Anomalous Origin of the Right Coronary Artery From the Left Sinus of Valsalva in an Elderly Man
Life-Threatening Worsening of Angina After Left Lung Lobectomy

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A 77-year-old man underwent left lower-lung lobectomy for lung cancer in August 2009. He was free of angina before surgery. He presented to our hospital with exertional chest pain in September 2010. Exercise stress ECG revealed ST-segment depression in leads II, III, aVF, V5, and V6 with chest pain (Figure 1). Computed tomographic coronary angiography revealed a severe stenosis at the right coronary artery (RCA) ostium without atherosclerotic plaque that originated from the left sinus of Valsalva and coursed between the aortic root and the pulmonary artery (Figure 2). Compared with the prelobectomy chest computed tomography, the pulmonary artery was larger than before surgery (Figure 3). Estimated right ventricular systolic pressure measured by Doppler echocardiography was also higher than before surgery (32 versus 23 mm Hg). We thought that his worsening angina might be caused by extrinsic mechanical compression of the RCA between the aortic root and the dilated pulmonary artery after the left lower-lung lobectomy. Coronary artery angiography revealed an RCA with an anomalous origin from the left sinus of Valsalva and a severe stenosis of the RCA ostium (Figure 4 and Movies I and II in the online-only Data Supplement). Intravascular ultrasound findings showed a functionally stenotic slit-like coronary lumen resulting from compression between the pulmonary artery and aortic wall (Figure 5 and Movie III in the online-only Data Supplement). After intravascular ultrasound, fractional flow reserve was determined with a 0.014-in sensor-tipped high-fidelity pressure wire (RADI Medical, Uppsala, Sweden). Fractional flow reserve was 0.41 after intracoronary administration of adenosine 30 μg in the RCA. We decided to schedule coronary artery bypass grafting of the RCA. One week after coronary artery angiography, the patient complained of chest pain with decreased systolic blood pressure of 60 mm Hg and a heart rate of 23 bpm with atrial fibrillation (Figure 6). Emergent coronary artery bypass grafting was performed using a saphenous vein graft from the aorta to the midportion of the RCA (Figure 7). After coronary artery bypass grafting, he was free of angina, and an exercise stress ECG 1 year later was normal.

Anomalous origin of the RCA from the left sinus of Valsalva, which can potentially cause myocardial ischemia and sudden...
death in older children and young adults, is a rare congenital anomaly with an incidence of ≈0.5%. The mechanism of myocardial ischemia and sudden death in these patients is not fully understood, but several mechanisms have been proposed: (1) compression of the RCA between the aorta and pulmonary artery, accentuated by exercise-related expansion of the pulmonary artery; (2) intermittent flap closure of the functionally stenotic slit-like coronary arterial orifice; (3) compression of the intramural segment of the proximal coronary artery by the aortic commissure or aortic wall; and (4) spasm of the coronary artery as a result of endothelial injury. In the present case, chest symptoms had not occurred before the lung surgery. Lung lobectomy caused a decrease in the pulmonary vascular bed and elevation of pulmonary vascular resistance that resulted in elevation of right ventricular pressure and pulmonary artery dilatation. Pulmonary artery dilatation might have been responsible for worsening of the RCA compression between the pulmonary artery and aortic root.

This is the first report, to the best of our knowledge, of a life-threatening anomalous origin of the RCA from the left sinus of Valsalva in an elderly patient with gradual worsening of angina after lung surgery. Careful attention should be paid to anomalous coronary artery origins in patients undergoing lung surgery.

Disclosures
None.

References

Figure 2. Computed tomography coronary angiography images. A, Volume-rendering image and (B) curved multiplanar reformatted image showing the right coronary artery (yellow arrow) originating from the left sinus of Valsalva and coursing between the aorta (Ao) and pulmonary artery (PA). RV indicates right ventricle; RA, right atrium.

Figure 3. A, Pulmonary artery (PA) size measured by chest computed tomography obtained before the lung lobectomy was 31×39 mm. B, Computed tomography coronary angiography obtained during worsening of the angina revealed an enlarged pulmonary artery of 32×48 mm. AO indicates aorta. White arrow indicates the right coronary artery.
Figure 4. Coronary artery angiography showed a severe stenosis of the right coronary artery ostium (white arrow). A, Right anterior oblique (RAO) 30° view; B, RAO 30°, cranial (CRA) 30° view.

Figure 5. Left, coronary artery angiography A through D indicate the locations of intravascular ultrasound cross-sectional images in the right coronary artery. A through D, A functionally stenotic slit-like coronary lumen compressed between the pulmonary artery (PA) and aortic (Ao) wall was observed.
Figure 6. ECG revealed bradycardic atrial fibrillation with ST-segment depression in leads V₅ and V₆.

Figure 7. Computed tomography coronary angiography images after coronary artery bypass grafting. A, Volume-rendering image shows the saphenous vein graft (white arrow) to the midportion of the right coronary artery. B, The right coronary artery (yellow arrow) originating from the left sinus of Valsalva and coursing between the aorta (Ao) and pulmonary artery (PA). RV indicates right ventricle.
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