Suspected Thoracic Aortic Aneurysm
EVIDENCE TABLE

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
1. Kuzmik GA, Sang AX, Elefteriades JA. Natural history of thoracic aortic aneurysms. J Vasc Surg. 2012;56(2):565-571.	Review/Other-Dx	N/A	To discuss some of the most clinically relevant features of thoracic aortic aneurysms (TAAs) and highlight in an evidence summary specific characteristics of the natural history of TAAs.	No results stated in abstract.	4
2. Elefteriades JA, Farkas EA. Thoracic aortic aneurysm clinically pertinent controversies and uncertainties. J Am Coll Cardiol. 2010;55(9):841-857.	Review/Other-Tx	N/A	To review clinical controversies and uncertainties regarding thoracic aortic aneurysm and its treatment.	No results in abstract.	4
3. Evans JM, Bowles CA, Bjornsson J, Mullany CJ, Hunder GG. Thoracic aortic aneurysm and rupture in giant cell arteritis. A descriptive study of 41 cases. Arthritis Rheum. 1994;37(10):1539-1547.	Review/Other-Tx	41 patients	To determine the features and outcomes of patients with giant cell arteritis (GCA) who have aneurysms or rupture of the thoracic aorta.	Ten men and 31 women with GCA were found to have TAA and/or rupture. Three developed TAA before GCA was diagnosed, 5 developed aortic findings near the time of the diagnosis, and 33 after the diagnosis of GCA (median of 7 years after diagnosis). Sixteen patients developed acute aortic dissection, which caused death in 8. Nineteen patients also had AI due to aortic root dilation, 15 of whom developed congestive heart failure. Eighteen patients underwent 21 surgical procedures for TAA resection and/or aortic valve replacement or repair. Aortitis was documented histologically in 10 cases.	4
4. Hiratzka LF, Bakris GL, Beckman JA, et al. 2010 ACCF/AHA/AATS/ACR/ASA/SCA/SCAI/SIR/STS/SVM Guidelines for the diagnosis and management of patients with thoracic aortic disease. A Report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines, American Association for Thoracic Surgery, American College of Radiology,American Stroke Association, Society of Cardiovascular Anesthesiologists, Society for Cardiovascular Angiography and Interventions, Society of Interventional Radiology, Society of Thoracic Surgeons,and Society for Vascular Medicine. J Am Coll Cardiol. 2010;55(14):e27-e129.	Review/Other-Tx	N/A	To report guidelines on Thoracic Aortic Disease	No results in abstract.	4

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5. American College of Radiology. ACR Appropriateness Criteria®: Thoracic Aorta Interventional Planning and Follow-up. Available at: https://acsearch.acr.org/docs/3099659/Narrative/.	Review/Other-Dx	N/A	Evidence-based guidelines to assist referring physicians and other providers in making the most appropriate imaging or treatment decision for thoracic aorta interventional planning and follow-up.	N/A	4
6. Garcier JM, Petitcolin V, Filaire M, et al. Normal diameter of the thoracic aorta in adults: a magnetic resonance imaging study. Surg Radiol Anat. 2003;25(3-4):322-329.	Observational-Dx	66 Patients	To determine the evolution of the diameter of the thoracic aorta with age in order to detect dilatation more reliably by imaging.	Sixty-six subjects aged 44.1±19.1 years (range 19.1–82.4 years) obtained between 1991 and 2000 on a Magnetom SP 42 1T apparatus (Siemens) using T1-weighted spin echo sequences with electrocardiographic synchronization. We found an increase in the thoracic aorta diameter and a significant relationship between this diameter and the age of our subjects, wherever the measure was performed. However, there was no systematic correlation between aortic diameter and age. The aortic diameter evolved with age and a marked difference seemed to exist in measurements made in groups younger and older than 40 years.	3
7. Goldstein SA, Evangelista A, Abbara S, et al. Multimodality imaging of diseases of the thoracic aorta in adults: from the American Society of Echocardiography and the European Association of Cardiovascular Imaging: endorsed by the Society of Cardiovascular Computed Tomography and Society for Cardiovascular Magnetic Resonance. J Am Soc Echocardiogr. 2015;28(2):119-182.	Review/Other-Dx	N/A	To summarize the fundamental role of the major noninvasive imaging techniques and the clinical acumen and suspicion, knowledge of imaging modalities for the assessment and management of the often life threatening diseases of the aorta.	No results in abstract	4

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Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
8. Vriz O, Driussi C, Bettio M, Ferrara F, D'Andrea A, Bossone E. Aortic root dimensions and stiffness in healthy subjects. Am J Cardiol. 2013;112(8):1224-1229.	Observational-Dx	422 Patients	To investigate the full range of aortic root diameters and stiffness in a group of subjects without known cardiovascular risk factors and/or overt cardiovascular disease.	Four hundred and twenty-two healthy subjects (mean age 44.35 – 16.91 years, range 16 to 90, 284 men [67%]) underwent comprehensive transthoracic echocardiography. The leading edge method was used for the end-diastolic aortic root diameters measured at 4 locations (1) the aortic annulus, (2) the sinuses of Valsalva, (3) the sinotubular junction, and (4) the maximum diameter of the proximal ascending aorta. Aortic wall stiffness was assessed using 2-dimensional guided M-mode evaluation of systolic and diastolic aortic diameter, 3 cm above the aortic valve. The absolute aortic root diameters increased with age in both genders. Aortic measurements were significantly greater in men than in women at all levels, whereas body surface area - indexed values were similar in men and women, except for the ascending aorta for which women tended to have greater values. Multivariable regression analysis using age and body size (weight, height, and body surface area) predicted all aortic diameters, whereas blood pressure indexes predicted only the distal part of the aorta. Aortic stiffness increased with age in men and women with no differences between genders; only age predicted aortic stiffness.The increment in aortic diameter with age was lesser when adjusted for aortic stiffness.	1

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Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
9. Vriz O, Aboyans V, D'Andrea A, et al. Normal values of aortic root dimensions in healthy adults. Am J Cardiol. 2014;114(6):921-927.	Observational-Dx	1,043 patients	To explore the full spectrum of aortic root diameters by 2-dimensional transthoracic color Doppler echocardiography (TTE) in a large cohort of healthy adults.	A total of 1,043 Caucasian healthy volunteers (mean age 44.7 – 15.9 years, range 16 to 92 years, 503 men [48%]) underwent comprehensive TTE. TTE measurements of the AR were made at end-diastole in parasternal long-axis views at 4 levels: (1) annulus, (2) sinuses of Valsalva, (3) sinotubular junction, and (4) proximal ascending aorta. The absolute aortic diameters were significantly greater in men than in women at all levels, whereas body surface area - indexed aortic diameters were greater in women (p [0.0001). No significant gender differences were registered for sinuses of Valsalva and sinotubular junction to annulus diameter ratios (p [0.9), whereas ascending aorta to annulus diameter ratio was higher in women (p [0.0001). There was a straight correlation between aortic diameters (absolute and indexed values), their ratios, and age in both genders (p [0.0001).	1
10. Albornoz G, Coady MA, Roberts M, et al. Familial thoracic aortic aneurysms and dissections--incidence, modes of inheritance, and phenotypic patterns. Ann Thorac Surg. 2006;82(4):1400-1405.	Review/Other-Dx	520 Patients	To examine the genetic nature and phenotypic features of thoracic aortic aneurysms (TAAs) and dissections in a large cohort of patients.	An inherited pattern for TAA was present in 21.5% of non-MFS patients. The predominant inheritance pattern was autosomal dominant (76.9%), with varying degrees of penetrance and expressivity. The familial TAA group was significantly younger than the sporadic group ($p < 0.0001$), but not as young as the MFS group ($p < 0.0001$) (mean ages, 58.2 versus 65.7 versus 27.4 years). Among all 197 probands and kindred with aneurysm, 131 (66.5%) had TAA, 49 (24.9%) had abdominal aortic aneurysm (AAA), and 17 (8.6%) had cerebral or other aneurysms. Ascending aneurysm paired most commonly with ascending, and descending with abdominal. Abdominal aortic aneurysms (AAAs) and hypertension were more often associated with descending than with ascending TAAs ($p < 0.001$). Aortic growth rate was highest for the familial group (0.21cm/y), intermediate for the sporadic group (0.16 cm/y), and lowest for the Marfan group (0.1 cm/y; $p < 0.01$).	4

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11. Isselbacher EM. Thoracic and abdominal aortic aneurysms. Circulation. 2005;111(6):816-828.	Review/Other-Dx	N/A	To summarize the current understanding of thoracic and abdominal aortic aneurysms.	No results in abstract.	4
12. Kim JB, Kim K, Lindsay ME, et al. Risk of rupture or dissection in descending thoracic aortic aneurysm. Circulation. 2015;132(17):1620-1629.	Observational-Dx	257 Patients	To evaluate the outcomes of unrepaired descending thoracic and TAA aneurysms as captured in our institution's Thoracic Aortic Center database in the interest of contributing to a greater understanding of the optimal triggers for surgical intervention by determining independent predictors of adverse events.	257 nonsyndromic patients (age, 72.4±10.5 years; 143 female) with descending thoracic or thoracoabdominal aortic aneurysm without a history of aortic dissection in whom surgical intervention was not undertaken. The primary end point was a composite of aortic dissection/rupture and sudden death. Baseline mean maximal aortic diameter was 52.4±10.8 mm, with 103 patients having diameters ≥55 mm. During a median follow-up of 25.1 months (quartiles 1–3, 8.3–56.4 months), definite and possible aortic events occurred in 19 (7.4%) and 31 (12.1%) patients, respectively. On multivariable analyses, maximal aortic diameter at baseline emerged as the only significant predictor of aortic events (hazard ratio=1.12; 95% confidence interval, 1.08–1.15). Estimated rates of definite aortic events within 1 year were 5.5%, 7.2%, and 9.3% for aortic diameters of 50, 55, and 60 mm, respectively. Receiver operating characteristic curves for discriminating aortic events were higher for indexed aortic sizes referenced by body size (area under the curve=0.832–0.889) but not significantly different from absolute maximal aortic diameter (area under the curve=0.805).	3

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Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
13. Olsson C, Thelin S, Stahle E, Ekbom A, Granath F. Thoracic aortic aneurysm and dissection: increasing prevalence and improved outcomes reported in a nationwide population-based study of more than 14,000 cases from 1987 to 2002. Circulation. 2006;114(24):2611-2618.	Review/Other-Tx	14,229 Patients	To investigate the prevalence, incidence, and mortality of thoracic aortic diseases (TAD) managed with or without surgery in a large, nationwide, contemporary population.	Of 14,229 individuals with thoracic aortic disease, 11 039 (78%) were diagnosed before death. Incidence of thoracic aortic disease rose by 52% in men and by 28% in women to reach 16.3 per 100 000 per year and 9.1 per 100 000 per year, respectively. Operations increased 7-fold in men and 15-fold in women over time. Of the 2455 patients who underwent operation, 389 (16%) died within 30 days, with older age and thoracic aortic rupture as risk factors. In Cox analysis, increasing age was the only variable associated with long-term mortality. Both short- and long-term mortality improved over time. In patients who underwent operation, actuarial survival (95% CI) at 1, 5, and 10 years was 92% (91% to 93%), 77% (75% to 80%), and 57% (53% to 61%), respectively. The cumulative incidence of thoracic aortic reoperations was 7.8% at 10 years.	4
14. Zhang L, Wang HH. The genetics and pathogenesis of thoracic aortic aneurysm disorder and dissections. Clin Genet. 2016;89(6):639-646.	Review/Other-Dx	N/A	To describe the molecular basis of aortic aneurysmal diseases such as Thoracic aortic aneurysm disorder and dissections (TAADs).	No results in abstract.	4

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Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
15. Sidloff D, Choke E, Stather P, Bown M, Thompson J, Sayers R. Mortality from thoracic aortic diseases and associations with cardiovascular risk factors. Circulation. 2014;130(25):2287-2294.	Review/Other-Dx	N/A	To examine trends in mortality from thoracic aortic aneurysm (TAA) and aortic dissection (AD) with the aim of identifying associations with trends in established cardiovascular risk factors.	Eighteen World Health Organization member states were included (Europe=13, Australasia=2, North America=2, Asia=1). Ecological regression was performed of temporal trends in cardiovascular risk factors (1946–2010) and independent correlations to mortality trends. TAA and AD mortality trends show substantial heterogeneity but are generally declining. TAA mortality has increased in Hungary, Romania, Japan, and Denmark, and AD mortality has increased in Romania and Japan; therefore, the mortality decline is not universal. A linear relationship exists between trends in systolic blood pressure, cholesterol, and body mass index and mortality from TAA. Body mass index demonstrated a negative linear association with female AD mortality, whereas trends in systolic blood pressure demonstrated a positive linear relationship with male AD mortality. Trends in smoking prevalence were not associated with TAA or AD mortality trends.	4
16. Ramanath VS, Oh JK, Sundt TM, 3rd, Eagle KA. Acute aortic syndromes and thoracic aortic aneurysm. Mayo Clin Proc. 2009;84(5):465-481.	Review/Other-Dx	N/A	To discuss the pathophysiology and risk factors, classification schemes, epidemiology, clinical presentations, diagnostic modalities, management options, and outcomes of various aortic conditions, including acute aortic dissection (and its variants intramural hematoma and penetrating aortic ulcers) and thoracic aortic aneurysms.	No results in abstract.	4

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Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
17. Douglas PS, Khandheria B, Stainback RF, et al. ACCF/ASE/ACEP/ASNC/SCAI/SCCT/SCMR 2007 appropriateness criteria for transthoracic and transesophageal echocardiography: a report of the American College of Cardiology Foundation Quality Strategic Directions Committee Appropriateness Criteria Working Group, American Society of Echocardiography, American College of Emergency Physicians, American Society of Nuclear Cardiology, Society for Cardiovascular Angiography and Interventions, Society of Cardiovascular Computed Tomography, and the Society for Cardiovascular Magnetic Resonance. Endorsed by the American College of Chest Physicians and the Society of Critical Care Medicine. J Am Soc Echocardiogr. 2007;20(7):787-805.	Review/Other-Dx	N/A	To provide an appropriateness review for transthoracic and transesophageal echocardiography (TTE/TEE).	No results in abstract.	4
18. Erbel R, Alfonso F, Boileau C, et al. Diagnosis and management of aortic dissection. Eur Heart J. 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
19. 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. Arch Intern Med. 2006;166(13):1350-1356.	Meta-analysis	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.	M

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Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
20. Kurabayashi M, Okishige K, Ueshima D, et al. Diagnostic utility of unenhanced computed tomography for acute aortic syndrome. Circ J. 2014;78(8):1928-1934.	Experimental-Dx	219 patients	To evaluate how well AAS can be diagnosed based solely on unenhanced CT images in patients presenting to the emergency room (ER) with chest or back pain.	Diagnosis of AAS was confirmed in 103 patients (47%, 95 AAD and 8 ruptured TAA patients) based on evaluation of both unenhanced and contrast-enhanced CT images, which was used as the reference standard for validating the diagnostic value of the unenhanced CT findings. Sensitivity and specificity of the findings of a high-attenuation crescent, which represents hematoma in the aortic wall, were 61.2% and 99.1%, respectively. Sensitivity and specificity of linear high density in the aorta, which represents an intimal flap, were 59.2% and 96.6%, respectively. If unenhanced CT showed none of high-attenuation crescent, linear high density, internal displacement of intimal calcification, or TAA, the negative predictive value was 93.3%.	2
21. Davenport MS, Khalatbari S, Cohan RH, Dillman JR, Myles JD, Ellis JH. Contrast material-induced nephrotoxicity and intravenous low-osmolality iodinated contrast material: risk stratification by using estimated glomerular filtration rate. Radiology. 2013;268(3):719-728.	Review/Other-Dx	17,652 patients	To determine the effect of intravenous (IV) low-osmolality iodinated contrast material (LOCM) on the development of post-computed tomography (CT) acute kidney injury (AKI), stratified by pre-CT estimated glomerular filtration rate (eGFR), in patients with stable renal function.	After 1:1 propensity matching, IV LOCM had a significant effect on the development of post-CT AKI (P = .04). This risk increased with decreases in pre-CT eGFR (>/= 60 mL/min/1.73 m(2): odds ratio, 1.00; 95% confidence interval: 0.86, 1.16; 45-59 mL/min/1.73 m(2): odds ratio, 1.06; 95% confidence interval: 0.82, 1.38; 30-44 mL/min/1.73 m(2): odds ratio, 1.40; 95% confidence interval: 1.00, 1.97; <30 mL/min/1.73 m(2): odds ratio, 2.96; 95% confidence interval: 1.22, 7.17).	4
22. American College of Radiology. ACR–NASCI–SIR–SPR Practice Parameter for the Performance and Interpretation of Body Computed Tomography Angiography (CTA). Available at: http://www.acr.org/~/media/ACR/Documents/PGTS/guidelines/Body_CTA.pdf.	Review/Other-Dx	N/A	Guidance document to promote the safe and effective use of diagnostic and therapeutic radiology by describing specific training, skills and techniques.	N/A	4
23. Fleischmann D, Mitchell RS, Miller DC. Acute aortic syndromes: new insights from electrocardiographically gated computed tomography. Semin Thorac Cardiovasc Surg. 2008;20(4):340-347.	Review/Other-Dx	N/A	To describe developments of CTA with retrospective electrocardiographic (ECG) gating provides additional benefits because it eliminates cardiac pulsation motion artifacts and has extended the clinical applicability of CTA to also include the aortic root.	No results in abstract	4

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24. Siriapisith T, Wasinrat J, Slisatkorn W. Computed tomography of aortic intramural hematoma and thrombosed dissection. Asian Cardiovasc Thorac Ann. 2010;18(5):456-463.	Observational-Dx	23 Patients	To evaluate the appearance of the aortic wall on computed tomography for the purpose of developing criteria for differentiating acute aortic intramural hematoma from thrombosed false lumen seen in aortic dissection.	Computed tomography angiography findings of the thoracoabdominal aorta in 23 patients with suspected intramural hematoma and 25 with thrombosed false lumen were reviewed. The more common features of an intramural hematoma were hyperattenuation of the aortic wall, wall thickness less than a quarter of the aortic diameter, intrinsic wall calcification, a lesion extending around the entire aortic circumference, and ulcer-like projections that may be precursors of intramural hematoma.	3
25. Li Y, Fan Z, Xu L, et al. Prospective ECG-gated 320-row CT angiography of the whole aorta and coronary arteries. Eur Radiol. 2012;22(11):2432-2440.	Observational-Dx	61 Patients	To investigate the feasibility of using a prospective ECG-gated wide-volume protocol in CT angiography (CTA) of the whole aorta and coronary arteries (CA).	All of the examinations were performed successfully. The image quality was acceptable in the ascending aorta, aortic valve (100 %) and CA (94.4 %). The mean radiation dose was 18.42 +/- 5.02 mSv. Of 61 patients, 14 were diagnosed with aortic aneurysm and 35 were diagnosed with aortic dissection or intramural haematoma. Coronary artery stenosis was detected in 12 patients.	1
26. Malkawi AH, Hinchliffe RJ, Yates M, Holt PJ, Loftus IM, Thompson MM. Morphology of aortic arch pathology: implications for endovascular repair. J Endovasc Ther. 2010;17(4):474-479.	Review/Other-Tx	49 Patients	To present a detailed description of aortic arch morphology in patients with aneurysm and dissection undergoing thoracic endovascular aortic repair (TEVAR).	The diameter of the aortic arch increased as it approached the aortic root (mean 38.9+/-6.4 mm at the sinotubular junction versus 30.7+/-16.6 mm at the left subclavian artery (LSA). Mean angulation of the arch at the level of the LSA was 117 degrees +/-23 degrees . Five (10%) patients had a common origin of the innominate artery and left common carotid artery (LCCA). The distance between the LCCA and the LSA was <15 mm in 80%; 37 (80%) had clock-face positions of the LCCA and LSA ostia within 15 degrees of each other. There was no statistical difference in any measurements between the aneurysm and dissection patients.	4

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27. Quint LE, Liu PS, Booher AM, Watcharotone K, Myles JD. Proximal thoracic aortic diameter measurements at CT: repeatability and reproducibility according to measurement method. Int J Cardiovasc Imaging. 2013;29(2):479-488.	Observational-Dx	37 Patients	To determine the variability in CT measurements of proximal thoracic aortic diameters obtained using double-oblique short axis and semiautomatic centerline analysis techniques.	Mean intraobserver diameter differences using double oblique views ranged from −0.3 – 0.6 mm. The 95% confidence interval for difference in diameters was ±2.4 – ±5.1 mm for radiologist #1 and ±2.6 – ±5.2 mm for radiologist #2, depending on location. Mean intraobserver diameter differences using centerline analysis ranged from 0.2 – 2.3 mm, and the 95% confidence interval for difference in diameters was ±2.0 – ±4.6 mm, depending on location. Significant interobserver differences were seen for both double oblique views and centerline analysis. Measurements obtained using the two methods were strongly correlated (r = 0.81 – 0.99), although they were consistently larger using centerline analysis (95% confidence interval, ±1.8 – ±3.2 mm).	2
28. Hansen PA, Richards JM, Tambyraja AL, Khan LR, Chalmers RT. Natural history of thoraco-abdominal aneurysm in high-risk patients. Eur J Vasc Endovasc Surg. 2010;39(3):266-270.	Observational-Tx	216 Patients	To reports the outcome of patients who, after thorough assessment, were considered to be unfit for surgical repair, and were managed non-operatively.	Of 216 patients assessed, 89 (41%) patients were considered to be unfit for intervention. The median (interquartile range, IQR) age of patients was 75 (70e80) years and there were 39 men (44%). Median (IQR) aneurysm size was 6 (5.6e7.0) cm. The median (IQR) follow-up time was 12 (7e26) months. There were 49 (55%) deaths during the follow-up period of which 23 (47%) cases were due to ruptured TAAA and 26 (53%) were not aneurysm-related. Comparing patients with aneurysms <6 cm (33 patients) with those aneurysms 6 cm (56 patients) there was no difference in aneurysm-related death (p Z 0.32) or all-cause mortality (p = 0.147).	2

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29. Quint LE, Platt JF, Sonnad SS, Deeb GM, Williams DM. Aortic intimal tears: detection with spiral computed tomography. J Endovasc Ther. 2003;10(3):505-510.	Observational-Dx	52 Patients	To determine the frequency, locations, and sizes of aortic intimal tears detected using spiral computed tomography (CT).	In 52 patients, 129 tears were identified (mean 2.48 per patient, median 2, range 1-7). There were no significant differences in the number or size of tears between the acute and chronic, the type A and type B, or the single detector and multidetector groups (p>0.05). The most common locations for tears were the descending aorta (57, 44%) and the juxtarenal region (26, 20%). Within the type B category, there was no significant difference in tear locations between the acute and chronic groups (p>0.05). The majority of tears (88, 68%) were < or =1 cm in each dimension. Tears in the thoracic aorta were significantly larger than abdominal aortic tears (p<0.05).	3
30. Shah A, Stavropoulos SW. Imaging Surveillance following Endovascular Aneurysm Repair. Semin Intervent Radiol. 2009;26(1):10-16.	Review/Other-Dx	N/A	To review the classification of endoleaks and discuss the different imaging strategies available for post-EVAR surveillance.	No results in abstract.	4
31. Tanasoontornrerk A, Wasinrat J, Siriapisith T, Slisatkorn W. CT angiography evaluation of endoleak after thoracic endovascularaortic repair in thoracic aortic aneurysm. J Med Assoc Thai. 2010;93(9):1050-1057.	Review/Other-Dx	68 Patients	To analyze the incidence and findings of endoleak after thoracic endovascular aortic repair by using CT angiography. No contrast was administered in this study.	Endoleaks were detected in 26 patients (38.2%). There were type I endoleaks in three cases (11.5%), type II endoleaks in 22 cases (84.6%), and type III endoleaks in one case (3.9%). Type II endoleaks were detected as peritubular collection, mostly located at periphery of the aneurysm. Eleven cases (50%) of type II endoleaks were supplied by left subclavian artery. Twenty patients who had completed 1, 3, and 6 months follow-up CT angiography were selected for further evaluation of changing in size of aneurysm. The measurement of the thoracic aneurysm showed no decreasing of the maximum length of diameter and volume of the aneurysmal sac in endoleak group.	4
32. Kopp AF, Kuttner A, Trabold T, Heuschmid M, Schroder S, Claussen CD. Multislice CT in cardiac and coronary angiography. Br J Radiol. 2004;77 Spec No 1:S87-97.	Review/Other-Dx	N/A	To describe mechanical multidetector-row CT (MDCT) as a non-invasive technique for the detection, visualization and characterization of stenotic artery disease.	No results in abstract.	4

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33. Schlosser FJ, Mojibian HR, Dardik A, Verhagen HJ, Moll FL, Muhs BE. Simultaneous sizing and preoperative risk stratification for thoracic endovascular aneurysm repair: role of gated computed tomography. J Vasc Surg. 2008;48(3):561-570.	Observational-Dx	11 Patients	To investigate the feasibility of simultaneously assessing thoracic aortic pathology as well as cardiac structures and function, including the coronary arteries, with ECG-gated 64-slice CT angiography.	All images of the patients could be successfully assessed for calcium scores, coronary artery stenoses, coronary artery anomalies, interventricular septal wall thickness, myocardial scar, left ventricular ejection fraction, muscle mass, and aortic and mitral valve calcification, mobility, and valve anatomy. Diagnostic image quality was also achieved in all patients for the underlying thoracic aortic disease.	3
34. Shin HJ, Kim SS, Lee JH, et al. Feasibility of low-concentration iodinated contrast medium with lower-tube-voltage dual-source CT aortography using iterative reconstruction: comparison with automatic exposure control CT aortography. Int J Cardiovasc Imaging. 2016;32 Suppl 1:53-61.	Observational-Dx	90 Patients	To evaluate the feasibility of low-concentration contrast medium (CM) for vascular enhancement, image quality, and radiation dose on computed tomography aortography (CTA) using a combined low-tube-voltage and iterative reconstruction (IR) technique.	Images of the two groups were compared regarding attenuation, image noise, signal-to-noise ratio (SNR), contrast-to-noise ratio (CNR), iodine load, and radiation dose in various locations of the CTA. In comparison between Group A and Group B, the average mean attenuation (454.73 +/- 86.66 vs. 515.96 +/- 101.55 HU), SNR (25.28 +/- 4.34 vs. 31.29 +/- 4.58), and CNR (21.83 +/- 4.20 vs. 27.55 +/- 4.81) on CTA in Group B showed significantly greater values and significantly lower image noise values (18.76 +/- 2.19 vs. 17.48 +/- 3.34) than those in Group A (all Ps < 0.05).	2
35. Erbel R, Aboyans V, Boileau C, et al. 2014 ESC Guidelines on the diagnosis and treatment of aortic diseases: Document covering acute and chronic aortic diseases of the thoracic and abdominal aorta of the adult. The Task Force for the Diagnosis and Treatment of Aortic Diseases of the European Society of Cardiology (ESC). Eur Heart J. 2014;35(41):2873-2926.	Review/Other-Tx	N/A	Guidance document on the diagnosis, methods for imaging, and treatment of aortic diseases.	No results in abstract.	4
36. 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. Radiology. 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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Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
37. Lin FY, Devereux RB, Roman MJ, et al. Assessment of the thoracic aorta by multidetector computed tomography: age- and sex-specific reference values in adults without evident cardiovascular disease. J Cardiovasc Comput Tomogr. 2008;2(5):298-308.	Observational-Dx	103 Patients	To establish reference values for thoracic aortic diameters MDCT in healthy normotensive nonobese adults without evident cardiovascular disease.	End-diastolic diameter 95% confidence intervals were 2.5–3.7 cm for the aortic root, 2.1–3.5 cm for the ascending aorta, and 1.7–2.6 cm for the descending thoracic aorta. Aortic diameters were significantly greater at end systole than end diastole (mean difference 1.9 - 1.2 mm for ascending and 1.3 - 1.8 for descending thoracic aorta, P < 0.001). Aortic root and ascending aortic diameter increased significantly with age and body surface area.	1
38. Clouse WD, Marone LK, Davison JK, et al. Late aortic and graft-related events after thoracoabdominal aneurysm repair. J Vasc Surg. 2003;37(2):254-261.	Experimental-Tx	333 Patients	To define late aortic and graft-related events and to identify factors associated with their development.	In-hospital mortality occurred in 28 patients (8.4%), which left 305 available for follow-up (mean length of follow-up, 26 months; interquartile range, 2.7 to 38.4 months). After TAA repair, aneurysm remained in 60 patients (19.7%; ascending/arch, n 41; 68.3%; discontinuous infrarenal, n 12; 20%; contiguous descending, n 7; 11.7%; contiguous abdominal, n 4; 6.7%). Events occurred in 33 individuals (10.8%) at 30 27 months after surgery. Twenty-four patients (73% of events; 7.9% of cohort) had aortic-related events, including another elective aneurysm repair (n 16), urgent/emergent aneurysm operation (n 5), acute dissection (n 2), and atherothrombotic embolization (n 1). Nine patients (27% of events; 2.9% of cohort) had graft-related incidents, including renovisceral occlusion (n 5), visceral patch pseudoaneurysm (n 2), graft infection (n 2), and graft-esophageal fistula (n 1). Variables independently predictive of events were female gender (odds ratio [OR], 2.3; P .03), initial aneurysm rupture (OR, 4.8; P .04), partial disease resection (OR, 4.2; P .0008), and expansion of remaining aortic segments on imaging surveillance (OR, 2.5; P .03). The event-free survival rates were 96% (95% CI, 93% to 98%) and 71% (95% CI, 60% to 83%) at 1 and 5 years.	2

Suspected Thoracic Aortic Aneurysm
EVIDENCE TABLE

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
39. Tutarel O, Meyer GP, Lotz J, Westhoff-Bleck M. Serial evaluation of the thoracic aorta in patients with a bicuspid aortic valve: a magnetic resonance angiography study. Vasa. 2010;39(2):140-144.	Observational-Dx	40 Patients	To determine if the progressive dilation of the aorta in BAV is limited to the aortic root or if it also affects more distal parts of the thoracic aorta.	A significant increase of the diameter was observed at the aortic root (35.4 +/- 5.6 mm --> 39.1 +/- 6.5 mm, p < 0.001), the ascending aorta (37.3 +/- 8.0 mm --> 39.5 +/- 8.5 mm, p = 0.001), proximal to the innominate artery (29.4 +/- 6.1 mm --> 31.6 +/- 6.8 mm, p = 0.008), and the descending aorta (20.2 +/- 2.4 mm --> 21.6 +/- 4.2 mm, p = 0.03). There was no significant increase proximal (24.0 +/- 5.7 mm --> 24.6 +/- 5.3 mm, p = 0.44) and distal to the left subclavian artery (21.4 +/- 4.6 mm --> 21.9 +/- 4.5 mm, p = 0.19). These observations were independent of the presence of arterial hypertension, a previous operation, gender, and functional status of the aortic valve.	3
40. Michaely HJ, Dietrich O, Nael K, Weckbach S, Reiser MF, Schoenberg SO. MRA of abdominal vessels: technical advances. Eur Radiol. 2006;16(8):1637-1650.	Review/Other-Dx	N/A	To describe the main technical innovations and focuses on the impact these developments may have on abdominal MRA. Special consideration is given to the interaction of these various technical advances.	No results in abstract.	4
41. Gauvrit JY, Law M, Xu J, Carson R, Sunenshine P, Chen Q. Time-resolved MR angiography: optimal parallel imaging method. AJNR Am J Neuroradiol. 2007;28(5):835-838.	Observational-Dx	14 Patients	To evaluate TR MRA of the intracranial vessels at different integrated parallel acquisition technique (IPAT) factors.	There was no significant difference in SNR between IPAT factors 0 and 2. Moreover, SNR was significantly lower with IPAT 3 than with IPAT 0 or 2. Smaller vessel segments (M3 and P3) were rated significantly inferior with TR MRA IPAT 2 or 3 compared with MRA without IPAT. For larger proximal vessels (A1 and A2 segments of anterior cerebral artery, M1 and M2 segments of middle cerebral artery, P2 segment of posterior cerebral artery, and basilar artery), there was no difference between TR MRA IPAT 0 and 2.	3
42. Kramer U, Nael K, Fenchel M, Miller S. Magnetic resonance angiography of chest and abdomen at 3 T. Top Magn Reson Imaging. 2007;18(2):105-115.	Review/Other-Dx	N/A	To describe the main technical innovations of advanced CE-MRA techniques at 3 T, illustrated by characteristic cases.	No results in abstract.	4

Suspected Thoracic Aortic Aneurysm
EVIDENCE TABLE

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
43. Bireley WR, 2nd, Diniz LO, Groves EM, Dill K, Carroll TJ, Carr JC. Orthogonal measurement of thoracic aorta luminal diameter using ECG-gated high-resolution contrast-enhanced MR angiography. J Magn Reson Imaging. 2007;26(6):1480-1485.	Observational-Dx	45 Patients	To compare orthogonal measurements of the thoracic aortic luminal diameter to standard axial measurements within the same patient population using ECGgated high-resolution contrast-enhanced MR angiography (CE-MRA).	We found that the aorta diameter measurements acquired from axial MRA images were significantly greater (P 0.05) than those acquired from images orthogonal to the course of the aorta at six of seven anatomic sites. Overall, standard axial measurements were found to overestimate luminal diameter of the thoracic aorta by 0.24 cm (95% confidence interval [CI]: 0.14, 0.33) compared to orthogonal measurements. 13.3% of the patients were placed into a greater aorta size classification based on the axial versus the orthogonal measurements.	3
44. Wang Y, Alkasab TK, Narin O, et al. Incidence of nephrogenic systemic fibrosis after adoption of restrictive gadolinium-based contrast agent guidelines. Radiology. 2011;260(1):105-111.	Observational-Tx	52,954 MRI exams	To retrospectively determine the incidence of nephrogenic systemic fi brosis (NSF) in a large academic medical center after the adoption of restrictive gadolinium-based contrast agent (GBCA) administration guidelines.	A total of 52,954 contrast-enhanced MR examinations were performed during the post–guidelines adoption period. Of these 52 954 examinations, 46 464 (88%) were performed in adult patients with an eGFR of 60 mL/min/m 2 or higher or presumed normal renal function and 6454 (12%) were performed in patients with an eGFR of 30– 59 mL/min/m 2 . Thirty-six patients with an eGFR lower than 30 mL/min/m 2 underwent contrast-enhanced MR imaging for emergent indications. Review of the pathology records for January 2008 to September 2010 revealed no new cases of NSF resulting from GBCA exposure.	3
45. American College of Radiology. Manual on Contrast Media. Available at: http://www.acr.org/Quality-Safety/Resources/Contrast-Manual.	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

Suspected Thoracic Aortic Aneurysm
EVIDENCE TABLE

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
46. Ayuso JR, de Caralt TM, Pages M, et al. MRA is useful as a follow-up technique after endovascular repair of aortic aneurysms with nitinol endoprostheses. J Magn Reson Imaging. 2004; 20(5):803-810.	Observational-Dx	28 patients	To evaluate whether MRA is a useful tool for the follow-up of aortic aneurysms treated with nitinol endoluminal grafts.	Three type III leaks were correctly assessed at both examinations; however, CTA was less sensitive (50%) than MRA in depicting type II or unclassified leaks. No differences in aneurismal size were observed between the two examinations or between arterial signal-to-noise ratios observed in or out of the devices. MRA can provide all relevant information necessary for the follow-up of patients treated with nitinol endoprostheses, and performs better than CTA in detecting endoleaks.	3
47. Metzger PB, Novero ER, Rossi FH, et al. Evaluation of preoperative computed tomography angiography in association with conventional angiography versus computed tomography angiography only, in the endovascular treatment of aortic diseases. Radiol Bras. 2013;46(5):265-272.	Experimental-Tx	156 Patients	To evaluate the association of conventional angiography (AG) with computed tomography angiography (CTA) as compared with CTA only, preoperatively, in the treatment of aortic diseases.	The authors evaluated 156 patients. In subgroups 1A and 1B, the rate of technical success was, respectively, 100% and 94.7% ($p = 1.0$); and the rate of therapeutic success was, respectively, 81% and 58% ($p = 0.13$). A higher number of complications were observed in subgroup 1B ($p = 0.057$). The accuracy in the calculation of the prosthesis was higher in subgroup 1A ($p = 0.065$). In their turn, the rate of technical success in subgroups 2C and 2D was, respectively, 92.3% and 98.6% ($p = 0.17$). The rate of therapeutic success was 73% and 98.6% ($p = 0.79$).	2
48. Viscomi SG, Duran-Mendicuti A, Rybicki FJ, Ledbetter S. Computed Tomography. In: Coselli JS, LeMaire SA, eds. Aortic Arch Surgery: Principles, Strategies and Outcomes. Oxford, UK: Blackwell Publishing, Ltd; 2008.	Review/Other-Dx	Book Chapter	N/A	N/A	4

Suspected Thoracic Aortic Aneurysm
EVIDENCE TABLE

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
49. Khatri IA, Mian N, Alkawi A, et al. Catheter-based aortography fails to identify aortic atherosclerotic lesions detected on transesophageal echocardiography. J Neuroimaging. 2005;15(3):261-265.	Observational-Dx	34 Patients	To compare the findings of aortograms with the findings of TEE to determine the utility of the aortogram.	A total of 34 patients underwent both aortography and echocardiography. Of a total of 34 transesophageal echocardiograms, 29 showed abnormal findings in the aorta (85%) and 5 appeared normal (15%). These aortic abnormalities included mild to moderate atherosclerosis in 18 cases (52%), moderate to severe atherosclerosis in 4 cases (12%), and severe atherosclerosis in 7 cases (21%). None of these abnormalities were detected by aortography. No disease was visualized in the origin of the supraaortic arteries.	3
50. American College of Radiology. ACR Appropriateness Criteria® Radiation Dose Assessment Introduction. Available at: http://www.acr.org/~/media/ACR/Documents/AppCriteria/RadiationDoseAssessmentIntro.pdf.	Review/Other-Dx	N/A	Guidance document on exposure of patients to ionizing radiation.	N/A	4

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.

- M = Meta-analysis

Dx = Diagnostic

Tx = Treatment