

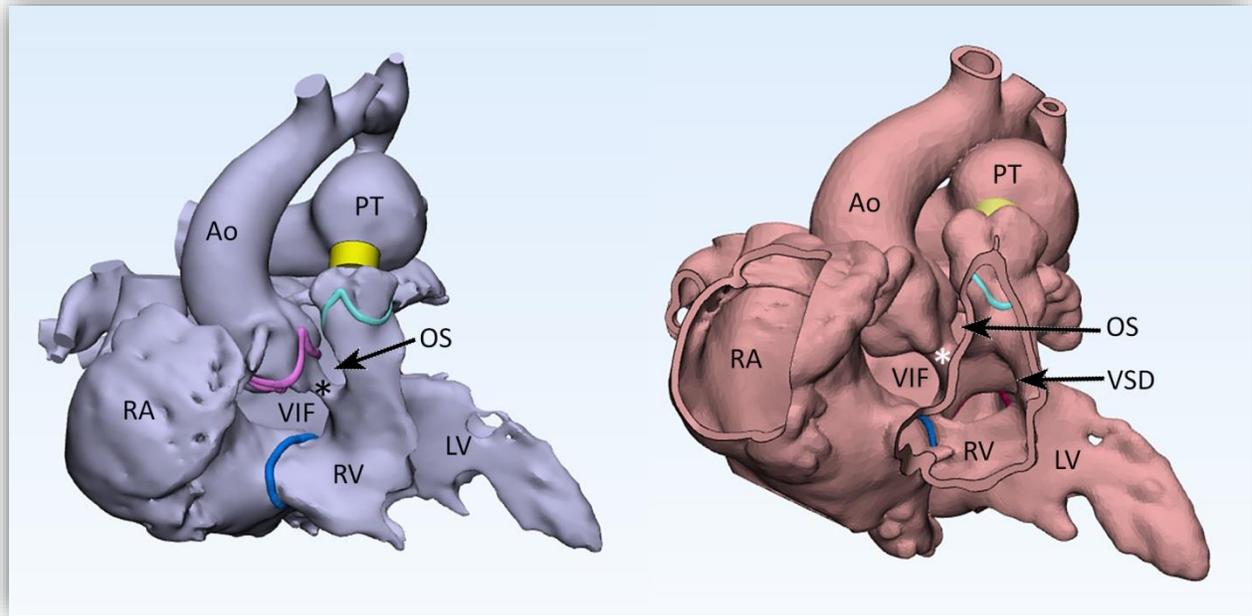
SURGICAL PROCEDURES IN CONGENITAL HEART DISEASES

Cases Descriptions

Shi-Joon Yoo

CASE 1. Pulmonary artery banding in an 11 months old infant with double outlet right ventricle.

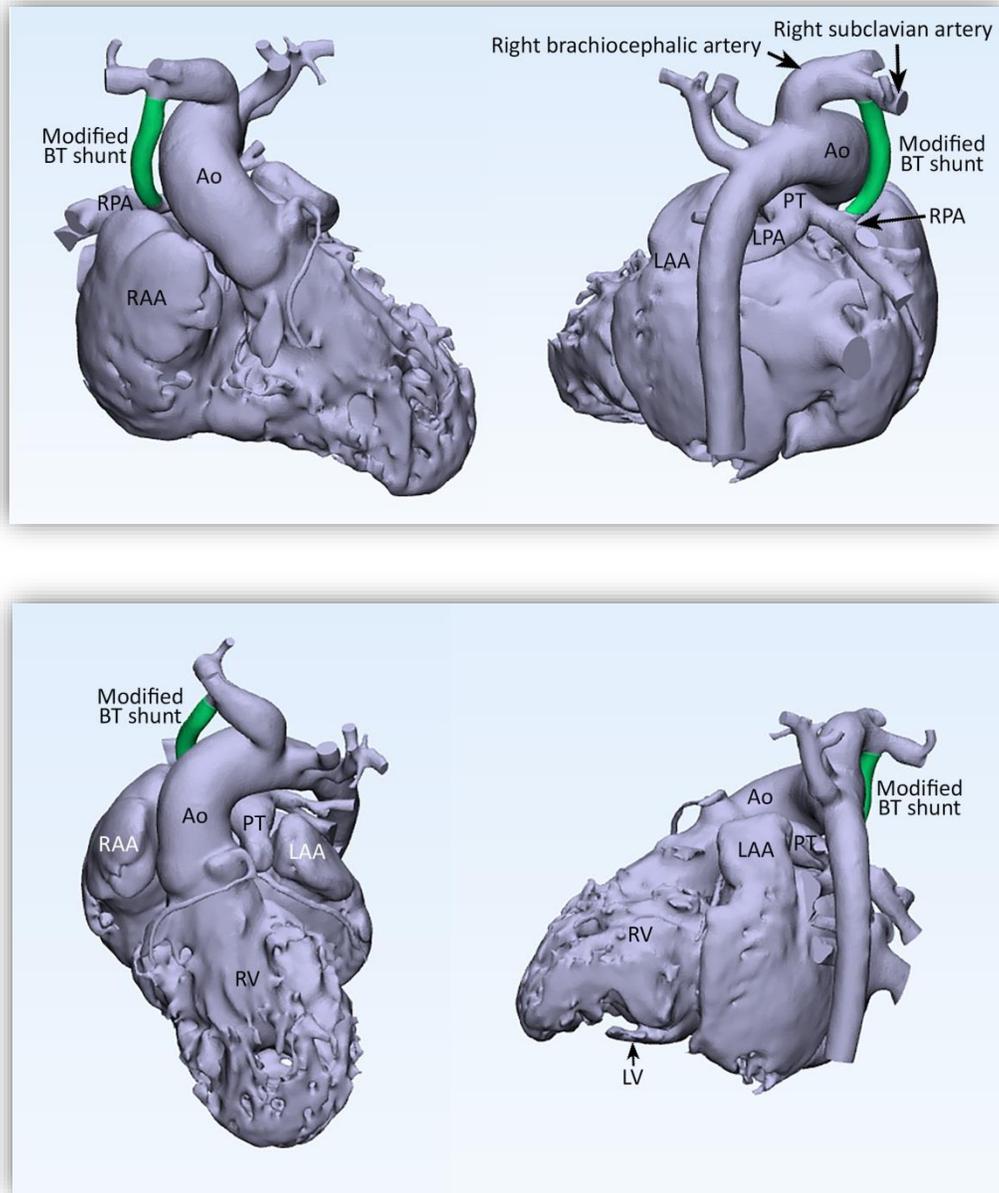
❖ Source images: Contrast-enhanced MR angiograms obtained in end-systole (SickKids, Toronto).



- ♥ Situs solitus / Levocardia / Concordant atrioventricular connection
- ♥ Double outlet right ventricle with subaortic and subpulmonary infundibulum
- ♥ Normally related arterial trunks
- ♥ Perimembranous confluent VSD, remote from both arterial valves but more closely aligned with the subaortic outflow tract
- ♥ Well-positioned pulmonary artery banding (colored in yellow) that was performed in the patient's native country at one month of age
- ♥ Severe biventricular hypertrophy
- ♥ Severe narrowing of subaortic outflow tract (asterisk) with severely hypertrophic ventriculoinfundibular fold (VIF) and outlet septum (OS).
- ♥ Lesser degree of subpulmonary outflow tract obstruction
- ♥ Tubular hypoplasia of the aortic arch with distal coarctation

CASE 2. Modified Blalock-Taussig shunt in a patient with heterotaxy and right isomerism.

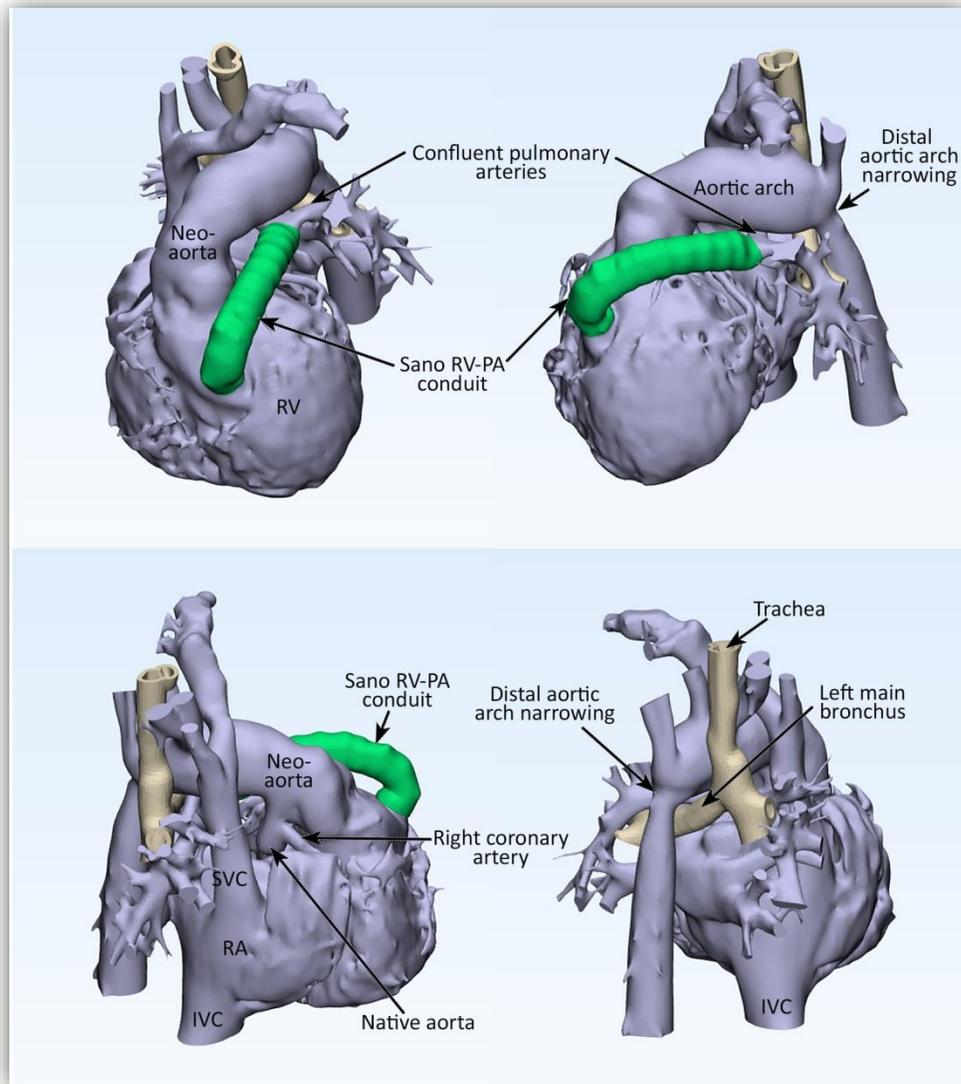
- ❖ Source images: Contrast-enhanced CT angiograms obtained in end-systole (Seoul National University Hospital).



- ♥ Heterotaxy / Levocardia. Both right and left atrial appendages (RAA and LAA) showing the characteristic of the right atrial morphology.
- ♥ Double inlet right ventricle through a common atrioventricular valve (not shown). Tiny rudimentary left ventricle below the right ventricle (right panel of bottom figure)
- ♥ Aorta from right ventricle. Pulmonary atresia.
- ♥ Modified Blalock-Taussig (BT) shunt between the dilated right subclavian artery and right pulmonary artery (RPA).

CASE 3. Norwood operation with Sano right ventricle-to-pulmonary artery conduit in hypoplastic left heart syndrome.

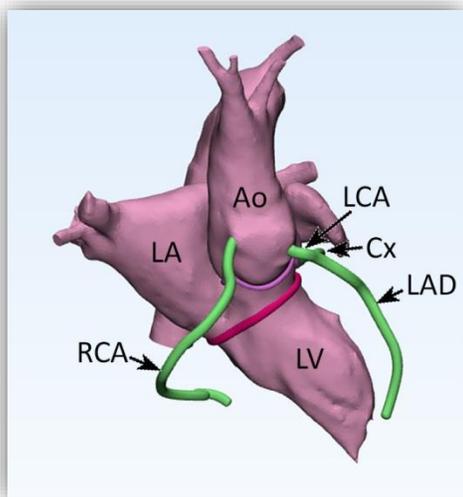
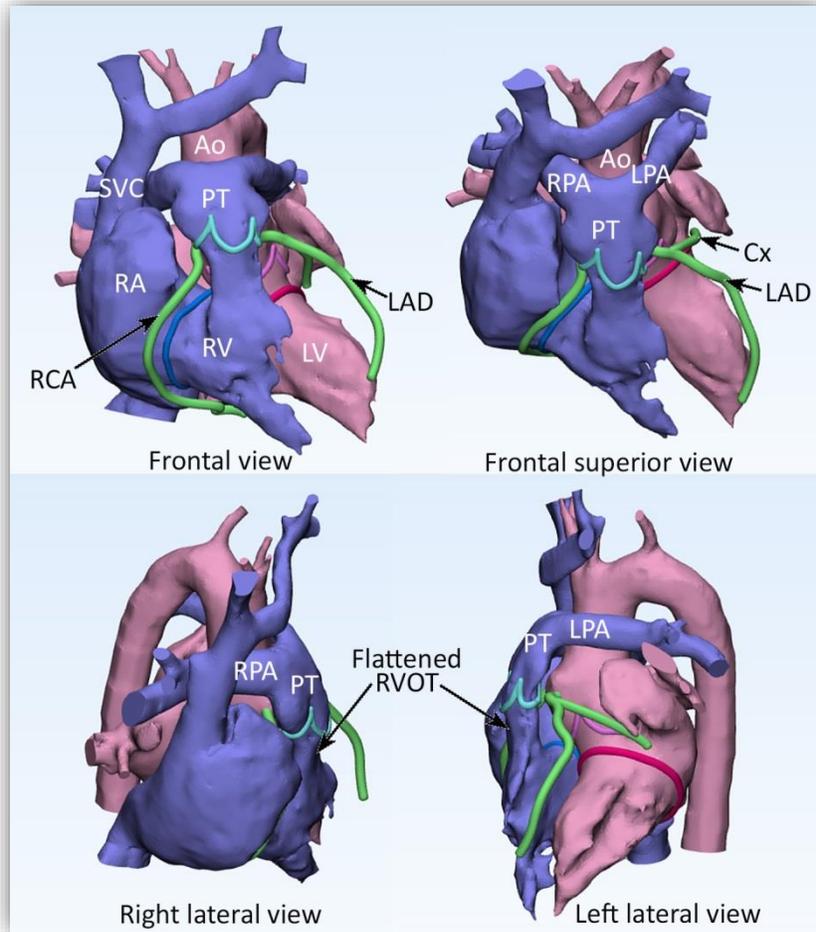
❖ Source images: Contrast-enhanced MR angiograms obtained in end-systole (SickKids, Toronto).



- ♥ Situs solitus / levocardia / left aortic arch
- ♥ Norwood operation with unobstructed anastomosis between native pulmonary arterial trunk and aorta. Large reconstructed aortic arch with distal narrowing.
- ♥ Sano shunt extending from the right ventricular outflow tract and confluent pulmonary arteries with mild narrowing and distortion.
- ♥ Note that the reconstructed aortic arch may encroach on the distal trachea and left main bronchus from above, which is not the case in this patient despite the large size of the aortic arch.

CASE 4. Arterial switch operation in transposition of the great arteries with intact ventricular septum.

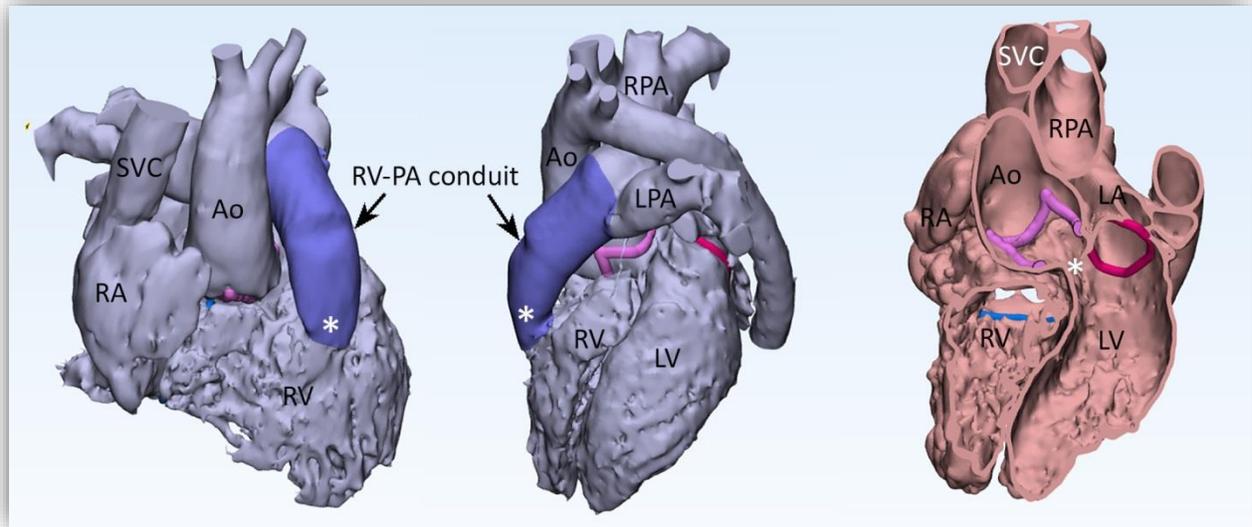
❖ Source images: Contrast-enhanced MR angiograms obtained in end-systole (SickKids, Toronto)



- ♥ Situs solitus / levocardia / left aortic arch
- ♥ Concordant atrioventricular connection
- ♥ Concordant ventriculoarterial connection after arterial switch operation
- ♥ Right ventricular outflow tract (RVOT) mildly flattened in front of the dilated aortic root.
- ♥ Branch pulmonary arteries draping around the dilated ascending aorta without obstruction
- ♥ Commissural malalignment between the neo-aortic and neo-pulmonary sinuses. Both right and left coronary arteries connected to the anteriorly located neo-aortic sinus.

CASE 5. Rastelli procedure in a patient with transposition of the great arteries and ventricular septal defect.

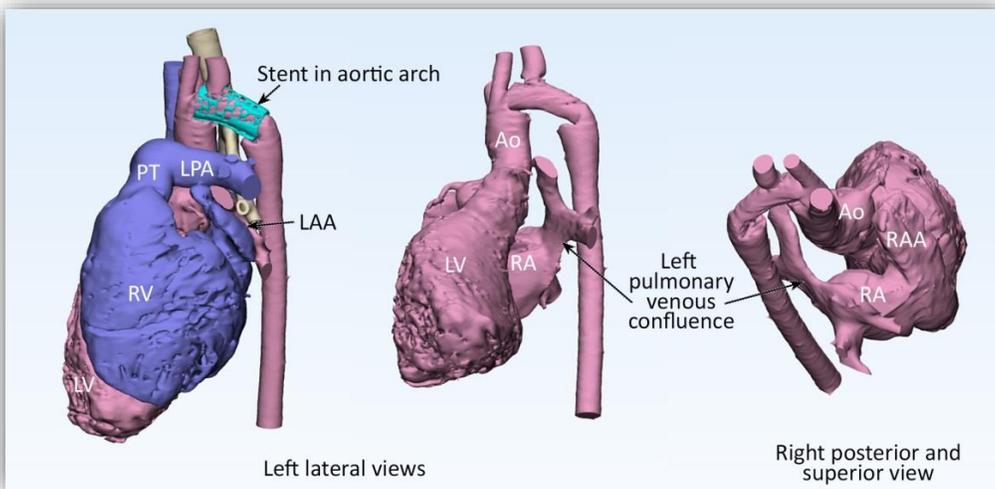
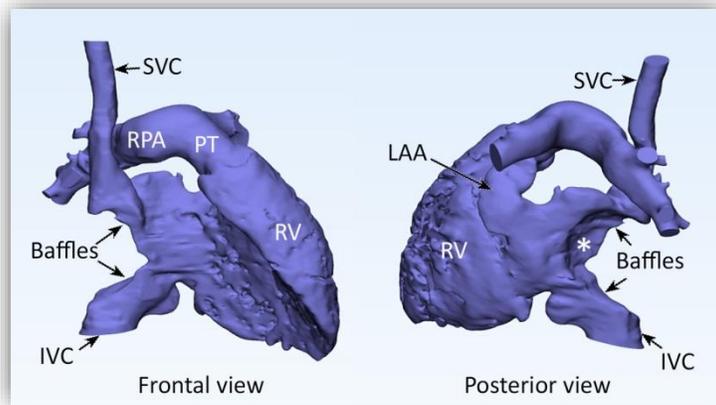
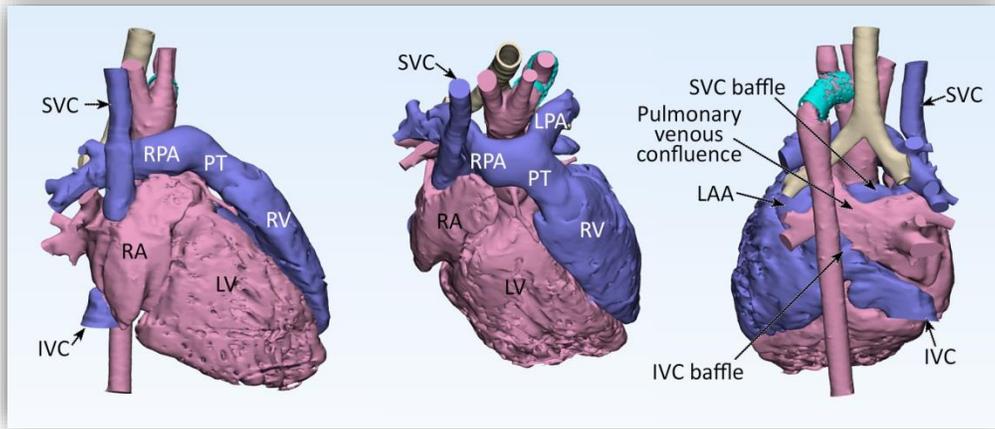
❖ Source images: Contrast-enhanced CT angiograms (Children's Hospital Colorado).



- ♥ Situs solitus / levocardia / left aortic arch
- ♥ Frontal and left anterior oblique views of the cast model on the left panels showing narrowing (asterisk) of the proximal anastomosis site of the right ventricle-to-pulmonary artery (RV-PA) conduit.
- ♥ Left anterior oblique view of the wall model on the right panel showing acutely angled left ventricular outflow tract with narrowing (asterisk) at the original location of the VSD.

CASE 6. Double switch operation in a patient with congenitally corrected transposition of the great arteries.

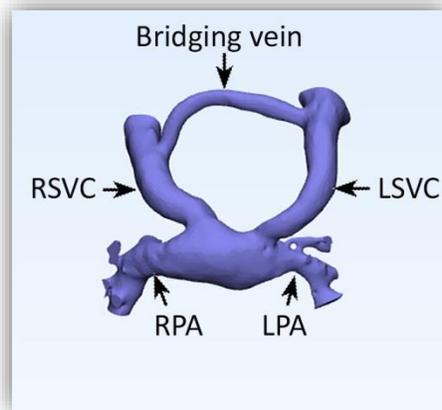
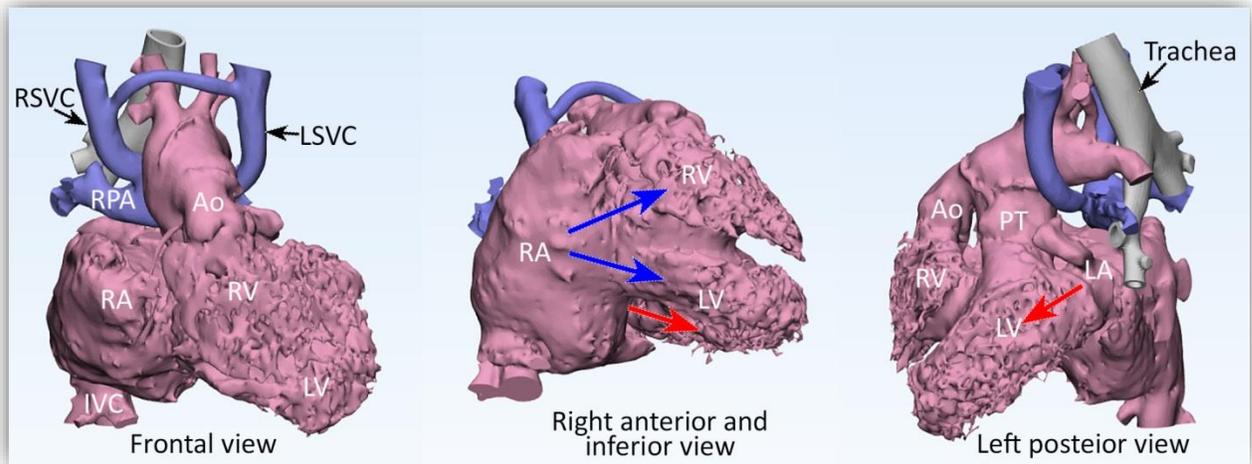
❖ Source images: Contrast-enhanced CT angiograms (Children’s Hospital Colorado).



- ♥ Situs solitus / levocardia / left aortic arch
- ♥ The SVC and IVC are baffled to the left-sided morphologically right ventricle through the left atrium and tricuspid valve.
- ♥ The pulmonary venous confluence is baffled to the right-sided morphologically left ventricle through the right atrium and mitral valve.
- ♥ The SVC and IVC baffles are compressed forward and leftward (asterisk in right panel in middle figure) by the pulmonary venous baffle in the anatomically right atrium.
- ♥ The left pulmonary venous confluence is flattened in anteroposterior direction by the systemic venous baffles.
- ♥ There is concordant ventriculoarterial connection after arterial switch procedure.

CASE 7. Damus-Kaye-Stensel operation and bilateral bidirectional cavopulmonary connection in a patient with twisted atrioventricular connection and transposition of the great arteries.

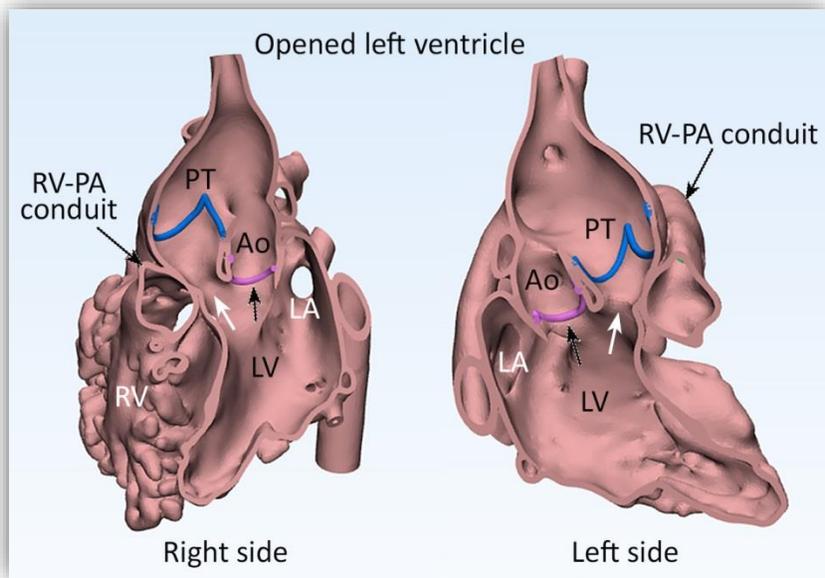
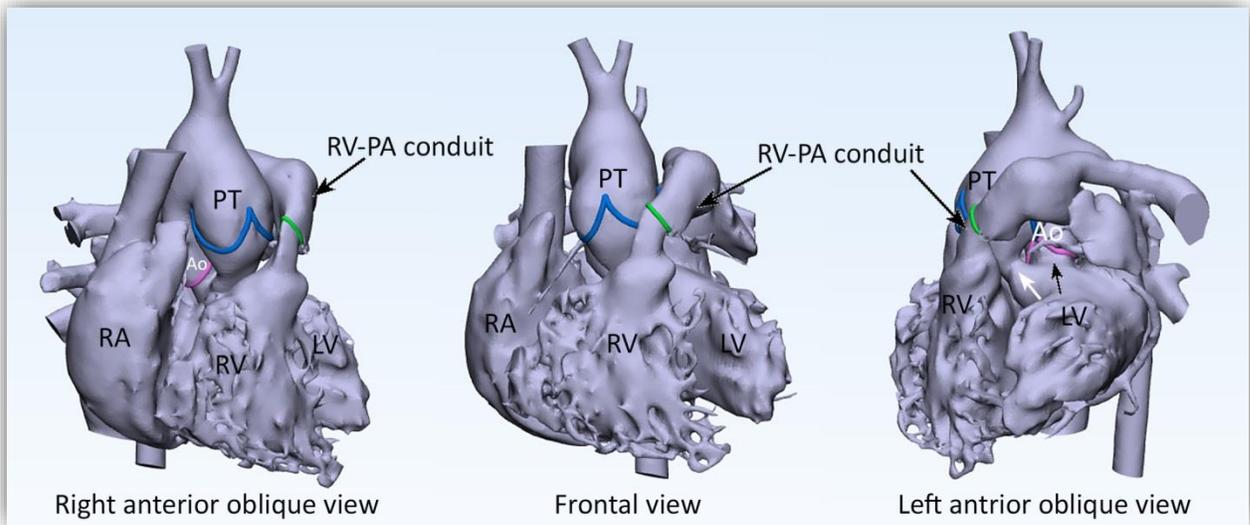
❖ Source images: Contrast-enhanced MR angiograms obtained in end-systole (SickKids, Toronto)



- ♥ Situs solitus / levocardia / left aortic arch
- ♥ Right atrium connecting to superiorly located right ventricle and partly to inferiorly located left ventricle.
- ♥ Left atrium connecting to inferiorly located left ventricle.
- ♥ Loss of parallel atrioventricular connection axes:
 - Right atrial connection to right ventricle and left ventricle: From right to left
 - Left atrial connection to left ventricle: From left posterior to left inferior
- ♥ Hypoplastic right ventricle giving rise to native aorta.
- ♥ Left ventricle giving rise to dissected pulmonary arterial trunk.
- ♥ End-to-side anastomoses of dissected pulmonary arterial trunk to aorta (Damus-Kaye-Stensel)
- ♥ Bilateral superior venae cavae connected by narrow bridging vein.
- ♥ Both superior venae cavae connected to confluent pulmonary artery (bilateral bidirectional cavopulmonary anastomosis)

CASE 8. Yasui procedure in a patient with interrupted aortic arch with a ventricular septal defect.

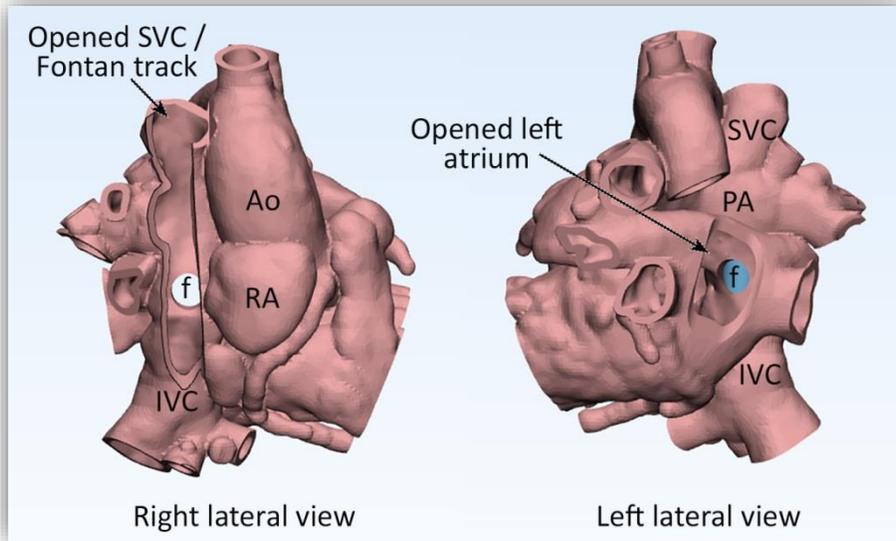
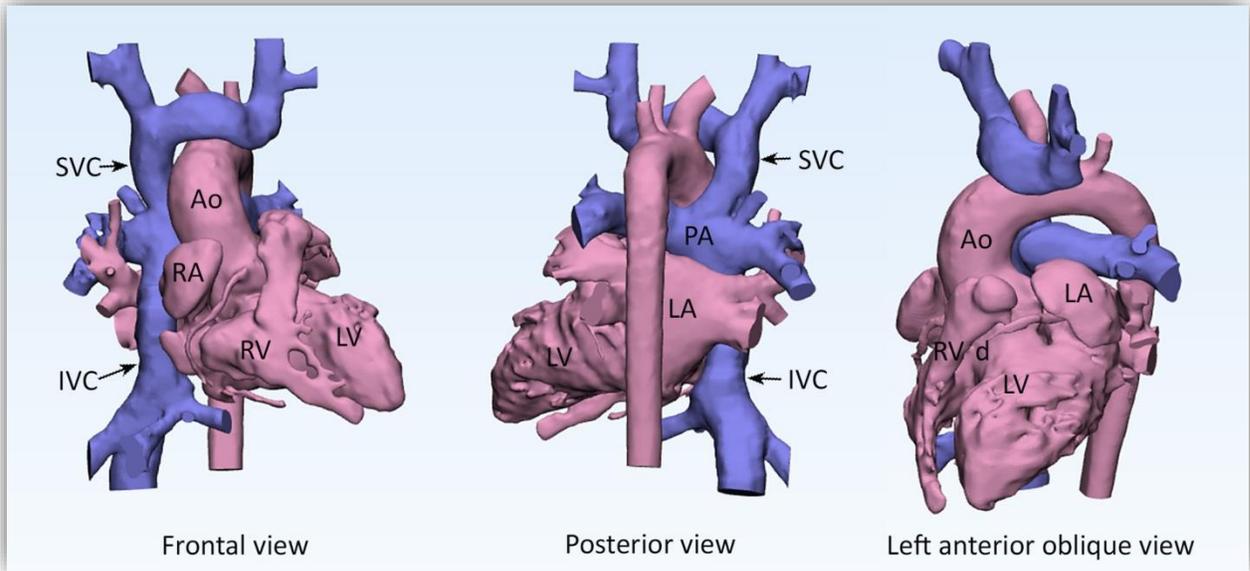
❖ Source images: Contrast-enhanced MR angiograms obtained in end-systole (SickKids, Toronto)



- ♥ Situs solitus / levocardia / left aortic arch
- ♥ The left ventricle is baffled to the native pulmonary arterial trunk that is divided below the branch pulmonary arteries. The proximal pulmonary arterial trunk is connected to the native ascending aorta. As a result, the left ventricular outflow tract consists of two channels: the native left ventricular outflow tract (black arrow) and the VSD (white arrow) that is baffled to the native pulmonary arterial trunk. The latter channel is significantly narrowed.
- ♥ The right ventricle-to-pulmonary arterial (RV-PA) conduit is severely narrowed.

CASE 9. Fenestrated Fontan operation in a patient with hypoplastic right ventricle, severe hypoplasia of tricuspid valve and a ventricular septal defect .

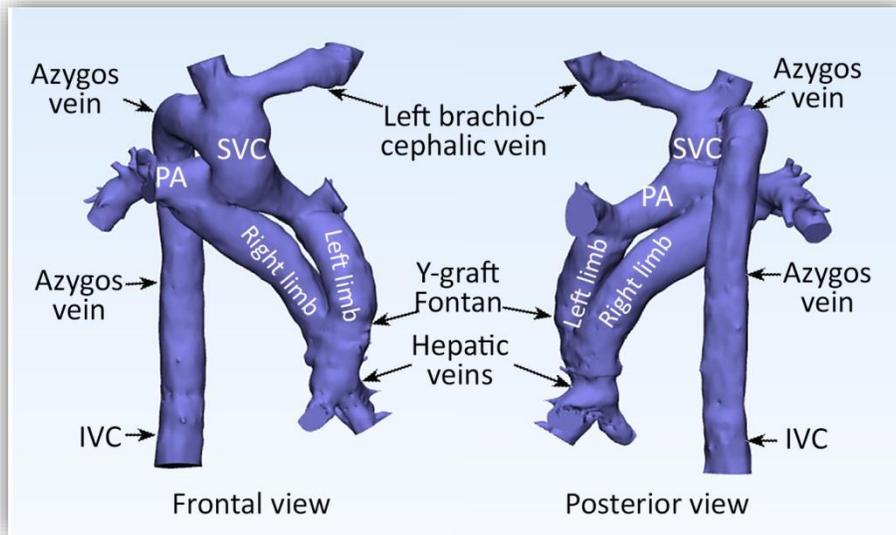
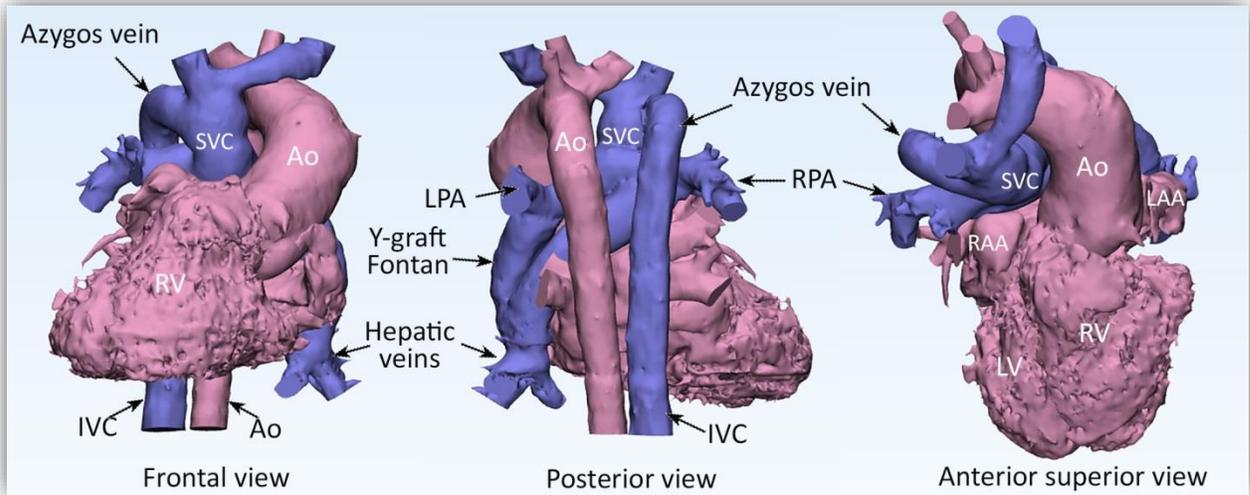
❖ Source images: Contrast-enhanced MR angiograms obtained in end-systole (SickKids, Toronto)



- ♥ Situs solitus / levocardia / left aortic arch
- ♥ Right ventricular hypoplasia with small stenotic tricuspid valve and perimembranous VSD (marked as “d” on the right-hand figure of the upper panel)
- ♥ Extracardiac Fontan pathway with a fenestration (marked as “f” in the lower panel figures).

CASE 10. Kawashima procedure with Y-graft Fontan in a patient with heterotaxy, left isomerism and interrupted inferior vena cave.

❖ Source images: Contrast-enhanced non-ECG gated CT angiograms (SickKids, Toronto)



- ♥ Heterotaxy with left isomerism / dextrocardia / left aortic arch
- ♥ Atrioventricular septal defect with unbalanced ventricular size. Right ventricle located anteriorly and leftward in relation to left ventricle (left-hand topology or L-loop ventricles).
- ♥ Aorta from right ventricle.
- ♥ Interrupted inferior vena cava with azygos continuation to right-sided superior vena cava.
- ♥ Superior vena cava surgically connected to confluent pulmonary artery (Kawashima procedure)
- ♥ Extracardiac Y-graft Fontan along the left-aided atrial border.