A Rare Case of Anomalous Origin of the Right Coronary Artery with Interarterial Course

Nadir Bir Olgu: Interarterial Seyir Gösteren Anormal Orjinli Sağ Koroner Arter

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Geliş Tarihi / Received : 4 August 2024 Kabul Tarihi / Accepted: 8 August 2024

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Hippocrates Medical Journal / Hippocrates Med J 2024, 4(2):74-77 DOI: https://doi.org/ 10.58961/hmj.1527889

Abstract

Anomalous aortic origin of the coronary artery from the opposite sinus of Valsalva (AAOCA) is an established risk factor for sudden cardiac death, particularly in young adults. In this paper, we present a case of 41-years-old male patient with anomalous origin of the right coronary artery (ARCA) from left sinus of Valsalva.Recent developments in multidetector computed tomography (MDCT) technology have effectively decreased the duration of imaging, the amount of contrast media required, and the level of radiation exposure. MDCT can serve as an initial radiological technique for diagnosing coronary anomalies like ARCA.

Keywords

Anomalous origin, right coronary artery, coronary computed tomography angiography, sudden cardiac death.

Özet

Koroner arterlerin karş sinüs Valsalva'dan köken alma anomalileri özellikle genç hastalarda ani kardiyak ölüme yol açabilen bozukluklardır. Bu çalışmada, sağ koroner arterin sol sinus Valsalva'dan köken aldığı (ARCA) 41 yaşında bir erkek hastayı sunuyoruz. Çok kesitli bilgisayarlı tomografi (ÇKBT) teknolojisinde son dönemlerde meydana gelen gelişmeler, tetkik sürelerinin kısalmasını, tetkik başı ihtiyaç duyulan kontrast madde miktarının ve radyasyon maruziyetinin azalmasını sağlamıştır. Bu gelişmeler ile birlikte ÇKBT, ARCA gibi koroner arter anomalileri tanısında tercih edilecek ilk radyolojik yöntem olarak kullanılabilir.

Anahtar Kelimeler

Anormal orijin, sağ koroner arter, koroner bilgisayarlı tomografi anjiyografi, ani kardiyak ölüm.

INTRODUCTION

Coronary artery anomalies belong to a rare group of cardiac diseases with the most of cases being benign (1,2). Due to their often-asymptomatic nature, these anomalies are usually detected incidentally. However, early diagnosis is crucial due to their potential to cause myocardial ischemia and sudden death. In young adults, cardiac anomalies are the cause of approximately half of non-traumatic sudden deaths. In 2/3 of these cases, the underlying cause is a coronary artery anomaly (3).

The right coronary artery (RCA) arises from the right sinus of Valsalva, while the left anterior descending and left circumflex arteries originate as branches of the left mail coronary artery, which arises from the left sinus of Valsalva (4). Anomalous aortic origin of the coronary artery from the opposite sinus of Valsalva (AAOCA) is recognized as a factor that can lead to sudden cardiac death in especially young adults. While the most of patients with AAOCA are initially diagnosed based on symptoms indicating myocardial ischemia, it is common for these patients to be asymptomatic. AAOCA is frequently discovered after the assessment of additional cardiovascular diseases or non-specific cardiac symptoms (5). The 2018 America Heart Association (AHA)/American College of Cardiology (ACC) Guideline for the Management of Adults with Congenital Heart Disease states that surgery for AAOCA is typically recommended for patients experiencing symptoms of myocardial ischemia and for patients with AAOCA affecting the left coronary artery (LCA). However, the surgical recommendation for patients with AAOCA affecting the right coronary artery (ARCA), especially for asymptomatic patients, is not well-defined (5,6). An ARCA can either be hypoplastic or follow the course between the two primary arterial trunks, namely the pulmonary artery and the aorta, and is referred to as ARCA-IA. Among the several types of coronary anomalies, the interarterial course is regarded as one of the most reliable indicators of sudden cardiac death (6,7).

CASE REPORT

A 41-year-old male patient with no prior cardiac history, presented to our emergency department due to 3 days of intermittent dyspnea and 2 day of chest pain atypical for angina. The patient denied experiencing any symptoms that could indicate myocardial ischemia. Blood pressure was 110/60 mmHg, and his pulse rate was 78 beats per minute with a regular rhythm. The remainder of his vital signs were also unremarkable. The past medical and surgical history was nonspecific, while anamnestic data indicated hyperlipidemia. The physical examination revealed a normal cardiovascular and respiratory system assessment. The rest of the physical examination was also normal. The initial laboratory analysis including troponin levels, and initial posterior-anterior (P-A) chest radiograph showed no significant findings. The electrocardiogram (ECG) showed no signs of ischemia signs or arrhythmias. The patient was referred to follow up with the pulmonology and cardiology outpatient clinics and was discharged.

At the patient's follow-up visit to the pulmonology clinic two days later, no significant findings were observed in the physical examination and pulmonary function tests. At the cardiology outpatient clinic follow-up, it was considered that the chest pain was not consistent with angina. A transthoracic echocardiography was conducted, revealing an ejection fraction of 55%-60% and no observed anomalies in regional wall motion. After giving informed consent, he underwent coronary computed tomography angiography (CTA). CTA imaging showed that the left coronary artery (LCA) had a normal origin, whereas the right coronary artery (RCA) had an anomalous origin. The RCA emerged from the left sinus of Valsalva and followed an interarterial course between the aorta and the pulmonary truncus (Figure). Since it was considered that the patient's symptoms were not related to cardiac causes, the patient was deemed asymptomatic from a cardiac perspective and regular cardiology outpatient follow-ups and lifestyle changes were recommended.

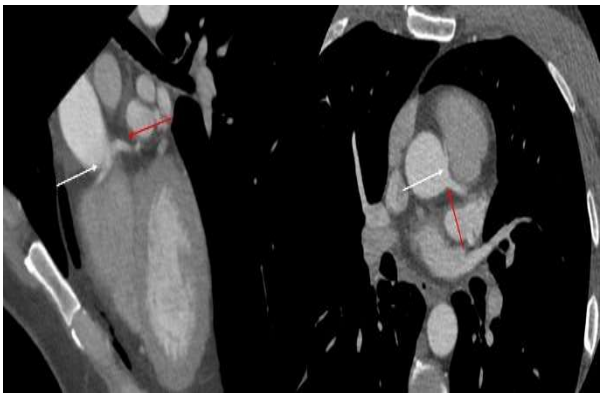

Figure 1. Coronary CTA. Curved multiplanar reformatted coronary CTA images showing the anomalous origin of the right coronary artery (white arrow). The left main artery originates from left sinus of Valsalva (red arrow).
CTA, coronary computed tomography angiography.

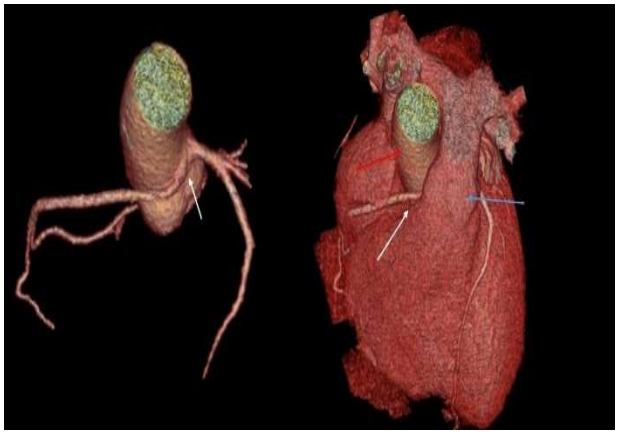

Figure 2. Volume rendered coronary CT demonstrating the anomalous origin of right coronary artery from left sinus of Valsalva and follows an interarterial course (white arrow) between the aorta (red arrow) and pulmonary truncus (blue arrow).
CT, computed tomography.

DISCUSSION

The classification of coronary artery origins from the opposing sinus includes four types: interarterial (between the aorta and the pulmonary artery), retroaortic, prepulmonic, and septal (subpulmonic) (8). The interarterial type is of significant clinical importance due to its association with sudden death and ischemic heart disease (7,8). Various morphological and pathophysiological characteristics have been identified as contributing factors to the risk of sudden death in ARCA-IA (9). Morphological variables encompass characteristics such as a narrow, slit-shape ostium, a sharp acute take-off angle, and an intramural course of RCA. Pathophysiological variables involve conditions like vasospasm, increased development of atherosclerosis (3,7-8). We think that these variables can collectively lead to myocardial ischemia and sudden death. Nevertheless, exercise is a persistent physiological occurrence that might result in sudden death in individuals with ARCA-IA (4,8). The hypothesized pathophysiological mechanism involves elevated pressure in the aorta and pulmonary artery, together with diastolic expansion of the major blood arteries during exercise. This results in the mechanical compression of the RCA, resulting to ischemia (8). According to a study on intravascular ultrasonography, the narrowing of the coronary artery was entirely caused by the aorta since the pressure in the pulmonary artery was lower than that in the aorta (10).
Coronary CT angiography is a highly effective imaging method for detecting coronary artery anomalies. Before the technological advancements in cardiac CT, conventional angiography was the primary imaging method. However, several studies have shown that cardiac CT is superior to conventional angiography in detecting coronary artery anomalies (1,7-8). In a study involving 1,758 patients who underwent coronary CT, coronary artery anomalies were found in 28 patients. When catheter angiography was performed on 20 of these patients, anomalies were detected in only 11 of them (11).
In patients with ARCA, the appropriate therapeutic approach is uncertain as most instances are not life-threatening, mostly because these patients have a lesser risk of sudden cardiac death, particularly if the diagnose is not a high interarterial course. One proposal is that surgical intervention should be considered for young patients (<35 years old) who are symptomatic. Asymptomatic young patients are evaluated individually, considering the presence of high-risk conditions (12).
Here we report a case of ARCA with interarterial course, detected on coronary CTA. ARCA has been linked to ischemic heart disease and sudden death. It is crucial to perform an accurate investigation of the anomalous. Recent advancements in MDCT technology have successfully reduced imaging time, contrast medium dosage, and radiation exposure. MDCT can be utilized as a first-step radiological method for diagnosing ARCA. Conventional angiography is limited in the diagnosis of coronary anomalies by its projectional nature. Therefore, precise anatomical information is typically obtained through the use of MDCT. It is anticipated that MDCT will become a valuable tool for understanding the clinical importance of this ailment and evaluating the treatment of patients.

Ethical Declarations:
Not required. Consent was obtained from the participant for this case report.
Conflict of Interest:
None declared.
Financial Disclosure:
None declared.
Author Contribution:
None declared by the authors.

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