

**Acute Chest Pain — Suspected Aortic Dissection  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
1. Nienaber CA, Eagle KA. Aortic dissection: new frontiers in diagnosis and management: Part I: from etiology to diagnostic strategies. <i>Circulation</i> . 2003;108(5):628-635.	Review/Other-Dx	N/A	Review etiology, natural history, and classification (with vascular staging) of aortic wall disease and diagnostic strategies.	Modern imaging techniques can reliably identify variants of dissection such as IMH, plaque ulceration, or traumatic aortic injury.	4
2. Hagan PG, Nienaber CA, Isselbacher EM, et al. The International Registry of Acute Aortic Dissection (IRAD): new insights into an old disease. <i>JAMA</i> . 2000;283(7):897-903.	Review/Other-Dx	464 patients	Use case series to assess the presentation, management, and outcomes of AAD.	Wide range of manifestations. Data support the need for continued improvement in prevention, diagnosis, and management of AAD.	4
3. Trimarchi S, Tolenaar JL, Tsai TT, et al. Influence of clinical presentation on the outcome of acute B aortic dissection: evidences from IRAD. <i>J Cardiovasc Surg (Torino)</i> . 2012;53(2):161-168.	Observational-Tx	550 patients	To analyze the patients of the International Registry of Acute Aortic Dissection (IRAD) in order to clarify the influence of the clinical presentation on the outcome.	The overall in-hospital mortality among 550 patients was 12.4%. Mortality in group I (250 patients) was 20.0%, compared to 6.1% in group II (300 patients) (P<0.001). Univariate predictors of ABAD complications were Marfan syndrome, abrupt onset of pain, migrating pain, any focal neurological deficits, need for higher number of diagnostic examinations and use of MR and/or aortogram, abdominal vessels involvement at aortogram, larger descending aortic diameter, especially >6 cm, pleural effusion, and widened mediastinum on chest x-ray. Univariate predictors of a noncomplicated status were normal chest x-ray and medical management. In group I, in-hospital mortality following surgical and endovascular intervention were 28.6% and 10.1% (P=0.006), respectively. Independent predictors of overall in-hospital mortality included age >70 years, female gender, ECG showing ischemia, preoperative acute renal failure, preoperative limb ischemia, periaortic hematoma, and surgical management. The only independent variable protective for mortality was magnetic resonance as diagnostic test.	2

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4. Romano L, Pinto A, Gagliardi N. Multidetector-row CT evaluation of nontraumatic acute thoracic aortic syndromes. <i>Radiol Med.</i> 2007;112(1):1-20.	Review/Other-Dx	N/A	To evaluate acute thoracic nontraumatic aortic syndromes to illustrate the examination technique and the key imaging findings related to each disease. The role of MDCT for planning specific treatment is also highlighted.	Acute thoracic aortic syndromes encompass a spectrum of emergencies presenting with acute chest pain and marked by a high risk of aortic rupture and sudden death. These include nontraumatic disease entities of the thoracic aorta, namely, dissection, intramural haematoma, penetrating atherosclerotic ulcer and aneurysm rupture. In clinical practice, the most frequent imaging procedure used in the diagnostic assessment of these diseases is CT, which, thanks to recent technological developments (ie, MDCT), affords important diagnostic possibilities and very interesting future perspectives.	4
5. Erbel R, Alfonso F, Boileau C, et al. Diagnosis and management of aortic dissection. <i>Eur Heart J.</i> 2001;22(18):1642-1681.	Review/Other-Dx	N/A	Review diagnosis and treatment of AAD.	CT is often used for patients with suspected AD. MRI has the highest accuracy and sensitivity as well as specificity (nearly 100%) for detection of all forms of dissection except subtle forms. MRI provides excellent visualization of tear localization, aortic regurgitation, side branch involvement and complications.	4
6. Erbel R, Oelert H, Meyer J, et al. Effect of medical and surgical therapy on aortic dissection evaluated by transesophageal echocardiography. Implications for prognosis and therapy. The European Cooperative Study Group on Echocardiography. <i>Circulation.</i> 1993;87(5):1604-1615.	Observational-Dx	168 patients in 8 centers	Prospective follow-up study to determine whether status of communications between true and false lumen analyzed by TEE influences risk after initiation of medical or surgical therapy.	Preoperative mortality is reduced by TEE. Intraoperative and postoperative mortality remains high. Fluid extravasation and open false lumen with high communication are risk factors. Important to detect and resect intimal tears as patients with communication have higher reoperation rate and mortality.	3

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7. Coady MA, Rizzo JA, Goldstein LJ, Elefteriades JA. Natural history, pathogenesis, and etiology of thoracic aortic aneurysms and dissections. <i>Cardiol Clin.</i> 1999;17(4):615-635; vii.	Review/Other-Dx	N/A	To review the history, pathogenesis and etiology of aortic aneurysms.	The natural history of thoracic aortic aneurysms and dissections is diverse, reflecting a broad spectrum of etiologies which include increasing aortic size, hypertension, and genetic factors. The pathogenesis is related to defects or degeneration in structural integrity of the adventitia, not the media, which is required for aneurysm formation. The ascending and descending aorta appear to have separate underlying disease processes that lead to a weakened vessel wall and an increased susceptibility for dissection. Etiologic factors for aortic aneurysms and dissections are multifactorial, reflecting genetic, environmental, and physiologic influences.	4
8. Evangelista A, Mukherjee D, Mehta RH, et al. Acute intramural hematoma of the aorta: a mystery in evolution. <i>Circulation.</i> 2005;111(8):1063-1070.	Observational-Dx	1,010 patients	To study patients with acute aortic syndromes to describe prevalence, presentation, management, and outcomes of acute IMH.	5.7% patients had IMH. IMH is a highly lethal condition when it involves the ascending aorta and surgical therapy should be considered, but this condition is less critical when limited to the arch or descending aorta. 16% of patients have evidence of evolution to dissection on serial imaging.	3
9. Eyer WR, Clark MD. Dissecting aneurysms of the aorta: roentgen manifestations including a comparison with other types of aneurysms. <i>Radiology.</i> 1965;85(6):1047-1057.	Review/Other-Dx	46 cases of dissecting aneurysms, 34 cases of arteriosclerotic, luetic, thoracic aneurysms	Comparison of radiographic findings in patients with AD and other types of aneurysms.	Radiographic and angiographic manifestations in a series of 46 patients with dissecting aneurysm of the aorta reviewed and classified. Classification can be radiographic changes on radiographs or on contrast studies.	4
10. McMahon MA, Squirrell CA. Multidetector CT of Aortic Dissection: A Pictorial Review. <i>Radiographics.</i> 2010;30(2):445-460.	Review/Other-Dx	N/A	To review the benefits of MDCT of AD.	Modern MDCT is a fast, widely available imaging modality with high sensitivity and specificity. MDCT allows the early recognition and characterization of AD as well as determination of the presence of any associated complications, findings that are essential for optimizing treatment and improving clinical outcomes.	4

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11. Lai V, Tsang WK, Chan WC, Yeung TW. Diagnostic accuracy of mediastinal width measurement on posteroanterior and anteroposterior chest radiographs in the depiction of acute nontraumatic thoracic aortic dissection. <i>Emerg Radiol.</i> 2012;19(4):309-315.	Observational-Dx	220 patients	To explore the diagnostic accuracy of various mediastinal measurements in determining acute nontraumatic thoracic AD with respect to posteroanterior and anteroposterior chest radiographs.	The maximal mediastinal width and maximal left mediastinal width were measured by 2 independent radiologists and the mediastinal width ratio was calculated. Statistical analysis was then performed with independent sample t test. Posteroanterior projection was significantly more accurate than anteroposterior projection, achieving higher sensitivity and specificity. Left mediastinal width and mediastinal width were the most powerful parameters on posteroanterior and anteroposterior chest radiographs, respectively. The optimal cutoff levels were left mediastinal width = 4.95 cm (sensitivity, 90%; specificity, 90%) and mediastinal width = 7.45 cm (sensitivity, 90%; specificity, 88.3%) for posteroanterior projection and left mediastinal width = 5.45 cm (sensitivity, 76%; specificity, 65%) and mediastinal width = 8.65 cm (sensitivity, 72%; specificity, 80%) for anteroposterior projection. Mediastinal width ratio was found less useful and less reliable. The use of left mediastinal width alone in posteroanterior film would allow more accurate prediction of AD. Posteroanterior chest radiograph has a higher diagnostic accuracy when compared with AP chest radiograph, with negative posteroanterior chest radiograph showing less probability for AD.	3
12. Moore AG, Eagle KA, Bruckman D, et al. Choice of computed tomography, transesophageal echocardiography, magnetic resonance imaging, and aortography in acute aortic dissection: International Registry of Acute Aortic Dissection (IRAD). <i>Am J Cardiol.</i> 2002;89(10):1235-1238.	Observational-Dx	628 patients	Comparative study to assess the current status of diagnostic imaging in AAD at several cardiovascular referral centers throughout the world by analyzing data on test preference and performance gathered in the IRAD.	For AAD, CT is selected most frequently worldwide as the initial test, followed by TEE. Aortography and MRI are performed much less often. More than two-thirds of the patient's required second imaging tests.	3

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13. Yoshida S, Akiba H, Tamakawa M, et al. Thoracic involvement of type A aortic dissection and intramural hematoma: diagnostic accuracy--comparison of emergency helical CT and surgical findings. <i>Radiology</i> . 2003;228(2):430-435.	Observational-Dx	57 patients	To assess the accuracy of various findings at emergency HCT for the evaluation of thoracic involvement of type A AD and type A IMH and to compare these findings with those at surgical confirmation.	For the detection of AD or IMH of the thoracic aorta, the accuracy of HCT was 100%. The sensitivity, specificity, and accuracy, respectively, were 82%, 100%, and 84% for an entry tear; 95%, 100%, and 98% for arch branch vessel involvement; and 83%, 100%, and 91% for pericardial effusion. These values were all 100% for aortic arch anomalies.	2
14. Lovy AJ, Rosenblum JK, Levsky JM, et al. Acute aortic syndromes: a second look at dual-phase CT. <i>AJR Am J Roentgenol</i> . 2013;200(4):805-811.	Observational-Dx	2,868 patients	To assess the diagnostic performance of the unenhanced and contrast-enhanced phases separately in patients imaged with CT for suspected acute aortic syndromes.	45 patients had one or more CT findings of acute aortic syndrome: AD (n = 32), IMH (n = 27), aortic rupture (n = 10), impending rupture (n = 4), and penetrating atherosclerotic ulcer (n = 2). Unenhanced CT was 89% (40/45) sensitive and 100% (45/45) specific for acute aortic syndrome. Unenhanced CT was 94% (17/18) and 71% (10/14) sensitive for type A and type B dissection, respectively (P=0.142). Contrast-enhanced CTA was 100% (8/8) sensitive for isolated IMH. Mean radiation effective dose was 43 +/- 20 mSv.	2
15. Thoongsuwan N, Stern EJ. Chest CT scanning for clinical suspected thoracic aortic dissection: beware the alternate diagnosis. <i>Emerg Radiol</i> . 2002;9(5):257-261.	Review/Other-Dx	130 patients	Retrospective review to evaluate the spectrum of chest diseases in patients presenting with clinical suspicion of thoracic AD in the emergency department.	Found AD in 32 patients (24.6%), 22 of which were Stanford classification type A and 10 Stanford type B. In 28 patients (21.5%), CT revealed an alternate diagnosis that, along with the clinical impression, probably explained the patients presenting symptoms.	4
16. Ballal RS, Nanda NC, Gatewood R, et al. Usefulness of transesophageal echocardiography in assessment of aortic dissection. <i>Circulation</i> . 1991;84(5):1903-1914.	Observational-Dx	61 patients	To clarify role of TEE (36% biplane) in evaluation of AD with attention to type of dissection and associated complications and in assessment of immediate postoperative repair. TEE results compared to CT, angiography, surgery, or autopsy.	TEE made correct diagnosis of dissection in 33/34 patients (sensitivity 97%; specificity 100%). CT made correct diagnosis in only 67% and misclassified the type of dissection in 33%. TEE identified coronary artery involvement by dissection in 6/7 with dissection; detected entry sites, thrombi in false lumen and false aneurysm formation. Sensitivity and specificity calculations suspect as group II patients were not suspected of having dissection and 16 patients had intraoperative TEE.	3

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17. Laissy JP, Blanc F, Soyer P, et al. Thoracic aortic dissection: diagnosis with transesophageal echocardiography versus MR imaging. <i>Radiology</i> . 1995;194(2):331-336.	Observational-Dx	41 patients	Retrospective study to compare TEE and MRI in diagnosis of dissection of thoracic aorta. Imaging results compared at independent double-blind readings.	MRI depicted intimal flap in 95% ADs; TEE in 86% (P<0.05). Sensitivity for MRI for detection of residual dissection 100% vs 86% with TEE. Inferior extent dissection seen only with MRI. MRI superior to TEE in follow-up thoracic AD. However, because of limited MRI availability, TEE should remain standard modality for diagnosis.	2
18. Nienaber CA, von Kodolitsch Y, Nicolas V, et al. The diagnosis of thoracic aortic dissection by noninvasive imaging procedures. <i>N Engl J Med</i> . 1993;328(1):1-9.	Observational-Dx	110 patients	Comparative study to assess reliability and safety of TTE, single plane TEE, contrast enhanced CT and MRI as compared to contrast angiography in patients with clinically suspected AD. Results were compared in a blinded fashion and validated independently against intraoperative findings in 62 patients, autopsy findings in 7, and the results of contrast angiography in 64.	MRI, TEE and x-ray CT have similar sensitivities for detecting dissection; 98.3%, 97.7% and 93.8% respectively. Specificities of both TTE (83%) and TEE (76.9%) were lower than those of CT (87.1%) and MRI (97.8%) mainly as a result of false positive findings in the ascending aorta. A noninvasive diagnostic strategy using MRI and TEE in unstable patients should be considered optimal approach to dissection of thoracic aorta.	2
19. Sommer T, Fehske W, Holzknrecht N, et al. Aortic dissection: a comparative study of diagnosis with spiral CT, multiplanar transesophageal echocardiography, and MR imaging. <i>Radiology</i> . 1996;199(2):347-352.	Observational-Dx	49 patients	Prospective study to compare usefulness of spiral CT, multiplanar TEE and MRI in the diagnosis of thoracic AD and arch vessel involvement.	Sensitivity in detection thoracic AD was 100% for all techniques, specificity 100%, 94% and 94% for spiral CT, multiplanar TEE and MRI, respectively. For assessment of aortic arch vessel involvement, sensitivity 93%, 60% and 67% respectively and specificity was 97%, 85%, and 88% respectively. In the assessment of the supra aortic branches, spiral CT is superior (P<.05).	2
20. Roos JE, Willmann JK, Weishaupt D, Lachat M, Marincek B, Hilfiker PR. Thoracic aorta: motion artifact reduction with retrospective and prospective electrocardiography-assisted multi-detector row CT. <i>Radiology</i> . 2002;222(1):271-277.	Observational-Dx	20 prospectively 20 retrospectively, 20 non-ECG-assisted MDCT	To compare prospective and retrospective ECG-assisted MDCT with non-ECG-assisted MDCT of the thoracic aorta with regard to reduction of motion-related artifacts.	ECG-assisted MDCT compared with non-ECG-assisted MDCT showed a significant reduction in motion artifacts for the entire thoracic aorta.	2

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21. Schertler T, Glucker T, Wildermuth S, Jungius KP, Marincek B, Boehm T. Comparison of retrospectively ECG-gated and nongated MDCT of the chest in an emergency setting regarding workflow, image quality, and diagnostic certainty. <i>Emerg Radiol.</i> 2005;12(1-2):19-29.	Observational-Dx	32 consecutive patients	To assess the influence of ECG-gated acquisition on workflow and to compare image quality and diagnostic certainty for retrospectively ECG-gated and nongated MDCT of the chest in the emergency suite.	The motion artifacts of the thoracic aorta and the supra-aortic vessels were significantly reduced in the ECG-gated data acquisition compared with the nongated technique (P<0.001). Subjective diagnostic certainty for assessment of the aorta was significantly better using ECG gating. The image quality of the lung parenchyma (P<0.005), the spine (P<0.005), and the ribs (P<0.002) was inferior in the ECG-gated data sets but did not compromise the detection rate of traumatic lesions and fractures. Performing ECG gating in the emergency room did not slow down the diagnostic workup. ECG-gated acquisition performed better in the assessment of the aorta, but image quality for lung and bone structures was slightly reduced. Further studies are required to assess the influence of the imaging technique on the diagnostic outcome.	3
22. Chin AS, Fleischmann D. State-of-the-art computed tomography angiography of acute aortic syndrome. <i>Semin Ultrasound CT MR.</i> 2012;33(3):222-234.	Review/Other-Dx	N/A	To review the imaging spectrum and state-of-the-art CT for patients presenting with acute aortic syndrome.	Acute aortic syndrome refers to a spectrum of acute life-threatening aortic abnormalities requiring prompt recognition and treatment. Although underlying pathologies are diverse, presenting signs and symptoms are often indistinguishable clinically, underscoring the role of imaging to make the correct diagnosis. CTA, a safe and accessible imaging modality, is paramount in accurately confirming or excluding critical aortic lesions, defining location and extent, and describing associated complications. Electrocardiographic gating further improves diagnostic precision of CT, providing motion-free 3- and 4-dimensional imaging of the entire aorta.	4

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23. Imoto K, Uchida K, Karube N, et al. Risk analysis and improvement of strategies in patients who have acute type A aortic dissection with coronary artery dissection. <i>Eur J Cardiothorac Surg.</i> 2013;44(3):419-424; discussion 424-415.	Review/Other-Tx	75 patients	To identify the risk factors for mortality and establish improved treatment strategies in patients who have acute type A AD with coronary artery dissection.	Hospital death was 18/75 patients (24%), 16/48 (33%) among patients with ischemia and 2/27 (7.4%) without ischemia. The culprit lesion involved the right coronary artery in 4/26 patients (15%), the left right coronary artery in 9/19 (47%) and the right coronary artery + left right coronary in 3/3 (100%). Factors related to operative mortality were ischemia (P=0.019), left right coronary territory ischemia (P=0.003) and preoperative cardiopulmonary arrest (P=0.013). Postoperative LOS was less common in patients with coronary stent placement (P=0.042).	4
24. Rubin GD. MDCT imaging of the aorta and peripheral vessels. <i>Eur J Radiol.</i> 2003;45 Suppl 1:S42-49.	Review/Other-Dx	N/A	To describe how MDCT technology has substantially improved imaging of the aorta and peripheral vessels.	Discusses advantages of MDCT for evaluating a variety of aortic pathologies including AD. Discusses strengths and limitations of TEE, CT and MRI in AD and makes recommendations on efficient use of MDCT.	4
25. Shiga T, Wajima Z, Apfel CC, Inoue T, Ohe Y. Diagnostic accuracy of transesophageal echocardiography, helical computed tomography, and magnetic resonance imaging for suspected thoracic aortic dissection: systematic review and meta-analysis. <i>Arch Intern Med.</i> 2006;166(13):1350-1356.	Review/Other-Dx	1,139 patients from 16 studies	Systematic review of the diagnostic accuracy of imaging techniques: TEE, CT, MRI in patients with suspected thoracic AD.	TEE, HCT, and MRI, yield clinically equally reliable diagnostic values for confirming or ruling out thoracic AD.	4
26. Rogg JG, De Neve JW, Huang C, et al. The triple work-up for emergency department patients with acute chest pain: how often does it occur? <i>J Emerg Med.</i> 2011;40(2):128-134.	Observational-Dx	622 patients	To measure the degree of overlap and diagnostic yield for evaluations of acute coronary syndrome, pulmonary embolism, and AD among emergency department patients.	Over a 2-week period, 626 patient encounters among 622 unique patients were identified. Among these 626 visits, 139 (22%) included diagnostic tests for more than 1 of the 3 diagnoses of interest. The majority of these multiple tests were for acute coronary syndrome plus pulmonary embolism (n = 121, 87% of all multiple tests), whereas a minority of patients received tests for acute coronary syndrome plus AD (n = 14, 10% of all multiple tests) or for the “triple workup” of acute coronary syndrome plus pulmonary embolism plus AD (n = 4, 2.9% of all multiple tests).	4



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27. Halpern EJ. Triple-rule-out CT angiography for evaluation of acute chest pain and possible acute coronary syndrome. <i>Radiology</i> . 2009;252(2):332-345.	Review/Other-Dx	N/A	To evaluate triple-rule-out CTA for the evaluation of acute chest pain and possible acute coronary syndrome.	Triple-rule-out CTA can provide a cost-effective evaluation of the coronary arteries, aorta, pulmonary arteries, and adjacent intrathoracic structures for the patient with acute chest pain. Triple-rule-out CTA is most appropriate for the patient who is judged to be at low-risk to intermediate-risk for acute coronary syndrome and whose symptoms may also be attributed to acute pathologic conditions of the aorta or pulmonary arteries. When performed with appropriate attention to timing and technique, triple-rule-out CTA provides coronary image quality equal to that of dedicated coronary CTA and pulmonary arterial images that are free of motion artifact related to cardiac pulsation. In an appropriately selected emergency department patient population, triple-rule-out CT can safely eliminate the need for further diagnostic testing in over 75% of patients.	4
28. Rogers IS, Banerji D, Siegel EL, et al. Usefulness of comprehensive cardiothoracic computed tomography in the evaluation of acute undifferentiated chest discomfort in the emergency department (CAPTURE). <i>Am J Cardiol</i> . 2011;107(5):643-650.	Experimental-Dx	59 patients	A randomized diagnostic trial to compare the efficiency of a comprehensive cardiothoracic CT examination in the evaluation of patients presenting to the emergency department with undifferentiated acute chest discomfort or dyspnea.	Overall, 59 patients (mean age 51.2 +/- 11.4 years, 72.9% men) were randomized to either dedicated (n = 30) or comprehensive (n = 29) CT scanning. No significant difference was found in the median length of stay (7.6 vs 8.2 hours, P=0.79), rate of hospital discharge without additional imaging (70% vs 69%, P=0.99), median interval to exclusion of an acute event (5.2 vs 6.5 hours, P=0.64), costs of care (P=0.16), or the number of revisits (P=0.13) between the dedicated and comprehensive arms, respectively. In addition, radiation exposure (11.3 mSv vs 12.8 mSv, P=0.16) and the frequency of incidental findings requiring follow-up (24.1% vs 33.3%, P=0.57) were similar between the 2 arms.	3

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29. Hou DJ, Tso DK, Davison C, et al. Clinical utility of ultra high pitch dual source thoracic CT imaging of acute pulmonary embolism in the emergency department: are we one step closer towards a non-gated triple rule out? <i>Eur J Radiol.</i> 2013;82(10):1793-1798.	Observational-Dx	115 consecutive patients	To retrospectively compare the image quality and the radiation dose of an ultra-high pitch CT scan for the evaluation of pulmonary embolism and visualization of cardiac structures in comparison to our institution's standard pulmonary embolism protocol.	For the ultra-high pitch protocol, 14% (8/57) were positive for pulmonary embolus compared to 13.7% (8/58) for the standard pitch group. 98.2% of the ultra-high pitch scans were diagnostic for pulmonary embolus vs 94.8% of the standard protocol. Visualization of cardiac structures was significantly improved with the ultra-high pitch protocol (P<0.0001). Significantly more lung parenchymal motion was observed on the standard protocol (P<0.0001). The mean pulmonary vessel attenuation, signal-to-noise ratio, and contrast-to-noise ratio were not significantly different. The mean effective dose was lower for the ultra-high pitch studies (4.09mSv+/-0.78 vs 7.72mSv+/-2.60, P<0.0001).	2

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<p>30. Hendel RC, Patel MR, Kramer CM, et al. ACCF/ACR/SCCT/SCMR/ASNC/NASCI/SCAI/SIR 2006 appropriateness criteria for cardiac computed tomography and cardiac magnetic resonance imaging: a report of the American College of Cardiology Foundation Quality Strategic Directions Committee Appropriateness Criteria Working Group, American College of Radiology, Society of Cardiovascular Computed Tomography, Society for Cardiovascular Magnetic Resonance, American Society of Nuclear Cardiology, North American Society for Cardiac Imaging, Society for Cardiovascular Angiography and Interventions, and Society of Interventional Radiology. <i>J Am Coll Cardiol.</i> 2006;48(7):1475-1497.</p>	<p>Review/Other-Dx</p>	<p>N/A</p>	<p>2006 appropriateness review conducted for 2 relatively new clinical cardiac imaging modalities, cardiac CT and CMR imaging. The reviews assessed the risks and benefits of the imaging tests for several indications or clinical scenarios.</p>	<p>For the 39 indications for cardiac CT, 13 were found to be appropriate, and 12 were uncertain. 14 of these indications were felt to be inappropriate reasons for CT test performance. There was great variability in scores for the uncertain category, suggesting markedly differing opinions. However, there was substantial agreement as defined by RAND (9) for a panel this size for the categories labeled as either appropriate or inappropriate, with 77% and 86%, respectively, showing agreement. Cardiac CT was considered reasonable for a number of scenarios beyond assessments of structure and function, but still over 40% of the indications were for this area. For CMR, 17/33 indications were ranked as appropriate, with another 7 being uncertain. Nine scenarios were considered to be inappropriate reasons for MR test performance. Similar to the indications for cardiac CT, uncertain scenarios showed wider dispersion of scores than those for indications at either end of the spectrum. Agreement, as defined for a panel this size by RAND (9), was present for 82% of the appropriate indications and 89% for those felt to be inappropriate. Two-thirds of the appropriate and uncertain indications for CMR were related to assessment of structure and function. These results support the strengths of CMR as a tool for defining the etiology of complex patient presentations where the clinical suspicion is high. The scores for other uses reflect the evolving nature of the capabilities of the test.</p>	<p>4</p>

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31. Poon M, Rubin GD, Achenbach S, et al. Consensus update on the appropriate usage of cardiac computed tomographic angiography. <i>J Invasive Cardiol.</i> 2007;19(11):484-490.	Review/Other-Dx	N/A	To produce an updated consensus on CTA's utility and appropriateness in everyday clinical practice among radiologists and cardiologists.	Some consensus statements: CTA is useful in ruling out the presence of significant coronary stenosis. CTA has high NPV, and the result may provide clinical guidance for a longer period of time than other noninvasive imaging modalities. Patients with high pretest probability may not be the appropriate candidates for CTA because of a higher PPV of stress myocardial perfusion imaging and other forms of stress functional testing. Not all patients with stents are evaluable by CTA.	4
32. Lee HY, Song IS, Yoo SM, et al. Rarity of isolated pulmonary embolism and acute aortic syndrome occurring outside of the field of view of dedicated coronary CT angiography. <i>Acta Radiol.</i> 2011;52(4):378-384.	Review/Other-Dx	103 patients with acute PE and 50 patients with acute aortic syndrome	To determine the frequency of exclusion of findings of acute aortic syndrome, pulmonary embolism, and significant incidental noncardiac pathology that may be the cause of acute chest pain when using a restricted dedicated coronary CT angiography field of view.	There were 2 cases of isolated pulmonary embolism (2/103, 1.9%) excluded from the field of view of dedicated coronary CT angiography. One case of PE was isolated to the subsegmental pulmonary artery in the posterior segment of the right upper lobe. In the second case, pulmonary embolism in the left main pulmonary artery was located out of the field of view of dedicated coronary CT angiography because the left main pulmonary artery was retracted upwardly by fibrotic scar in the left upper lobe due to prior tuberculosis. There was no case of acute aortic syndrome and significant noncardiac pathology excluded from the field of view of dedicated coronary CT angiography. acute aortic syndrome (n = 50) consisted of penetrating atherosclerotic ulcer (n = 7), IMH (n = 5) and AD (n = 38).	4
33. Shaida N, Bowden DJ, Barrett T, et al. Acceptability of virtual unenhanced CT of the aorta as a replacement for the conventional unenhanced phase. <i>Clin Radiol.</i> 2012;67(5):461-467.	Observational-Dx	49 patients	To evaluate whether virtual unenhanced CT images generated of the aorta were of sufficient quality to replace the conventional unenhanced images.	The attenuation was significantly higher in the virtual unenhanced images compared to the conventional unenhanced images within the thoracic aorta (P<0.01) but not within the abdominal aorta (P=0.15). Overall the virtual unenhanced images of the abdominal aorta were deemed acceptable as replacements for the conventional unenhanced images in 93% of cases. For the thoracic aorta, the virtual unenhanced images were deemed acceptable in only 12% of cases, primarily due to pulsation artifact.	4

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34. Vlahos I, Chung R, Nair A, Morgan R. Dual-energy CT: vascular applications. <i>AJR Am J Roentgenol.</i> 2012;199(5 Suppl):S87-97.	Review/Other-Dx	N/A	To describe the current status, potential advantages, and limitations of dual-energy CT.	No results stated in abstract.	4
35. Vlahos I, Godoy MC, Naidich DP. Dual-energy computed tomography imaging of the aorta. <i>J Thorac Imaging.</i> 2010;25(4):289-300.	Review/Other-Dx	N/A	To review dual-energy CT imaging of the thoracic aorta.	There are 2 inseparable and complimentary technical advantages of dual-energy CT imaging of the thoracic aorta. One advantage stems from the simultaneous availability of low and high peak kVp spectra data and, in particular, the benefits conferred by the improved conspicuity of iodinated contrast media at lower kVp CT imaging. This, in turn, permits improved aortic visualization or, alternatively, reduction in the volume or rate of contrast administration. Image noise at low kVp does not appear to be a significant issue, with the backup availability of simultaneously acquired high kVp images a distinct advantage over single, low kVp imaging techniques. The second advantage of dual-energy CT imaging stems from the potential to calculate material-specific images derived mathematically from the simultaneous availability of attenuation measurements at 2 distinct energies. These material-specific data sets include virtual noncontrast images, virtual contrast, or “bone-subtracted” angiographic-like images. These techniques may confer significant advantages in the evaluation of patients with aortic disease, improving interpretation and reducing reconstruction time, while potentially reducing the need for, and associated radiation burden of, precontrast or postcontrast multiphasic imaging.	4

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36. Chandarana H, Godoy MC, Vlahos I, et al. Abdominal aorta: evaluation with dual-source dual-energy multidetector CT after endovascular repair of aneurysms--initial observations. <i>Radiology</i> . 2008;249(2):692-700.	Observational-Dx	22 patients	To evaluate the possible radiation dose reduction facilitated by using dual-energy MDCT after endovascular repair of abdominal aortic aneurysms.	Both independent readers' interpretations of the virtual nonenhanced and weighted-average venous CT data revealed six type II endoleaks. Aortic attenuation during the arterial, 80-kVp venous and weighted-average data acquisitions were 288, 213, and 150 HU, respectively. The attenuation of the endoleaks was higher during the 80-kVp acquisition (P<.03) than during the arterial phase and weighted-average venous phase acquisitions. The mean effective dose for dual-energy venous phase CT was 11.1 mSv compared with 27.8 mSv for standard triple-phase CT with a single-source configuration. Preliminary observations suggest that obtaining dual-energy MDCT data by using a single 60-second contrast material-enhanced acquisition may be all that is required for surveillance after endovascular repair of abdominal aortic aneurysm.	2
37. Barron DJ, Livesey SA, Brown IW, Delaney DJ, Lamb RK, Monro JL. Twenty-year follow-up of acute type a dissection: the incidence and extent of distal aortic disease using magnetic resonance imaging. <i>J Card Surg</i> . 1997;12(3):147-159.	Observational-Dx	87 patients	To report findings of 20-year follow-up in patients who have undergone surgical repair of type A dissection with all survivors undergoing MRI.	For dissection extending beyond arch, the choice of surgical technique does not prevent persistence of a distal false lumen. MRI gives ideal assessment of distal aortic disease and provides surgeon with all necessary information to plan timing and indications for further surgery.	3
38. Prince MR, Narasimham DL, Jacoby WT, et al. Three-dimensional gadolinium-enhanced MR angiography of the thoracic aorta. <i>AJR Am J Roentgenol</i> . 1996;166(6):1387-1397.	Observational-Dx	90 patients 97 MR exams, 4 observers	To evaluate image quality and preliminary experience with 3D gadolinium enhanced MRA of thoracic aorta. All MR exams were evaluated retrospectively for intravascular signal-to-noise ratio.	Signal-to-noise ratio highest in aortic arch, upper descending aorta, upper abdominal aorta. Stenosis of major branch vessel origins detected with sensitivity 90%, specificity 96%. Type of dissection correctly determined in all 8 dissection patients. 3D gadolinium-enhanced MRA has the potential to accurately diagnose AD, coarctation, and aneurysm.	2
39. Cigarroa JE, Isselbacher EM, DeSanctis RW, Eagle KA. Diagnostic imaging in the evaluation of suspected aortic dissection. Old standards and new directions. <i>N Engl J Med</i> . 1993;328(1):35-43.	Review/Other-Dx	N/A	To discuss the strengths, weaknesses and relative merits of the 4 imaging techniques: CT, echocardiography (especially TEE), MRI, and angiography available for evaluating patients with suspected AD.	MRI and TEE are the most sensitive studies. Specificity of aortography CT and MRI quite high, but TEE specificity high only when strict definition is positive study applied. Selection of imaging technique depends on hospital resources.	4

**Acute Chest Pain — Suspected Aortic Dissection  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
40. Nienaber CA, Spielmann RP, von Kodolitsch Y, et al. Diagnosis of thoracic aortic dissection. Magnetic resonance imaging versus transesophageal echocardiography. <i>Circulation</i> . 1992;85(2):434-447.	Observational-Dx	53 consecutive patients	To prospectively assess reliability of ECG triggered MRI and monopolar TEE for diagnosis of AD. Patients were subjected to a protocol in random order; imaging results were compared and validated against “gold standard” of intraoperative findings (n=27), necropsy (n=7), and/or contrast angiography (n=53).	Both MRI and monopolar TEE had sensitivity of 100%. TEE had lower specificity of 68% vs 100% for MRI resulting mainly from false positive findings confined to ascending segment of aorta.	3
41. Shinbane JS, Colletti PM, Shellock FG. Magnetic resonance imaging in patients with cardiac pacemakers: era of "MR Conditional" designs. <i>J Cardiovasc Magn Reson</i> . 2011;13:63.	Review/Other-Dx	N/A	To discuss the development and implementation of MR conditional cardiac pacemakers in addition to issues related to future design and implementation of other cardiac devices.	The advancement of MR conditional technology has led to greater options for patient management and has also resulted in greater complexity of clinical issues. The current MR conditional pacing technology provides definite solutions to some specific issues related to MR scanning. Future design, engineering, testing, and implementation of systems will need to focus on a goal of broadening these applications to further decreasing the barriers to scanning patients with cardiac and noncardiac, electronically activated devices.	4
42. Pereles FS, McCarthy RM, Baskaran V, et al. Thoracic aortic dissection and aneurysm: evaluation with nonenhanced true FISP MR angiography in less than 4 minutes. <i>Radiology</i> . 2002;223(1):270-274.	Review/Other-Dx	29 patients	Retrospective review. Authors hypothesized that nonenhanced true fast imaging with steady-state precession portion alone of their comprehensive imaging protocol would be adequate to confidently confirm or exclude dissection or aneurysm of the aorta.	Nonenhanced true fast imaging with steady-state precession MRI alone was 100% accurate for determining the presence or absence of dissection or aneurysm.	4
43. American College of Radiology. <i>Manual on Contrast Media</i> . Available at: <a href="http://www.acr.org/Quality-Safety/Resources/Contrast-Manual">http://www.acr.org/Quality-Safety/Resources/Contrast-Manual</a> .	Review/Other-Dx	N/A	Guidance document on contrast media to assist radiologists in recognizing and managing risks associated with the use of contrast media.	N/A	4

**Acute Chest Pain — Suspected Aortic Dissection  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
44. Krishnam MS, Tomasian A, Malik S, Desphande V, Laub G, Ruehm SG. Image quality and diagnostic accuracy of unenhanced SSFP MR angiography compared with conventional contrast-enhanced MR angiography for the assessment of thoracic aortic diseases. <i>Eur Radiol.</i> 2010;20(6):1311-1320.	Observational-Dx	50 patients	To determine the image quality and diagnostic accuracy of 3-D unenhanced SSFP MRA for the evaluation of thoracic aortic diseases.	Abnormal aortic findings, including aneurysm (n = 47), coarctation (n = 14), dissection (n = 12), aortic graft (n = 6), IMH (n = 11), mural thrombus in the aortic arch (n = 1), and penetrating aortic ulcer (n = 9), were confidently detected on both datasets. Sensitivity, specificity, and diagnostic accuracy of SSFP MRA for the detection of aortic disease were 100% with contrast enhanced-MRA serving as a reference standard. Image quality of the aortic root was significantly higher on SSFP MRA (P<0.001) with no significant difference for other aortic segments (P>0.05). Signal-to-noise ratio and contrast-to-noise ratio values were higher for all segments on SSFP MRA (P<0.01).	1



**Acute Chest Pain — Suspected Aortic Dissection  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
45. Morita S, Masukawa A, Suzuki K, Hirata M, Kojima S, Ueno E. Unenhanced MR angiography: techniques and clinical applications in patients with chronic kidney disease. <i>Radiographics</i> . 2011;31(2):E13-33.	Review/Other-Dx	N/A	To review the principles of the currently available unenhanced MR angiographic techniques, along with their advantages and limitations, and describe their clinical applications.	Alongside the 2 conventional unenhanced MR angiographic techniques, namely time-of-flight and phase-contrast MRA, several novel techniques have since been developed, including ECG-gated fast spin echo, SSFP, and arterial spin labeling. These techniques are increasingly being used to avoid severe complications caused by contrast materials, such as iodinated contrast material-induced nephropathy and gadolinium-induced nephrogenic systemic fibrosis. However, image acquisition and interpretation with these techniques are more complicated than with contrast-enhanced MRA because of numerous types of artifacts. Appropriate use of these techniques can allow diagnosis of vascular diseases in patients with chronic kidney disease without using contrast materials. For example, time-of-flight angiography is the main technique for evaluating intracranial arteries. Phase-contrast imaging is increasingly being used for physiologic evaluation rather than morphologic evaluation. Meanwhile, ECG-gated fast spin echo MRA can show peripheral arteries in more detail. SSFP MRA with or without arterial spin labeling can provide high-resolution images of blood vessels including renal arteries, the aorta, and coronary arteries. Black-blood imaging is also used to evaluate vessel walls and intravascular abnormalities including plaque, dissection, and thrombi.	4
46. Erbel R, Engberding R, Daniel W, Roelandt J, Visser C, Rennollet H. Echocardiography in diagnosis of aortic dissection. <i>Lancet</i> . 1989;1(8636):457-461.	Observational-Dx	164 consecutive patients	Multicenter study to measure sensitivity, specificity and predictive value of echocardiography including TEE in diagnosis AD.	Echocardiography had sensitivity of 99% and specificity of 98% with PPV of 98% and NPV of 99%. CT had sensitivity of 83% and specificity of 100%, with PPV of 100% and NPV of 86%. Aortography had sensitivity of 88% and specificity of 94% with PPV of 96% and NPV of 84%.	3

**Acute Chest Pain — Suspected Aortic Dissection  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
47. Keren A, Kim CB, Hu BS, et al. Accuracy of biplane and multiplane transesophageal echocardiography in diagnosis of typical acute aortic dissection and intramural hematoma. <i>J Am Coll Cardiol.</i> 1996;28(3):627-636.	Observational-Dx	112 patients	To evaluate diagnostic accuracy of biplane and multiplane TEE in patients with suspected AD including IMH.	Overall sensitivity and specificity of TEE for presence dissection 98% and 95% respectively. Specificity for type A and B dissection 97% and 99% respectively. Accuracy of TEE for diagnosis of acute aortic regurgitation and pericardial tamponade was 100%.	3
48. Evangelista A, Avegliano G, Aguilar R, et al. Impact of contrast-enhanced echocardiography on the diagnostic algorithm of acute aortic dissection. <i>Eur Heart J.</i> 2010;31(4):472-479.	Observational-Dx	128 consecutive patients	To determine the usefulness of contrast echocardiography in the diagnosis of AD and in the assessment of findings necessary for adequate patient management.	Sensitivity and specificity of conventional TTE increased after contrast enhancement from 73.7% to 86.8% (P<0.005) and 71.2% to 90.4% (P<0.05), respectively. Sensitivity and specificity of enhanced TTE was similar to conventional TEE in ascending aorta (93.3% vs 95.6% and 97.6% vs 96.4%, respectively) and in the arch (88.4% vs 93.0% and 95.3% vs 98.82%, respectively). Contrast-enhanced TEE permitted the location of nonvisualized entry tear in 7 cases (10.6%), helped to correctly identify the true lumen in 6 (9.1%), and diagnosed retrograde dissection in 9 (13.6%). Contrast enhancement substantially improves TTE in the diagnosis of AD and should be considered as the initial imaging modality in the emergency setting. Contrast enhancement also has significant value for obtaining critical morphological and haemokinetic information by TEE useful for adequate patient management.	2
49. Adachi H, Omoto R, Kyo S, et al. Emergency surgical intervention of acute aortic dissection with the rapid diagnosis by transesophageal echocardiography. <i>Circulation.</i> 1991;84(5 Suppl):III14-19.	Observational-Dx	45 patients	Evaluate rapid diagnosis and emergency surgical intervention of AAD by biplanar TEE.	Sufficient information for surgery obtained with bedside TEE (uniplane and biplane) with 98% of patients diagnosed accurately without aortography.	3
50. Omoto R, Kyo S, Matsumura M, et al. Evaluation of biplane color Doppler transesophageal echocardiography in 200 consecutive patients. <i>Circulation.</i> 1992;85(4):1237-1247.	Observational-Dx	200 consecutive patients	To evaluate the clinical applicability and advantages of biplane images of the heart using a biplane TEE probe.	Both transverse and longitudinal scans allowed correct identification of true and false lumina in all 30 AD examinations but longitudinal scans were superior in detecting types I and III entry sites. Longitudinal images increased acoustic window of the heart.	3

**Acute Chest Pain — Suspected Aortic Dissection  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
51. Willens HJ, Kessler KM. Transesophageal echocardiography in the diagnosis of diseases of the thoracic aorta: part 1. Aortic dissection, aortic intramural hematoma, and penetrating atherosclerotic ulcer of the aorta. <i>Chest</i> . 1999;116(6):1772-1779.	Review/Other-Dx	1 patient	Cased-based review to focus on the use of TEE in the acute aortic syndrome (AD, aortic IMH and penetrating atherosclerotic ulcer) of the aorta. Discusses the strengths and weaknesses of monoplane and biplane TEE in particular the problems with both in the assessment of the ascending aorta.	Suggests use of TEE-derived M-mode echocardiography may help to distinguish reverberation artifacts originating from posterior wall of the aorta or right pulmonary artery and to differentiate these artifacts from dissection.	4
52. Cho JR, Kim JS, Cho YH, et al. Subintimal angioplasty of an aortoiliac occlusion: re-entry site created using a transseptal needle under intravascular ultrasound guidance. <i>J Endovasc Ther</i> . 2007;14(6):816-822.	Review/Other-Dx	1 patient	To report the use of a transseptal needle to cross the intimal flap in subintimal angioplasty of a flush aortoiliac occlusion via a retrograde approach.	The use of a transseptal needle to cross the intimal flap in total aortoiliac occlusions is technically feasible under IVUS guidance and enables successful angioplasty.	4
53. Hu W, Schiele F, Meneveau N, et al. Value of intravascular ultrasound imaging in following up patients with replacement of the ascending aorta for acute type A aortic dissection. <i>Chin Med J (Engl)</i> . 2008;121(21):2139-2143.	Observational-Dx	16 consecutive patients	To assess the potential use of IVUS imaging in patients with replacement of the ascending aorta for acute type A AD.	There were no complications related to IVUS imaging. For the replaced graft, as other imaging modalities, IVUS could identify all 5 grafts, the proximal and the distal anastomoses, and the ostia of the reimplanted coronary arteries. In 2 cases, IVUS detected 2 peri-graft pseudo-aneurysms (1 per case), which were also detected by MRI but omitted by aortography. For the residual dissection, IVUS had similar findings as other imaging modalities in detecting the patency (5/5), the longitudinal and the circumferential extent, the thrombus (4/5), the recurrent dissection (1/5) and an aneurysm distal to the graft (5 in 4 patients). However, it detected more intimal tears and side branch involvements than other imaging modalities (15 vs 10 and 3 vs 1, respectively). In following-up patients with replacement of the ascending aorta for acute type A AD, IVUS imaging can provide complete information of the replaced graft and the residual dissection. So, IVUS imaging may be considered when the four current frequently used imaging modalities cannot supply sufficient information or there are some discrepancies between them.	3

**Acute Chest Pain — Suspected Aortic Dissection  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
54. Zanchetta M, Calzolari D, Pedon L, Faresin F, Ronsivalle S. Images in cardiovascular medicine. "Elephant trunk" mimicking thoracic aortic dissection: the role of intravascular ultrasound. <i>Circulation</i> . 2007;115(19):e455-456.	Review/Other-Dx	1 patient	To discuss a case of a woman with history of hypertension and extensive aortic aneurysm associated with severe aortic valvular regurgitation and the experience of aortic valve and ascending aorta replacement as treatment.	Secondary elephant trunk fixation by endovascular stent grafting was performed under fluoroscopic guidance; this was followed by a repeated IVUS examination, which showed complete expansion of the skeletonized elephant trunk on the aortic wall. No neurological deficit occurred, and follow-up CT confirmed the absence of endoleaks. Familiarity with these images, coupled with detailed knowledge of surgical technique, is essential for accurately evaluating postoperative findings and avoiding misdiagnosis.	4
55. Chirillo F, Cavallini C, Longhini C, et al. Comparative diagnostic value of transesophageal echocardiography and retrograde aortography in the evaluation of thoracic aortic dissection. <i>Am J Cardiol</i> . 1994;74(6):590-595.	Observational-Dx	64 patients	Prospective study to assess the comparative diagnostic value of TEE and retrograde aortography for morphologic evaluation and anatomic mapping of AD.	For detection of AD, aortography showed lower sensitivity (87.5% vs 97.5%) and NPV (85.3% vs 96.7%); For the epiphenomena of AD, aortography was significantly more accurate (97.2% vs 78%; P<0.05) in assessing the site of entry, and TEE was more accurate in identifying thrombus formation (90% vs 65%; P<0.05). In elective patients, combining both techniques seems the best approach; in unstable patients, TEE may be preferential because it is less invasive, requires no contrast injection, and provides accurate diagnosis in a short time at the bedside.	3
56. Andresen J, Baekgaard N, Allermann H. Evaluation of patients with thoracic aortic dissection by intraarterial digital subtraction angiography. <i>Vasa</i> . 1992;21(2):167-170.	Review/Other-Dx	17 patients, 11 patients	Determine quantity of information obtainable with arterial subtraction angiography in planning treatment of thoracic AD.	In 17 patients, a thoracic AD could be revealed by intra-arterial digital-subtraction angiography with exact delineation of the proximal and distal extent. In 11 patients the entry was seen over a longer area. Arterial digital-subtraction angiography provided accurate diagnosis with visualization of all pathophysiological aspect including flow into supra aortic and infradiaphragmatic arteries.	4

**Acute Chest Pain — Suspected Aortic Dissection  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
57. Tsagakis K, Konorza T, Dohle DS, et al. Hybrid operating room concept for combined diagnostics, intervention and surgery in acute type A dissection. <i>Eur J Cardiothorac Surg.</i> 2013;43(2):397-404.	Review/Other-Dx	1,883 cardiological and surgical patients	To present the results of the hybrid operating room concept encompassing simultaneous hemodynamic control, noninvasive and invasive diagnostics and immediate surgical and/or interventional treatment.	Preoperative angiography was performed in 71 patients, and no angiography related complications were observed during the procedure. A total of 32% (23/71) of these underwent coronary artery bypass graft for newly-diagnosed coronary artery disease in 21% of cases and for coronary malperfusion in 11%. Visceral/peripheral malperfusion syndromes, necessitating primary endovascular intervention, were detected in 23% (16/71). Ascending aorta replacement was performed in 100% (124/124) of patients, arch replacement in 88% (109/124) and descending aorta repair in 35% (44/124). Five postoperative endovascular interventions became necessary due to persistent malperfusion. In-hospital mortality was 13% (12/90) in patients who had undergone preoperative invasive diagnostics and 24% (8/34) in patients who had not.	4
58. Kato K, Nishio A, Kato N, Usami H, Fujimaki T, Murohara T. Uptake of 18F-FDG in acute aortic dissection: a determinant of unfavorable outcome. <i>J Nucl Med.</i> 2010;51(5):674-681.	Observational-Dx	28 patients	To investigate the use of FDG-PET/CT to predict short- and midterm outcomes in medically controlled AAD patients.	Maximum dissection diameter in the unfavorable group was significantly greater than that in the favorable group (P=0.0207). On 50-min images, maximal and mean SUV at maximum AD sites were significantly greater for the unfavorable group than for the favorable group (all P<0.01). A stepwise-forward selection procedure demonstrated that the mean SUV at sites of maximum AD on 50-min images significantly and independently predicted an unfavorable outcome for AAD (P=0.0171; odds ratio, 7.72; 95% CI, 1.44-41.4; R(2)=0.2372). A mean SUV greater than 3.029 had significant predictive power, with sensitivity of 75.0%, specificity of 70.0%, a PPV of 50.0%, a NPV of 87.5%, and accuracy of 71.4%. Greater uptake of FDG in AAD was significantly associated with an increased risk for rupture and progression. FDG-PET/CT may be used to improve AAD patient management, although more studies are still needed to clarify its role in this clinical scenario.	3

**Acute Chest Pain — Suspected Aortic Dissection  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
59. Kuehl H, Eggebrecht H, Boes T, et al. Detection of inflammation in patients with acute aortic syndrome: comparison of FDG-PET/CT imaging and serological markers of inflammation. <i>Heart</i> . 2008;94(11):1472-1477.	Observational-Dx	33 patients	To assess the impact of PET/CT and serological markers of inflammation to identify patients at high risk for disease progression.	The follow-up time was 224 (195) days. 9/11 PET-positive patients (82%) showed progression of acute aortic syndrome. In contrast, 55% of PET-negative patients showed stable disease or regression during the follow-up period. Kaplan-Meier analysis showed a clear, but not yet significant trend to longer survival in PET-negative patients, whereas elevated C-reactive protein and D-dimers did not allow for distinguishing of high-risk patients. Vessel wall inflammation was found in one-third of the patients with acute aortic syndrome and this patient group seems to have a high risk for disease progression. These initial results need further investigation.	3
60. Reeps C, Pelisek J, Bundschuh RA, et al. Imaging of acute and chronic aortic dissection by 18F-FDG PET/CT. <i>J Nucl Med</i> . 2010;51(5):686-691.	Observational-Dx	18 patients	To analyze the FDG uptake in the aortic wall of acute and chronic stable AD.	In contrast to chronic stable AD, all acute or acute progressive AD showed accentuated FDG uptake at the injured aortic wall or dissection membrane. The maximum SUV of the dissection membrane or aortic wall was significantly higher (P=0.02) in AAD than in chronic stable AD. Thereby, SUV varied from 3.03 to 4.64 (average maximum SUV, 3.84 +/- 0.51) for the dissection membrane and from 2.22 to 4.60 (average maximum SUV, 2.94 +/- 0.81) for the aortic wall, with false-negative and false-positive outliers. The discrimination between acute and stable AD was improved significantly (P<0.001), and false-positive or -negative outliers were eliminated, using the SUV ratio method. Our results indicate that FDG-PET/CT might be useful in differentiation of acute from chronic AD in clinically unclear cases. However, larger studies are needed to confirm our preliminary results.	3

**Acute Chest Pain — Suspected Aortic Dissection  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
61. Rudd JH, Warburton EA, Fryer TD, et al. Imaging atherosclerotic plaque inflammation with [18F]-fluorodeoxyglucose positron emission tomography. <i>Circulation</i> . 2002;105(23):2708-2711.	Review/Other-Dx	8 patients	To test whether FDG-PET imaging can identify inflammation within carotid artery atherosclerotic plaques.	The estimated net FDG accumulation rate (plaque/integral plasma) in symptomatic lesions was 27% higher than in contralateral asymptomatic lesions. There was no measurable FDG uptake into normal carotid arteries. Autoradiography of excised plaques confirmed accumulation of deoxyglucose in macrophage-rich areas of the plaque. This study demonstrates that atherosclerotic plaque inflammation can be imaged with FDG-PET, and that symptomatic, unstable plaques accumulate more FDG than asymptomatic lesions.	4
62. Vallabhajosula S, Fuster V. Atherosclerosis: imaging techniques and the evolving role of nuclear medicine. <i>J Nucl Med</i> . 1997;38(11):1788-1796.	Review/Other-Dx	N/A	To review the various imaging techniques for atherosclerosis.	MRA, being noninvasive, may replace conventional angiography for anatomical imaging of the vasculature. IVUS is the only technique that appears to be clinically useful in imaging the unstable, vulnerable plaques in coronary arteries. MRI techniques may be able to image vulnerable plaques and characterize plaques in terms of lipid and fibrous content and identify the presence of thrombus associated with the plaques. Radiolabeled lipoproteins, platelets and immunoglobulin have shown some clinical potential as imaging agents, but due to poor target-to-background and target-to-blood ratios these agents are not ideal for imaging coronary or even carotid lesions. FDG-PET also appears to offer new opportunities for noninvasive imaging of atherosclerosis and atherothrombosis.	4

**Acute Chest Pain — Suspected Aortic Dissection  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
63. Schillinger M, Domanovits H, Bayegan K, et al. C-reactive protein and mortality in patients with acute aortic disease. <i>Intensive Care Med.</i> 2002;28(6):740-745.	Observational-Dx	255 consecutive patients	To evaluate the association of acute-phase reaction and outcome of patients with acute vascular diseases by assessing the prognostic value of admission C-reactive protein in patients with acute aortic aneurysm or dissection.	Cumulative mortality 1, 3, and 6 months after presentation were 32%, 37%, and 40%, respectively. Increased C-reactive protein levels were independently associated with mortality, adjusted for age, sex, hemodynamic shock, mechanical ventilation, coronary artery disease, aortic rupture, hemoglobin, diabetes, and treatment strategy (surgery vs conservative). Hazard ratios in patients with C-reactive protein levels in quartiles 2-4 compared to quartile 1 were 0.7, 1.8, and 2.6, respectively. Elevated admission C-reactive protein values in patients with symptomatic aortic aneurysm/dissection were independently associated with poor prognosis. C-reactive protein levels higher than 6.3 mg/dl indicate a high risk for short-term mortality.	4



Acute Chest Pain — Suspected Aortic Dissection  
EVIDENCE TABLE

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
64. Sugano Y, Anzai T, Yoshikawa T, et al. Serum C-reactive protein elevation predicts poor clinical outcome in patients with distal type acute aortic dissection: association with the occurrence of oxygenation impairment. <i>Int J Cardiol.</i> 2005;102(1):39-45.	Observational-Dx	61 patients	To determine the significance of serum C-reactive protein elevation in the development of oxygenation impairment and clinical outcome with distal type AAD.	Oxygenation impairment, defined as the lowest PaO <sub>2</sub> /FIO <sub>2</sub> ratio ≤200 mmHg, was noted in 31 patients (51%). In patients with oxygenation impairment, peak C-reactive protein levels (20.7 +/- 7.9 vs 12.7 +/- 3.8 mg/dl, P<0.001), peak white-blood cell counts (14,600 +/- 3,600 vs 11,800 +/- 4,300/mm <sup>3</sup> , P=0.008) and body temperature (38.4 +/- 0.5 vs 38.0 +/- 0.6 degrees Celsius, P=0.004) were significantly higher than those without. Peak C-reactive protein level was inversely correlated with the lowest PaO <sub>2</sub> /FIO <sub>2</sub> (P<0.001). Patients who underwent urgent surgical treatment and/or died in the hospital had higher peak C-reactive protein levels (25.1 +/- 12.3 vs 16.1 +/- 7.4 mg/dl, P=0.010) than those who did not. Multivariate analysis revealed that a peak C-reactive protein level ≥15 mg/dl (relative risk = 12.6, P<0.001) was an independent determinant of the development of oxygenation impairment. The greater serum C-reactive protein elevation after distal type AAD was associated with a higher incidence of oxygenation impairment and poor clinical outcome. Systemic activation of the inflammatory system after aortic injury may play an important role in the development of oxygenation impairment.	3

## Evidence Table Key

### Study Quality Category Definitions

- *Category 1* The study is well-designed and accounts for common biases.
- *Category 2* The study is moderately well-designed and accounts for most common biases.
- *Category 3* There are important study design limitations.
- *Category 4* The study is not useful as primary evidence. The article may not be a clinical study or the study design is invalid, or conclusions are based on expert consensus. For example:
  - a) the study does not meet the criteria for or is not a hypothesis-based clinical study (e.g., a book chapter or case report or case series description);
  - b) the study may synthesize and draw conclusions about several studies such as a literature review article or book chapter but is not primary evidence;
  - c) the study is an expert opinion or consensus document.

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Dx = Diagnostic

Tx = Treatment

## Abbreviations Key

AD = Aortic dissection

AAD = Acute aortic dissection

CI = Confidence interval

CMR = Cardiac magnetic resonance

CT = Computed tomography

CTA = Computed tomography angiography

ECG = Electrocardiogram

FDG-PET = Fluorine-18-2-fluoro-2-deoxy-D-glucose-positron emission tomography

HCT = Helical computed tomography

IMH = Intramural hematoma

IVUS = Intravascular ultrasound

MDCT = Multidetector computed tomography

MRA = Magnetic resonance angiography

MRI = Magnetic resonance imaging

NPV = Negative predictive value

PET = Positron emission tomography

PPV = Positive predictive value

SSFP = Steady-state free precession

SUV = Standardized uptake value

TEE = Transesophageal echocardiography

TTE = Transthoracic echocardiography