

Influence of in-plane artifact on pulmonary nodule size measurements in chest tomosynthesis

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Objective: In tomosynthesis imaging, a halo-like artifact can appear around structures in the reconstructed section images. This is due to the limited angular range of the tomosynthesis scan, leading to an incomplete sampling of the frequency space. The artifact is generally more prominent in the scan direction. In the case of chest tomosynthesis, the appearance of the artifact around pulmonary nodules may have an effect on the accuracy of nodule diameter measurements such that it might not be obvious if the artifact should be included or not in the measurement. The aim of the present study was to investigate how the halo-like artifact should be managed when measuring pulmonary nodules in chest tomosynthesis images in order to achieve a high level of accuracy in nodule size assessment.

Methods: An analysis of measurements of the longest diameter of artificial ellipsoid shaped nodules with known dimensions inserted in clinical chest tomosynthesis images was performed. The measurements were done as part of a previous study investigating nodule measurement accuracy. Before the simulated nodules were inserted in the images a rotation was applied to them such that the longest diameter lied in different directions in the image plane relative to the tomosynthesis scan direction. The amount of rotation for each nodule was chosen randomly. Measurements were made by four thoracic radiologists. The analysis of the data for the present study included an investigation of a possible dependency of measurement error on the amount of rotation of the nodules.

Results: All radiologists chose not to include the artifact in their measurements. The measurement error of the longest diameter of the nodules was at a constant level regardless of in which direction the longest diameter of the nodule lied relative to the scan direction.

Conclusion: The results indicate that the halo-like artifact visible around pulmonary nodules in chest tomosynthesis images should not be included when measuring the diameter of the nodules.