Case 10

Diagnosis of a Complex Pediatric CHD using ECG-Triggered Adaptive Sequential Cardiac CT

By Guilin Bu, MD and Ying Miao, MD

Department of Radiology, Guangxi Nanxi Shan Hospital, Guangxi, P.R. China

History

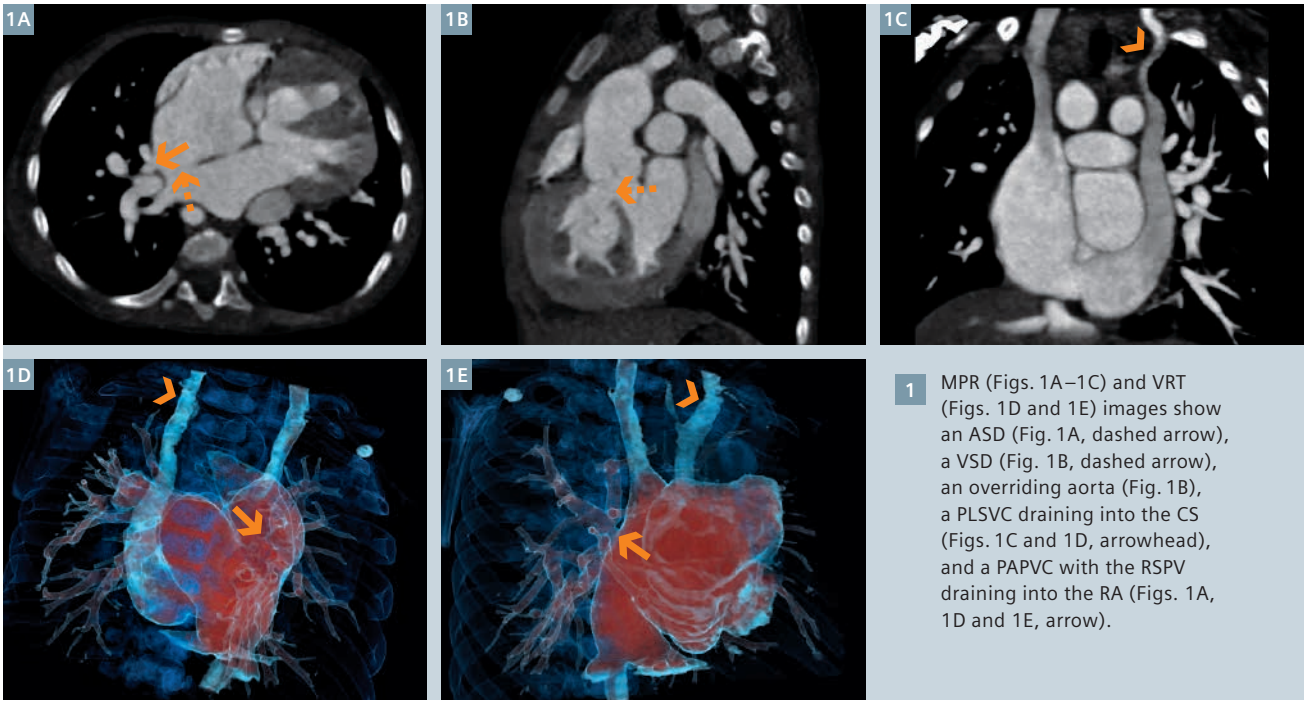
A heart murmur was detected in an 18-month-old girl six months ago. An echocardiography revealed an atrial septal defect (ASD), a ventricular septal defect (VSD), an overriding aorta, a persistent left superior vena cava (PLSVC), an anomalous pulmonary venous connection (APVC), and pulmonary hypertension. A cardiac CT examination was requested to specify the diagnosis and type of APVC as well as to demonstrate the complex anatomical structures of the heart.

Diagnosis

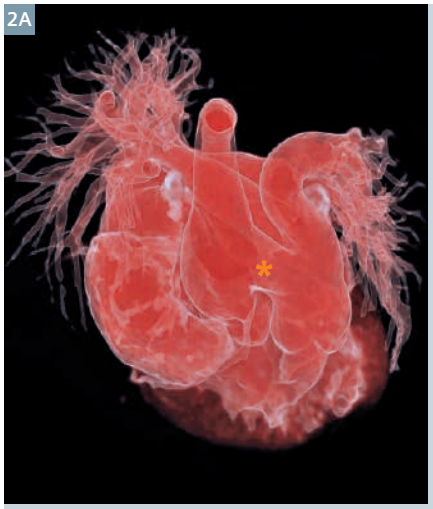
CT images confirmed the echocardiography findings of an ASD, a VSD, an overriding aorta, and a PLSVC draining into the coronary sinus (CS) and then into the right atrium (RA). A partial anomalous pulmonary venous connection (PAPVC) was specified by showing the right superior pulmonary veins (RSPV) connected with the RA. Additionally, a main pulmonary window, a right aortic arch which caused a tracheal stenosis, an anomalous origin of the coronary arteries, and a pig bronchus (i.e. the right superior bronchus is originated directly from the supracarinal trachea) were seen.

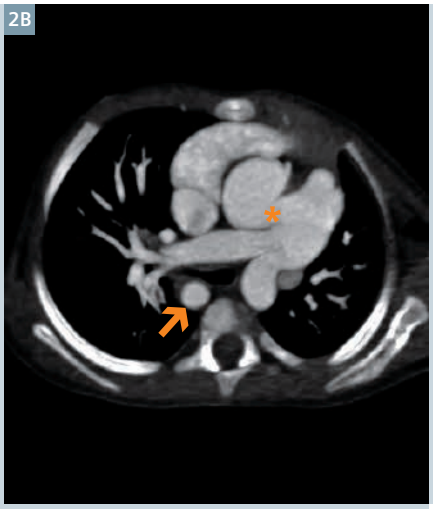
Comments

PAPVC is the condition when one or more, but not all four, pulmonary veins are connected to the right atrium or systemic veins. Corrective surgery has positively changed the outlook for this group of patients and is the only definitive way of management. Surgical approach and techniques differ as per types of anomalous venous connections and also associated cardiac anomalies. Missing these anomalous veins before surgery is hazardous. In this case, cardiac CT examinations not only specified the diagnosis of a PAPVC, confirming the other associated cardiac anomalies shown by echocardiography, but also allowed visualization of the findings such as a main pulmonary window, a right aortic arch which caused a tracheal stenosis, an anomalous origin of the coronary arteries, and a pig bronchus which had been missed by echocardiography. Taking into consideration the higher heart rate (117–125 bpm) and lower dose necessary for the child, an ECG-triggered adaptive sequential cardiac scan was performed in the systolic phase, which resulted in excellent image quality with only 0.91 mSv effective dose and 15 mL contrast media. ■



1 MPR (Figs. 1A–1C) and VRT (Figs. 1D and 1E) images show an ASD (Fig. 1A, dashed arrow), a VSD (Fig. 1B, dashed arrow), an overriding aorta (Fig. 1B), a PLSVC draining into the CS (Figs. 1C and 1D, arrowhead), and a PAPVC with the RSPV draining into the RA (Figs. 1A, 1D and 1E, arrow).





2

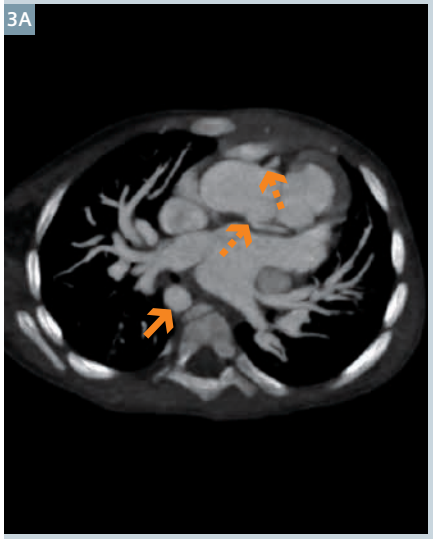
VRT (Fig. 2A) and MPR (Fig. 2B) images show a main pulmonary window (asterisks) and a right aortic arch (Fig. 2B, arrow).

3

MPR images show an anomalous origin of the coronary arteries (dashed arrows), and a right aortic arch (Fig. 3A, arrow).

4

VRT images show a pig bronchus (dashed arrow) and a tracheal stenosis caused by a right aortic arch (Fig. 4B).



Examination Protocol

Scanner	SOMATOM Definition AS+
Scan area	Thorax
Scan mode	ECG triggered adaptive sequential scan
Scan length	171.5 mm
Scan direction	Cranio-caudal
Scan time	6 s
Tube voltage	80 kV
Tube current	70 mAs
$CTDI_{vol}$	0.83 mGy
DLP	14 mGy cm
Effective dose	0.91 mSv
Rotation time	0.3 s
Slice collimation	128 × 0.6 mm
Slice width	0.75 mm
Reconstruction increment	0.5 mm
Reconstruction kernel	B26f
Temporal resolution	150 ms
Heart rate	117–125 bpm
Contrast	350 mg / mL
Volume	15 mL
Flow rate	1.3 mL / s
Start delay	21 s