

Routine "Submillisievert" Coronary CTA with Prospective Gating and Iterative Reconstruction

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Background: Ultra-low radiation coronary CTA (submillisievert) has been so far only performed with high-pitch dual source CT.

Objective: To perform submillisievert coronary CTA with a regular 64-slice CT combining prospective ECG-gating (PECG) with iterative reconstruction (IR) that allows to reduce radiation dose without increasing image noise.

Methods: Forty-seven patients (age 53 ± 12 , 70% men, BMI 24.7 ± 2.0) with a regular heart rate < 60 bpm underwent coronary CTA using PECG, IR (100% IR, 0% FBP) a tube voltage of 100 kVp and a tube current that was adapted to patients BMI but reduced by 25% as compared to CTA performed without IR. For PECG, "padding" allowing reconstruction of images from 70 to 80% of the RR interval was used. Subjective image quality was graded 0 (non diagnostic) -3 (perfect) by 2 independent readers. Image noise, contrast to noise (CNR) and signal to noise (SNR) ratios were measured. The group was matched with a control group of 46 similar patients imaged with helical mode, 100 kVp without IR.

Results: Radiation and image noise were significantly lower in the study group: 0.84 ± 0.13 mSv vs 5.1 ± 1.2 mSv ($P < 0.001$), noise: 28.1 ± 4.6 HU vs 30.4 ± 5.4 ($p = 0.01$). SNR and CNR were similar: 24.9 ± 5.4 vs 24.0 ± 4.7 and 24.4 ± 5.4 vs 23.5 ± 4.7 in both groups. Mean Image quality was similar: 2.8 ± 0.3 vs 2.9 ± 0.3 ($p = \text{ns}$). Inter-observer agreement was good ($\kappa = 0.74$).

Conclusion: Routine "Submillisievert" high quality coronary CTA is feasible in patients with a normal BMI and a regular slow heart rate combining PECG and IR with a 64-slice CT.