Why Do I Do It?
Why to perform CMR in patients pre-Glenn and pre-Fontan

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Overview

- Lesions and palliative procedures
- Pre-Glenn CMR
- Pre-Fontan CMR
Single ventricle lesions

• Too little systemic flow:
  – Hypoplastic left heart syndrome
  – Tricuspid atresia with TGA

• Too little pulmonary flow:
  – Tricuspid atresia with normally related great vessels
  – Pulmonary atresia/ intact ventricular septum

• Complex lesions
First surgery

- Stage I (Norwood) for HLHS and related lesions
- BT shunt for lesions with insufficient blood flow
- Pulmonary artery band for excessive pulmonary blood flow
- Both of above procedures are extracardiac
- Rarely, can do nothing early (moderate pulmonary stenosis acts as band)
Single ventricle palliation

http://www.pediatriccardiacinquest.mb.ca
Pre-Glenn Imaging

• Success is dependent on low pulmonary pressure, no obstruction in circuit

• What surgeons need to know
  – Restrictive/non-restrictive flow across atrial septum and VSD (if there is one)
  – Atrioventricular/semilunar valve regurgitation
  – Ventricular function
  – Shunt appearance
  – Branch pulmonary artery stenosis
  – Pulmonary venous anatomy
  – IVC/SVC anatomy
  – Qp:Qs
  – **Collateral flow
  – **PVR
Glenn example images

- Restrictive/non-restrictive flow across atrial septum
- Atrioventricular/semilunar valve regurgitation
- Ventricular function
Restriction at the VSD

Diastole

Systole
Glenn example images

- Shunt appearance
- Branch pulmonary artery stenosis
- IVC/SVC anatomy
- Qp:Qs
- **Collateral flow
- **PVR
Glenn examples: flow data
Fontan

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- What surgeons need to know
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  - IVC/SVC anatomy
  - Qp:Qs
  - **Collateral flow**
  - **PVR**
Branch PA assessment
Fontan examples

- Coronal/bicaval views
- Imaging fenestration
- 3DSSFP
Glenn and Fontan

Slide courtesy of L. Grosse-Wortman
Method 1: Pulmonary venous return – branch PA flow

Method 2: Aortic net flow-SVC flow – IVC flow (desc aorta)
Method 1: pulm veins (3.6+4.2) – BPAs (2.0+1.7) = 4.1 ml

Method 2: Aortic (12.0) - SVC (4.6) – desc aorta (3.8) = 3.8 ml
Collateral flow

• Method A: 4.1 ml
  – Percent total = 4.1/11.6 = 35%
• Method B: 3.8 ml
  – Percent total = 3.8/12.0 = 32%
• Qp:Qs without collateral flow: 0.31:1
• Qp:Qs with collateral flow: 0.65:1
Possible changes in plan based on CMR

• Ligation/embolization of collaterals
• +/- Intracardiac repair with Glenn/Fontan
  – Atrioventricular valve repair
  – Outflow tract adjustment
  – Opening up atrial septum
• Arch re-repair
• Branch PA augmentation
• Change planned baffle pathway in heterotaxy
• Consideration for transplant
Conclusions

• With CMR, it is possible to visualize complex structures and to understand many of the hemodynamics in the single ventricle heart.

• Results of CMR aid in surgical planning.

• Understanding of individual anatomy is important for interpretation of data, and identifying abnormalities
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