

Aberrant Right Coronary Artery from the Left Coronary Sinus Presenting with Inferior Wall Myocardial Infarction

Abstract

Coronaries arise normally from the aortic sinus which consists of one anterior and two posterior cusps of which the right coronary artery (RCA) arises from the anterior cusp and the left coronary artery arises from the left posterior cusp. Abnormal origin of coronary arteries is very rare and counts for about 2.33% of prevalence and below 1% incidence and are comparatively very difficult to diagnose through routine investigations. Till date, only one case has been reported in the literature where the culprit vessel was the victim as seen in our case. We report a case of a 68-year-old male, who underwent coronary angiography for his anginal chest pain, was diagnosed with coronary artery disease with an “abnormally arising RCA” from the left coronary cusp with a proximal stenotic lesion in the anomalously arising RCA, which was confirmed on multidetector computed tomography three-dimensional reconstruction volume-rendered imaging.

Keywords: Acute coronary syndrome, chest pain, computed tomography, coronary artery anomaly

Introduction

Coronary arteries supplying the heart originate from the aortic sinus, also referred as the sinus of Valsalva. The aortic sinus divides into the anterior coronary sinus (right), posterior coronary sinus (left), and noncoronary sinus. The right coronary sinus gives rise to the right coronary artery (RCA) which supplies the right chambers of the heart, a portion of the left ventricle, and the atrioventricular and sinoatrial node. The left coronary sinus gives rise to the left main coronary artery, that further divides into the left circumflex artery and left anterior descending artery, which supplies the atrium and ventricle of the left side.^[1] Abnormal origin for the coronary arteries is a congenital condition, in which they do not follow their normal pattern of emergence from the right or left coronary sinuses. These congenital anomalies are usually diagnosed as incidental findings during coronary angiography.^[2] Here, we report a case of a 68-year-old male, who underwent coronary angiography for his anginal chest pain, was diagnosed with coronary artery disease with an “abnormally arising RCA” from the left coronary cusp with a proximal stenotic

lesion in the anomalously arising RCA, which was confirmed on multidetector computed tomography (MDCT) three-dimensional (3D) reconstruction volume-rendered imaging.

Case Report

A 68-year-old male patient came to the outpatient department with the complaint of chest pain radiating to the left arm and back region, associated with vomiting for 3 days. On a general physical examination, bipedal pitting-type edema was present. On systemic examination, crepts were heard bilaterally on basal lung fields. The patient was a known case of diabetes mellitus for the past 15 years and was on regular medications for the same. Depending upon the history and clinical examination, acute coronary syndrome was suspected and electrocardiography was performed on this patient. It revealed ST segment elevation in II, III, and avF leads. A two-dimensional echocardiogram was suggestive of inferior wall hypokinesia with a 45% ejection fraction. Blood investigations showed positive cardiac markers of CKMB and TROP-I. Coronary angiography revealed stenotic lesions in the proximal RCA, which were abnormally arising from the left coronary cusp with an empty right coronary

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sinus and absence of RCA in the right cusp; percutaneous transluminal coronary angioplasty (PTCA) was performed in the proximal RCA, as shown in Figure 1. MDCT 3D reconstruction volume-rendered imaging was done to confirm the anomalous origin of the RCA from the left cusp, as shown in Figures 2-4. The patient was monitored after the procedure and discharged after stabilization on dual antiplatelet drugs and statins.

Discussion

Under normal circumstances, RCA originates through the anterior coronary sinus and left coronary artery through the left posterior coronary sinus.^[1] Abnormal origin of coronary arteries is very rare, with an incidence rate of <1% and a prevalence of about 2.33%.^[3,4] Coronary artery anomalies (CAAs) can arise from either a pulmonary artery or contralateral or incorrect aortic sinus.^[5] Angelini has classified the CAA most accurately into four categories. These categories include (i) anomalies of origin and course

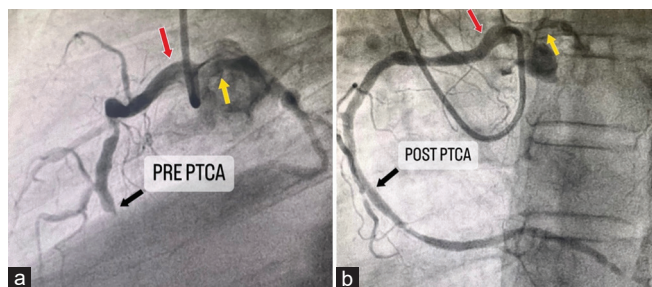


Figure 1: Coronary angiography images of pre- and postpercutaneous transluminal coronary angioplasty (PTCA) of abnormally arising right coronary artery (RCA): (a) Lateral view representing RCA (red arrow) arising from left cusp with stenotic lesion pre PTCA (black arrow) and left main (LM) (yellow arrow) arising from left cusp. (b) Left anterior oblique view with post-PTCA scenario (black arrow) with RCA (red arrow) arising from left coronary cusp and LM (yellow arrow) arising from left cusp. PTCA: Percutaneous transluminal coronary angioplasty

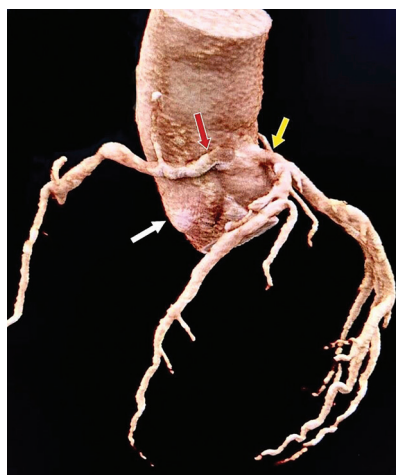


Figure 3: Multidetector computed tomography three-dimensional reconstruction volume rendered image of root of aorta: Right coronary artery (red arrow) abnormally arising from left coronary sinus with empty right coronary sinus (white arrow) and left main (yellow arrow) arising from left cusp further bifurcating into left anterior descending and left circumflex artery

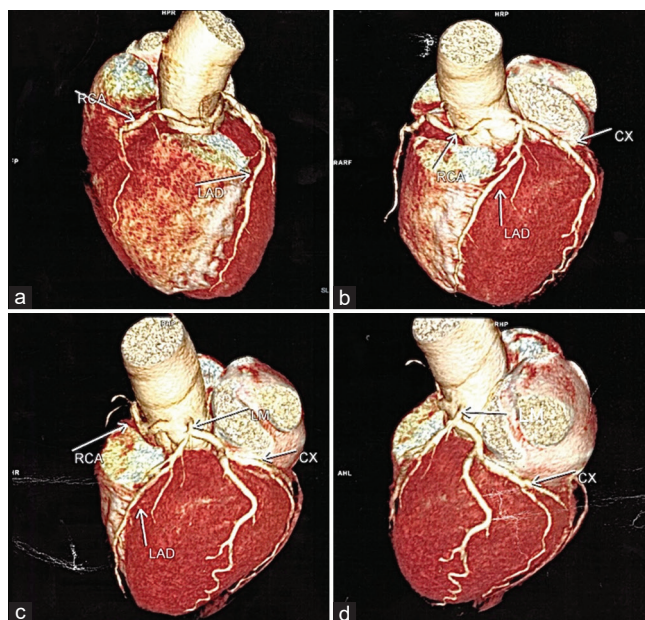


Figure 2: Multidetector computed tomography three-dimensional reconstruction volume rendered image of heart: (a-d) Coronary anatomies and course with white arrows showing right coronary artery abnormally arising from left cusp along with left main which further divides into left anterior descending and left circumflex artery

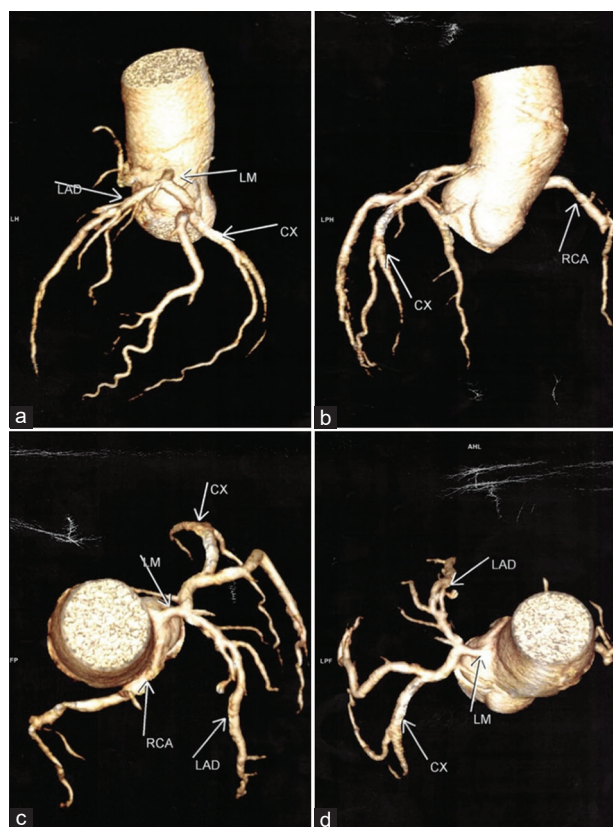


Figure 4: Multidetector computed tomography three-dimensional reconstruction volume rendered images of coronary anatomical course: (a) Left anterior oblique view (b) posterior view (c and d) Cranial views; depicting abnormal anatomy of right coronary artery arising from left coronary cusp along with left main anatomy and its course further dividing into left anterior descending artery and left circumflex artery. LAD: Left anterior descending, LM: Left main, CX: Circumflex artery, RCA: Right coronary artery

of coronary arteries; (ii) anomalies of intrinsic coronary anatomy; (iii) anomalies of coronary artery termination; and (iv) anomalous collateral vessels.^[6] Furthermore, CAA can originate from the aorta (either from a wrong sinus or beyond the sinuses); as a branch from another coronary artery; the pulmonary artery; other arteries; and the ventricular chamber.

The most common type of origin observed is the ectopic aortic origin, among which an anomalous origin from a wrong sinus of Valsalva predominates.^[6,7] The present case represents an anomalous coronary artery arising through the opposite sinus. The incidence of CAAs in the Indian population is 0.95%.^[8] An incidence rate of about 0.026%–0.25% has been reported for anomalous RCA originating from the left coronary sinus.^[9] The majority of anomalous RCA cases are asymptomatic, and only a minority of patients exhibit “malignant” type demonstrating high-risk features, which include intramural course, a slit-like ostium, higher interarterial, and high take-off.^[10] CAA, which causes an alteration or limitation of blood flow, often presents clinically with symptoms and signs of myocardial ischemia, including chest pain, dyspnea, shortness of breath, and, in rare cases, sudden cardiac death (SCD).^[5] Till date, only one case has been reported in the literature with elevated ST segment myocardial infarction due to a lesion in the anomalously arising RCA from the left coronary cusp, like in our case, which makes it a rarest of the rare scenario.^[5] In the past decade, <10 cases of anomalous RCA originating through the left coronary sinus have been reported worldwide, of which none are reported from India.^[7-10]

Conventional coronary angiography has been regarded as the standard investigation tool for patients with acute chest pain. Owing to the increased applications of conventional coronary angiography, CAAs and coronary artery variants (CAVs) are being encountered more frequently. In the majority of cases, CAA and CAV are not clinically significant, whereas in some patients, these alterations may result in myocardial ischemia due to their flow-limiting effect.^[5] Hence, distinguishing clinically significant anomalies from those with no or little risk becomes crucial. In our case, we performed conventional coronary angiography, which revealed an anomalous origin of RCA through the left coronary cusp with an empty right coronary sinus. Coronary angiography also showed stenotic lesions in the RCA. In the majority of cases, CAAs are asymptomatic and are often diagnosed incidentally. In these cases, no treatment is required. However, in our case, where the culprit CAA was the victim of CAD, treatment was required.

Conclusion

The CAA of RCA originating through the left coronary cusp is very rare, which carries the risk of SCD as a result of ischemia of the coronary artery. This case report depicts the importance

of awareness of anomalies in coronaries as they are very rare, and complications associated with these anomalies can be life-threatening and can prove to be major hurdles during diagnostic and management procedures such as coronary artery bypass graft and PTCA. Abnormal origins of coronary arteries are relatively difficult to diagnose through routine investigations. Hence, it is important to create awareness of such rare anomalies and bring them to the knowledge of clinicians for early diagnosis and prompt management tactics.

Declaration of patient consent

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

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Conflicts of interest

There are no conflicts of interest.

References

1. Rehman S, Khan A, Rehman A. Physiology, Coronary Circulation. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2023.
2. Shaikh SS, Deshmukh V, Patil V, Khan Z, Singla R, Bansal NO. Congenital absence of the left circumflex artery with super-dominant right coronary artery: Extremely rare coronary anomaly. *Cardiol Res* 2018;9:264-7.
3. Khurana KV, Singh A, Rao T, Toshniwal S, Acharya S, Agrawal G, *et al.* Congenital absence of the left circumflex artery presenting with inferoposterior wall myocardial infarction due to stenosis of the super dominant right coronary artery: A rare case. *Cureus* 2023;15:e46709.
4. Toshniwal S, Pawar T, Kabra R, Rao T, Kumar S, Acharya S. Left main coronary artery arising from the right coronary sinus presenting as acute coronary syndrome: A rare anomaly managed conservatively. *J Pract Cardiovasc Sci* 2022;8:178-81.
5. Xie Z, Zou J, Zhu H, Bu H. Case report: Anomalous origin of the right coronary artery from the left sinus of valsalva with aortic dissection: New myocardial ischemia mechanism. *Front Cardiovasc Med* 2022;9:900803.
6. Rajani P, ElMorsy ElMaghawry M, Mittal T, Mattar W. Anomalous left coronary artery arising from right coronary sinus in the setting of anterior STEMI. *JACC Case Rep* 2021;3:1182-6.
7. Tyczyński P, Kukuła K, Pietrasik A, Bochenek T, Dębski A, Oleksiak A, *et al.* Anomalous origin of culprit coronary arteries in acute coronary syndromes. *Cardiol J* 2018;25:683-90.
8. Sirasapalli CN, Christopher J, Ravilla V. Prevalence and spectrum of coronary artery anomalies in 8021 patients: A single center study in South India. *Indian Heart J* 2018;70:852-6.
9. Arun Kumar P, Patel B, Dasari M, Bhattad PB, Prabhu S, Hadley M. Anomalous aortic origin of right coronary artery from left coronary cusp: A management conundrum: A case report. *J Med Case Rep* 2023;17:191.
10. Rosseel L, Bonnier H, Sonck J. Anomalous right coronary artery in a middle-aged patient: A case report and review of the literature. *Medicine (Baltimore)* 2016;95:e5508.