

Radiation dose in cardiovascular computed tomography

Purpose: To assess the effective dose delivered to patients undergoing cardiovascular CT examinations at one institution. To highlight how adjustment of scan parameters to compensate for body habitus affects the CT dose index (CTDI), and how variations in CTDI and scan length combine to deliver a wide range of estimated effective dose. To evaluate the ability of manual scan parameter selection based on perceived patient size to maintain consistent image quality.

Method and Materials: CT scan protocol parameters including kV, effective mAs, scan length, scan time, CTDIvol, dose length product (DLP), and effective dose were collected or calculated for cardiovascular CT examinations performed on a Philips Brilliance 64 scanner from Oct 2006 – March 2007. The effect of parameter selection on CTDIvol and effective dose was measured. Clinical factors were analyzed to determine the major contributors to CTDI and scan length, and thus to effective dose. Image contrast, noise and contrast-to-noise ratio were measured on clinical images to evaluate the ability of manual selection of kVp and mAs to compensate for body habitus and achieve consistent image quality.

Results: The scan length in this patient population was 193.6 +/- 29 mm (range 125.6 – 279.2 mm). Effective dose measured 16.9 +/- 5.5 mSv (range 8.7 - 31.3 mSv). When the aorta and pulmonary arteries are also evaluated in “triple rule-out” studies, scan length and thus effective dose tend to increase compared with simple coronary angiography. Image noise and contrast to noise ratio can be stabilized by adjusting kVp and mAs per slice based on patient size.

Conclusions: Effective dose in CT depends linearly on both CTDIvol and scan length. Both of these factors can vary widely in cardiovascular CT, resulting in the potential for effective dose exceeding 30 mSv.