

## CASE REPORT

# A Rare Case: Visualization of a Single Coronary Artery Originating from the Right Coronary Sinus Using Computed Tomography

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## Abstract

Coronary artery anomalies are detected in 0.3–1.3% of patients undergoing angiography and in 1% of autopsy examinations. The origin of the left main coronary artery from the right coronary sinus is a rare condition, accounting for 1–3% of all coronary artery anomalies. This case presents the presence of a left main coronary artery originating from a single ostium in the right coronary sinus and includes a review of the literature. A 47-year-old male patient presented with chest pain and palpitations. His symptoms, which appeared with exertion, had worsened in recent days. Computed tomography (CT) angiography revealed that a single coronary artery originating from a single ostium in the right coronary sinus bifurcated into two branches after a short course, and the left main coronary artery passed in front of the pulmonary trunk. Coronary artery anomalies usually do not present symptoms and are often incidentally detected during coronary angiography. The origin of the left main coronary artery from the right coronary sinus is rare. In our case, the coronary artery originating from a single ostium in the right coronary sinus bifurcated into two branches after a short course. CT angiography should be used for the accurate diagnosis of such anomalies.

**Keywords:** Case report; CT angiography; right coronary sinus; single coronary artery.

Coronary artery anomalies are detected in 0.3–1.3% of patients undergoing invasive coronary angiography and in approximately 1% of routine autopsy examinations [1]. Anomalous origin of the left main coronary artery from the right sinus of Valsalva is a very rare condition, accounting for 1–3% of all coronary artery anomalies [2,3]. Despite its rarity, the subsequent course of the left main coronary artery may lead to a wide spectrum of clinical outcomes, ranging from benign findings requiring no treatment to sudden death necessitating open-heart surgery. In this case report, we present a patient with a left main coronary artery originating from the right sinus of Valsalva and review the relevant literature.

## Case Report

Written informed consent was obtained from the patient for publication of this case report and the accompanying images. A 47-year-old man presented to the cardiology clinic with complaints of chest pain and palpitations. For the previous six months, he had experienced exertional chest pain and palpitations lasting approximately 5–10 minutes; these symptoms had worsened over the preceding ten days. The patient had no significant personal or family medical history.

On physical examination, blood pressure was 130/75 mmHg and the pulse rate was 74 beats per minute. Heart

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**Submitted Date:** 02.08.2024 **Revised Date:** 21.08.2025 **Accepted Date:** 24.09.2025

Haydarpaşa Numune Medical Journal

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sounds were regular, and no murmurs were detected. The electrocardiogram showed no abnormalities, and cardiac enzyme and troponin levels were within normal limits.

A 128-slice CT angiography study revealed a single coronary artery arising from a single ostium in the right coronary sinus. After a short course, the vessel bifurcated into two branches, with the left main coronary artery passing anterior to the pulmonary trunk, consistent with the prepulmonic type (SCA R-IIA according to the Lipton classification). A millimetric calcified plaque causing less than 25% luminal narrowing was observed along the prepulmonic course. The patient was discharged with medical therapy and follow-up recommendations.

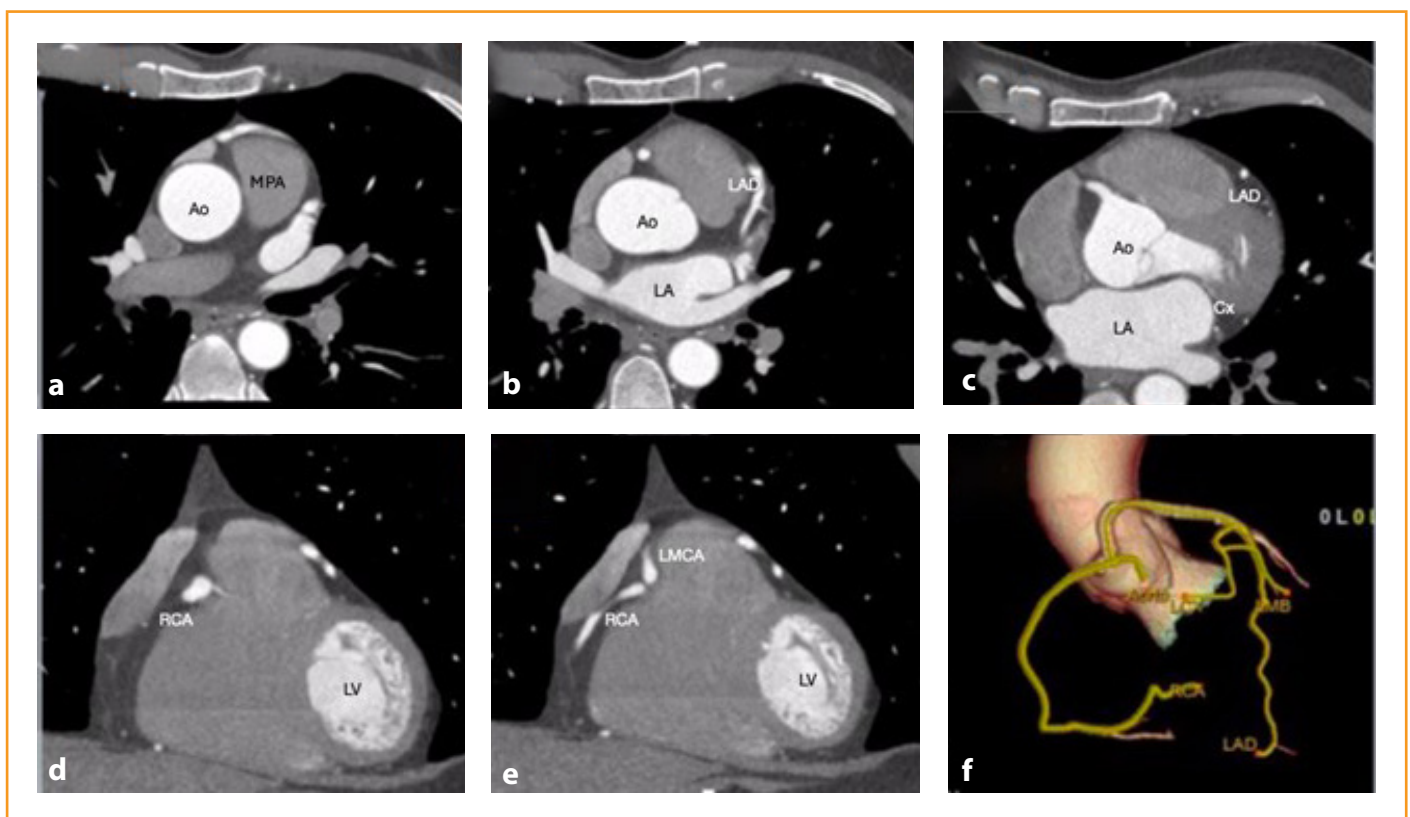
## Discussion

Most coronary artery anomalies are asymptomatic and are usually detected incidentally during coronary angiography [4]. The left main coronary artery originating from the right sinus of Valsalva is particularly uncommon [5]. In single coronary artery (SCA) anatomy, all coronary branches arise

from a single ostium and perfuse the entire myocardium [6,7]. The reported prevalence in the general population, as diagnosed by invasive coronary angiography, ranges from 0.024% to 0.066%. SCA is associated with other congenital heart diseases in approximately 40% of cases [8]. Because of variations in origin and course, several classification systems have been developed to facilitate anatomical identification [9].

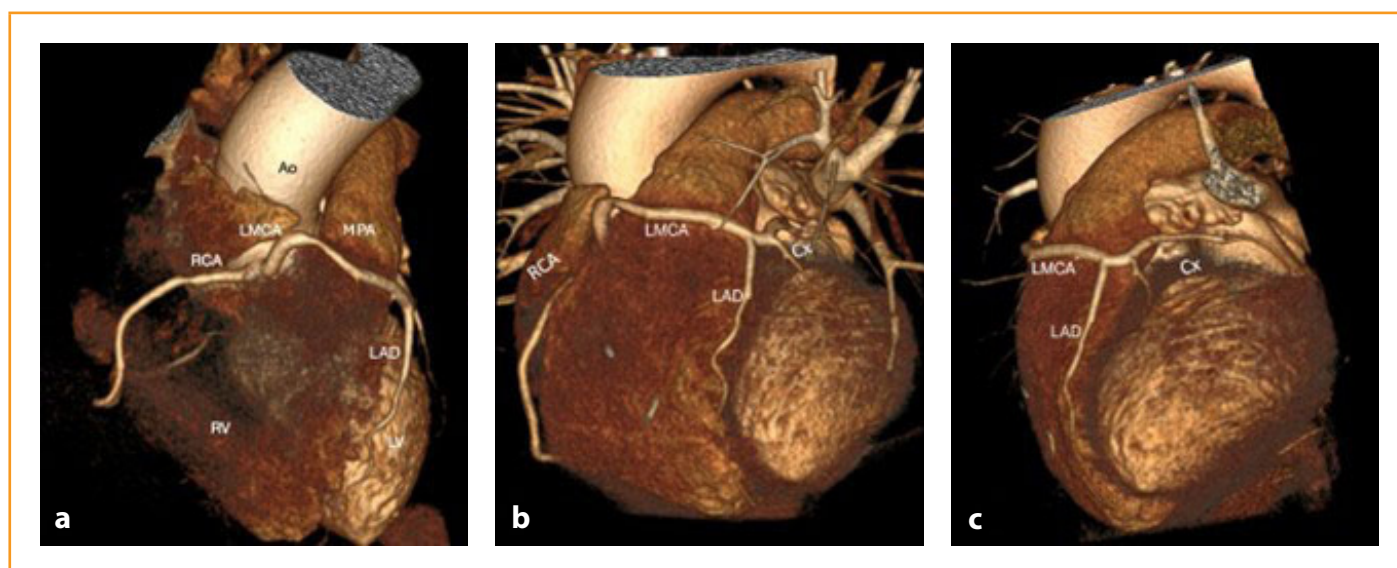
In 1979, Lipton proposed an SCA classification system based on the origin, branching pattern, and course of the coronary artery [7]. In 1990, Yamanaka and Hobbs modified this system to include a septal route [4]. SCAs originating from the anatomical right or left sinus are denoted by R and L, respectively, followed by the numerical category (I–III) describing the branching pattern. The posterior sinus origin is not included in the Lipton classification, and the system was not primarily developed for congenital heart disease with abnormally aligned great vessels [7].

In our patient, a single coronary artery arising from a single ostium in the right coronary sinus bifurcated after a



**Figure 1.** Axial (a, b, c) and coronal (d, e) CT images, and post-processing image (f) show a single coronary artery originating from a single ostium in the right coronary sinus (c and d), which bifurcates into two branches after a short course (e) and follows a prepulmonic route (a). This single coronary artery divides into two branches, with one following the interventricular groove (c) (LAD) and the other following the left atrioventricular groove (b) (LCx) (f).

Ao: Aorta; MPA: Main pulmonary artery; LAD: Left anterior descending; Cx: Circumflex; LA: Left atrium; LV: Left ventricle; RCA: Right coronary artery; LMCA: Left main coronary artery.



**Figure 2.** 3D volume rendering images of the left coronary artery originating from the right coronary cusp and following a prepulmonic course is shown.

Ao: Aorta; LV: Left ventricle; LMCA: Left main coronary artery; RV: Right ventricle; LAD: Left anterior descending; Cx: Circumflex, RCA: Right coronary artery; MPA: Main pulmonary artery.

short course. One branch, the right coronary artery (RCA), extended along the right atrioventricular groove and gave rise to the posterior descending artery in the interventricular groove. The posterolateral branch also originated from this artery. The other branch followed a prepulmonic course and divided into two vessels: the left anterior descending artery (LAD) in the interventricular groove and the circumflex artery (Cx) in the left atrioventricular groove (Figs. 1 and 2). In addition, a millimetric calcified plaque causing less than 25% narrowing was observed along the prepulmonic segment.

In recent years, invasive angiography has traditionally been considered the gold standard for evaluating coronary artery anomalies. However, because two-dimensional imaging limits accurate assessment of coronary artery course and because of advances in cross-sectional imaging techniques, invasive angiography is no longer the preferred first-line modality for this purpose<sup>[10,11]</sup>. Therefore, we performed 128-slice CT angiography to determine the exact anatomy in our patient. The examination demonstrated that the left main coronary artery originated from a single ostium in the right coronary sinus and coursed anterior to the pulmonary artery (prepulmonic).

When the left main coronary artery follows an interarterial course, mortality before age 20 is high, and death typically occurs after strenuous physical activity. During exercise, the artery may be compressed between the dilated aorta and pulmonary artery. Angina pectoris, acute myocardial infarction, syncope, and sudden death have all been reported due to compression of the left main coronary artery

between these two major vessels, particularly during exertion<sup>[5,8,10]</sup>.

Therefore, determining the course of a left main coronary artery arising from the right sinus of Valsalva is critical. Because conventional coronary angiography may lead to diagnostic errors owing to its two-dimensional nature, multislice CT angiography—a noninvasive modality—can accurately define the arterial course and help identify potentially fatal interarterial variants.

**Ethics Committee Approval:** This is a single case report, and therefore ethics committee approval was not required in accordance with institutional policies.

**Informed Consent:** The patient gave consent for the publication of identifiable details, which can include images and/or case history and/or details within the text to be published in the Journal. Written informed consent was obtained.

**Conflict of Interest:** The authors have no conflicts of interest to declare.

**Funding:** The authors declared that this study received no financial support.

**Use of AI for Writing Assistance:** No use of AI-assisted technologies was declared by the authors.

**Author Contributions:** Concept – A.B.Y.; Design – A.B.Y., M.H.; Supervision – M.H.; Resource – A.B.Y.; Materials – M.B., A.E.S.; Data Collection and/or Processing – M.B., A.E.S.; Analysis and/or Interpretation – M.B., A.E.S.; Literature Review – M.H., A.B.Y.; Writing – M.B., A.B.Y.; Critical Review – A.B., M.H.

**Peer-review:** Externally/Internally peer-reviewed.

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