



1 Background

The aorta as well as the central venous structures (superior and inferior vena cava and brachiocephalic vein), pulmonary veins and pulmonary arteries can be evaluated in 3D with high visual and spatial resolution with Chest MR angiography and/or venography (MRA/MRV).

2 Why CMR?

- High diagnostic accuracy.
- Excellent image quality independent from body habitus.
- No ionizing radiation exposure.

3 Guidelines and Appropriate Use Criteria

Positive genetic screening and limited visualization on TTE

Class 1*

Surveillance for Marfan Syndrome

- Poor visualization of aortic root, ascending aorta on TTE
- Confirm TTE findings
- Post-aortic valve replacement annually, if normal and unchanged after 2 years, every other year

Class 1*/ 8A+

Class 2a*

Class 1*

Surveillance for Loeys-Dietz Syndrome

- Dilated or dissected aorta and/or arterial branches at baseline, annual surveillance imaging
- Baseline imaging (head to pelvis)
- Without dilated aorta, every 2 years is reasonable

Class 1*/8A+

Class 1*/8A+

Class 2a*

Surveillance for Turner Syndrome

- Baseline imaging (chest)
- Without risk factors for aortic dissection (coarctation, dilation, bicuspid aortic valve, hypertension), surveillance imaging with TTE or MRI to evaluate the aorta is recommended every 5 years in children and every 10 years in adults, as well as before planning a pregnancy.

Class 1*

Class 1*

* Isselbacher, E. et al. 2022 ACC/AHA Guideline for the Diagnosis and Management of Aortic Disease: A Report of the American Heart Association/American College of Cardiology Joint Committee on Clinical Practice Guidelines.



† Doherty, J. et al. ACC/AATS/AHA/ASE/ASNC/HRS/SCAI/SCCT/SCMR/STS 2019 Appropriate Use Criteria for Multimodality Imaging in the Assessment of Cardiac Structure and Function in Nonvalvular Heart Disease





3 Guidelines and Appropriate Use Criteria

Bicuspid aortic valve

- Limited visualization of aortic root/ascending aorta on TTE
- Poor visualization of aortic root, ascending aorta on TTE
- Confirm TTE findings
- Aortic root \pm ascending aorta ≥ 4.0 cm
- Post-aortic valve repair/replacement with aortic root \pm ascending aorta ≥ 4.0 cm

Class 1*
Class 1*
Class 2a*
Class 1*
Class 1*

General surveillance

- Dilated thoracic aorta (baseline and serial imaging – 6-12 and then 6-24 months)
- Relative of a patient with known aortic aneurysm or dissection
- Reassessment of known ascending aortic dilation, history of dissection with change in symptoms

Class 2a/ 8A†
Class 2a/ 8A†
Class 2a/8A †

Acute aortic syndrome

- Initial evaluation (alternative to CT)
- Post open or endovascular aortic repair or medically managed (long-term surveillance – 1, 6, 12, months then annually)

Class 1*
Class 1*

Pre-pregnancy with risk factors

- Baseline imaging of the aorta (genetic, Turner, bicuspid aortic valve with aortic dilation, other aortopathy)

Class 1*

Pregnancy with aortic disease

- Surveillance imaging (non-contrast)

Class 1*

Inflammatory aortitis (Takayasu and Giant Cell Arteritis)

- Baseline imaging
- Surveillance imaging with active disease, post-treatment
- Surveillance imaging in remission

Class 1*
Class 1*
Class 1*

Coarctation of the aorta

Baseline imaging

Surveillance imaging

Class 1*
Class 1*

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Thoracic Vascular Disease

Presented by



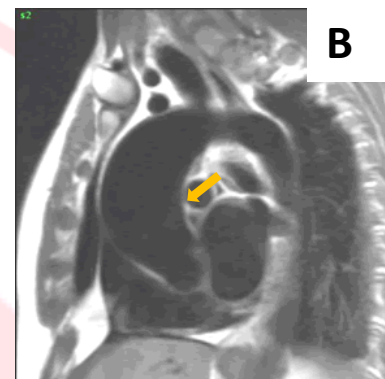
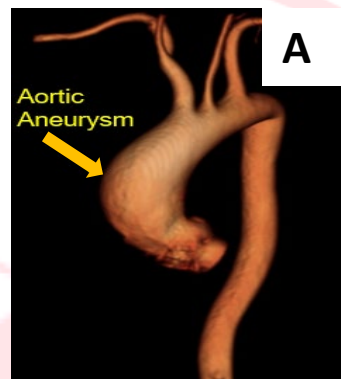
Society for
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Magnetic
Resonance

4 Images

Aortic Aneurysm

Courtesy of: Sihong Huang (Spectrum Health).

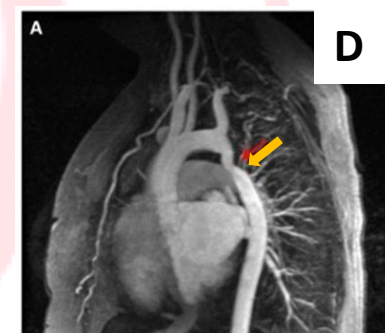
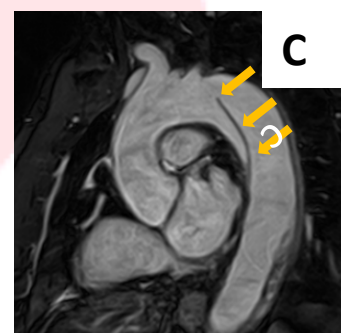
A volume rendered image (A) and black blood image (B) of a fusiform aortic aneurysm are shown.



Aortic Dissection

Courtesy of: Kanae Mukai (Salinas Valley Health).

Non-contrast SSFP imaging (C) of a Type B aortic dissection is shown.



Coarctation of the aorta

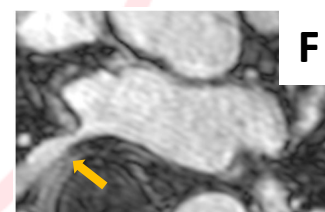
Source: Sommers, D. and Kholmovski, E. JCMR. 2012. 14 (Suppl 1):P211.

Contrast enhanced 3D MRA (D) of an unrepaired coarctation of the aorta is shown.

Pulmonary vein stenosis

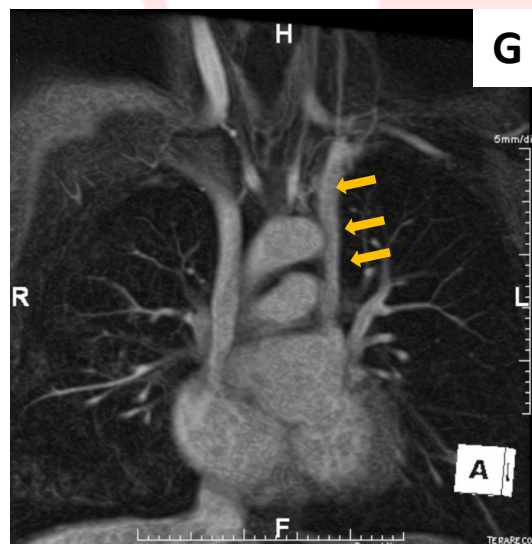
Source: Jimenez Juan, L. et al. JCMR. 2012. 14 (Suppl 1): O68.

Pre-ablation scan of a normal right inferior pulmonary vein (E) is shown. Post-ablation, there was stenosis (F).



Persistent left sided superior vena cava

Source: Kanfi, A. et al. JCMR. 2012. 14 (Suppl 1):P130.



Persistent left sided SVC drains into the coronary sinus (G).

Anomalous pulmonary venous return

Source: Kanfi, A. et al. JCMR. 2012. 14 (Suppl 1):P130.



The pulmonary vein drains the right upper and middle lobes terminates in the superior vena cava (H).