Imaging for Post-Repair Complications

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Disclosure

- No financial disclosure
- Off-label use of gadolinium for MRA
Before post-repair imaging

- Surgical procedures
  - Current procedures
  - Historic procedures
- Interventional
  - Angioplasty
  - Stent

Extra-anatomic conduit
Coarctation surgery

- Surgery types
  - End-to-end anastomosis
  - Left subclavian flap
  - Patch repair
  - Interposition graft
  - Extra-anatomic conduit
- All associated with late complications
  - Re-coarctation
  - Aneurysms
Complication tendencies

- Earlier surgery
  - ↑ re-coarctation
  - ↓ hypertension

- Subclavian flap vs end-to-end repair*
  - ↑ re-coarctation
  - ↑ aneurysm

Other limitations

- **Patch repair***
  - ↑ aneurysms (especially Dacron)
  - Pregnancy aortic rupture
- **Extra-anatomic conduit**
  - Not recommended in growing child

Interventional procedures*

- **Balloon angioplasty**
  - Children < 1 year old with prior surgery
  - ↑ re-coarctation rate
  - ↑ aneurysm/aorta rupture

- **Stent placement**
  - Older children/adult
  - Expandable stents in children
  - ↓ aneurysm & re-coarctation

Recoarctation & external iliac artery stenosis following balloon angioplasty
Long term complications requiring surgery or interventional procedures*

- Re-coarctation
- Aneurysm formation

Coarctation follow-up

- Clinical
- Echocardiography
- Advanced imaging
  - Magnetic resonance imaging
  - Computed tomography angiography
Clinical limitations

- 50% re-coarctation cases: no findings*
- MRI re-coarctation detection rate same for symptomatic & asymptomatic patients*
- Aorta aneurysms are not detected**


Echo limitations

- Windows limited
  - Post operative
  - Older patient
- Re-coarctation detection < MRI
- Poor detection of post-operative descending aorta aneurysms*

25 year old with bicuspid aorta valve and prior hx coacatation
Re-coarctation of the aorta
What is re-coarctation?

- **Traditional:** gradient > 20 mm Hg
- **Morphology:** MRI or CTA
  - Aorta focal diameter reduction
  - Proximal descending aorta: diaphragm < 1.0
  - Significant re-coarctation? No consensus!
    - Moderate .41-.60  
      - < 0.9  
      - < 0.6  
      - < 0.5  
      - Puranik
      - Bogaert
      - Thanopoulos
      - Tsai
Residual isthmus narrowing
MRA shows apparent re-coarctation following subclavian flap repair. Clip artifact associated with MRI examination. Gradient 13 mm Hg
MRA shows an extra-anatomic conduit with a kink (not an artifact). Flow analysis revealed a significant gradient and collateral flow.
CTA shows two extra-anatomic conduits. The smaller conduit was outgrown. A kink in the larger lateral conduit is present (calcification and stenosis present)
Aneurysm vs pseudoaneurysm

Aorta focal diameter increase
  - Proximal descending aorta: diaphragm > 1.5

↑ risk factors
  - Balloon angioplasty
  - Patch angioplasty
  - Bicuspid aortic valve (ascending & descending aorta)*

Coarctation of the Aorta

Pseudoaneurysm following balloon angioplasty
Aneurysm protrudes anterior to distal extension of Dacron patch on dorsal aorta.
Stents for coarctation

- Compared to balloon angioplasty
  - ↓ complications compared to balloon angioplasty
    - Aortic rupture/aneurysm
    - Re-coarctation
  - Longer coverage

- Age
  - Ideal for older children and adults
  - Not recommended in children < 10 years old*

Stent complications

- Stent
  - Migration
  - Fracture
  - Cover left subclavian artery origin
  - Outgrown
- Planned reintervention
- Peripheral vascular injury
Left subclavian artery origin covered by stent
Fractures in aorta stent
Lifelong cardiology follow-up is recommended for all patients with aortic coarctation (repaired or not), including an evaluation by or consultation with a cardiologist with expertise in ACHD.

Evaluation of the coarctation repair site by MRI/CT should be performed at intervals of 5 years or less, depending on the specific anatomic findings before and after repair.
Post repair coarctation patients require life-long follow up
Clinical and echo are inadequate
MRI is the preferred imaging modality
Computed tomography angiography
  • Can substitute for MRI
  • Preferred in patients with stents