A 55-year-old man had presented with progressive dyspnea and chest pain on exertion. The patient underwent a treadmill stress echocardiogram which reproduced his symptoms. However, no regional wall motion abnormalities were documented and the stress test was read as negative. He had achieved 10.0 METs on the Bruce protocol (double product 25988) and had a resting ejection fraction of 62% that improved to 80% with stress. Despite medical optimization with β blockade and long acting nitrates, the patient continued to have significant symptomatology while engaged in activities of daily living. He was referred for coronary angiography because of ongoing angina.

Angiography revealed that the left main coronary artery had a 70% stenosis and led to a diminutive left circumflex and ramus intermedius arteries. There was an arterial connection bridging from the ramus intermedius connecting to an anomalous left anterior descending artery (LAD) which filled both anterograde and retrograde (Figure 1). The ostium of the LAD could not be initially located despite extensive effort. To further characterize the coronary anatomy for planning revascularization, a contrast-enhanced CT coronary angiogram with 3-dimensional reconstruction was obtained (Movie I in the online-only Data Supplement). This confirmed the origin of the LAD from the right aortic sinus and ruled out an aortic intramural component or slit-like orifice. This artery coursed behind the right ventricular outflow tract and in the interventricular septum before reaching its perfusion territory (Figure 2).

Coronary angiography was subsequently used to reconfirm full patency of the LAD before assessing the LM stenosis with intravascular ultrasound (Movie II in the online-only Data Supplement) and fractional flow reserve. Despite the presence of collateral flow from the anomalous LAD, the fractional

**Figure 1.** Angiographic evaluation reveals an anomalous left anterior descending artery (LAD) arising from the right sinus of Valsalva. Retrograde filling of the LAD with dye injected into the left main coronary artery identifies communication via the ramus intermedius (upper left); this was corroborated with contrast instillment into the LAD (lower left). Faint right coronary artery (RCA) filling could be detected with retrograde filling and ostial LAD spillover into the right sinus.

**Figure 2.** CT coronary angiography delineates anatomic course of the anomalous left anterior descending artery (LAD). Left main coronary artery with stenosis (arrow) giving rise to the left circumflex (upper left). LAD arising from the right sinus (upper middle). Dominant right coronary artery (RCA) with typical anatomic course (upper right). Three-dimensional reconstruction highlights the course of the anomalous LAD (lower panels, see also Movie I in the online-only Data Supplement). LCx indicates left circumflex artery.
flow reserve of the left main coronary artery was 0.82. Intravascular ultrasound revealed minimal luminal diameter of 1.6 mm and a minimal luminal area of 2.4 mm. The diameter stenosis was estimated to be 72% (Figure 3, upper left and inset). A Xience 3- × 15-mm drug eluting stent was successfully deployed in the left main coronary artery (Figure 3, Movie III in the online-only Data Supplement) with complete resolution of his symptoms.

Coronary artery anomalies are rare, occurring in 0.6% to 1.3% of all patients undergoing coronary angiography, with men affected more frequently than females. A LAD originating from either the proximal right coronary artery or the right sinus of Valsalva occurs in 1% to 6% of all detected coronary anomalies, which equates to an angiographic prevalence of 1 in 10000. Though the main driving force for PCI was ongoing angina, patients with left sided coronary artery arising from the right cusp have a 14:1 increased risk of sudden cardiac death when compared with those with right sided coronaries from the left cusp. Furthermore, correlation between exertion and sudden death is documented in this population. This patient was symptomatic, had a job that demanded significant exertion, and an LAD coming off of the right cusp. Thus it was felt that in addition to symptomatic benefit, his risk for sudden death would be reduced with correction of the left main lesion.

To our knowledge, this is the first report of an anomalous LAD originating from the right sinus with persistent communication with the native left main system via an arterial bridge connection to the ramus intermedius.

Disclosures
None.

References
Persistent Angina Uncovers Unusual Communication Between the Left Anterior Descending and Circumflex Arteries

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Circulation. 2013;127:2465-2466
doi: 10.1161/CIRCULATIONAHA.112.135111

The online version of this article, along with updated information and services, is located on the World Wide Web at:
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