Right-Sided Origin of the Left Main Coronary Artery

Typical Variants and Their Visualization by Cardiac Computerized Tomography

Dieter Ropers, MD, FACC,* David Chew Soon Ping, MD,† Stephan Achenbach, MD, FACC*

CORONARY ARTERY ANOMALIES occur in approximately 1% to 2% of the population. In the majority of cases, they lack hemodynamic significance (1). A course of the left anterior descending or left main coronary artery between the aorta and pulmonary artery has been associated with ischemic events and sudden death, whereas other anomalies with a right-sided origin (and, by many experts, origin of the right coronary artery from the left sinus of valsalva with passage between the aorta and pulmonary artery) are considered to be harmless (1,2). Cardiac computerized tomography (CT) generates high-resolution 3-dimensional data sets of the heart and the coronary arteries. Thus, it permits exact and straightforward classification of the origin and course of anomalous coronary arteries.

We present coronary CT angiography of 4 variants of anomalous left main coronary arteries arising from the right sinus of valsalva, a coronary anomaly found in 0.0024% to 0.02% of the population (3). Whereas the “interarterial” course of the anomalous vessel, between the aorta and pulmonary artery, is a malignant variant, the pre-pulmonary and retroaortic course and especially a subpulmonary course—which in coronary angiography may have very similar appearance to the interarterial course—are considered to be benign (Figs. 1 to 4).

From the *Department of Internal Medicine 2 (Cardiology), University of Erlangen, Erlangen, Germany; and the †National Heart Institute, Kuala Lumpur, Malaysia.

Address for correspondence: Dr. Dieter Ropers, Medizinische Klinik 2, Universitätsklinikum Erlangen, Ulmenweg 18, 91054 Erlangen, Germany. E-mail: dieter.ropers@uk-erlangen.de.

REFERENCES
Figure 1. Anterior or Pre-Pulmonic Course of a Right-Sided Left Main Coronary Artery (50-Year-Old Woman)

(A) Transaxial cross-section demonstrating the origin of the left main coronary artery (small arrows) from the proximal right coronary artery (large arrow). (B) Curved multiplanar reconstruction demonstrating the course of the left main coronary artery anterior to the pulmonary artery. (C) Maximum-intensity projection demonstrating the bifurcation of the left main coronary artery into the left anterior descending coronary artery (large arrow) and the left circumflex coronary artery (small arrows). (D) Three-dimensional reconstruction (volume-rendering technique) visualizing the course of the left main coronary artery anterior to the pulmonary artery and its division into the left anterior descending and left circumflex coronary artery. (E) Invasive angiogram (left anterior oblique cranial projection). The large arrow indicates the right coronary artery, and the small arrows indicate the anomalous left main coronary artery. Ao = ascending aorta; LV = left ventricle; PA = pulmonary artery.

Figure 2. Interarterial Course (41-Year-Old Man)

(A) Transaxial cross-section demonstrating the origin of the left main coronary artery from the right sinus of valsalva. The vessel follows a course between the aorta and pulmonary artery. (B) Curved multiplanar reconstruction demonstrating the course of the left main coronary artery between the aorta and pulmonary artery. Inset: sagittal reconstruction demonstrating the position of the vessel between the aorta and pulmonary artery; the arrow points to the cross-section of the left main coronary artery. (C) Maximum-intensity projection demonstrating the bifurcation of the left main coronary artery into the left anterior descending (large arrow) and left circumflex coronary artery (small arrows). (D) Three-dimensional reconstruction demonstrating the course of the left main coronary artery between the ascending aorta and pulmonary artery. (E) Invasive angiogram (left anterior oblique cranial projection). The large arrow indicates the right coronary artery, and the small arrows indicate the anomalous left main coronary artery. Abbreviations as in Figure 1.
Figure 3. Subpulmonary Course of a Right-Sided Left Main Coronary Artery (60-Year-Old Man)

In contrast to the interarterial course, this anomaly is considered to be benign. (A) Transaxial cross-section demonstrating the origin of the left main coronary artery (small arrows) from a common ostium with the right coronary artery (large arrow). (B) Curved multiplanar reconstruction demonstrating the course of the left main coronary artery through the septum and below the pulmonary artery. Inset: sagittal multiplanar reconstruction showing a cross-section of the left main coronary artery; the vessel is completely embedded in the septum. (C) Maximum-intensity projection demonstrating the bifurcation of the left main coronary artery into the left anterior descending (large arrow) and left circumflex coronary artery (small arrows). (D) Three-dimensional reconstruction visualizing the left main coronary artery surfacing from the septum in the anterior interventricular groove. (E) Invasive angiogram (left anterior oblique cranial projection). The large arrow indicates the right coronary artery, and the small arrows indicate the anomalous left main coronary artery. Abbreviations as in Figure 1.

Figure 4. Posterior or Retroaortic Course (61-Year-Old Man)

(A) Transaxial cross-section demonstrating cross-sections of the left main coronary artery (small arrows) which originates from the right coronary ostium and passes below and posterior to the aortic root (large arrow = right coronary artery). (B) Curved multiplanar reconstruction of the left main coronary artery, demonstrating its course below and posterior to the aortic root (small arrows = left main coronary artery; large arrow = right coronary artery). (C) Maximum-intensity projection demonstrating the bifurcation of the left main coronary artery into the left anterior descending artery (large arrow) and left circumflex coronary artery (small arrow). (D) Three-dimensional reconstruction demonstrating the course of the left main stem posterior to the ascending aorta. (E) Invasive angiogram (left anterior oblique cranial projection). The large arrow indicates the right coronary artery, and the small arrows indicate the anomalous left main coronary artery. Ao = ascending aorta; LA = left atrium.