Chapter 59
Uses of Cardiac CT

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What is the major use of coronary CT angiography?	Detecting coronary artery stenosis.
Is coronary CT angiography a screening test?	No.
What factors limit image quality?	Heart rate, body weight, ability to follow demands, and extent of coronary artery calcification.
How long must patients be able to hold their breath for during image acquisition?	Approximately 10 seconds.
What is the ideal heart rate during image acquisition?	Less than 60–65 beats per minute.

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When are beta blockers administered to help control the heart rate?	Orally, 1 hour before the scan or IV, immediately before scanning. Orally 100 mg metoprolol 1 hour prior to scan or 100–200 mg atenolol. Intravenously 5 mg metoprolol at arrival to scanner with additional 2.5–5 mg (not exceeding 30 mg).
How much iodine-based contrast is administered during the scan?	50–100 mL IV at approximately 4–7 mL/s.
How is CT angiography protocolled?	Retrospective cardiac gating or prospective triggering. High-contrast flow of 5–7 cc/sec is required for optimal contrast to noise ratio.
What are differences between retrospective vs. prospective gating?	Prospective gating is associated with less radiation exposure. Nonetheless it is extremely sensitive to heart rate changes and has limited spatial resolution to cover the entire surface of the heart in a single scan. It is only effective when HR is less 90 beats per minute and is not ideal in the setting of arrhythmias. Retrospective gating allows continuous image acquirement to then retrospectively analyze cardiac function through image reconstruction.
What is an advantage and disadvantage of retrospective gating?	An advantage is to be able to choose an optimal cardiac phase for analysis, which does not contain motion artifact. A disadvantage is that it is associated with much higher radiation dose.
What is the sensitivity and specificity of coronary CT?	There is high sensitivity (90–95%) and high negative predictive value to rule out stenosis. There is lower specificity and positive predictive value due to overestimation of stenosis and detection of lesions, which do not lead to ischemia.

Which additional techniques can improve detection of ischemia?	CT myocardial perfusion scanning and computational fluid dynamics.
Does lack of coronary calcium indicate no stenosis in symptomatic individuals?	No. There is poor correlation.
Is coronary calcium a good measure for risk stratification of major cardiac events?	Yes.
What is the accuracy of coronary CT in evaluating bypass grafts?	Low, often due to small diameter of the graft vessels.
When is cardiac CT used to assess ventricular function or congenital heart disease?	When echocardiography and MRI fail.
What is the use of cardiac CT for transcatheter aortic valve replacement?	To measure the aortic annulus dimension.

Further Reading

Schoepf U, et al. Coronary CT angiography. Radiology. 2007;244(1):48–63.

Sundaram B, et al. Anatomy and terminology for the interpretation and reporting of cardiac MDCT: part 1, structured report, coronary calcium screening, and coronary artery anatomy. AJR. 2009;192(3):574–83.

Sundaram B, et al. Anatomy and terminology for the interpretation and reporting of cardiac MDCT: part 2, CT angiography, cardiac function assessment, and noncoronary and extracardiac findings. AJR. 2009;192(3):584–98.

Machida H, et al. Current and novel imaging techniques in coronary CT. Radiographics. 2015;35(4):991–1010.

Chu L, et al. Cardiac CT angiography beyond the coronary arteries: what radiologists need to know and why they need to know it. Am J Roentgenol. 2014;203(6):583–95.

Desjardins B, Kazerooni EA. ECG-gated cardiac CT. Am J Roentgenol. 2004;182(4):993–1010.

Mahabadi AA, et al. Safety, efficacy, and indications of β-adrenergic receptor blockade to reduce heart rate prior to coronary CT angiography. Radiology. 2010;257(3):614–23.