National Imaging Associates, Inc.*	
Clinical guidelines **CHEST CTA**	**Original Date: September 1997**
CPT Codes: 71275	**Last Revised Date: April 2021**
Guideline Number: NIA_CG_022-1	**Implementation Date: January 2022**

INDICATIONS FOR CHEST CTA

Chest Computed Tomography Angiography (CTA) is ordered for evaluation of the intrathoracic blood vessels. Chest CT and Chest CTA should not be approved at the same time. ~~**Some indications are for magnetic resonance imaging (MRI), magnetic resonance angiography (MRA), computed tomography (CT), or computed tomography angiography (CTA). More than one should not be approved at the same time.**~~

Suspected Pulmonary Embolism (PE)

(ACCP, 2013; ACR, 202016; Corrigan, 2016; Kirsch, 2017; Konstantinides, 2014)

- High risk for PE based on shock or hypotension
  - **Risk can be determined by the parameters detailed** ~~**at the bottom of this document**~~**in Background section**
- Positive D-dimer (Corrigan, 2016; Konstantinides, 2014)

Vascular Disease

- Superior vena cava (SVC) syndrome (Friedman, 2017)
- Subclavian Steal Syndrome after positive or inconclusive ultrasound (Osiro, 2012; Potter, 2014)
- Thoracic Outlet Syndrome (ACR, ~~2014~~**2019**; Povlsen, 2018)
- Takayasu's arteritis (Keser, 2014)
- Clinical concern for Acute Aortic dissection (ACR, 2017; Barman, 2014)
  - Sudden painful ripping sensation in the chest or back and may include
    - New diastolic murmur
    - Cardiac tamponade
    - Distant heart sounds
    - Hypotension or shock

- ~~Initial evaluation of aneurysm (Erbel, 2014; Hannuksela, 2015; Hiratzka, 2010)~~

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- ~~Echocardiogram shows aneurysm~~

Initial/Screening for Thoracic Aortic Disease
(Erbel, 2014; Hannuksela, 2015; Hiratzka, 2010)

- **Echocardiogram or chest x-ray show aneurysm**
- **Initial study for a suspected aneurysm**~~Echocardiogram inconclusive of proximal aorta and first degree relative with thoracic aneurysm~~
- ~~Chest x-ray shows possible aneurysm~~ **Screening of first-degree relatives of individuals with a thoracic aortic aneurysm (defined as > 50% above normal) or dissection**
    - **Known connective tissue disease or genetic conditions that predispose to aortic aneurysm or dissection (e.g., Marfan syndrome, Ehlers Danlos or Loeys-Dietz syndromes)**
- **Screening of the thoracic aorta after a diagnosis of a bicuspid aortic valve (dilation of the ascending aorta may not be seen on echocardiogram) (Borger, 2018)**
    - **If normal, re-image every three to five years**
- **Screening of first-degree relatives of patients with a bicuspid aortic valve**
- **Turner's syndrome – Screen for coarctation or aneurysm of the thoracic aorta.**
    - **If normal results, screen every 5-10 years.**
    - **If abnormal, screen annually**

Suspected vascular cause of dysphagia or expiratory wheezing with other imaging is suggestive or inconclusive

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Follow-up after established Thoracic Aneurysm ~~(above these sizes surgery is usually recommended)~~

(Erbel, 2014; Hannuksela 2015; Hiratzka, 2010)

Six months follow-up after initial finding of a dilated thoracic aorta, for assessment of rate of change

-
    - Aortic Root or Ascending Aorta **(in cm)**
        - 3.5 to 4.~~5~~4 Annual
        - 4.5 to 5.~~4~~5 **or growth rate > 0.5 cm/year** - Every 6 months
    - Genetically mediated (Marfans syndrome, Aortic Root or Ascending Aorta) **(in cm)**
        - 3.5 to 4.~~0~~4 Annual
        - 4.~~0~~5 to 5.0 **or growth rate > 0.5 cm/year** Every 6 months
        - **Surgery generally recommended over 5.0 cm**
    - Descending Aorta **(in cm) (Braverman, 2011)**
        - 4.0 to 5.0 -Annual
        - 5.0 to 6.0- Every 6 months

Diagnosis of bicuspid aortic valve

- Suspected vascular cause of dysphagia or expiratory wheezing with other imaging is suggestive or inconclusive

Thoracic Aortic Disease

- If TTE was not performed, was technically inadequate, or if imaging is required beyond the proximal ascending aorta

Initial/Screening

- Screening of first-degree relatives of individuals with a thoracic aortic aneurysm (defined as ≥ 50% above normal) or dissection, or if an associated high-risk mutation is present
  - If one or more first degree relatives of a patient with a known thoracic aortic aneurysm or dissection, have thoracic aortic dilatation, aneurysm or dissection, then imaging of 2nd degree relatives is reasonable
  - Evaluation of the ascending aorta in suspected connective tissue disease or genetic conditions that predispose to aortic aneurysm or dissection (e.g., Marfan syndrome, Ehlers Danlos or Loeys-Dietz syndromes) at time of diagnosis
  - Patients with Turner's syndrome should undergo imaging to assess for bicuspid aortic valve, coarctation of the aorta or dilation of the ascending or thoracic aorta. If the initial imaging is **normal** and there are no additional risk factors for dissection, imaging can be done every 5-10 years.
  - Screening of first-degree relatives of patients with a bicuspid aortic valve

Follow-up known aneurysm/vascular pathology

- Six months follow-up after initial finding of a dilated thoracic aorta, for assessment of rate of change
- Biannual (twice/year) follow-up of enlarged aortic root ≥ 4.5 cm or showing growth rate ≥ 0.5 cm/year
- Evaluation of the ascending aorta in known connective tissue disease or genetic conditions that predispose to aortic aneurysm or dissection (e.g., Marfan syndrome, Ehlers Danlos or Loeys-Dietz syndromes) 6 months after initial imaging for growth rate assessment, followed by annual imaging, or biannual (twice yearly) if diameter ≥ 4.5 or expanding ≥ 0.5 cm/yr
- Turner's syndrome - If an **abnormality** exists on initial imaging, annual imaging is recommended
- Re-evaluation of known ascending aortic dilation or history of aortic dissection with a change in clinical status or cardiac exam or when findings may alter management
- Re-evaluation (<1 y, generally twice a year) of the size and morphology of the aortic sinuses and ascending aorta in patients with a bicuspid AV with 1 of the following:
  - Aortic diameter ≥ 4.5 cm
  - Rapid rate of change in aortic diameter when an annual growth rate of ≥ 0.5 cm is suspected.
  - Family history (first-degree relative) of aortic dissection
- **Follow-up post medical treatment of aortic dissection**:

- **Acute dissection: 1 month, 6 months, then annually**
- **Chronic dissection: annually**

- ~~Follow up post medical treatment of aortic disease:~~
  - ~~Acute dissection: 1 month, 6 months, then annually~~
  - ~~Chronic dissection: annually~~
- Follow-up post either root repair or AVR plus ascending aortic root/arch repair: baseline post-op, then annually
- **Re-evaluation of known ascending aortic dilation or history of aortic dissection with a change in clinical status or cardiac exam or when findings may alter management**

Congenital Malformations (Chest Magnetic Reasonance Angiography preferred if pediatrics or repeat imaging)

- Thoracic malformation on other imaging (chest x-ray, echocardiogram, gastrointestinal ~~GI~~ study, or inconclusive CT) (Ferreira, 2015; Hellinger, 2011; Karaosmanoglu, 2015; Poletto, 2017)
- Congenital heart disease with pulmonary hypertension **(Pascall, 2018) or vascular anomalies** ~~(Pascall, 2018)~~
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- Pulmonary sequestration (~~Tanzer~~**Sancak, 2003**) ~~(Al-Timmy, 2016; Long, 2016)~~

Pulmonary Hypertension based on other testing
(Ascha, 2017; Rose-Jones, 2015)

- Echocardiogram
- Right heart catheterization

Atrial fibrillation with ablation planned
(Kolandaivelu, 2012)

Preoperative/procedural evaluation

- **Pre-operative evaluation for a planned surgery or procedure**

~~**Post-operative/procedural evaluation**~~

- ~~Post-operative complications (Bennet, 2017; Choudhury, 2017)~~
- ~~Routine post-operative evaluation of:~~
  ~~(Lawrence; 2018; Uthof; 2012; Zierler, 2018)~~

Post-operative/procedural evaluation

- **Post-operative complications (Bennet, 2017;** Choudhury, 2017)
- **Routine post-operative (Lawrence; 2018; Uthof, 2012)**
  - **Thoracic endovascular or open surgical aneurysm repair**
    - **1 month**
    - **More frequent follow-up/possible intervention if complication detected**
    - **If stable, annual for 5 years**
  - ~~Thoracic endovascular aneurysm repair~~

- 1 month, then at
- 6 months if initial abnormal or if for aortic dissection, then
- Annually for 5 years

- Open surgical repair
  - Once every 5 years

Chest CTA and Abdomen CTA or Abdomen/Pelvis CTA

- Transcatheter Aortic Valve Replacement (TAVR) (Achenbach, 2012; ACR, 2017)
- Acute aortic dissection (Barman, 2014)
- Takayasu's arteritis (Keser, 2014)
- Post-operative complications (Bennet, 2017; Choudhury, 2017)

BACKGROUND

Computed tomography angiography is a non-invasive imaging modality that may be used in the evaluation of thoracic vascular problems. Chest CTA (non-coronary) may be used to evaluate vascular conditions, e.g., pulmonary embolism, thoracic aneurysm, thoracic aortic dissection, aortic coarctation, or pulmonary vascular stenosis. The vascular structures as well as the surrounding anatomical structures are depicted by CTA.

OVERVIEW

CTA and Coarctation of the Aorta – Coarctation of the aorta is a common vascular anomaly characterized by a constriction of the lumen of the aorta distal to the origin of the left subclavian artery near the insertion of the ligamentum arteriosum. The clinical sign of coarctation of the aorta is a disparity in the pulsations and blood pressures in the legs and arms. Chest CTA may be used to evaluate either suspected or known aortic coarctation and patients with significant coarctation should be treated surgically or interventionally.

CTA and Pulmonary Embolism (PE) – **Note**: D-Dimer blood test in patients at low risk for DVT is indicated prior to CTA imaging. Negative D-Dimer suggests alternative diagnosis in these patients.

CTA has high sensitivity and specificity and is the primary imaging modality to evaluate patients suspected of having acute pulmonary embolism. When high suspicion of pulmonary embolism on clinical assessment is combined with a positive CTA, there is a strong indication of pulmonary embolism. Likewise, a low clinical suspicion and a negative CTA can be used to rule out pulmonary embolism.

Low risk is not approved. Low risk is defined as **NO** to **ALL** of the following questions with intermediate and high risk defined based on the number of positive responses (Konstantinides, 2020):

- Evidence of current or prior DVT;

- HR > 100;
- Cancer diagnosis;
- Recent surgery or prolonged immobilization;
- Hemoptysis;
- History of PE;
- Oral hormone use;
- Another diagnosis beside PE is less likely

CTA and Thoracic Aortic Aneurysms – Computed tomographic angiography (CTA) allows the examination of the precise 3-D anatomy of the aneurysm from all angles and shows its relationship to branch vessels. This information is very important in determining the treatment: endovascular stent grafting or open surgical repair.

CTA and Thoracic Aorta Endovascular Stent-Grafts – CTA is an effective alternative to conventional angiography for postoperative follow-up of aortic stent grafts. It is used to review complications after thoracic endovascular aortic repair. CTA can detect luminal and extraluminal changes to the thoracic aortaic after stent-grafting and can be performed efficiently with fast scanning speed and high spatial and temporal resolution.

POLICY HISTORY

Date	Summary
April 2021	• Follow-up recommendations for bicuspid aortic valve. • Added suspected vascular cause of dysphagia or expiratory wheezing • • Combined follow-up surveillance recommendations for endovascular and open ascending aorta repair as per literature review • Clarified pre-operative evaluation for a planned surgery or procedure~~Did literature review and added references~~ • ~~Added references~~
May 2020	• For Suspected Pulmonary Embolism, removed: 'Low Risk is not approved' section • Moved Vascular Disease content from Chest CT to Chest CTA, including: ○ *Initial evaluation of aneurysm* ▪ *Echocardiogram shows aneurysm* ▪ *Echocardiogram inconclusive of proximal aorta and first degree relative with thoracic aneurysm* ▪ *Chest x-ray shows possible aneurysm* • *Follow-up after established Thoracic Aneurysm (above these sizes surgery is usually recommended)*

	○ ***Aortic Root or Ascending Aorta*** ▪ ***3.5 to 4.5 Annual*** ▪ ***4.5 to 5.4 Every 6 months*** ○ ***Genetically mediated (Marfans syndrome, Aortic Root or Ascending Aorta*** ▪ ***3.5 to 4.0 Annual*** ▪ ***4.0 to 5.0 Every 6 months*** ○ ***Descending Aorta*** ▪ ***4.0 to 5.0 Annual*** ▪ ***5.0 to 6.0 Every 6 months*** • **Thoracic Aortic Disease** ○ **Organized into two sections:** ▪ **Initial/Screening** ▪ **Follow-up of known aneurysm/vascular pathology** ○ **Removed: *'Annual follow up of enlarged thoracic aorta that is above top normal for age, gender, and body surface area'***
May 2019	• **Expanded vascular indications including:** ○ **Superior vena cava syndrome** ○ **Takayasu's arteritis** ○ **Subclavian steal syndrome after positive or inconclusive ultrasound** • **Expanded indications for congenital anomalies to include pulmonary sequestration** • **Updated thoracic aortic section to match cardiac guidelines**

~~May 2019~~

- ~~Expanded vascular indications including:~~
  - ~~Superior vena cava syndrome~~
  - ~~Takayasu's arteritis~~
  - ~~Subclavian steal syndrome after positive or inconclusive ultrasound~~
- ~~Expanded indications for congenital anomalies to include pulmonary sequestration~~
- ~~Updated thoracic aortic section to match cardiac guidelines~~

~~May 2020~~

- ~~For Suspected Pulmonary Embolism, removed: 'Low Risk is not approved' section~~
- ~~Moved Vascular Disease content from Chest CT to Chest CTA, including:~~
  - ~~*Initial evaluation of aneurysm*~~
    - ~~*Echocardiogram shows aneurysm*~~

- *Echocardiogram inconclusive of proximal aorta and first degree relative with thoracic aneurysm*
- *Chest x-ray shows possible aneurysm*

- *Follow-up after established Thoracic Aneurysm (above these sizes surgery is usually recommended)*
  - *Aortic Root or Ascending Aorta*
    - *3.5 to 4.5 Annual*
    - *4.5 to 5.4 Every 6 months*
  - *Genetically mediated (Marfans syndrome, Aortic Root or Ascending Aorta*
    - *3.5 to 4.0 Annual*
    - *4.0 to 5.0 Every 6 months*
  - *Descending Aorta*
    - *4.0 to 5.0 Annual*
    - *5.0 to 6.0 Every 6 months*
- Thoracic Aortic Disease
  - Organized into two sections:
    - Initial/Screening
    - Follow-up of known aneurysm/vascular pathology
      - Removed: *'Annual follow up of enlarged thoracic aorta that is above top normal for age, gender, and body surface area'*

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Reviewed / Approved by Reviewed / Approved by M. Atif Khalid, M.D., Medical Director, Radiology

GENERAL INFORMATION

It is an expectation that all patients receive care/services from a licensed clinician. All appropriate supporting documentation, including recent pertinent office visit notes, laboratory data, and results of any special testing must be provided. If applicable: All prior relevant imaging results and the reason that alternative imaging cannot be performed must be included in the documentation submitted.