Abstract
Anomalous coronary artery from the opposite sinus is a rare congenital anomaly that can present with symptoms similar to coronary artery disease, and sudden cardiac death. Management of ACAOS varies; however, current guidelines suggest surgery in symptomatic patients.

Our case is a middle-aged male with a history of coronary artery disease and status post coronary artery bypass graft. He presented with complaints of vague chest pain. After a positive stress test, he was sent to the catheterization suite. Diagnosis of an anomalous right coronary artery from the left coronary sinus was made. The patient underwent surgical revascularization, and is awaiting follow-up with cardiology.

A timely diagnosis of an anomalous coronary artery is critical in symptomatic patients due to risk of sudden cardiac death, especially arteries with an interarterial course. This case demonstrates the importance of making the correct diagnosis, as appropriate surgical management can dramatically improve outcomes.

Introduction
The origin of a coronary artery from the opposite aortic sinus is a rare congenital abnormality that could potentially lead to cardiac ischemia or sudden cardiac arrest. Most commonly, these anomalies involve the left circumflex artery originating from a separate ostium in the right coronary sinus. Here we present a case of an anomalous right coronary artery originating from the left coronary sinus in a middle-aged patient who presented with atypical chest pain.

Case Report
O.G. is a 43-year-old male with a history of coronary artery disease, coronary artery bypass graft, hypertension, and hyperlipidemia, who presented to the emergency department with intermittent, sharp, atypical chest pain. His physical exam findings were negative and troponin was mildly elevated at 0.009.

After monitoring the patient overnight with ECG and serial cardiac enzymes, myocardial scintigraphy was performed, which showed signs of reversible ischemia in the inferolateral portion of the left ventricle (Figure 1). The patient was subsequently taken to the catheterization lab suite and left heart catheterization with coronary angiography was performed. Imaging revealed a single left sinus of Valsalva ostium that gave rise to the left coronary artery (LCA), which divided into the left anterior descending (LAD) and left circumflex (LCX) arteries. However, there was also an anomalous right coronary artery (RCA) that was originating from the proximal LCA (Figure 2). The RCA did not demonstrate any significant stenosis, nor was there any occlusion noted in the RCA during systole or diastole. No arteries were found arising from the right coronary cusp. A subsequent coronary computed tomography (CT) angiography scan was performed and demonstrated an interarterial pathway of the RCA as it took a course between the aortic root and pulmonary artery (Figure 3). In addition, a 3D CT was also performed, further confirming the anomalous origin of the RCA that was suggested by the initial imaging (Figure 4).

Based on these images and clinical findings, the decision for surgical revascularization was made. A coronary artery bypass graft was performed with anastomosis of the right internal mammary artery with the distal RCA, followed by ligation of the proximal RCA. The patient tolerated the procedure well without complications and was taken to the intensive care unit. He was subsequently discharged and is currently awaiting post-op follow-up with cardiology.

Discussion
Anomalous coronary artery from the opposite sinus (ACAOS) is a rare phenomenon with varying prevalence rates. In a separate study where echocardiogram was used for diagnosis, the prevalence rate of ACAOS was much lower at 0.17%. Clinical symptoms of ACAOS can present very similarly to symptoms of coronary artery disease, especially if the anomalous artery takes an interarterial course. The interarterial course associated with a right-sided ACAOS can be further classified as a high or low intervention course. When there is a high interarterial course of the right-sided ACAOS, it is postulated that the enlarged vessels mechanically compresses the RCA, effectively acting as an exercise-dependent form of stenosis.

Diagnosis of ACAOS is usually incidental as most patients are asymptomatic. In those who do present with symptoms, the most common ones are exertional syncope, chest pain, or palpitations. Coronary computed tomography angiography (CCTA) is a well-known imaging modality that has shown to be effective in diagnosing ACAOS and excluding other coronary anomalies with high accuracy, as well as being an accurate technique for distinguishing patients at high risk for adverse events. Ashrafpoor et al demonstrated in their study that there are specific CT-derived anatomical criteria that are associated with an increased risk for MACS such as unstable angina and MIs.

Due to the increased risk of sudden cardiac death, it is important to carefully consider treatment options in these patients. The ACC/AHA 2008 guidelines recommend surgery in patients with clinical adverse events or evidence of ischemia. In patients with either of those criteria, surgery is not the clear-cut choice. Our patient underwent bypass surgery and tolerated it with no complications.

In conclusion, while ACAOS is fairly rare, the potential risk of SCD and other adverse complications make accurate diagnosis and treating this condition crucial to maximizing patient outcomes. This case is a good representation of what current literature recommends in terms of appropriate work-up and treatment.

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Figure 1. Stress test showing reversible ischemia in inferolateral left ventricle.
Figure 2. Coronary angiography showing an anomalous right coronary artery (RCA) originating from the proximal LCA.
Figure 3. Coronary CT angiography showing interarterial course of anomalous RCA.
Figure 4. 3D computer tomography (CT) of anomalous RCA arising from proximal LCA.

References

Interarterial Course of Anomalous Right Coronary Artery: Pathophysiology, Diagnosis, and Treatment
George R. Wu OMS III, Aman Saini OMS III, James Gnecco OMS II, Imtiaz Ahmed MD, Charles Finch DO