

Pulmonary nodule detection with digital projection radiography: an ex-vivo study on increased latitude post-processing

To evaluate increased image latitude post-processing of digital projection radiograms for the detection of pulmonary nodules. 20 porcine lungs were inflated inside a chest phantom, prepared with 280 solid nodules of 4-8 mm in diameter and examined with direct radiography (3.0x2.5 k detector, 125 kVp, 4 mAs). Nodule position and size were documented by CT controls and dissection. Four intact lungs served as negative controls. Image post-processing included standard tone scales and increased latitude with detail contrast enhancement (log-factors 1.0, 1.5 and 2.0). 1280 sub-images (512x512 pixel) were centered on nodules or controls, behind the diaphragm and over free parenchyma, randomized and presented to six readers. Confidence in the decision was recorded with a scale of 0-100%. Sensitivity and specificity for nodules behind the diaphragm were 0.87/0.97 at standard tone scale and 0.92/0.92 with increased latitude (log factor 2.0). The fraction of "not diagnostic" readings was reduced (from 208/1920 to 52/1920). As an indicator of increased detection confidence, the median of the ratings behind the diaphragm approached 100 and 0, respectively, and the inter-quartile width decreased (controls: $p < 0.001$, nodules: $p=0.239$) at higher image latitude. Above the diaphragm, accuracy and detection confidence remained unchanged. Here, the sensitivity for nodules was 0.94 with a specificity from 0.96 to 0.97 (all $p > 0.05$). Increased latitude post-processing has minimal effects on the overall accuracy, but improves the detection confidence for sub-centimeter nodules in the posterior recesses of the lung.