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Congenital Absence of the Left Coronary Artery in a 64 Year Old Asymptomatic Man: A Rare Coronary Anomaly Uncovered Through Cardiac CT

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Abstract **Case Report**

Congenital coronary artery anomalies are rare, and complete congenital absence of the left coronary artery (LCA) is among the rarest subtypes. Most are diagnosed incidentally, though they may have significant implications for myocardial perfusion. We present the case of a 64-year-old asymptomatic man referred for routine coronary calcium scoring due to a strong family history of coronary artery disease. A coronary calcium score of 77 was noted (Agatston method) and revealed a unique right coronary artery. Subsequent coronary computed tomography angiography (CCTA) confirmed the complete congenital absence of the LCA. The right coronary artery (RCA) was dominant and supplied the entire myocardium, including the left anterior descending (LAD) and circumflex (LCx) territories, via prominent collateral vessels. No stenotic lesions were identified. This case highlights a rare Lipton R-I type coronary anomaly with a benign course. The absence of ischemia and presence of an RCA with extensive collateral supply are in line with recent literature on similar cases. Multimodal imaging plays a key role in diagnosis and management, supporting non-invasive monitoring for asymptomatic individuals.

Keywords: Single Coronary Artery, Congenital Absence of Left Coronary Artery, Isolated Right Coronary Artery, Coronary CT Angiography.

INTRODUCTION

Coronary artery anomalies (CAAs) are present in less than 1% of the population and are often incidental findings during angiography or advanced imaging. Among them, congenital absence of the LCA with RCA dominance, classified as Lipton R-I subtype, represents one of the rarest forms, with a reported incidence of approximately 0.0008% [1, 2]. In this anomaly, the RCA provides collateral circulation to the left coronary territory, which may have functional and prognostic implications [3].

Although such anomalies can be benign, they may pose a risk of ischemia, arrhythmia, or sudden cardiac death, especially in younger or symptomatic individuals. With the increasing use of cardiac CT, particularly in screening asymptomatic patients with risk factors, these rare anomalies are being identified with greater frequency [4].

The case underscores the role of CT coronary angiography in detecting such anomalies and evaluating their potential impact on myocardial perfusion.

CASE PRESENTATION

A 64-year-old man was referred for a coronary calcium scoring scan as part of a routine cardiovascular risk assessment. He was asymptomatic but had a significant family history of coronary artery disease, with his brother having suffered an acute coronary syndrome at 63 years old. He had no personal history of hypertension, diabetes, or hyperlipidemia.

Non-contrast cardiac CT revealed a coronary calcium score of 77 according to the Agatston method, indicating mild coronary artery calcification. However, contrast-enhanced coronary CT angiography demonstrated the complete absence of the LCA. The RCA was dominant and supplied the entire myocardium, with prominent collateral branches perfusing the left coronary territory, including the left anterior descending

and circumflex artery distributions. No significant stenotic lesions were identified.

The patient's ECG and physical examination were unremarkable. He remained asymptomatic and was advised on preventive strategies including lifestyle modifications. No pharmacologic or invasive therapy was indicated.

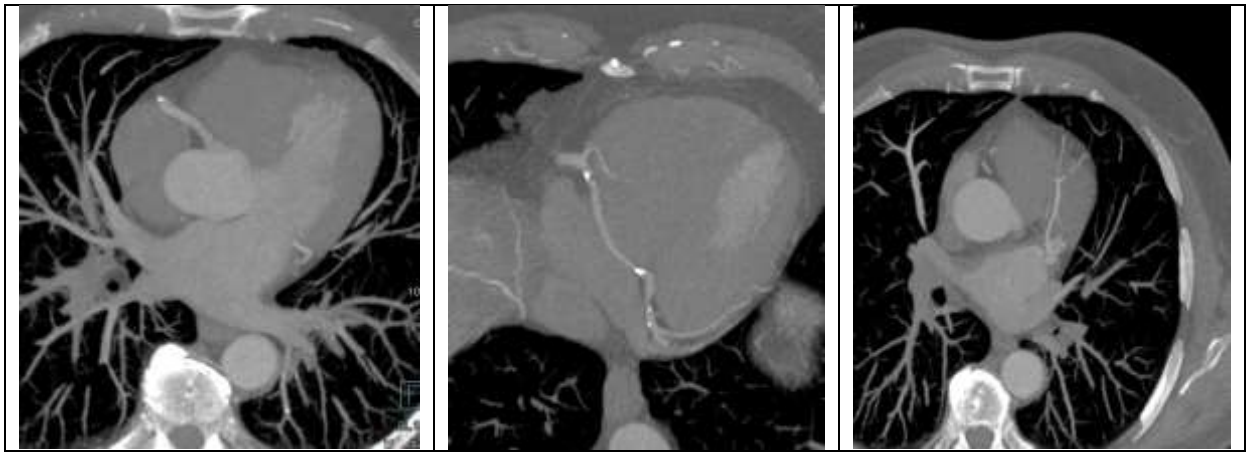

Figure 1: Coronary computed tomography angiography depicting an agenesis of the left main artery and its ostium with single coronary artery supplying the entire myocardium. We also note atherosclerotic coronary plaques without significant stenosis

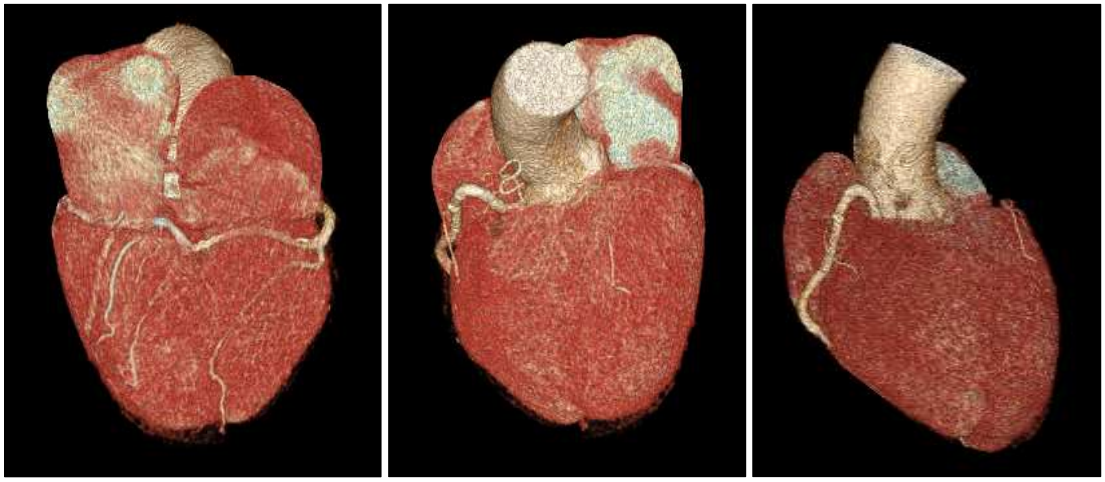

Figure 2: Coronary computed tomography angiography with 3D reconstructions depicting a single coronary artery with its ostium in the right sinus of Valsalva

DISCUSSION

The congenital absence of the left coronary artery (LCA) is an exceptionally rare anomaly with significant anatomical and physiological implications. In such cases, the right coronary artery (RCA) typically compensates by developing an extensive collateral network to supply the territories usually perfused by the LCA [5, 6].

The clinical presentation of this condition largely depends on the adequacy of collateral circulation and the presence or absence of concomitant coronary artery disease. When collateral perfusion is sufficient, patients may remain asymptomatic. However, in cases where it is inadequate, symptoms such as myocardial ischemia, arrhythmias, or even sudden cardiac events may occur, particularly during periods of increased cardiac demand [7, 4].

In the present case, we observed a Lipton R-I variant of single coronary artery, a particularly rare entity in which the RCA supplies the entire myocardial circulation. A review of the literature confirms the rarity of this condition, with only a few reported cases and heterogeneous clinical presentations. For example, Suchodolski *et al*., described a 63-year-old male presenting with palpitations and atypical angina, found to have a malignant RCA course with 53% stenosis [8]. The patient was managed conservatively. Neiva *et al*., reported a 44-year-old female with Takotsubo cardiomyopathy and an incidental right SCA; she recovered completely under conservative treatment despite initial severe left ventricular dysfunction [9].

In contrast to these cases, our patient was entirely asymptomatic, highlighting that even profound congenital anomalies can remain clinically silent when compensatory mechanisms are sufficient. This case illustrates the importance of individualized risk assessment, rather than intervention based on anatomical abnormality alone.

Multimodality imaging, particularly coronary CT angiography (CCTA), was instrumental in this case. It enabled a precise anatomical diagnosis and helped avoid unnecessary procedures. This approach aligns with the recommendations in the literature, which recognize CCTA and cardiac MRI as the gold standards for the diagnosis and risk stratification of rare coronary anomalies [2-10].

Given the absence of significant stenosis, the presence of robust collateral circulation, and the lack of high-risk features, a non-invasive management strategy was adopted. Long-term care will focus on routine monitoring and control of cardiovascular risk factors—a prudent and patient-centered approach in such rare anatomical variants.

CONCLUSION

Congenital absence of the LCA with RCA dominance is an exceptionally rare coronary anomaly, especially in asymptomatic adults. This case highlights the importance of cardiac CT in detecting clinically silent but structurally significant anomalies and supports conservative management in the absence of ischemia or symptoms. Further studies are needed to determine the long-term outcomes of patients with this rare coronary variant and to guide appropriate management strategies.

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