

# Ring of Vieussens: a collateral coronary pathway on electrocardiography-gated 320-row CT in a 10-week-old boy with the anomalous left coronary artery from the pulmonary artery

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A 10-week-old boy was admitted with symptoms and signs of heart failure and suspicion of dilated cardiomyopathy. On electrocardiogram (ECG), myocardial ischemia was present: ST-T elevation in leads II, III, aVF, V<sub>5</sub> through V<sub>6</sub> (arrows in **FIGURE 1A** and **1B**); deep Q waves in leads I, II, V<sub>6</sub>; and abnormal positive T wave in leads V<sub>1</sub> through V<sub>4</sub>. Echocardiography revealed left ventricular (LV) enlargement, decreased LV ejection fraction (10%–16%) and mitral valve regurgitation. The left coronary artery (LCA) origin was not visible and retrograde flow was recorded in the pulmonary artery (PA). Pathological flow in coronary collaterals was visualized in the interventricular septum.

The modality chosen for cardiac imaging including coronary arteries depends on the age of the patient and local capabilities.<sup>1</sup> Echocardiography remains the first-line modality in pediatric cardiac imaging with growing evidence in anatomical and functional cardiac assessment.<sup>2</sup> The diagnosis of anomalous left coronary artery from the pulmonary artery can be made by echocardiography alone,<sup>3</sup> but in the majority of centers, objective invasive angiography or computed tomography (CT) angiography would be required.

Our patient underwent volumetric, 320-row CT (Aquilion One; Canon Medical Systems) with prospective, end-systolic ECG-gating, without sedation and while free-breathing after the administration of 10 ml of iso-osmolal, iodine contrast medium with flow rate of 1.5 ml/s through

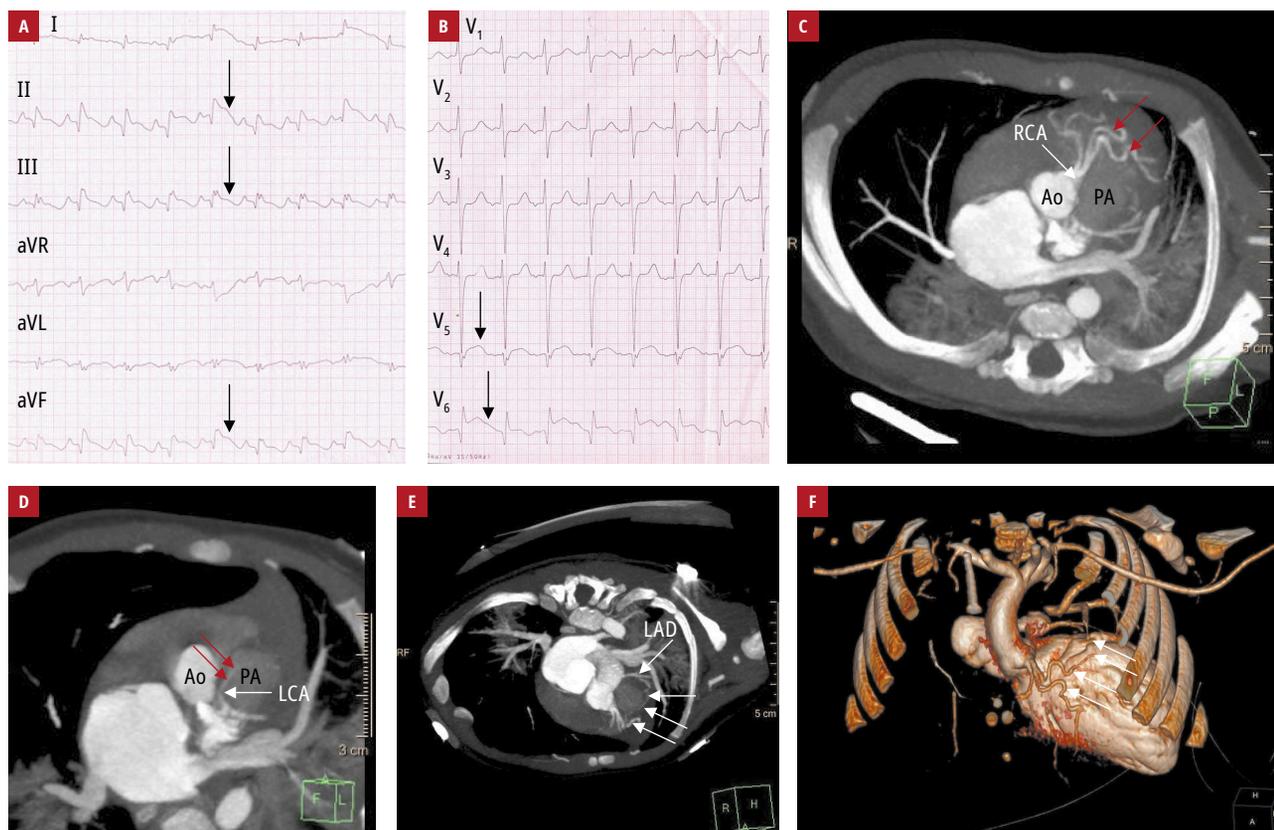
22G intravenous catheter inserted in the lower extremity vein. His weight was 5.3 kg and heart rate was 150 bpm. Radiofrequency dose index, DLP (dose-length product), calculated for a body phantom was 22.8 mGy × cm. The right coronary artery (RCA) arose typically from the right sinus of the aorta (**FIGURE 1C**), while the LCA from the medial wall of the PA (**FIGURE 1D**). Retrograde flow from the LCA to the PA was observed (red arrows in **FIGURE 1D**) through arterial ring of Vieussens, collateral pathway between prominent branches of the conal artery and proximal branches of the left anterior descending artery (arrows in **FIGURE 1C**, **1E**, and **1F**).

Patient underwent successful reimplantation of the LCA. During 1-year follow-up, he remains stable on medications, normalization of LV parameters was seen 4 months after surgery.

Infant type of the anomalous left coronary artery from the pulmonary artery is a well known pediatric cardiac emergency and requires prompt diagnosis and treatment. Recent years have brought the possibility of a routine use of advanced CT technology also in pediatric patients with faster heart rate who are free-breathing and nonsedated with acceptable radiation doses. Computed tomography allows for precise preoperative evaluation of not only the ostia but also distal coronary branches and its relations even in severely ill infants. In our patient, it was possible to clearly identify collateral vessels of millimeter diameters, supplying

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Received: April 16, 2020.

Revision accepted: April 21, 2020.  
Published online: April 28, 2020.  
Kardiologia Pol. 2020; 78 (6): 603-604  
doi:10.33963/KP.15317  
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**FIGURE 1** **A, B** – electrocardiographic ischemic changes: ST-T elevation in leads: II, III, aVF, V<sub>5</sub> through V<sub>6</sub> (arrows), deep Q waves in leads I, II, V<sub>6</sub> and abnormal positive T wave in leads V<sub>1</sub> through V<sub>4</sub>; **C** – maximum intensity projection image, transverse oblique plane: typical orifice of the right coronary artery (RCA; arrow) from the right sinus of the aorta (Ao) and prominent branches of the conus artery (red arrows); **D** – maximum intensity projection image in the transverse oblique plane: the orifice of the left coronary artery (LCA) from the medial wall of the pulmonary artery (PA; arrow), retrograde flow from the left coronary artery to the pulmonary artery (red arrows); **E, F** – maximum intensity projection image, view from above (2C) and volume rendered image, anterior view (2D): arterial ring of Vieussens (arrows), collateral pathway between prominent branches of the conal artery and proximal branches of the left anterior descending artery (LAD)

the LCA from the RCA. They form arterial circle of Vieussens, a peritruncal embryologic remnant that becomes clinically significant also in adult patients with severe LCA stenosis.<sup>4</sup>

## ARTICLE INFORMATION

**CONFLICT OF INTEREST** None declared.

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**HOW TO CITE** Roik D, Kucińska B, Roik M, Werner B. Ring of Vieussens: a collateral coronary pathway on electrocardiography-gated 320-row CT in a 10-week-old boy with the anomalous left coronary artery from the pulmonary artery. *Kardiol Pol.* 2020; 78: 603-604. doi:10.33963/KP.15317

## REFERENCES

- 1 Han BK, Rigby CK, Hlavacek A, et al. Computed tomography imaging in patients with congenital heart disease Part 1: rationale and utility. An expert consensus document of the Society of Cardiovascular Computed Tomography (SCCT): endorsed by the Society of Pediatric Radiology (SPR) and the North American Society of Cardiac Imaging (NASCI). *J Cardiovasc Comput Tomogr.* 2015; 9: 475-492.
- 2 Kamińska H, Werner B. Three-dimensional echocardiography in the assessment of ventricular function in children pros, cons and hopes. *Kardiol Pol.* 2019; 77: 12-17.
- 3 Thatte N, Kirakosian M, Kaza A, Friedman K. Echocardiographic diagnosis of anomalous single coronary artery from the pulmonary artery: use of bubble contrast echocardiography. *Pediatr Cardiol.* 2020; 4: 215-216.
- 4 Klein LW, Campos EP. The embryologic origin of Vieussens' ring. *J Invasive Cardiol.* 2019; 31: 49-51.