2011 Imaging Criteria

Computed Tomography Angiogram (CTA), Coronaries[1*RIN, 2, 3, 4, 5, 6]

ICD-9-CM: 87.41
CPT: 75574, 76497
I/O Setting: Outpatient

INDICATION(S)

100 Evaluation of chest pain
200 Known congenital heart disease
300 Coronary artery anomaly by cardiac catheterization
400 Elevated coronary artery calcium score ***and*** send for secondary medical review

100 Evaluation of chest pain **[All]**
- 110 Chest pain of suspected cardiac etiology **and [Both]**[7]
  - 111 ECG normal/nondiagnostic for etiology of chest pain
  - 112 Troponin/cardiac enzymes negative
- 120 ETT/nuclear stress test nondiagnostic for etiology of chest pain[8]
- 130 Send for secondary medical review[9*MDR]

200 Known congenital heart disease **[All]**[10*RIN]
- 210 Preoperative evaluation[11]
- 220 Low CAD risk[12]
- 230 Send for secondary medical review[13*MDR]

300 Coronary artery anomaly by cardiac catheterization **[Both]**[14]
- 310 Preoperative evaluation
- 320 Additional imaging information needed[15]

400 Elevated coronary artery calcium score ***and*** send for secondary medical review[16*MDR, 17]

Notes

(1)-RIN:

These criteria address evaluation of the coronary anatomy with CT angiography and do not cover coronary calcium measurement. For coronary calcium measurement, see the "Computed Tomography (CT), Coronaries" criteria subset.

(2)

Contraindications to coronary CTA include the following (Amsterdam et al., Circulation 2010: July 26, 2010; Achenbach et al., J Am Coll Cardiol Img 2008; 1(2): 177-186; Horiguchi et al., AJR Am J Roentgenol 2008; 190(2): 315-320):

- Arrhythmias (e.g., atrial fibrillation or flutter, frequent PVCs)
- Heart rate > 70 refractory to calcium channel or beta blockers. Elevated heart rates can cause heart motion artifact
- Obesity. Images are more difficult to obtain because of tissue radiation interference
- Renal insufficiency
- Iodine contrast allergy

(3)

Coronary computed tomography angiography (CTA) provides high-resolution coronary angiograms noninvasively. Both coronary CTA and cardiac catheterization use x-rays and imaging contrast to look at the heart vessels to understand their structure. Coronary CTA is a noninvasive alternative to coronary angiography and has a sensitivity of 81% to 96% and a negative predictive value of 96% (Limkakeng et al., Am J Emerg Med 2007; 25(4): 450-458; Hamon et al., J Am Coll Cardiol 2006; 48(9): 1896-1910).

(4)

Limitations of CTA include inadequate image quality, the inability to determine the physiological significance of coronary lesions of intermediate severity, the inability to perform an invasive intervention (e.g., stent placement), calcification causing false positive readings, and the need for an IV contrast injection (Bluemke et al., Circulation 2008; 118(5): 586-606; Goldstein et al., J Am Coll Cardiol 2007; 49(8): 863-871). Also, many studies of coronary CTA define a clinically significant coronary lesion using a measurement of ≥ 50% stenosis, rather than the conventional measurement of ≥ 70% used with cardiac catheterization (Kantor et al., Curr Probl Cardiol 2009; 34(4): 145-217; Limkakeng et al., Am J Emerg Med 2007; 25(4): 450-458).

(5)

CTA performed using a 64-slice, or greater, scanner has higher sensitivity and specificity than older scanning technology. As the technology becomes more advanced (e.g., 128-, 256-, and 320-slice scans, dual source models), sensitivity and specificity will continue to improve (Mark et al., Circulation 2010, 121: 2509-43; Achenbach et al., J Am Coll Cardiol Img 2008; 1(2): 177-186; Ravipati et al., Am J Cardiol 2008; 101(6): 774-775).

(6)

There is concern about radiation exposure, although exposure for coronary CTA is approximately equal to the radiation of a nuclear stress test (Schroeder et al., Eur Heart J 2008; 29(4): 531-556; Einstein et al., JAMA 2007; 298(3): 317-323).

(7)

Many small-scale studies demonstrated the potential application of coronary CTA as a means of triaging patients with chest pain (Bonello et al., Int J Cardiol 2008:; Halon et al., Cardiology 2008; 109(2): 73-84; Hollander et al., Acad Emerg Med 2007; 14(2): 112-116). These studies have looked at varying populations. Studies have concluded that patients who are considered to be at high risk for coronary stenosis are not considered appropriate for CTA, as they would most likely require an additional interventional procedure. While CTA appears to have promise as a noninvasive method of triage for patients presenting to the ED, there are presently no established guidelines for use of coronary CTA in patients with chest pain because of limited evidence on prognostic ability (Mark et al., Circulation 2010, 121: 2509-43).

(8)

Coronary CTA has better sensitivity, specificity, positive predictive values, and negative predictive values than stress testing for diagnosing CAD. For symptomatic patients who can exercise, however, stress testing has greater prognostic value and proven outcomes in evaluating patients with chest pain (Ravipati et al., Am J Cardiol 2008; 101(6): 774-775). Coronary CTA is currently regarded as a second-line test to be considered only when stress testing results are equivocal or not diagnostic (Greenland et al., J Am Coll Cardiol 2007; 49(3): 378-402; American College of Cardiology Foundation Appropriate Use Criteria Task et al., J Am Coll Cardiol: j.jacc.2010.07.005).

(9)-MDR:

One of the potential benefits of coronary CTA is the reduction or avoidance of invasive angiography. Most studies have not been designed to generate evidence on reduction or avoidance of invasive angiography but utilized patients already scheduled to undergo cardiac catheterization; few of these studies included information on health outcomes (Min et al., J Am Coll Cardiol 2010; 55(10): 957-965; Achenbach et al., J Am Coll Cardiol Img 2008; 1(2): 177-186). Other recent studies, such as the Rule out Myocardial Infarction using Computer Assisted Tomography (ROMICAT) trial have evaluated CTA as a method for early triage of patients with acute chest pain, but have limitations due to enrollment procedures, population size, or duration of followup (Hoffmann et al., J Am Coll Cardiol 2009; 53(18): 1642-1650; Hollander et al., Acad Emerg Med 2009; 16(8): 693-698). Evidence demonstrating that coronary CTA reduces the need for invasive angiography remains limited and outcome studies are needed to evaluate benefit of coronary CTA. Therefore, requests for CTA for the evaluation of a patient with chest pain require secondary medical review.

(10)-RIN:

These criteria include evaluation of patients with complex congenital heart disease such as anomalies of the coronary circulation, great vessels, and cardiac chambers.

(11)

Coronary CTA is done to evaluate the coronaries prior to reparative congenital surgery in low-risk patients.

(12)

The probability of a patient having CAD can be calculated based on history, clinical findings, abnormal resting ECG, and multiple risk factors for atherosclerosis. One model uses age, gender, and chest pain characteristics, with the latter being the most predictive for CAD. There are a number of algorithms that can be used to calculate a patient's CAD risk. In symptomatic patients, pretest probability can be stratified as high (> 90%), intermediate (10% to 90%), low (< 10%), or very low (< 5%) pretest probability of CAD (Hendel et al., J Am Coll Cardiol 2009; 53(23): 2201-2229).

(13)-MDR:

Advances in the field of cardiac surgery have led to dramatic improvements in survival rates for most forms of congenital heart disease. Noninvasive cardiac imaging such as CTA of the coronaries may be appropriate in certain circumstances, such as preoperative evaluation in patients who are considered to be at low risk for CAD (Prakash et al., Circ Cardiovasc Imaging 2010; 3(1): 112-125). Due to the lack of evidence that CTA would reduce the need for invasive angiography, requests for CTA of the coronaries require secondary medical review (Warnes et al., J Am Coll Cardiol 2008; 52(23): e1-121).

(14)

Coronary anomalies (e.g., anomalies of the origin from the coronary sinus, ectopic origin of the main pulmonary artery) are rare conditions but possible consequences include sudden cardiac death, MI, or other cardiac symptoms (e.g., angina, syncope, HF) (Kacmaz et al., Clin Cardiol 2008; 31(1): 41-47; Komatsu et al., Heart Vessels 2008; 23(1): 26-34).

(15)

Coronary anomalies are usually discovered incidentally during invasive coronary angiography. Sometimes, the course of the abnormal artery can be difficult to ascertain from the 2-dimensional data provided by invasive angiography. Noninvasive coronary imaging may be used to complete the imaging assessment of the coronary vasculature (Bluemke et al., Circulation 2008; 118(5): 586-606; Schroeder et al., Eur Heart J 2008; 29(4): 531-556; American College of Cardiology Foundation Appropriate Use Criteria Task et al., J Am Coll Cardiol: j.jacc.2010.07.005).

(16)-MDR:

There is insufficient evidence to support the use of coronary CTA to evaluate the coronaries in asymptomatic patients with an elevated coronary artery calcium score (Greenland et al., J Am Coll Cardiol 2007; 49(3): 378-402; Budoff et al., Circulation 2006; 114(16): 1761-1791). An elevated coronary artery calcium score is not always indicative of obstructive CAD and the impact of an elevated coronary artery calcium score on clinical outcomes has not been established. Therefore, all requests for coronary CTA for an elevated coronary artery calcium score require secondary medical review.

(17)

Coronary artery calcium scoring by CT is a noninvasive method used to screen patients for CAD. Cardiac calcification may be a surrogate marker for CAD and is usually encountered in advanced atherosclerotic disease. A score ≥ 400 places the patient in the high-risk category and risk-reducing therapy, including the use of statins and lifestyle changes, should be initiated.
Not all calcified lesions obstruct the coronary artery or result in clinically significant stenosis, however. The concept that absence of coronary calcification excludes the possibility that a patient has obstructive coronary artery disease has also been challenged. The coronary calcium score is, therefore, an imperfect measure of atherosclerotic burden and the risk of CAD (Gottlieb et al., J Am Coll Cardiol 2010; 55(7): 627-634; Greenland et al., J Am Coll Cardiol 2007; 49(3): 378-402).
Criticisms of the use of coronary artery calcium scores in practice has been the lack of a standardized protocol; the fact that data

gathered is derived from studies using electron beam tomography, while multidetector computed tomography is used in practice; and the use of two different scoring systems, the Agatston score and volume scores. A variety of other factors including heart rate control and differing imaging technique can affect the results of a scan (Mao et al., J Comput Assist Tomogr 2009; 33(2): 175-178).