

Single Origin Coronary Artery Anomaly

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Abstract

Single coronary artery is a rare anomaly that can be observed both alone and in conjunction with other congenital heart anomalies. A single coronary artery can lead to sudden cardiac death due to reduced myocardial perfusion. The incidence rate varies between 0.024% and 1% according to different sources. There is no significant correlation between the type of anomaly and angina symptoms.

Clinical Case

A 58-year-old female patient presented to our clinic with complaints of heart palpitations, angina-like pain, and shortness of breath. She also suffers from hypertension and has been taking 5 mg of amlodipine regularly. Her blood pressure is 160/80 mmHg, pulse is 81 bpm, and oxygen saturation (SpO₂) is 97%. Laboratory tests are normal.

ECG: Normal sinus rhythm, trigeminal ventricular ectopics.



Echocardiography: LVEF - 60%, no significant segmental wall abnormalities observed, minimal mitral regurgitation (MR).

The patient underwent coronary angiography (CAG):

All coronary vessels originate from the right coronary cusp and the same ostium. Selective contrast was administered to the left coronary cusp, but no coronary outflow was observed. The patient was advised to undergo a 24-hour rhythm Holter monitoring.

24-hour rhythm Holter: 6,220 (6%) isolated, bigeminy, and trigeminy ventricular ectopics were noted. The patient was started on Metoprolol 25 mg b.i.d.

1-month follow-up: The patient reported no complaints, and the 24-hour rhythm Holter showed a 2% occurrence of ventricular ectopics.

Discussion

Single coronary artery (SCA) is an extremely rare anomaly where all coronary vessels originate from a single ostium, supplying the entire heart. In most cases, patients are asymptomatic, and the diagnosis is often made incidentally during

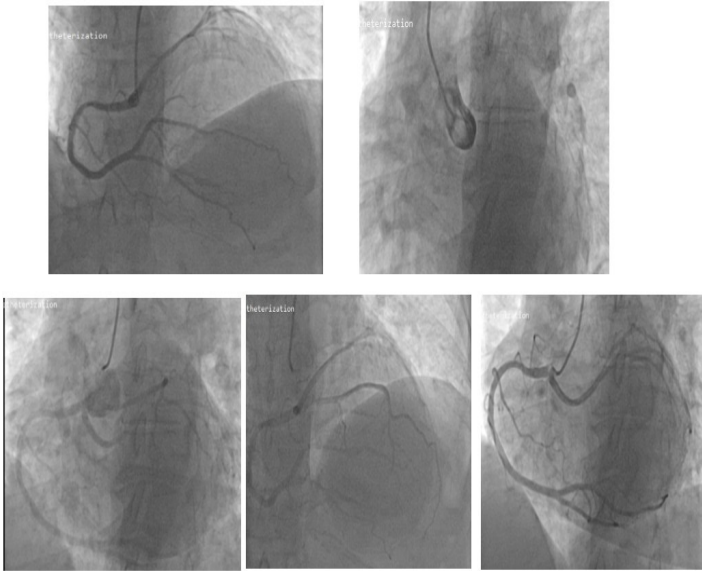


Table 1: Lipton's Classification of Single Coronary Artery

Right Coronary Origin	Definition	Left Coronary Origin
RI	A single vessel arising from the right or left coronary cusp, following the course of a normal right or left coronary artery.	RII
RIIA	Abnormal vessels are divided into 3 types according to their relationship with large vessels. Type A passes in front of the pulmonary trunk. Type B is located between the aorta and the pulmonary trunk. Type P passes behind the aorta	LIIA
RIIB		LIIB
RIIP		LIIP
RIII	Absence of the left coronary artery, with the right coronary artery giving rise to the left anterior descending and circumflex arteries.	

coronary angiography. However, symptoms such as typical chest pain, sudden cardiac death related to decreased myocardial perfusion, syncope, myocardial infarction, etc., can occur, especially during physical activity[3]. The diagnosis can be confirmed not only by coronary angiography but also by CT angiography and cardiac MRI. While CT angiography is a non-invasive imaging method, it is performed with the use of contrast agents. Cardiac MRI, on the other hand, allows for the evaluation of cardiovascular anatomy, perfusion, and function without exposure to ionizing radiation[4].

The gold standard remains coronary angiography (CAG), but due to their non-invasive nature, CT angiography and

cardiac MRI have become increasingly used in recent times. Identifying the exact course of anomalous coronary vessels in relation to the aorta and pulmonary artery is crucial, as myocardial ischemia during physical activity can occur due to the bending or compression of the anomalous SCA branches between the aorta and pulmonary artery.

Treatment options include conservative management, percutaneous coronary intervention (PCI), and surgical intervention. Although the prognosis for individuals with SCA remains uncertain, the majority of major adverse cardiac events occur in 15% of patients before the age of 40. Asymptomatic patients typically do not require treatment and should be managed with strict control of risk factors. In cases with multiple anatomical anomalies or in symptomatic patients, a multidisciplinary approach, including cardiothoracic surgery and invasive interventions, may be considered.

The presence of atherosclerotic coronary artery disease (CAD) in patients with coronary anomalies is particularly significant when deciding between PCI and coronary artery bypass grafting (CABG). Understanding the potential variations in coronary anatomy, their different origins, and courses is vital for both diagnostic and therapeutic purposes. Symptomatic patients with significant CAD can be treated with routine interventions like PCI or CABG[5]. Pre-surgical identification of coronary anomalies is also of great importance, as complications may arise during surgery, such as misidentifying or damaging an anomalous vessel during cardiopulmonary bypass.

Lipton[6] initially proposed an angiographic classification of SCA, which was later modified by Yamanaka. This classification takes into account the origin of the ostium from the sinus of Valsalva and the anatomical course of the vessels.

This table summarizes Lipton's classification of a single coronary artery, with different types based on the origin and anatomical course of the coronary artery.

The letters R or L are used to determine the ostial origin of the vessel; the Roman numerals I, II, or III are used to indicate the anatomical distribution of the vessel, while the letters A, B, P, S, and C describe the course of the vessel in relation to the pulmonary artery and aorta[7].

Some anomaly classifications, such as RI and LI types, show a benign clinical course. However, if the abnormal coronary artery is of the R/LIIB or R/III type, it suggests a higher tendency for serious clinical complications.

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