CATHETERIZATION PROTOCOL
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Cath Procedure Diagnosis: Aortic Valve Stenosis (NEONATE)
Aortic Balloon Valvuloplasty

Hospitalization Requirement: Yes, Same Day Admit (SDA) or inpatient

Blood on hold: (1 unit PRBC) Yes

Pre-Cath Preparation: CBC, INR/PTT, Type & Screen, Sickle Screen, ECG, CXR
Echo assessment of valve morphology, diameters, flows and gradients, function, presence of AI

Indications: NOT SO CLEAR-CUT IN NEWBORN

In presence of normal cardiac output
Critical AS (duct-dependent)
In the asymptomatic newborn – i.e. no symptoms, normal ECG, there is no “real” gradient cut-off for intervention. The newborn with any AS should be observed very closely for development of symptoms, cardiac dysfunction, progressive LVH, particularly in those infants with peak to peak gradients >50mmHg. Some may consider intervention for peak to peak gradients ≥ 60-70mmHg.

In the setting of decreased cardiac output/ventricular function
Severe aortic valve stenosis may be present in the setting of low gradients.
Intervention is based on the importance of aortic valve stenosis by combination of morphology, gradients, symptoms, presence of heart failure.

Cardiac Catheterization: techniques vary depending on operator

Anaesthesia: Patient intubated, ventilated under general anaesthetic in cath lab

Access: Possible routes
1. Antegrade via femoral vein → RA → (PFO open or probe patent) → LA → LV → AscAo
2. Retrograde via femoral artery → AscAo → LV
3. Carotid artery via surgical cutdown particularly in very small infants < 2kg → ascAo → LV
4. Umbilical artery → ascAo → LV

Once access obtained, ensure adequate anticoagulation (heparin 50-150u/kg) and then continue monitoring ACT as required.

Hemodynamic data: Optimally, simultaneous or pullback LV and aortic pressures should be obtained to calculate baseline peak-to-peak gradients.
**Angiography:**  
Aortogram – visualize valve position, morphology, regurgitation  
+/- LV angiogram - to assess LV function, aortic valve morphology and size, aortic regurgitation.

**Catheters/Procedure:**

Antegrade:
5F sheath with 5F Berman angiographic catheter into LV for pressure and angiogram (LV function, aortic valve morphology).
4 or 5 end-hole catheter (Judkins right or Cobra) across PFO into mouth of mitral valve followed by coronary wire into LV, across aortic valve, ascending aorta down femoral artery if possible (until wire is compressible at groin – achieves good wire stability).
Advance balloon catheter and dilate.

Retrograde:
4 Fr sheath with 4F pigtail catheter in femoral artery.
Aortic pressure then aortogram with pigtail catheter for valve annulus (rely on echo valve measurement).
4 end-hole catheter (Judkins right or Cobra) at aortic root.
Cross aortic valve with soft-tipped wire – 0.025” glide wire (e.g. Terumo) into LV.
Advance end-hole catheter into LV and obtain LV pressure.
+/- LV angiogram with pigtail or other catheter which has side-holes.
Position appropriate wire in LV – generally try to put a curl on end of wire.
Advance balloon valvuloplasty catheter across aortic valve and dilate.

**Balloon selection:**
Choose diameter 90-100% of aortic annulus, with length of balloon 2-3cm (neonates).
Generally, high pressure balloons are not needed for neonatal AS. Most utilized are Tyshak balloons which have low profiles but also low burst pressures.

**Post dilation:**
Determine LV-Ao gradient, degree of aortic regurgitation including LVEDP
**Goal is to decrease gradient by $\geq 50\%$ of pre-dilation gradient.**

**Technical tips:**
**Balloon stability:** techniques to reduce or eliminate cardiac output during inflation
1. Adenosine: dose – 0.125 mg/kg to 0.555 mg/kg. Inflation performed during severe braydycardia or asystole.

2. RV pacing: In order to decrease likelihood of balloon being ejected forcefully into aorta once inflated, advance a pacing catheter into RV. Pace RV at $\geq 180$-240 bpm to effectively reduce cardiac output and then inflate balloon. Once balloon deflated, stop pacing.

**Post-Cath Management:**
Patients should be admitted to hospital for monitoring post-dilation. Clinical and echocardiographic assessments should be repeated shortly thereafter to assess function, gradient, AI, MR.

Treat weak/absent femoral pulses aggressively.

**Discharge medications:** As clinically indicated.

**References:**