Dual-Source CT in Step-and-Shoot Mode:
Noninvasive Coronary Angiography with Low Radiation Dose

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Purpose: To prospectively investigate computed tomographic (CT) image quality parameters by using different protocols and to calculate radiation dose estimates for noninvasive coronary angiography performed with dual-source CT in the step-and-shoot (SAS) mode.
Materials and Methods: This study was local ethics board approved; written informed consent was obtained from all patients. In the preliminary portion of the study, 40 patients underwent CT coronary angiography in the SAS mode: at 100 kV (protocol A) in 22 patients with a body mass index (BMI) of less than 25 kg/m_2 and at 120 kV (protocol B) in 18 patients with a BMI of 25–30 kg/m_2. Both protocols involved use of an attenuation-based tube current and 1 mL of contrast material per kilogram of body weight. The final portion of the study involved 50 additional patients: 21 patients with a BMI of 25–30 kg/cm_2 assigned to protocol B and 29 patients with a BMI of less than 25 kg/cm_2 assigned to protocol C, which was performed with 100 kV, an attenuation-based tube current, and a reduced contrast material dose of 0.8 mL/kg. Image quality was independently assessed. Attenuation in the aorta and coronary arteries and image noise were measured. Radiation dose was estimated.
Results: Mean image noise was similar with protocols A and B. Mean attenuation in the aorta and coronary arteries with protocol A (444 HU) was significantly (*P* _ .001) higher than that with protocol B (358 HU). The reduced contrast material dose in protocol C yielded attenuation similar to that with protocol B. Diagnostic image quality was achieved with all protocols in 1237 (97.9%) of 1264 coronary segments. No significant differences in image quality between the 100- and 120-kV protocols were found. Mean heart rate had a significant effect on motion artifacts (area under receiver operating characteristic curve [AUC] _0.818; 95% confidence interval [CI]: 0.723, 0.892; *P* _.001), whereas heart rate variability had a significant effect on stair-step artifacts (AUC _ 0.79; 95% CI: 0.687, 0.865; *P* _ .001). The mean estimated effective dose was 1.2 mSv _ 0.2 for protocols A and C and 2.6 mSv _ 0.5 for protocol B.
Conclusion: Dual-source SAS-mode CT coronary angiography yielded diagnostic image quality for 97.9% of oronary segments at a low radiation dose.

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One of the major limitations of Cardiac CT is the required radiation dose. In the last few years, new protocols have been established to at least partially resolve this problem. Just recently, "step-and-shoot" protocols have been introduced using prospective triggering.
Stolzman et al report on the image quality using this attempt with rather encouraging results : The following conclusions were drawn:

1. *Low-radiation-dose coronary CT angiography performed in the "step and shoot" mode was found to be feasible in patients with heart rates lower than 70 beats per minute, and it depicted 97.9% of the coronary artery segments with diagnostic image quality.*
2. *Use of the SAS mode combined with body weight–adapted tube voltage and tube current resulted in mean estimated effective doses of 1.2 mSv in patients of normal weight and 2.6 mSv in overweight patients at cardiac CT. Use of the lowtube-voltage protocol enabled a 20% reduction in contrast material dose without a compromise in subjective or objective image quality.*
3. *Due to small patient number, further studies were claimed to assess the diagnostic performance for the diagnosis and exclusion of CAD.*

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