Radiation Dose And Lifetime Attributable Risk (LAR) Of Cancer Incidence In Prospectively ECG-triggered Coronary Computed Tomography

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Purpose of Study
This study aimed to measure the absorbed doses in organs for prospectively ECG-triggered coronary computed tomography angiography (CCTA) using five different state-of-the-art CT scanners in a female adult anthropomorphic phantom and to estimate the effective dose (HE) and the lifetime attributable risk (LAR) of breast and lung cancer incidence.

Materials and Methods
Prospectively ECG-triggered CCTA was performed using five commercially available CT scanners: 64-detector-row single source CT (SSCT), 2 Ã— 32-detector-row dual source CT (DSCT), 2 Ã— 64-detector-row DSCT and 320-detector-row SSCT scanners. Absorbed doses were measured in 34 organs using optically stimulated luminescence dosimeters (OSLDs) loaded in a standard female adult anthropomorphic phantom. HE was computed using phantom measurement data and the air kerma-length product (PKL)-to- HE conversion factor. LAR for cancers of breast, lung and others were estimated and compared.

Results
Both breasts and lungs had the highest radiosensitivity and received the highest radiation dose during CCTA examination. The highest HE was received from 2 Ã— 32-detector-row DSCT scanner (6.06 Â± 0.72 mSv), followed by 64-detector-row SSCT (5.60 Â± 0.68 and 5.02 Â± 0.73 mSv), 2 Ã— 64-detector-row DSCT (1.88 Â± 0.25 mSv) and 320-detector-row SSCT (1.34 Â± 0.48 mSv) scanners. The LAR for breast cancer is higher than lung cancer (2 to 66 cases per 100000 persons vs. 8 to 47 cases per 100000 persons) in young women who are less than 30-year-old while LAR for lung cancer is higher than breast cancer after 30-year-old. The LAR for lung cancer in men is generally lower than in women.

Conclusion
The radiation doses and LAR for cancer incidence from a prospectively ECG-triggered CCTA are relatively small and depend on the scanner model and imaging protocol. LAR for breast cancer increases exponentially for younger women hence the use of CCTA examination needs to be considered judiciously.