by 150 mm) to simulate lung surrounded by a soft tissue ring (350 mm by 250 mm). A 30mm acrylic rod, 30mm air hole, and hole for a water bottle were present in the foam. Polycarbonate rods to simulate airways with walls were embedded in the foam. The scan data was reconstructed using several reconstruction kernels. The means and standard deviations of the 6 uniform regions were measured using regions-of-interest of various sizes. The 6 regions were: water, acrylic rod, air in hole, lung simulating material, soft tissue ring, and air outside phantom. The wall thickness and the lumen radius of the 6 tubes in the phantom were measured using the FWHM method. These measurements were averaged over sections that spanned about 30 mm.

Results: Standard error of the CT number measurements was less than 1 HU. The CT number of the lung simulating material was -855 HU. A systematic difference between scanners was observed. The range of CT numbers was largest for acrylic, 14 HU, and smallest for water, 5 HU. No systematic variation between CT scanners for the size measurements could be demonstrated. The range of the size measurements was 0.1 mm.

Conclusion: The COPDGene phantom will be useful for QA evaluations during the COPDGene Study.