Detection of pulmonary nodules in chest tomosynthesis

Comparison with chest radiography, evaluation of learning effects and investigation of radiation dose level dependency

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I. Vikgren J, Zachrisson S, Svalkvist A, Johnsson Å A, Boijsen M, Flinck A, Kheddache S and Båth M. *Comparison of chest tomosynthesis and chest radiography for detection of pulmonary nodules: human observer study of clinical cases.* Radiology. 2008;249(3):1034-41.

II. Zachrisson S, Vikgren J, Svalkvist A, Johnsson Å A, Boijsen M, Flinck A, Månsson L G, Kheddache S and Båth M. *Effect of clinical experience of chest tomosynthesis on detection of pulmonary nodules*. Acta Radiologica 2009;50(8):884-91.

III. Asplund S, Johnsson Å A, Vikgren J, Svalkvist A, Boijsen M, Fisichella V A, Flinck A, Wiksell Å, Ivarsson J, Rystedt H, Månsson L G, Kheddache S and Båth M. *Learning aspects and potential pitfalls regarding detection of pulmonary nodules in chest tomosynthesis and proposed related quality criteria.* Acta Radiologica 2011;52(5):503-12.

IV. Asplund S, Johnsson Å A, Vikgren J, Svalkvist A, Flinck A, Boijsen M, Fisichella V A, Månsson L G and Båth M. *Effect of radiation dose level on the detectability of pulmonary nodules in chest tomosynthesis*. Accepted for publication in European Radiology.

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ABSTRACT

Chest tomosynthesis is a relatively recently introduced technique in health-care, which produces section images of the chest at a lower radiation dose than computed tomography (CT) and with better depth resolution than conventional chest radiography. The primary aims of the studies described in this dissertation were to compare chest tomosynthesis with conventional radiography, to evaluate the effects of clinical experience and learning with feedback on the performance of observers analyzing tomosynthesis images, and to investigate the effect of radiation dose level in tomosynthesis, in the detection of pulmonary nodules. Human observer studies were performed, in which radiologists were instructed to localize and rate pulmonary nodules in patient images. Chest CT was used as reference. The observers' performance regarding the detection of nodules was used as measure of detectability. The results of the studies indicate that the detection of pulmonary nodules is better in chest tomosynthesis than in conventional chest radiography, that experienced thoracic radiologists can quickly adapt to the new technique, that inexperienced observers may perform at a similar level to experienced radiologists after a learning session with feedback, and that a substantial reduction in the effective dose to the patient may be possible.