A 53-year-old man presented to our hospital with acute coronary syndrome and underwent uncomplicated cardiac catheterization with percutaneous coronary intervention. As part of an institutional research protocol for evaluation of the recently placed left circumflex stent, he underwent coronary CT angiography with ECG-gated, contrast-enhanced, 64-slice multidetector CT (Sensation Cardiac 64, Siemens Medical Solutions, Forchheim, Germany). An incidental note of an unroofed coronary sinus (CS) was made on the coronary CT angiogram (Figure 1A through 1D). The defect size measured by CT was 2.1×0.4 cm, and its distance from the CS ostium was 2.1 cm. In addition to its normal connection to the right atrium, the CS had a direct connection with the left atrium (LA) as noted by the contrast shunting from the LA into the CS and subsequently into the right atrium (Figure 1D). No other congenital anomalies, including persistent left superior vena cava (LSVC), were identified on the CT. Clinically, the patient had no prior history of strokes, hypoxia, or heart failure symptoms. His 12-lead surface ECG (Figure 2) showed normal sinus rhythm without evidence of...
chamber enlargement. The chest topogram from the CT (Figure 3) revealed clear lungs with normal heart size. His transthoracic echocardiogram (Movie 1) showed mild LA enlargement (AP diameter of 4.0 cm), with the other chambers being normal in size; normal biventricular function; and no significant valvular disease. The CS in the parasternal long-axis view (Figure 4) was mildly dilated, measuring 1.4 \times 1.0 \text{ cm}. However, agitated saline study, injected into the left upper extremity with provocative maneuvers, did not show bubbles in the CS or the left cardiac chambers that would suggest either the presence of a persistent LSVC or a right-to-left shunt (Movie 2).

Unroofed CS is a rare congenital cardiac anomaly in which there is partial (either focal or fenestrated) or complete absence of the roof of the CS, which results in a communication between the CS and the LA. Unroofed CS is the rarest type of atrial septal defect.\textsuperscript{1} It is often associated with persistent LSVC and other forms of complex congenital heart disease, usually heterotaxia syndromes. The morphological types have been classified into 4 groups: Type I, completely unroofed with persistent LSVC; type II, completely unroofed without persistent LSVC; type III, partially unroofed mid portion; and type IV, partially unroofed terminal portion (as illustrated in the present case). The fenestration into the LA typically occurs between the LA appendage and the left upper pulmonary vein. The size of the defect and the degree of left-to-right shunt generally determine the clinical presentation. The spectrum of symptoms may range from asymptomatic to nonspecific complaints to severe dyspnea with symptoms of overt right-sided heart failure from chronic right ventricular volume overload. The diagnosis should be considered in the evaluation of an unknown cardiac murmur, right-sided heart enlargement, transient cyanosis or hypoxia, or paradoxical embolism. Management is guided by the presence of clinical symptoms, with consideration of surgical repair when symptoms prevail.

Transthoracic echocardiography is the most widely used imaging modality for suspected unroofed CS, but it is limited in its ability to visualize the posterior cardiac structures, such as the CS and pulmonary veins. Transesophageal echocardiography and cardiac MRI can more accurately assess these posterior structures but were not indicated in this incidental case because of the patient’s lack of symptoms and thus were not performed. Multidetector CT with its excellent spatial resolution also allows for the visualization and accurate anatomic and morphological evaluation of the posterior structures of the heart. With the widespread use of cardiac CT
for coronary artery assessment, incidental findings of asymptomatic congenital heart disease are not a rare occurrence. Other non–coronary artery anatomic structures such as the coronary veins are easily visualized with gated cardiac CT, which is emerging as a potentially useful noninvasive imaging modality for evaluation of the coronary venous system.

A prior case report has documented indirect evidence of an unroofed CS with persistent LSVC (type I) on a conventional chest CT study. We herein report a rare case of an isolated unroofed CS (type IV, partially unroofed terminal portion without persistent LSVC) atrial septal defect that was diagnosed as an incidental finding on cardiac multidetector CT. Further hemodynamic evaluation with either Doppler analysis with transesophageal echocardiography or phase-contrast imaging with cardiac MRI to quantify the degree of intracardiac shunt is warranted if the patient develops symptoms of atrial septal defect physiology (ie, left-to-right shunting), shows signs of right-sided heart volume overload, or is being considered for surgical repair.

Disclosures
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