**CATHETERIZATION PROTOCOL**
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Cath Procedure Diagnosis: **POST-FONTAN**

Timing of catheterization post-Fontan: 6 months to 1 year

Hospitalization requirement: NO

Blood on hold (1 U PRBC): Not required

Pre-cath preparation: CXR, ECG, CBC, lytes

Access: Venous – usually femoral
+- arterial (depending on if APC’s anticipated to be occluded)

Catheters: Venous: 6F Gensini or Berman angiographic
Arterial: 5F pigtail

Wires: 0.35” Terumo, 0.35” Wholley

**Measurements:**
1) VO2 (by mass spectrometry)
2) Pressures: SVC, IVC, Fontan, pulmonary arteries, atrium +/ ventricular end-
diastolic, aortic

**Angiography:**
1) SVC (A plane – RAO/caudal) to visualize SVC-RPA connection & venous
collaterals
2) IVC – to visualized Fontan, fenestration, PA’s
3) innominate vein (to assess for venous collaterals i.e. R-L shunts)
4) Selective branch PAs if needed (also to assess pulmonary veins)
5) Hepatic veins (venous collaterals i.e. R-L shunts)
6) Aortogram for aortopulmonary collaterals, arch obstruction

**Additional:**
If suspicion of pulmonary AVM’s, consider bubble study selectively in each pulmonary
artery with simultaneous echocardiographic assessment of positive/negative results.

**Angiographic findings as potential indications for transcatheter intervention:**
1) Residual interatrial shunting (i.e. patent fenestration). See below.
2) Systemic venous collateral vessels – coils, plugs, devices
3) Significant aortopulmonary collateral vessels – coils, plugs
4) Pulmonary AVMs if amenable – coils

FENESTRATION CLOSURE (some centres routinely do not fenestrate)
The theoretical benefit of the Fontan fenestration is to allow for an increase in cardiac output in the setting of suboptimal pulmonary blood flow. It may be of particular benefit in the immediate post-operative period during recovery of the lungs from CPB and high PVR. This creates an obligatory right-to-left shunt i.e. cyanosis.

Indications for closure of fenestration
1) Significant decrease in arterial saturation
2) Prevention of paradoxical emboli

Possible contraindications to fenestration closure
1) Significant obstruction within Fontan pathway
2) Increased PVR – ventricular dysfunction, AVVR, pulmonary vein stenoses, pulmonary arterial stenoses, parenchymal lung disease
3) unfavourable rhythm

Test occlusion of fenestration (quite a crude assessment):
1) Baseline measurements – pressures (Fontan, systemic pressure (usually cuff)), Fontan venous gas and saturation
2) Berman angiographic catheter used to occlude fenestration for 10 min – document fenestration occlusion by increase in saturations
3) Repeat measurements (see above)

Unfavorable response to occlusion i.e. signs of elevation of Fontan pressures and decreased cardiac output:
1) Fontan pressure increase from baseline i.e. \( \geq 3-5 \text{ mmHg} \)
2) A-VO2 difference \( \geq 10\% \)
3) \( \downarrow \text{sBP} \geq 10\% \)

If favorable response to occlusion, close fenestration with transcatheter technique, either coil or device (Currently at HSC: Amplatzer 5mm (6F), CardioSEAL 17mm (10F))

Note: If Fontan hemodynamics are favourable, test occlusion of fenestration not performed.

References:
2) Bridges et al. Cardiac catheterization and test occlusion of the interatrial communication after the fenestrated Fontan operation. JACC 1995, 25(7): 1712-7