Study on the optimal imaging technique for dual-energy chest radiography

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Keywords: chest radiography, dual-enegry imaging technique, MTF, NPS, NEQ

Conventional chest-radiography images are the most basic x-ray imaging system for diagnosing lung diseases. However, space-averaging increases due to the overlapping of anatomy structures as three-dimensional information is reduced in two-dimensions. A dual-energy x-ray imaging (DEI) technique for resolve space-averaging is used to increase the conspicuity of the lesion (i.e., lung nodule and calcification) by suppressing anatomical background noise. DEI techniques perform the weighted log-subtraction using the attenuation characteristics of the material for low- and high-energy x-rays. And the weighting factor is calculated to suppressing anatomical background. The objective of this research is to increase the lesion conspicuity in lung regions by optimizing DE technique parameters. DE technique has been applied to three phantoms mimicking the average, thick, and thicker adult chest thicknesses while maintaining the total incident dose equivalent to that used to obtain a single chest radiograph. Investigating DE technique parameters include the added filtration, the low- and high-kVp pair, and the dose allocation between low- and high-kVp setups at the total dose equal to or less than that of the conventional chest radiograph. And the DE image performances investigated through modulation-transfer function, noise-power spectrum, and noise-equivalent quanta.

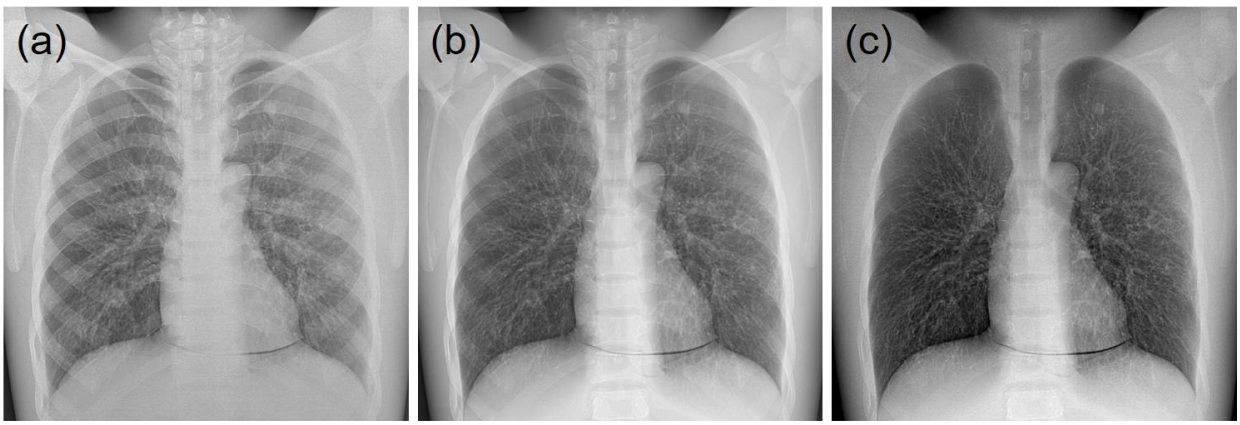

Fig. 1. Chest radiography. (a) Low-energy image, (b) High-energy image, (c) Bone-suppressed image.

Acknowledgments
J. Kim was supported by Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education (2020R1A6A3A01100169).