

Automatic tube potential selection with tube current modulation (APSCM) in coronary CT angiography: comparison of image quality and radiation dose with conventional body mass index-based protocol

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PURPOSE: Automatic Tube Potential Selection with Tube Current Modulation (APSCM) is a recent software that automatically selects the kV and modulates the mAs setting for each individual patient so that a user-chosen contrast-to-noise ratio is maintained. In contrast, conventional examination protocols have used BMI or weight as a rough estimate of each patient's attenuation profile for choosing kV and mAs. The purpose of this study was to analyze the effects of APSCM in radiation dose reduction and image quality when applied to coronary CTA, by comparison with coronary CTA performed according to conventional BMI-based examination protocols.

MATERIALS AND METHODS: 487 consecutive patients were retrospectively enrolled: 239 patients who underwent coronary CTA with APSCM (APSCM group) and 248 patients who underwent coronary CTA based on a BMI-based tube potential (kV) and tube current-time product (mAs) protocol (BMI-based group). Comparison of quantitative and qualitative image quality and radiation dose was performed

RESULTS: There was no significant difference in sex, height, weight, and BMI between the two groups. The use of APSCM revealed significant reduction in radiation dose when compared with the BMI-based protocol, in both mean CT DIvol (18.4 ± 18.1 mGy vs. 24.5 ± 22.5 mGy, $p < 0.001$) and mean DLP. Also there was a significantly more frequent use of 80 kV in the APSCM group ($p < 0.0001$). The mean CT number, contrast enhancement of coronary arteries and image noise were significantly higher in the APSCM group, but the SNR and CNR were decreased by 16%. However, diagnostic image quality was maintained, with no significant difference between the two groups ($p = 0.887$).

CONCLUSION: The application of APSCM for coronary CTA significantly reduced radiation dose while maintaining image quality, and therefore is feasible in daily practice composed of patients with various BMI values.