Vascular Model Repository Specifications Document

0060_H_PULMGLN_SVD

Legacy Name: 0096_0001

Model added: 27 Dec 2021

Species	Human
Anatomy	Pulmonary Glenn
Disease	Single Ventricle Defect
Procedure	Glenn

Clinical Significance and Background

Pulmonary Glenn

The pulmonary arteries are the blood vessels responsible for transporting deoxygenated blood to the lungs to perform respiration. A normal pulmonary anatomy involves the main pulmonary artery (MPA) trunk leaving the right ventricle of the heart which then branches off into the left and right pulmonary arteries which then continue to fractally branch towards the lungs. However, after the Glenn procedure (an open-heart surgery done on babies with congenital heart defects) the anatomy of the pulmonary system is slightly modified. The main pulmonary artery trunk is not present. Instead, the superior vena cava (SVC) is directly connected to the left and right pulmonary arteries in a T-shaped 3-way intersection configuration. This is done so that deoxygenated blood coming from the upper body (through the SVC) flows directly to the lungs without passing through the heart to allow for the heart to focus solely on pumping oxygenated blood from the lungs to the rest of the body.

The Glenn procedure is very often followed by the Fontan procedure which then further modifies the pulmonary artery anatomy by detaching the inferior vena cava (IVC) and also connecting it directly to the left and right pulmonary arteries in a 4-way intersection configuration.

Single Ventricle Defect

A single ventricle defect (SVD) is a type of heart defect that a child is born with. It occurs when one of the two pumping chambers in the heart, called ventricles, is not large enough or strong enough to work correctly. In some cases, the chamber might be missing a valve. Single ventricle defects are rare, affecting only about five out of 100,000 newborns. They are also one of the most complex heart problems, usually requiring at least one surgery. There are several types of single ventricle defects which include but are not limited to: tricuspid atresia, hypoplastic left heart syndrome (HLHS), mitral valve atresia (usually associated with HLHS), single left ventricle, double inlet left ventricle (DILV), double outlet right ventricle (DORV), pulmonary atresia with the intact ventricular septum (PA/IVS), and atrioventricular canal defect (AV Canal).

Glenn

The Glenn procedure is a type of open-heart surgery. Babies who need this surgery typically have it when they are 4 - 6 months old. The Glenn procedure is done for

children who are born with heart problems like hypoplastic left heart syndrome (HLHS), tricuspid atresia, and double outlet right ventricle. Depending on the heart problem, children may need the Norwood procedure before the Glenn surgery.

The Glenn procedure sends blood from the upper body directly to the lungs. This way, the single ventricle only has to pump blood to the body (and not to the lungs), so it does not have to work as hard.

During the Glenn procedure, the surgeon disconnects the superior vena cava (SVC) from the heart and connects it to the pulmonary artery. Now the blood from the upper part of the body flows directly into the pulmonary artery. The pulmonary artery takes the blood to the lungs. If the baby had the Norwood procedure, the surgeon will remove the shunt that was placed then.

Clinical Data

General Patient Data

Age (yrs)	3
Sex	Female

Specific Patient Data

CI (L/min/m^2)	3.7
P SVC MP cath	8
FS LPA MRI	0.4
FS RPA MRI	0.6

Notes

Paper patient "A". See paper for more details. See below for information on the image data.

Image Modality: MR

Image Type: VTI

Image Source: TLAB

Image Manufacturer: GE MEDICAL SYSTEMS

Publications

See the following publications which include the featured model for more details:

Troianowski, G., Taylor, C. A., Feinstein, J. A., & Vignon-Clementel, I. E. (2011). Three-dimensional simulations in Glenn patients: clinically based boundary conditions, hemodynamic results and sensitivity to input data. Journal of biomechanical engineering, 133(11).
http://www.doi.org/10.1115/1.4005377

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