CLINICAL CASE - TEST YOURSELF | Cardiac Imaging

An Uncommon Coronary Finding in a Chest Pain Patient

Muhammad Furhan Zamri[1], Soo Tze Hui[1], Jessica Hwang Zhen Shan[2]
[1] *Radiology Department, Universiti Putra Malaysia, Malaysia*
[2] *Cardiac Radiology Unit, Hospital Sultan Idris Shah Serdang, Malaysia*

SUBMISSION: 24/02/2026 | ACCEPTANCE: 02/06/2026

PART A

Clinical Presentation

A 58-year-old male, an active smoker presented to the hospital with chest discomfort and palpitations following alcohol consumption. His vital signs were stable, though physical examination was unremarkable. Laboratory investigations revealed a markedly elevated Troponin I level of 1852.1 ng/L. His electrocardiogram (ECG) showed a partial right bundle branch block. He was diagnosed with a non-ST elevation myocardial infarction (NSTEMI) and started on dual antiplatelet therapy and subcutaneous Fondaparinux. Coronary angiography (Fig 1) followed by multislice coronary CT angiogram (CCTA) (Fig 2 and 3) was performed to assess the extent of coronary artery disease in the next day. Based on the clinical presentation and imaging findings, the differential diagnosis includes both infectious and non-infectious conditions.

The combination of acute pain, raised inflammatory markers, and extensive bone marrow edema raises concern for osteomyelitis; however, the presence of focal low-signal material on all MRI sequences and the absence of aggressive features suggest an alternative diagnosis. Careful correlation with radiographic findings is essential.

KEY WORDS | Single coronary artery, Modified Lipton's classification, Rigatelli's Classification

CORRESPONDING AUTHOR, GUARANTOR
Soo Tze Hui, Radiology Department, Universiti Putra Malaysia, Malaysia.
Email: suzyhui88@upm.edu.my
Tel: +603-97692512

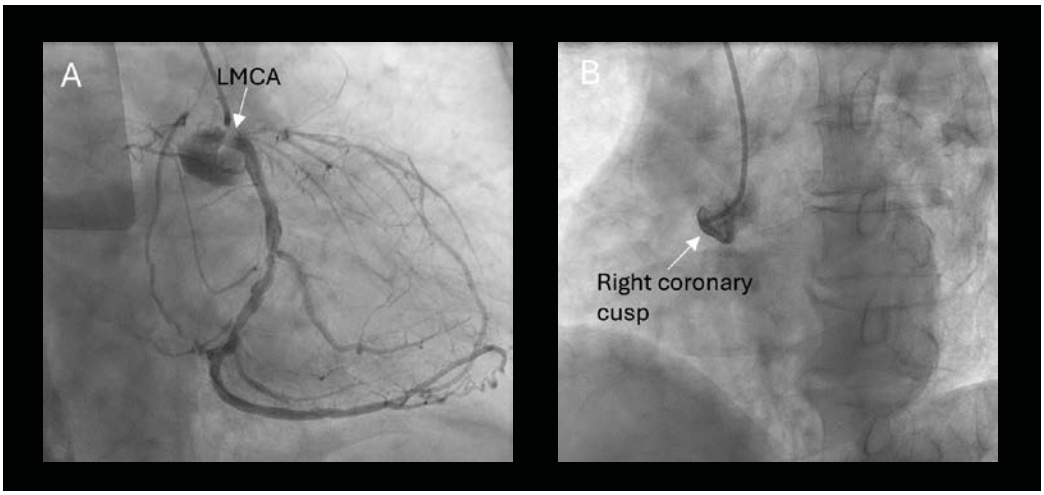

Figure 1: *Coronary angiography cannulating the left coronary ostium in the right anterior oblique view (Fig 1A) and right coronary cusp (Fig 1B).*

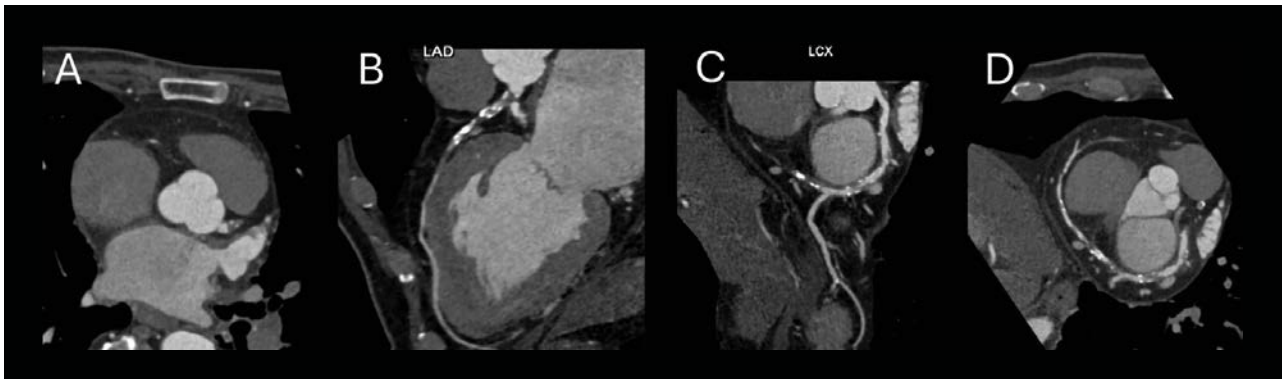

Figure 2: *Curved range radial multiplanar reformation (MPR) images obtained through Coronary CT angiogram at coronary sinus level (Fig 2A), LAD (Fig 2B), LCx (Fig 2C) and an artery courses through the crux of the heart.*

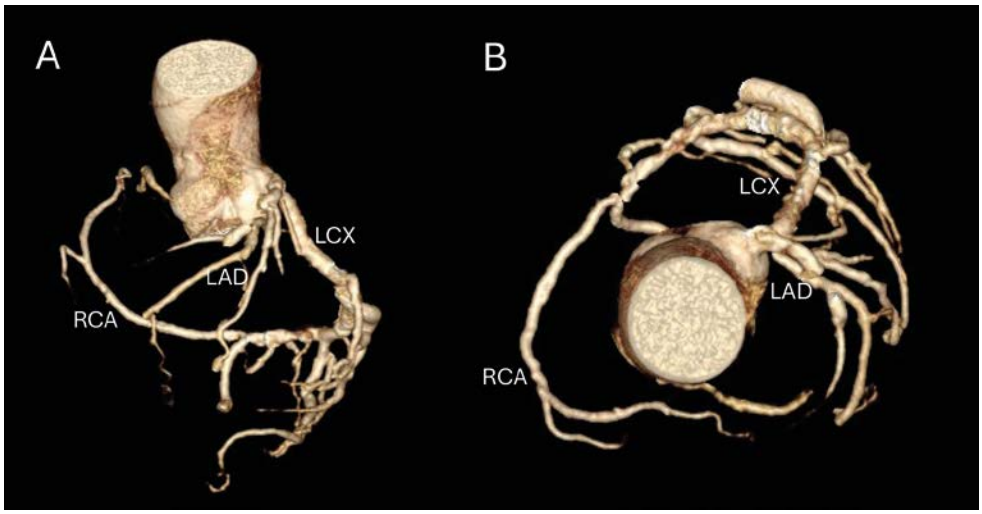

Figure 3: *A 3D volume-rendered image*

Part B

Diagnosis
Single Coronary Artery (SCA)
Modified Lipton Classification: L1 |Rigatelli's Class: IV

The right anterior oblique view from coronary angiography revealed total occlusion at the ostial-proximal segment of the left anterior descending (LAD) artery, along with severe stenosis at the mid-LAD. Interestingly, an anomalous right coronary artery (RCA) was observed originating from the proximal left circumflex (LCx) artery, which was also occluded at its proximal segment. No coronary artery was observed arising from the right coronary cusp. These angiographic findings highlighted not only the severe burden of coronary artery disease but also a rare coronary anomaly which further evaluate with a multislice coronary CT angiogram (CCTA).

The CCTA confirmed the anomalous origin of the RCA from the proximal LCx. Curved range radial multiplanar reformation (MPR) images demonstrated an isolated left main coronary artery (LMCA) originating from the left coronary cusp, which subsequently gave rise to both the LAD and a long, dominant LCx artery. Collateral vessels were found to supply the distal LAD. The coronary calcium score was notably high at 1005.8, indicating significant atherosclerotic involvement across the coronary vessels. No other associated congenital anomalies seen. The modified Lipton classification in this case is L1 with Rigatelli's class IV type. Considering the presence of a single coronary anomaly in conjunction with concurrent coronary artery disease, the patient undergone coronary artery bypass grafting successfully thereafter.

Discussion

Single coronary artery (SCA) is a rare congenital anomaly where a single coronary artery originates from a common ostium bifurcating into both right and left coronary arteries perfusing the entire heart. Large-scale coronary CT angiography (CCTA) studies report

Table 1: Rigatelli's classification of coronary artery anomalies

Class	Class Coronary Artery Anomaly
I. Benign	Ectopic origin of LCx from right sinus
	Separate origin of LCx and LAD
	Ectopic origin of LCx from the RCA
	Dual LAD types I-IV
	Myocardial bridge (score ≤ 5)
II. Relevant Related to myocardial ischemia	Coronary artery fistula
	Single coronary artery R-L, I-II-III, A-P
	Ectopic origin of LCA from PA
	Coronary artery atresia
	Hypoplastic coronary artery
III. Severe Potentially related to sudden death	Ectopic origin of LCA from the right sinus
	Ectopic origin of RCA from the left sinus
	Ectopic origin of RCA from the PA Single coronary artery R-L, I-II-III B
	Myocardial bridge (score ≥ 5)
IV. Critical Related to sudden death/myocardial ischemia and associated with superimposed CAD	Class II and superimposed CAD
	Class III and superimposed CAD

Abbreviation: CAD: coronary artery disease, LAD: left anterior descending coronary artery, LCx: left circumflex coronary artery, LCA: left coronary artery, PA: pulmonary artery, RCA: right coronary artery

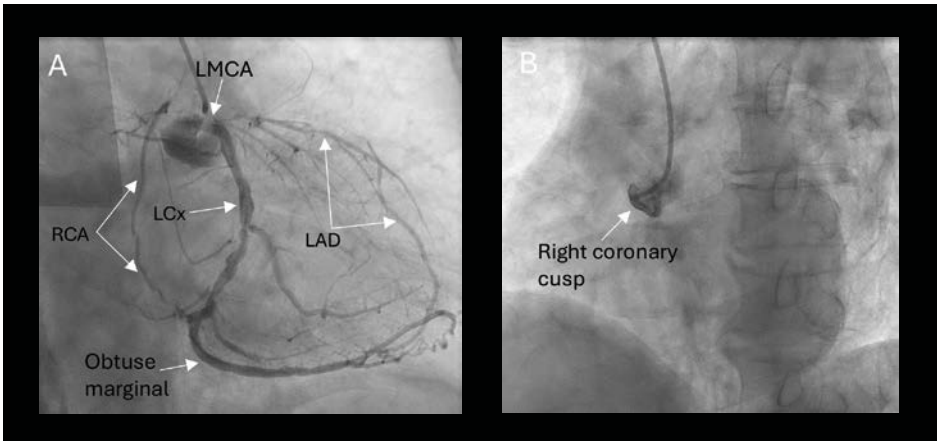

Figure 1: *Coronary angiography in the right anterior oblique view (Fig 1A) reveals total occlusion at the ostial-proximal segment of the LAD, along with severe stenosis at the mid-LAD. Varying degrees of stenosis are noted along the LCx artery. An anomalous RCA originates from the proximal LCx (Fig 1A) and is occluded at its proximal segment. No coronary artery is observed arising from the right coronary cusp (Fig 1B).*

Abbreviation: *LMCA: left main coronary artery, LAD: left anterior descending coronary artery, LCx: left circumflex coronary artery, RCA: right coronary artery*

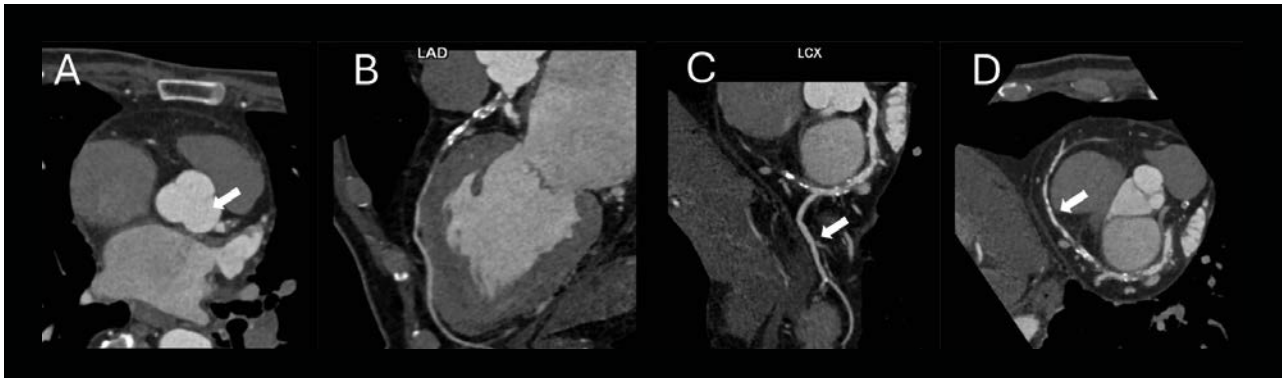

Figure 2: *Coronary CT angiogram images obtained through curved range radial multiplanar reformation (MPR) demonstrate an isolated LMCA originating from the left coronary cusp (arrow in Fig 2A). The LMCA gives rise to LAD (Fig 2B) and LCx artery (Fig 2C). The LCx (arrow in Fig 2C) is a long, dominant vessel that traverses the left atrioventricular groove, courses through the crux of the heart, and continues into the right atrioventricular groove, ultimately forming the right coronary artery (arrow in Fig 2D). Significant calcified and non-calcified plaque burden is observed in all three coronary arteries, resulting in varying degrees of stenosis.*

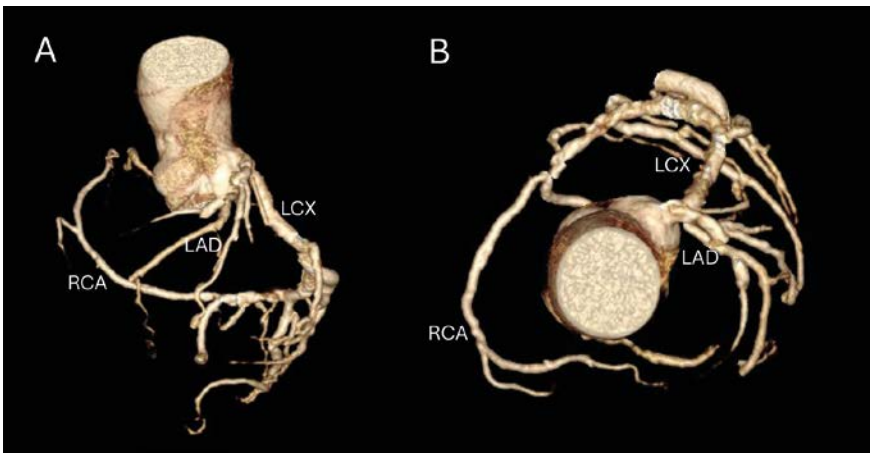

Figure 3: *A 3D volume-rendered image showing single coronary artery originating from the left coronary cusp which bifurcate into LAD and LCX. The LCX course posterior to the heart and continues into the right atrioventricular groove forming the RCA*

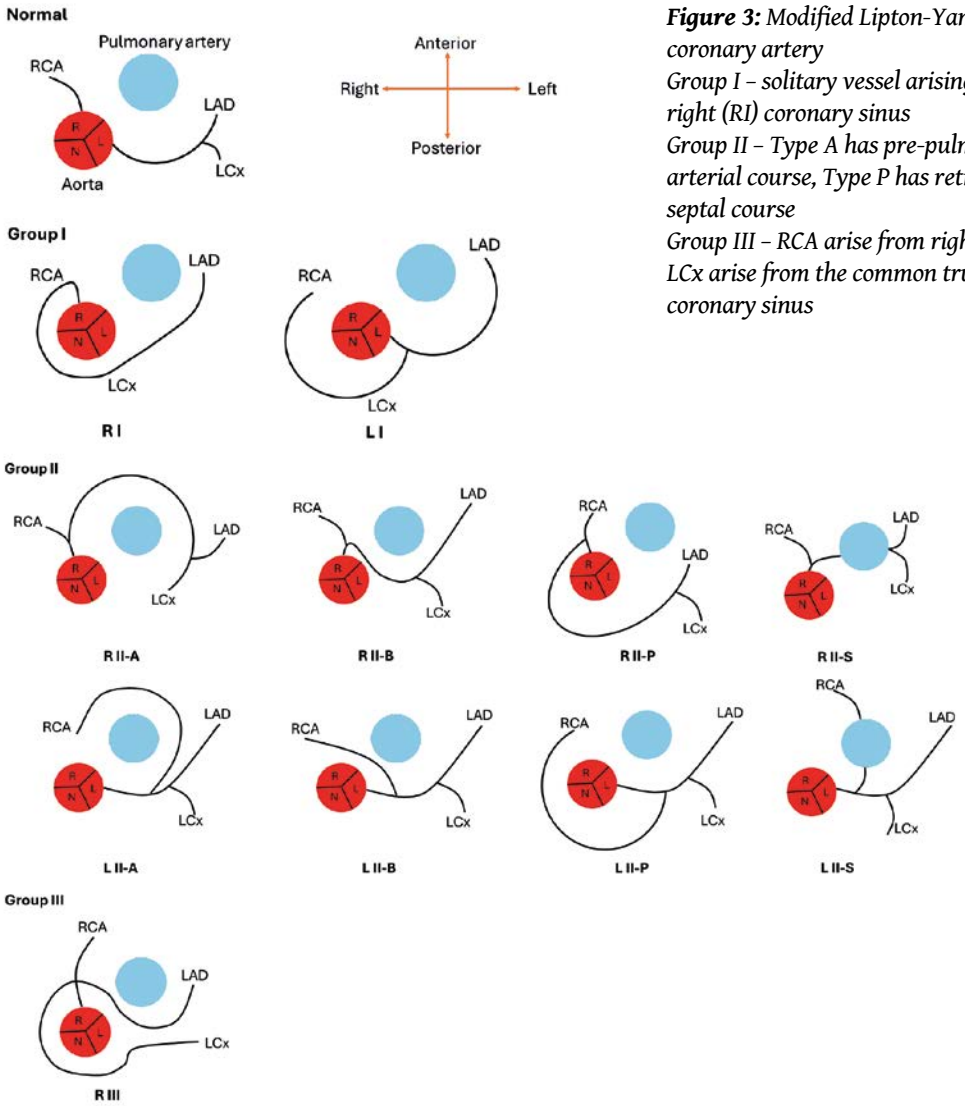

Figure 3: *Modified Lipton-Yamanaka classification of single coronary artery*
Group I – solitary vessel arising from either the left (LI) or right (RI) coronary sinus
Group II – Type A has pre-pulmonic course, Type B has inter-arterial course, Type P has retro-aortic course, Type S has septal course
Group III – RCA arise from right coronary sinus. LAD and LCx arise from the common trunk originating from the right coronary sinus

prevalence ranging from 0.024% to 0.27% across cohorts of 4,445 patients, with slight female predilection (male-to-female ratio of 5:7) and mean diagnostic age of 56–57 years [1,2]. Risk factors remain incompletely defined but it has an association with congenital heart defects such as bicuspid aortic valve (prevalence 15–20% in SCA cohorts), tetralogy of Fallot, patent ductus arteriosus, and coronary artery fistulas [1, 2, 3]. Clinical presentation varies widely with most cases remain asymptomatic and are discovered incidentally during ischemia evaluation, while 10–30% of symptomatic patients manifest as stable/unstable angina, exertional dyspnea, syncope, myocardial infarction, or sudden cardiac death [2,3], predominantly secondary to malignant interarterial courses compressing the anomalous coronary artery between the aorta and pulmonary artery during exertion.

The modified Lipton-Yamanaka system [1] classifies a single coronary artery (SCA) by its origin in the left or right coronary sinus, its numerical branching pattern (I–III), and its anatomical relationship to the great vessels (Fig 4). While the R-type (right sinus origin) is more prevalent, occurring in 65–92% of cases with RIII-C and RII-B as common subtypes [1], the L-type (left sinus origin) is further categorized by I/II/III branching and A/B/P/S pathways (prepulmonic, interarterial, posterior/retroaortic or septal course) to guide risk stratification. Within this framework, specific patterns such as LII-B and RII-B are recognized for their high malignant potential [3], as their interarterial or intramural segments pose a significant risk of vascular compression and sudden cardiac death. To address the clinical risk more accurately, Rigatelli et al. [4] introduced a functional classi-

fication focusing on the risk of ischemia (Table 1). While many reported cases in the literature involve incidental findings that fall into Rigatelli Class I or II, our patient is classified as Rigatelli Class IV. This class is reserved for high-risk variants characterized by significant atherosclerotic disease or high-risk arterial courses. Finding an L1 variant complicated by such a high coronary calcium score (1005.8) and extensive CAD including a 100% LAD occlusion is significantly rare. Because the solitary vessel provides the entire blood supply, there is no secondary system to provide "auto-bypass" or significant collateral support from another ostium, making the atherosclerotic burden much more dangerous.

Coronary CT angiography (CCTA) is the gold standard for diagnosing SCA anomalies, offering submillimeter spatial resolution to precisely delineate origins, interarterial/malignant courses, intramural segments, fistula, atherosclerotic burden and distal branching patterns essential for risk stratification [6]. Echocardiography serves as an initial non-invasive screening modality, particularly in neonates and pediatrics, effectively visualizing proximal coronary origins and flow direction but often limited by poor acoustic windows and inadequate distal vessel definition [6]. Cardiac magnetic resonance imaging (CMR) provides comprehensive anatomic and functional assessment including perfusion and viability without ionizing radiation [7], making it preferable for younger patients despite longer acquisition times and slightly inferior coronary resolution compared to CCTA.

Invasive coronary angiography, once the historical reference standard [3], is now primarily reserved for therapeutic planning or equivocal cases due to procedural risks and suboptimal intramural course visualization. CCTA demonstrates superior diagnostic accuracy over echocardiography (91% vs. 62% for anomalous course detection) [6] and is favored as the first-line modality in adults [1] for its speed, availability, and ability to generate multiplanar reconstructions guiding surgical decisions.

Management depends on anatomic risk and clinical symptoms. Benign variants warrant conservative therapy with aspirin, statins, beta-blockers, and lifestyle modification, mirroring standard coronary disease protocols [3]. Symptomatic SCA or malignant interarterial courses necessitate surgical intervention, including intramural segment unroofing, coronary artery bypass grafting, or percutaneous coronary intervention [1, 3, 8, 9]. Benign courses often have a normal life expectancy, similar to the general population [1]. In a cohort of 12 SCA patients (mean age 56), no major adverse cardiac events occurred over 25 months, even including those with CABG [1]. **R**

Financial disclosure: This work was funded by Universiti Putra Malaysia through GP-IPM/2023/9771200.

Conflicts of Interest: No conflict of interest was declared by the authors.**cknowledgement:** Nil

Institutional review board approval is not needed based on my institutional guideline. Hence, it is not applicable in my case.

Declaration of patient consent

The authors certify that we have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the journal. The patient understand that his name and initials will not be published and due efforts will be made to conceal his identity, but anonymity cannot be guaranteed.

References

1. Al Umairi, Rashid, Al-khouri, Maryam. Prevalence, Spectrum, and Outcomes of Single Coronary Artery Detected on Coronary Computed Tomography Angiography (CCTA), Radiology Research and Practice, 2019, 2940148, 7 pages, 2019. https://doi.org/10.1155/2019/2940148
2. Michalowska AM, Tyczynski P, Pregowski J, Skowronski J, Mintz GS, Kepka C, et al. Prevalence and Anatomic Characteristics of Single Coronary Artery Diagnosed by Computed Tomography Angiography. Am J Cardiol. 2019 Sep 15;124(6):939-946. doi: 10.1016/j.amjcard.2019.06.012.

3. Elbadawi A, Baig B, Elgendy IY, Alotaki E, Mohamed AH, Barssoum K, et al. Single Coronary Artery Anomaly: A Case Report and Review of Literature. Cardiol Ther. 2018 Jun;7(1):119-123. doi: 10.1007/s40119-018-0103-4.
4. Rigatelli G, Docali G, Rossi P, Bandello A, Rigatelli G. Validation of a Clinical-Significance-Based Classification of Coronary Artery Anomalies. Angiology. 2005;56(1):25-34. doi:10.1177/000331970505600104
5. Singh N., Gupta Y., Singh B. et al. Diagnosis and demonstration of single coronary artery by multidetector CT angiography: series of two cases. Egypt J Radiol Nucl Med53, 179 (2022). https://doi.org/10.1186/s43055-022-00870-5
6. Farooqi KM, Nees SN, Smerling J, et al. Assessment of Anomalous Coronary Arteries by Imagers and Surgeons: Comparison of Imaging Modalities. Ann Thorac Surg. 2021;111(2):672-681. doi:10.1016/j.athoracsur.2020.03.124
7. Alberto Cipriani, Mauro Lo Rito, Silvia Pica, Monica De Gaspari, Ilaria Rigato, Martina Perazzolo Marra, Giorgio De Conti, et. Cardiac magnetic resonance in the assessment of the anomalous right coronary artery originating from the left sinus of Valsalva, European Heart Journal. 2024;45(23): 2098–2100. https://doi.org/10.1093/eurheartj/ehae129
8. Najm HK, Karamlou T, Ahmad M, et al. Early Outcomes of Transconal Repair of Transseptal Anomalous Left Coronary Artery From Right Sinus. Ann Thorac Surg. 2021;112(2):595-602. doi:10.1016/j.athoracsur.2020.04.149
9. Sheng CC, Ghobrial J, Cho L. Patients with varying courses of single coronary artery: case series. Eur Heart J Case Rep. 2021 Sep 3;5(10):ytab314. doi: 10.1093/ehjcr/ytab314.

READY - MADE CITATION

Muhammad Furhan Zamri, Soo Tze Hui, Jessica Hwang Zhen Shan.
An Uncommon Coronary Finding in a Chest Pain Patient, Hell J Radiol 2026; 11(2): 74-80.