CATHETERIZATION PROTOCOL
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Cath Procedure: Coronary Angiography

Indications:
- Kawasaki disease with significant coronary aneurysms
- Post-heart transplant surveillance for vasculopathy
- Postoperative assessment of coronary anatomosis
  - e.g. TGA s/p coronary reimplantation, coronary bypass graft
- Preoperative assessment of coronary artery course
  - e.g. prior to RV-PA conduit revision
- Hypertrophic cardiomyopathy with possible myocardial bridging
- Suspected coronary artery abnormalities (abnormal origins, course, fistulae) not adequately assessed by noninvasive testing
- Chest pain, syncope, or aborted sudden death with high-risk findings on noninvasive testing

Hospitalization Requirement: Same day admission or outpatient unit

Blood on hold: No (unless intervention planned)

Pre-Cath Preparation: CXR, ECG within 6 weeks prior to cath
- CBC if cyanotic, lytes if on diuretics or digoxin
- Sickle cell test if African or Caribbean descent

Cardiac Catheterization:

Access:
- Femoral artery for aortic root angiogram or selective coronary angiography
- Venous access and right heart cath if relationship to RV-PA conduit required or assessing RV-coronaries fistulae in PA-IVS

Catheters:
- Pigtail (retrograde/antegrade) or Berman angio catheter (antegrade) for aortic root angiogram
- Judkins coronary catheters (JR, JL) for selective coronary angiography
- Most commonly, Judkins catheter used is determined by the size of the curve (see figure) which depends on the aortic root size
- Amplatz catheter also available if unsuccessful with Judkins (rounded distal curved leading to an angulated terminal hook)
- 4F for neonates, 5F for most children, 6F for adults
Types of coronary catheters

Angiography:

- Set up manifold with contrast agent bottle, contrast injection syringe, discard syringe, and pressure manometer attached to set up a closed system (for selective coronary angiogram). This allows for continuous source of contrast without disconnecting.
- Obtain access via femoral artery with modified Seldinger technique
- Give heparin 50-150 U/kg (staff-variable) once access obtained
- Insert catheter with wire in situ to straighten the catheter tip
- Advance catheter to the ascending aorta
- Remove guidewire and aspirate blood then attach to manifold while flushing with saline to remove any air
- Aortic root injection → the catheter tip should be in the ascending aorta distal to the sinotubular junction. Inject ~1 cc/kg over 2 cardiac cycles in the AP and lateral projections or a “down-the-barrel” projection (30º RAO, 30º LAO 45º Caudal)
- Selective LCA catheterization⁶ → gently advance the JL catheter in the ascending aorta, the catheter tip should naturally fall into the ostium of the LCA; if not, apply the “push-pull” technique: advance the catheter until the tip forms an acute angle which enters the left sinus of Valsalva then pull up until the LCA ostium is engaged (see figure below)
- Selective RCA catheterization\(^6\) → a bit trickier, once the JR catheter tip is at the level of the sinuses, rotate the catheter clockwise until the tip points anteriorly and should engage the RCA ostium; a small jog of contrast in the right coronary sinus will help to show to location of the ostium.
- Once the coronary ostium is engaged, check pressure tracing to make sure that the catheter tip is not wedged and give a contrast injection jog to confirm position.
- Use the minimum amount of contrast to fill the entire coronary artery for 2 cardiac cycles, approximately 4-8 cc for LCA and 3-6 cc for RCA in adults.

**Angiographic Views: (see also in cath lab manual for projections)**

- These are the common angiographic views\(^7\) although should be modified to obtain the best information for the individual patients’ anatomy.

<table>
<thead>
<tr>
<th>View</th>
<th>A Plane</th>
<th>B Plane</th>
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<tbody>
<tr>
<td>Selective LCA #1</td>
<td>30º RAO</td>
<td>60º LAO</td>
</tr>
<tr>
<td>Selective LCA #2</td>
<td>30º RAO 30º Cranial</td>
<td>60º LAO 25º Cranial</td>
</tr>
<tr>
<td>Selective LCA #2</td>
<td>30º RAO 30º Caudal</td>
<td>90º LAO</td>
</tr>
<tr>
<td>Selective RCA #1</td>
<td>30º RAO</td>
<td>60º LAO</td>
</tr>
<tr>
<td>Selective RCA #2</td>
<td>30º LAO 30º Cranial</td>
<td>parked</td>
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Selective LCA injections

• Watch the ECG and coronary pressures carefully with each injection. Disengage the catheter tip from the ostium if any concerns.
• After angiograms are completed, remove the catheter with wire in situ and apply pressure
• Consider vascular closure device (e.g. perclose) if older patient. May allow for earlier ambulation

Selective RCA injections

Single plane views:
LCA: 4 injections
1. LAO 30°, Cranial 25-30°
2. RAO 30°, Cranial 25-30°
3. LAO 30°, Caudal 25-30°
4. RAO 30°, Caudal 25-30°
RCA:  2 injections  
   1. RAO 30°, cranial 25-30°
   2. LAO 30°, cranial 25-30°

Post-Cath Management:  
   Bedrest for 4-6 hours
   Discharge home same day unless complications

Complications (from adult registry)⁶:
   - Death 0.11%
   - Myocardial infarction 0.05%
   - Cerebrovascular accident 0.07%
   - Significant arrhythmias 0.38%
   - Major vascular complications 0.43%
   - Contrast reaction 0.37%
   - Hemodynamic complications 0.26%
   - Perforation of heart chamber 0.03%
   - Other complications 0.28%
   - Total major complications 1.70%

References: