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Safety of Heart Rate Control and Relationship to Radiation Exposure from Coronary CT Angiography in 4,171 Studies

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Abstract

Background: The accuracy of Coronary CT Angiography (CCTA) is directly related to heart rate control. Previous studies show that at <60 bpm, 3% of coronary segments are unevaluable, whereas at 61-65 bpm, >21% of segments are unevaluable. Heart rate control also reduces radiation exposure through use of prospective gating or high-pitch scanning. The safety of "aggressive" heart rate control, using oral and intravenous metoprolol, has not been fully evaluated. Method: Retrospective review of all CCTA cases from a large, single centre institution. Data from all cases were logged into a prospective database including heart rate, DLP and effective dose, beta-blocker usage, and adverse events. Data were separated and analysed by calendar year, using the Fisher's exact test. Results: 4,171 CCTA were performed from Feburary 2007 to March 2012 (all-comers, excluding TAVI aortograms). Mean heart rate in 2009 was 63.9±11, 64.2±11 in 2010 (p=0.40), falling to 61.5±10 in 2011 (p=0.27), and to 59.4±9 in 2012 (p=0.0007). Radiation dose fell from 10.8±8.2 mSv to 6.9±7 mSv (p<0.0001), to 6.1±18 mSv (p=0.001), to 5.09±5 mSv (p<0.0001). One adverse event was recorded (0.023%) in a patient with undocumented left ventricular failure who was admitted due to acute pulmonary oedema in 2007. Conclusion: More aggressive heart rate control has resulted in significantly reduced radiation exposure in the period from 2007-2012, with no change in infrastructure or cost. This is due to better patient preparation, with an extremely low event rate. "Aggressive" heart rate control is safe and achievable in an academic public hospital setting, and has a significant impact on patient radiation exposure

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