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Adaptive Statistical Iterative Reconstruction-V for Lung Nodule Analysis

Introduction: Low-dose CT in lung cancer screening has demonstrated benefits in select patients. As the traditional filtered back projection (FBP) technique is limited by poor image quality, adaptive statistical iterative reconstruction-V (ASIR-V) algorithm has been developed to achieve higher image quality with processing efficiency.

Objective: To investigate the impact of various CT scan parameters on the semi-automated measurement of lung nodules using a Computer Aided Detection (CAD) program.

Methods: This IRB-exempt phantom experiment was conducted with a CT scanner capable of ASIR-V algorithm. Eight lung nodules sized 5-12 mm, of solid or ground glass type, were placed inside a multipurpose chest phantom with or without fat slabs. Voltage (kV), current (mA), and ASIR-V levels were varied, and series of CT images were produced. A CAD program semi-automatically analyzed the series and produced nodule diameters and volumes. Nodule measurement variance and the significance of variables were analyzed by one-way ANOVA and univariate regression.

Results: Nodule diameter and type contributed to error in both diameter and volume measurements. Current also impacted diameter measurement error. ASIR-V, kV, and fat slabs did not contribute to nodule measurement systematic error. On regression analysis, error is negatively related to mA and solid nodules, but is positively related to nodule diameter or volume.

Discussion: These results reinforce that nodule size, type, and mA have the highest influence on CAD software performance nodule quantification accuracy. ASIR-V and kV do not significantly alter the measurement error but, instead, maintain the accuracy of nodule evaluation while minimizing radiation dose.