The purpose of this study was to evaluate image quality and radiation dose using a 100 kVp tube voltage scan protocol compared with standard 120 kVp for coronary computed tomography angiography (CTA). Concerns have been raised about radiation exposure during coronary CTA. The use of a 100 kVp tube voltage scan protocol effectively lowers coronary CTA radiation dose compared with standard 120 kVp, but it is unknown whether image quality is maintained. We enrolled 400 nonobese patients who underwent coronary CTA: 202 patients were randomly assigned to a 100 kVp protocol and 198 patients to a 120 kVp protocol. The primary end point was to demonstrate noninferiority in image quality with the 100 kVp protocol, which was assessed by a 4-point grading score (1 = nondiagnostic, 4 = excellent image quality). For the noninferiority analysis, a margin of -0.2 image quality score points for the difference between both scan protocols was pre-defined. Secondary end points included radiation dose and need for additional diagnostic tests during follow-up. The mean image quality scores in patients scanned with 100 kVp and 120 kVp were 3.30 ± 0.67 and 3.28 ± 0.68, respectively (p = 0.742); image quality of the 100 kVp protocol was not inferior, as
demonstrated by the 97.5% confidence interval of the difference, which did not cross the pre-defined noninferiority margin of -0.2. The 100 kVp protocol was associated with a 31% relative reduction in radiation exposure (dose-length product: 868 ± 317 mGy × cm with 120 kVp vs. 599 ± 255 mGy × cm with 100 kVp; p < 0.0001). At 30-day follow-up, the need for additional diagnostic studies did not differ (13.4% vs. 19.2% for 100 kVp vs. 120 kVp, respectively; p = 0.114). A coronary CTA protocol using 100 kVp tube voltage maintained image quality, but reduced radiation exposure by 31% as compared with the standard 120 kVp protocol. Thus, 100 kVp scan protocols should be considered for nonobese patients to keep radiation exposure as low as reasonably achievable. (Prospective Randomized Trial on Radiation Dose Estimates of Cardiac CT Angiography in Patients Scanned With a 100 kVp Protocol [PROTECTION II]; NCT00611780).

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