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## Case Report

# Aberrant right coronary artery in an elderly Nigerian with recent dyspnoea detected on coronary CT angiogram <sup>☆,☆☆</sup>

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## ABSTRACT

An anomalous origin of the right coronary artery has been documented in up to 0.92% of the general population, which is more common than an anomalous origin of the left coronary artery. We present a case of an elderly hypertensive man who developed mild dyspnoea on exertion for 3 months with associated retro-sternal pain as well as occasional palpitation which all tend to subside at rest. An electrocardiogram showed evidence of left atrial enlargement. A coronary computed tomographic angiogram was acquired with a 160-slice scanner which revealed the right coronary artery to originate from the left aortic sinus with a retro-aortic pattern of anatomical course. Vascular wall calcifications were noted with multilevel luminal narrowing on the left anterior descending however distal opacification was adequate. Our case further depicts the reason for keeping in mind anatomical variations while evaluating cardiac pathologies even among Black Africans.

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## Introduction

In about 0.84%–1.2% of patients referred for coronary CT angiography, an aberrant origin of a coronary artery is detected

[1]. An anomalous origin of the right coronary artery has been documented in up to 0.92% of the general population, which is more common than an anomalous origin of the left coronary artery [2]. The abnormal origin of the right coronary artery (RCA) from the left sinus is an extremely rare aberration, with

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a 0.019% to 0.49% frequency on coronary angiography. Recent angiographic studies, however, have revealed a rather high incidence of coronary artery abnormalities (5.6%) and aberrant ARCA origins from the left sinus (0.92%) [3]. Although an anomalous origin of the right or left coronary artery from the contralateral sinus of Valsalva is generally asymptomatic, many patients, especially the younger ones, present with sudden death or myocardial ischemia without symptoms [2]. It is also important to highlight that the anomalous origin of the RCA from the left sinus differs between races. A study showed a higher incidence among Asians at 79% as against the western world at 27% [4]. There is a paucity of data with regard to the prevalence of anatomical variations of the coronary arteries among Africans of sub-Saharan origin in particular.

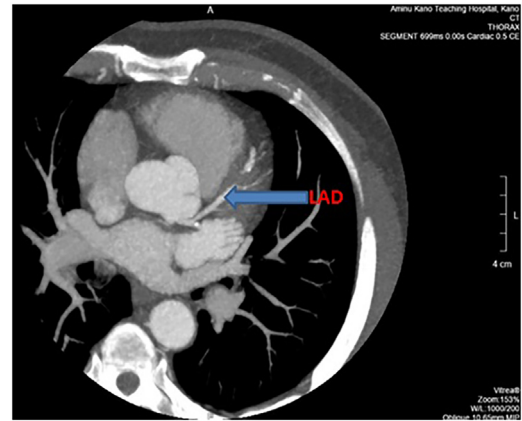
### Case presentation

Our patient is in his 70s and presented with mild dyspnea on exertion for 3 months. There is associated retro-sternal pain and heaviness with occasional palpitation. These symptoms always subsided with rest. He has never experienced other symptoms of cardiac disease. He has been a known hypertensive for 2 years and has been controlled with bisoprolol 5mg once daily and amlodipine 5 mg once daily. He has no diabetes mellitus or family history of cardiac disease. He has never smoked cigarette and never taken alcohol.

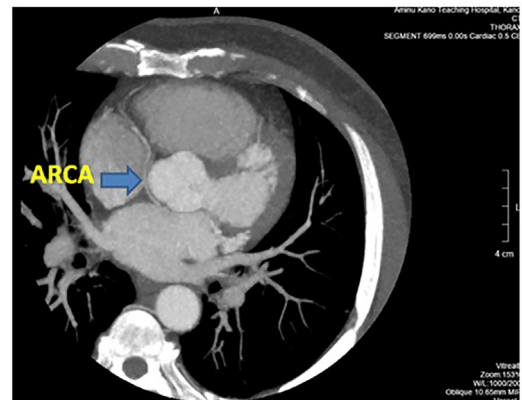
General physical examination was unremarkable. His pulse was 66 beats/min and blood pressure was 132/72 mm Hg, jugular venous pressure was not raised and apex beat was not displaced. The heart sounds were normal first and second only with no added sounds. The lung bases were clear and abdominal examination was unremarkable with no liver enlargement and no ascites. Other systemic examinations did not reveal any abnormality.

The results of complete blood count were normal. Other laboratory parameters, including levels of electrolytes, tests of liver and renal functions, as well as cardiac enzymes were all within normal limits. His total serum cholesterol was elevated to 224 mg/dL. The reference range is 150-200 mg/dL. The electrocardiogram (ECG) tracing showed sinus rhythm with ventricular rate of 86/min and evidence of left atrial enlargement and no other abnormality. Left atrium was enlarged (4.3 cm) on echocardiogram. Left ventricle (LV) was mildly dilated (5.9 cm) with no regional wall motion abnormality, while LV ejection fraction was 65%. Mitral valve Doppler showed pseudo-normal E/A ratio [87.1/59.1 (cm/s)]. There was moderate mitral regurgitation as well as moderate tricuspid regurgitation and pulmonary hypertension.

Coronary Computed Tomographic Angiogram was done with dynamic injection of 80mls nonionic water-soluble contrast medium (Iohexol 350) manufactured by Hindland pharmaceuticals under the trade name Hexopack at a rate of 5mls per second using Imaxeon Salient Injector System and bolus trigger technique. The scans were done with prospective ECG gating and suspended respiration. The machine was set at a kV value of 120 kV and mA value of 29 ms. The scans were obtained with a slice thickness of 3 mm and a gantry rotation time of 0.35s as well as a pitch of 20.5. The computed tomog-



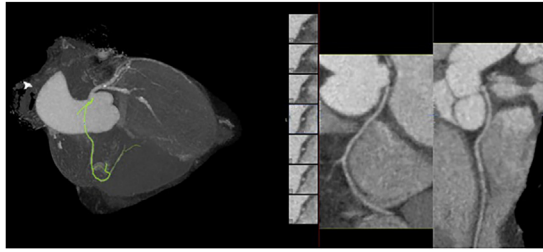
**Fig. 1 – Axial Coronary CT angiogram showing origin of the left main coronary artery as well as the left anterior descending artery (LAD) indicated by the arrow head.**



**Fig. 2 – Axial coronary CT angiogram showing origin of the right coronary artery from the left aortic sinus with a tapered calibre indicated by the arrow head.**

raphy dose index (CTDI) volume was 14.9 with a total Dose length volume (DLP) of 282.1. Images obtained were analyzed using a Vitrea work station and showed mild coronary artery calcium deposit with a Total Agatston score of about 62 mainly contributed by the left anterior descending artery. The left main artery had a normal origin from the left aortic sinus and terminated about 12mm from its origin into the left anterior descending and circumflex artery (Fig. 1). The right coronary artery however is seen to originate from the left aortic sinus and showed tapered caliber (Figs. 2 and 3). The posterior descending artery was observed to arise from the right coronary artery indicating right dominance. The left anterior descending artery (LAD) as well as the circumflex showed multifocal areas of wall calcification more on the LAD causing multilevel areas of moderate luminal narrowing however opacification of their distal branches with contrast medium was achieved.

A final diagnosis of hypertensive heart disease with coronary artery disease was made. His bisoprolol and amlodipine were maintained and Vastarel 35 mg twice a day with rosuvastatin



**Fig. 3 – Coronary CT Angio simulation multiplanar reformation images showing retroaortic course of the RCA.**

tatin 20 mg once a day were added with significant symptom reduction.

Patient subsequently had catheter angiography which also detected stenosis at LAD that led to insertion of stent. The patient is doing well as symptoms have subsided and on follow up with the cardiologists.

## Discussion

The Diagnosis of an aberrant coronary artery can be made with a coronary computed tomographic angiogram (CCTA) as it can reliably provide adequate information regarding the origin and anatomical course of the anomalous artery with the aid of post processing tools and 3D reconstruction [5]. The patient presented in this case was diagnosed with aberrant right coronary artery CCTA obtained using Toshiba Aquilion Prime 160-Slice scanner model TSX-303A, Toshiba Medical Systems Corporation, 1385, Shimoshigami, Otawara-Shi, Japan, 2014.

Our patient is elderly and of black African origin. A study by Saidi et al. [6] in Kenya also detected a case of anomalous right coronary artery originating from the left aortic sinus during evaluation of about one hundred hearts from autopsies to study the anatomy of the coronary arteries among black adults. It is crucial to identify and manage coronary artery anomalies (CCA) as they are responsible for 17% of exercise-related deaths, with more than half of these presenting as sudden death, making CAA the second most common cause of sudden cardiac death in adults [7].

An abnormal origin of the coronary artery from the opposite sinus of Valsalva (ACAOS) is characterized by an abnormal course and/or termination of a native coronary artery. It can be classified into benign or malignant. The malignant being mainly a pattern with an interarterial course while the benign variants represent all other courses [8]. The patient presented in this case has a benign variant.

There are several anatomical course patterns for coronary artery anomalies. Preaortic, interarterial, retrocardiac, retroaortic, intraseptal, and precardiac (prepulmonary) are all possible proximal courses for an ARCA [9]. We observed a proximal retroaortic pattern in our case. In a study by Lee et al. [10], the authors found that most cases of RCA originating from the left sinus of Valsalva with interarterial course tend to run a benign clinical course. In our case, the patient had dysp-

nea on exertion for about three months that warrant medical attention.

Some of the symptoms related to anomalous right coronary artery documented in the literature include chest pain (64%), arrhythmia (27%), syncope (18%) and dyspnea (9%) [11]. Our patient had retrosternal chest pain and dyspnea with occasional palpitation which all tend to subside with rest. These symptoms however, might be as a result of the observed lesion in the LAD. A stress test is valuable in evaluating coronary artery disease, a negative test but with exertional symptoms such as chest pain should warrant a CCTA to exclude anatomical cause [12]. Additionally, a myocardial perfusion scan or a cardiac MRI, which are both, unavailable in our center, could have made the distinction.

Some of the treatment options for patients with anomalous origin of the coronary artery from the opposite sinus of Valsalva include surgical correction, percutaneous coronary intervention, medical and conservative treatment. These can be achieved with or without sports restriction with regards to younger athletes. There is no consistent method of classifying these patients, making the risk assessment and treatment decision challenging [13].

## Conclusions

An abnormal origin of the coronary artery from the opposite sinus of Valsalva is an uncommon anomaly which can present across different age groups and races. Late presentation of symptoms is possible as demonstrated in our case who is an elderly patient without prior complaints until recently. Imaging with multidetector CT scanners is crucial in making a diagnosis which may be a limiting factor in sub-saharan Africa. Nonetheless its value cannot be underestimated and our case further depicts the reason of keeping in mind anatomical variations in evaluating cardiac pathologies even among patients of African origin.

## Learning points

- Aberrant right coronary artery is an uncommon anomaly and can be asymptomatic or present with symptoms that may warrant treatment
- Computed tomographic angiography plays a crucial role in the evaluation of an aberrant coronary anatomical course.
- An abnormal origin of the coronary artery can occur in different races around the world

## Ethical clearance

Ethical approval was obtained from the local institution Research ethics committee with approval number NHREC/28/01/2020/\*\*\*\*/EC/3672 on 30th October 2023.

## Authors contributions

YMA and ABU were responsible for drafting of text in the Introduction and Discussion sections respectively. ARM sourced clinical information, investigations and radiological images. MSM is the clinician in charge of the clinical care of the patient, who supervised the preparation of the manuscript and was responsible for obtaining informed consent. IA reviewed the CT images and drafted the Imaging findings. All authors have critically reviewed and approved the final draft and are responsible for the content and similarity index of the manuscript.

## Patient consent

In this case report, written informed consent was obtained. Explanation of the case and reason for publication was thoroughly explained by the lead Physician (Consultant Cardiologist) taking care of the patient to the patient and next of kin (Son) who signed the form.

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