



Cardiac CT  
Chapter 5

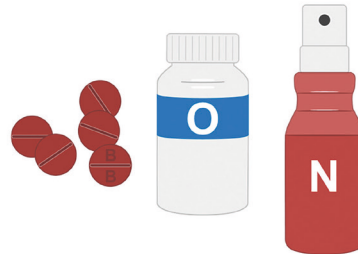
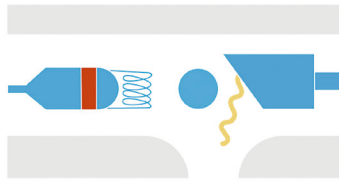
# ADVANCED CORONARY ARTERY EVALUATION



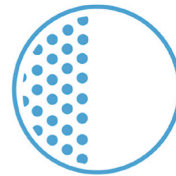
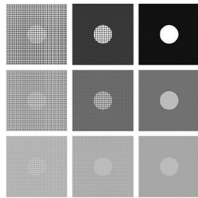
Ronak Rajani

## Advanced coronary artery evaluation

# ASSESSING CORONARY STENTS



Optimize chances



The evaluation of coronary artery stents with coronary CT angiography can be difficult due to stent blooming artifact. Consequentially, the only indication where coronary CT for stent evaluation is considered appropriate is where the stent exists in the left coronary artery, is 3 mm, and the patient is asymptomatic. If using coronary CT for stent evaluation, accurate evaluation can be enhanced by

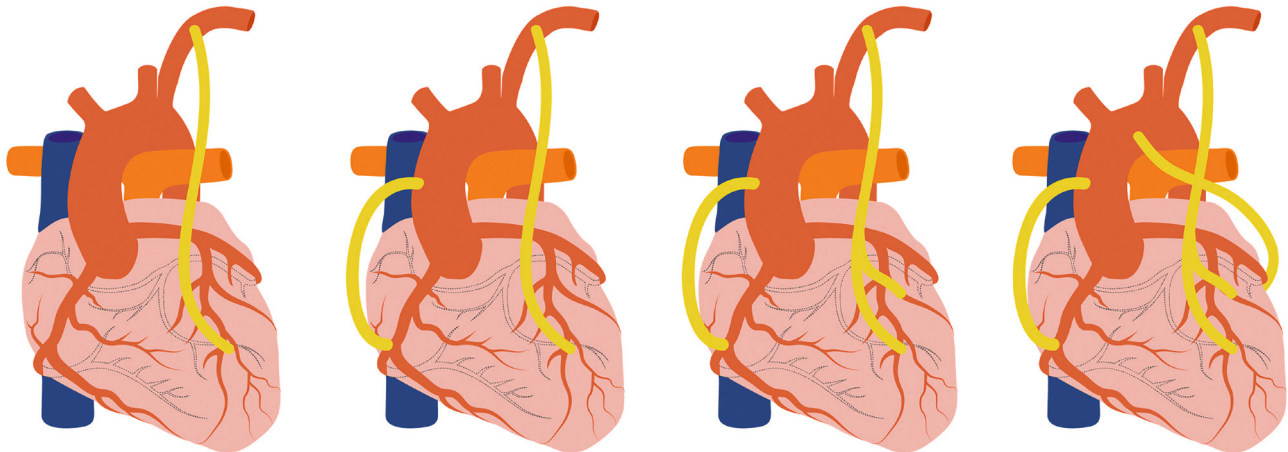
- Using a higher kVp to counteract blooming artifact
- GTN spray to increase vessel size
- Beta-blockers to ensure motion-free imaging (blooming artifacts may be accentuated by motion)
- Higher contrast flow rates 6–7 mL / s with a higher iodine concentration
- Use of a sharp post-processing filter, for image reconstruction, on scanner

The evaluation of stents is otherwise the same as standard coronary evaluation with double-oblique imaging and multiplanar reformatted reconstructions.

Stenosis is seen as hypoattenuation within the stents. Remember to evaluate the coronary vessel both proximal and distal to the stent insertion.

## Advanced coronary artery evaluation

# CORONARY ARTERY BYPASS GRAFTING



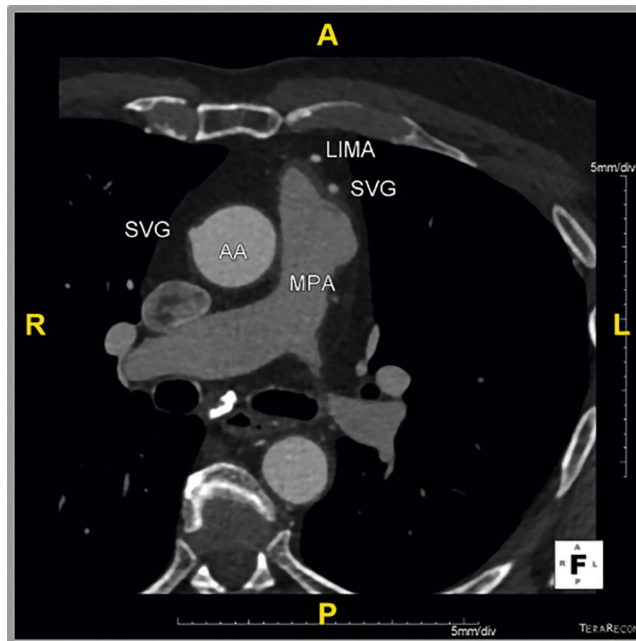
### Evaluation of bypass grafts

The evaluation of bypass grafts can be made easy on coronary CT:

- The request—does this include details of the coronary artery bypass grafts? If you know what you are looking for, this will make interpretation easy.
- Look at the scan range—does this extend from the subclavian arteries? It is likely, if this is the case, that the coronary CT scan has been performed to evaluate for the coronary artery bypass grafts.
- Look for midline sternotomy wires when you are quickly scanning through the data. This implies that cardiac surgery has been performed. Coronary artery bypass grafting is the predominant cardiac surgical operation.
- Native coronary disease—is there any evidence of native coronary artery occlusions or severe calcified plaque disease? If so, look carefully for bypass grafts.
- Look for metallic clips within the anterior mediastinum. This is a clue that arterial grafts have been used (left internal mammary, right internal mammary, and radial grafts). Clips are not used for saphenous vein grafts.
- Look very closely at the level of the main pulmonary artery. This is the one place you can instantly determine the number of coronary artery bypass grafts.
- Look for the left internal mammary artery (LIMA) and right internal mammary artery (RIMA) grafts in the anterior thoracic wall. This will instantly tell you whether these vessels have been used for bypass grafting.

## Advanced coronary artery evaluation

# REPORTING PATENCY OF CORONARY ARTERY BYPASS GRAFTS

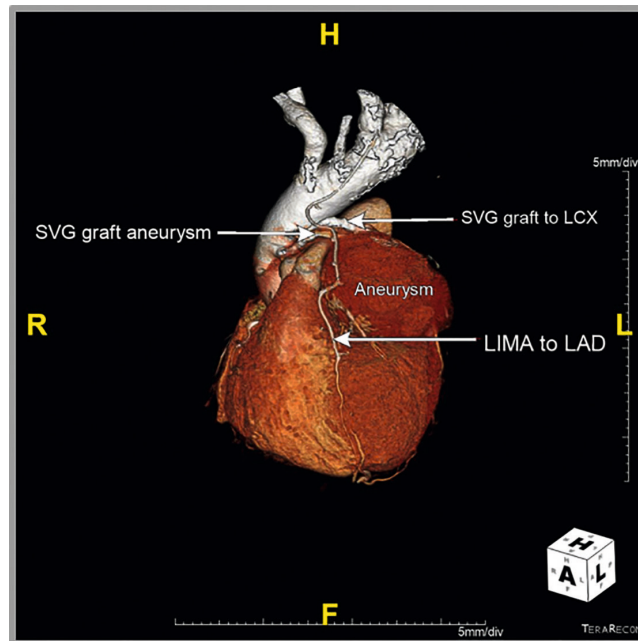


### Top tips

- The best view for determining the patency of the bypass grafts is at the level of the main pulmonary artery. This is the professionals' technique of choice, for quickly determining which bypass grafts have been used. To make life easy, increase the slice width thickness (slab thickness), on your workstations, to 4 mm.
- Bypass graft assessment requires an analysis of the origins of the bypass grafts, the proximal, mid, and distal segments of the grafts, along with the insertion point.
- Distal run-off of the bypass grafts is a subjective visualization of the contrast opacification within the native coronary artery, distal to the bypass graft.

## Advanced coronary artery evaluation

# EVALUATING COMPLEX CORONARY ARTERY BYPASS GRAFTS

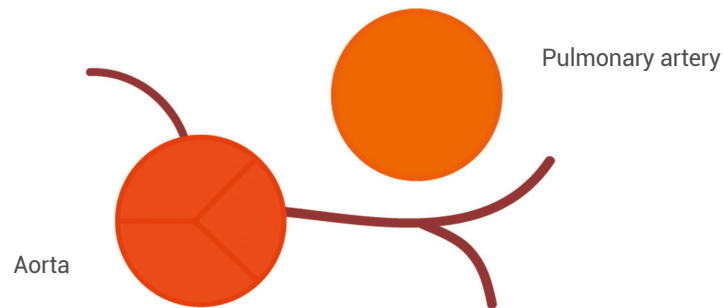


Coronary CT angiography is an ideal test for looking at coronary artery bypass graft complications. When evaluating the patency of bypass grafts, be sure to also evaluate the grafts carefully for various complications:

- Stenosis at the bypass graft origin
- Bypass graft stenosis
- Bypass graft occlusion
- Insertional point stenosis
- Bypass graft aneurysms (with saphenous vein grafts)
- Bypass graft fistula
- Bypass graft thrombus

## Advanced coronary artery evaluation

# DESCRIBING AND EXAMINING CORONARY ANOMALIES



Coronary anomalies are congenital abnormalities in the coronary anatomy of the heart. These occur in less than one percent of the population and can be seen concomitantly with other congenital heart defects. Coronary anomalies can be best thought of as coronary arteries that do not arise from the normal, expected, cusps of the aortic valve. Where abnormal vessel courses are seen—suspect a coronary anomaly.

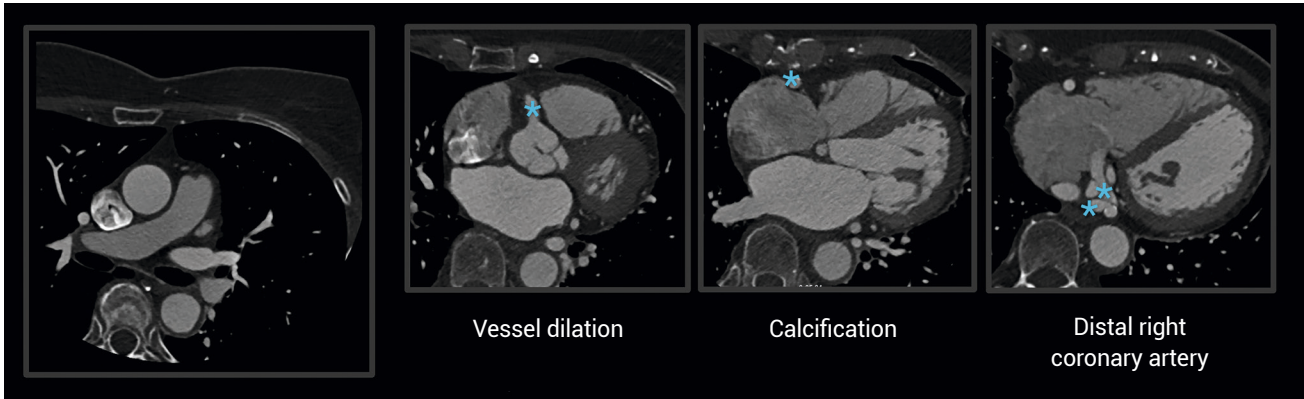
When evaluating for coronary anomalies follow these steps:

- Remember normal—The left coronary artery should arise from the left coronary cusp of the aortic valve, then bifurcate into the left anterior descending (LAD) artery and left circumflex artery (LCX). In trifurcation anatomy, the left coronary artery would trifurcate into the left anterior descending artery, the ramus (intermediate branch), and the left circumflex artery. The right coronary artery (RCA) should arise from the right coronary cusp.
- If the above is not seen, then suspect a coronary anomaly.
- Look systematically at the origin of the RCA, LAD, and LCX vessels.
- If they do not arise from the normal positions—a coronary anomaly exists.
- Identify the abnormal origin—this defines the coronary anomaly (i.e., if the RCA arises from the left coronary cusp this would be written as, “there is an anomalous right coronary artery that arises from the left coronary cusp.”)
- Following identification, describe the course of the vessel and where it terminates.
- Finally, look for any other congenital cardiac abnormalities.

A coronary anomaly is usually considered to be malignant. It can be associated with an adverse outcome if it passes between the great vessels of the aorta and main pulmonary artery, and there are high-risk features of a slit-like orifice, an intramural component to the vessel, or an acute angulation. Symptomatic young patients often require surgical correction of coronary anomalies, as do anomalies that arise from the main pulmonary artery.

## Advanced coronary artery evaluation

# EXAMINING CORONARY FISTULAS



Clues

### Key facts

- Coronary anomalies represent congenital variants to the origin of coronary arteries, whereas, coronary fistulas are defined as abnormal distal connections to the coronary arteries. In other words, fistulas are said to exist when one of the coronary arteries, or its branches, connects to the lumen of a cardiac chamber; or coronary sinus.
- 50% of coronary fistulas arise from the right coronary artery, 42% from the left coronary artery, and 8% from a combination of both (or another source).
- The most common sites of drainage are the RV followed by the RA, PA, coronary sinus, left atrium, LV, and then the SVC.

### Pathophysiology

- Largely dependent on the severity of the shunt size
- Majority of adults are asymptomatic
- Rare to diagnose coronary artery fistulae in the neonate
- Most common presentation is continuous heart murmur
- Symptoms can present later in life
- Dyspnea and right ventricle enlargement or dysfunction, secondary to progressive enlargement of the fistula, and increase in left to right shunting
- Fatigue
- Orthopnea
- Chest pain (coronary steal)
- Endocarditis (2–5%)
- Arrhythmias
- Myocardial infarction
- Pulmonary hypertension, rupture, thrombosis, arterial aneurysms
- Associated congenital abnormalities in up to 25%

## *Identification on coronary CT—the four clues*

1. Look for abnormal vessel dilation.
2. Look for abnormal vessel tortuosity.
3. Look for abnormal chamber dilation.
4. Look for increased vessel calcification.



***The four clues:***  
*Don't look once or twice. Look four times!*



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