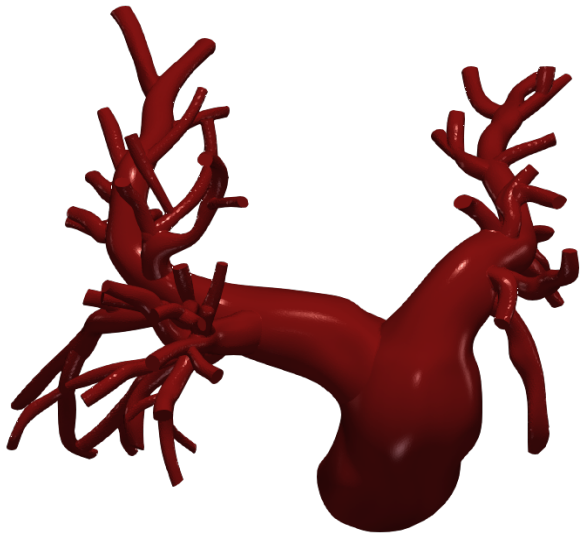
Vascular Model Repository Specifications Document



0133_H_PULM_PAH

Legacy Name: SU0230

Model added: 14 Sep 2022

Species	Human
Anatomy	Pulmonary
Disease	Pulmonary Arterial Hypertension
Procedure	None

Clinical Significance and Background

Pulmonary

Pulmonary circulation involves blood flowing from the right ventricle of the heart into the pulmonary arteries. From the pulmonary arteries, the blood then reaches the lungs, performs a gas exchange, and then continues to the pulmonary veins which then lead to the left atrium of the heart.

By definition, an artery is a blood vessel that carries blood away from the heart. This usually means arteries carry oxygenated blood to the rest of the body, but since the pulmonary arteries are transporting blood from the right side of the heart to the lungs to perform respiration, that makes the pulmonary arteries the only arteries in the body that carry deoxygenated blood. Similarly, the pulmonary veins, which carry blood that has been freshly oxygenated from the lungs back to the heart, are the only veins that carry oxygenated blood.

Pulmonary Arterial Hypertension

Pulmonary hypertension is a type of high blood pressure that affects the arteries in the lungs and the right side of the heart. In one form of pulmonary hypertension, called pulmonary arterial hypertension (PAH), blood vessels in the lungs are narrowed, blocked, or destroyed. The damage slows blood flow through the lungs, and blood pressure in the lung arteries rises. The heart must work harder to pump blood through the lungs. The extra effort eventually causes the heart muscle to become weak and fail. Changes in the cells that line the pulmonary arteries can cause the walls of the arteries to become stiff, swollen, and thick. These changes may slow down or block blood flow through the lungs, causing pulmonary hypertension.

Clinical Data

General Patient Data

Age (yrs)	17
Sex	Female

Specific Patient Data

BSA (m^2)	1.8
RV End Diastolic Vol. (ml)	251

RV End Systolic Vol. (ml)	197
Pulmonary Artery Flow (L/min)	5.6
End Diastolic Volume Index (ml/m^2)	140
Ejection Fraction (%)	22
Pulmonary Artery Pressure (mmHg)	122/70/85
Pulmonary Vascular Resistance Index (Wum^2)	24
Cardiac Index (L/min/m^2)	3.2

Notes

Model of a patient suffering from severe pulmonary arterial hypertension. Paper patient S3. \nSee paper for more details. See below for information on the image data.

Image Modality: CT/MR

Image Type: VTI

Image Source: Lucille Packard Children's Hospital

Publications

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

Yang, W., Dong, M., Rabinovitch, M., Chan, F. P., Marsden, A. L., & Feinstein, J. A. (2019). Evolution of hemodynamic forces in the pulmonary tree with progressively worsening pulmonary arterial hypertension in pediatric patients. Biomechanics and modeling in mechanobiology, 18(3), 779-796. http://www.doi.org/10.1007/s10237-018-01114-0

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AND/OR

N.M. Wilson, A.K. Ortiz, and A.B. Johnson, "The Vascular Model Repository: A Public Resource of Medical Imaging Data and Blood Flow Simulation Results," J. Med. Devices 7(4), 040923 (Dec 05, 2013) doi:10.1115/1.4025983.

AND/OR

Reference the official website for this data: www.vascularmodel.com

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