Elliott K. Fishman
CTA of Thoracic and Abdominal Aorta

SAM Questions

1. The “draped aorta sign” represents which CT imaging finding
   A. stable aneurysm
   B. contained aortic rupture
   C. thrombosed false lumen
   D. thrombosed true lumen
   E. AV fistulae

   ANSWER: B

Reference

Discussion
The draped aorta sign represents a contained abdominal aortic rupture. The posterior wall of the aorta “drapes” along the contour of the adjacent vertebral body. On the CT scan the aorta becomes indistinct from adjacent structures with loss of periaortic fat planes to the vertebral body and the psoas muscle.

2. In looking at abdominal aortic aneurysm which sign represents aortic instability and potential for rupture?
   A. diameter increase of 2 mm/year
   B. crescent sign
   C. increased calcification in the aortic wall
   D. aneurysm over 4.5 cm in size
   E. patient age over age 80

   ANSWER: B


The “crescent sign” represents infiltration of blood from the aortic lumen into mural thrombus and/or wall of the aorta. On CT you see a periluminal curvilinear hyperdensity in the aortic wall. There is higher attenuation than the attenuation of the lumen on unenhanced CT. The blood severely weakens the wall of the aorta leading to rupture of the aorta.

3. In the patient following endovascular stent repair which type of endoleak is most common?
   A. Type I: proximal or distal end of stent
   B. Type II: retrograde perfusion by patent arterial branch (Inferior mesenteric, lumbar)
   C. Type III: through the stent, overlapping stents
   D. Type IV: transient porosity
   E. Type V: endotension~ occult endoleak

   ANSWER: B

Reference:

Type II endoleaks are the most common endoleak. 80% of these endoleaks resolve within 6 months and require no treatment. A persistent leak (>6 months) is associated with aneurysm sac growth, need for reintervention and the increased risk of rupture. Multiphase CT is ideal for detecting endoleaks and is the study of choice.
**Shawn Teague, MD**  
**Cardiac CTA Pitfalls**  
**SAM Questions**

1. Which one of the following is NOT an appropriate patient for cardiac CT?  
   A. 35 yo male with chest pain during exercise with concern for coronary anomaly  
   B. 65 yo female with sudden onset chest pain with history of CABG  
   C. 60 yo male pre-op for myxoma removal with unstable angina  
   D. 69 yo female with atypical acute chest pain with normal ECG and troponin  
   E. 65 yo male with atypical chronic chest pain and uninterpretable ECG  

Answer: C

According to the 2010 Appropriate Use Criteria for Cardiac Computed Tomography all of the patients above are appropriate for cardiac CT except the patient who is pre-op for non-coronary cardiac surgery (myxoma removal) as this patient has an active cardiac condition. Patients which have an active cardiac condition (unstable angina, decompensated heart failure, significant arrhythmias, severe valvular disease) are not considered intermediate perioperative risk and only patients who are intermediate perioperative risk are appropriate. To be intermediate risk the patient must not have any active cardiac conditions as defined above but they must have 1 or more clinical risk factors such as ischemic heart disease, compensated or prior heart failure, cerebrovascular disease, diabetes, or renal insufficiency.

References:  
Taylor AJ et al. ACCF/SCCT/ACR/AHA/ASE/ASNC/NASCI/SCAI/SCMR 2010 appropriate use criteria for cardiac computed tomography. A report of the American College of Cardiology Foundation Appropriate Use Criteria Task Force, the Society of Cardiovascular Computed Tomography, the American College of Radiology, the American Heart Association, the American Society of Echocardiography, the American Society of Nuclear Cardiology, the North American Society for Cardiovascular Imaging, the Society for Cardiovascular Angiography and Interventions, and the Society for Cardiovascular Magnetic Resonance. J Am Coll Cardiol. 2010 Nov 23;56(22):1864-94.  

2. In a patient with a heart rate of 60 bpm in normal sinus rhythm during the performance of a cardiac CTA, what phase of the cardiac cycle would be best for reconstructions with the least motion?  
   A. 15-25%  
   B. 35-45%  
   C. 50-60%  
   D. 65-75%  
   E. 85-95%  

Answer: D

In a patient with a steady normal sinus rhythm with slow heart rate below 65 bpm the best time period for the least cardiac motion is mid-late diastole. Depending on the specific vendor of the
CT scanner this is typically defined between 65-75% of the R-R interval. Therefore, D is the best answer.
A and B are both during the systolic time period where there is the most motion. 15-25% is at peak systole which usually has the most motion of any time point of the entire cardiac cycle. 35-45% is typically at the end of systole. This can be useful as a good reconstruction time point for motion free images in a troublesome patient with a heart rate around 70 bpm or especially in someone with heart rate variability or arrhythmia.
C is early diastole which generally is another bad time with a fair amount of motion as the ventricles are undergoing passive filling.
E is late diastole again where there tends to be motion that prevents creation of good quality images.

Reference:

3. What is the overall radiation exposure reduction during a retrospective ECG gated cardiac CTA when the kVp is decreased from 120-100?

A. <20%
B. 20-30%
C. 30-50%
D. 60-80%
E. >80%

Answer: C

By decreasing the kVp from 120 to 100 the mean photon energy is also decreased which overall decreases the radiation exposure to the patient but in a non-linear way unlike a reduction in mAs. However, because the energy is closer to the k-edge of Iodine the contrast to noise is increased even though the signal to noise is overall decreased. This improvement in contrast to noise helps with image quality to compensate for the decrease in signal to noise. If all other parameters are kept constant the dose reduction effect for decreasing from 120kVp to 100kVp is 30-50%. This should be attempted in all reasonable patients.

Reference:
John Pellerito, MD  
Essentials of Carotid Doppler  
SAM Questions

1. Which of the following criteria is the most accurate for the determination of the degree of carotid artery stenosis with Doppler Ultrasound?
   A. Peak systolic velocity  
   B. ICA/CCA ratio  
   C. Presence of plaque  
   D. ICA end-diastolic velocity  
   Correct response: A  
   Studies show that the PSV is the best predictor of the degree of carotid stenosis compared to the other criteria.  

2. According to the SRU Consensus Criteria, a lesion may be characterized as a greater than 70% stenosis when the PSV is at least
   A. 150 cm/sec  
   B. 200 cm/sec  
   C. 230 cm/sec  
   D. 275 cm/sec  
   Correct response: C  
   The consensus criteria identified 230 cm/sec as the appropriate discriminating PSV for at least 70% stenosis.  

3. After successful carotid stenting, expected changes in the Doppler examination of the internal carotid artery include
   A. Decrease in end-diastolic velocity in the stented segment  
   B. Increase in peak systolic velocity in the stented segment  
   C. Decrease in the ICA/CCA peak systolic velocity ratio in the stented segment  
   D. Loss of diastolic flow in the stented segment  
   Correct response: B  
   Elevated PSV are commonly seen in the stented portion of the ICA.  
Scott Reeder, MD, PhD
Contrast-Enhanced MRA at 1.5 and 3T
SAM Questions

1. To maximize the T1 weighting of arterial phase contrast-enhanced MRI, one should:
   A. increase the TR
   B. decrease the flip angle to approximately 15°
   C. increase the flip angle to approximately 30°
   D. decrease the bandwidth
   E. wait until contrast is in equilibrium in the blood pool

   Answer: C

   Rationale: increasing the TR or decreasing the flip angle reduces T1 weighting. Decreasing the bandwidth does nothing to T1 weighting unless it increases TR (which decreases T1 weighting). We want to image during the arterial phase. So the best answer is c.

2. Time resolved contrast enhanced MRI increases the speed of acquisition by
   A. Acquiring fewer lines of k-space for each time frame
   B. Sharing lines of k-space between different time frames
   C. Repeating the acquisition of the outer edges of k-space more frequently
   D. Relying only on parallel imaging to accelerate the acquisition
   E. Reducing the spatial resolution

   Answer: B

   Rationale: time resolved MRI shares lines of k-space for each time frame, with frequent sampling of the center of k-space, so the correct answer is b. If you acquire fewer lines of k-space you will get lower spatial resolution or aliasing. Parallel imaging can be used with time resolved methods, but is not typically done exclusively.

3. The higher contrast-to-noise (CNR) performance of CE-MRA at 3.0T is probably related to
   A. Higher T1 of background tissue resulting in better background suppression
   B. Higher relaxivity of contrast agents at higher field strengths
   C. Increased susceptibility at higher field strengths
   D. Increased specific absorption rate (SAR) at 3.0T
   E. The use of more advanced RF coils at 3.0T

   Answer: A

   Rationale: Higher background T1 leads to more background suppression so the answer is a. The relaxivity of contrast decreases with increasing field strength. Higher susceptibility does not increase CNR, nor does SAR. Coils at 3T are not more advanced than at 1.5T.

References: