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CASE REPORT

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A Rare Coronary Anomaly: Single Coronary Artery; Two Cases

Nadir Bir Koroner Anomali: Tek Koroner Arter; İki Olgu

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ABSTRACT

We present two cases of a rare coronary anomaly—single coronary artery—identified incidentally during routine coronary angiography. Both patients presented with symptoms of chest pain and exertional angina. In both cases, the anomaly is located in the right sinus of Valsalva (R-1-A) and crosses the heart anterior to the right ventricle. (Figure 3) The first patient experienced significant stenosis in the proximal left anterior descending artery, which was successfully treated with percutaneous stent implantation. The second patient's chest pain was managed effectively with medical therapy alone. These cases highlight that a single coronary artery, often asymptomatic, can exist as a congenital anomaly in patients experiencing myocardial ischemia due to atherosclerotic coronary artery disease. Furthermore, they demonstrate that percutaneous coronary intervention, including stent placement, offers a promising treatment approach. In the literature, coronary artery bypass surgery should particularly be considered as a treatment option for these coronary anomalies. However, it has also been shown that in selected cases, percutaneous intervention or medical therapy can be viable alternatives.

Keywords: Coronary Angiography, Coronary Artery Anomalies, Single Coronary Artery, Chest Pain

ÖZ

Bu makalede, rutin koroner anjiyografi esnasında rastlantısal olarak keşfedilen iki tek koroner arter anomalisi vakası anlatılmaktadır. Hastaların semptomları arasında, eforla tetiklenen göğüs ağrısı ve anjina bulunmaktadır. Her iki olguda da anomali, sağ Valsalva sinüsünde (R-1-A) yer almaktadır ve sağ ventrikül önünden kalbi çaprazlamaktadır (Şekil -3). İlk hastanın proksimal sol ön inen arterinde ciddi bir darlık saptanmış ve bu darlık, perkütan stent implantasyonu ile etkin bir şekilde tedavi edilmiştir. İkinci hastanın göğüs ağrısı ise medikal tedavi ile giderilmiştir. Bu olgular, aterosklerotik koroner arter hastalığı sonucu miyokardiyal iskemi yaşayan kişilerde, sessiz bir konjenital koroner arter anomalisi olarak tek koroner arterin bulunabileceğini ve stent implantasyonu ile perkütan koroner müdahalenin uygun bir tedavi yöntemi olabileceğini ortaya koymaktadır. Bu koroner anomalilerde literatürde bypass cerrahisi tedavi seçeneği olarak özellikle akılda tutulmalı ancak seçilmiş vakalarda perkütan girişim veya medikal tedavinin de seçenek olabildiği gösterilmiştir.

Anahtar Sözcükler: Koroner Anjiyografi, Koroner Arter Anomalileri, Tek Koroner Arter, Göğüs Ağrısı

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Introduction

The detection of coronary artery anomalies has become more common due to the increasing use of angiography, with reported incidences ranging from 0.6% to 1.6%. Among these, a single coronary artery anomaly—where one coronary artery arises from a solitary ostium in the aortic arch—is rare, occurring in just 0.024% to 0.04% of cases [1]. First identified in 1967 via angiography, this anomaly is often associated with congenital heart defects like tetralogy of Fallot, pulmonary atresia, and persistent truncus arteriosus, found in about 40% of patients. Though typically benign and asymptomatic, certain variants of this anomaly can lead to severe cardiac events, such as sudden death or myocardial infarction, especially during physical activity. Furthermore, isolated single coronary artery anomalies may present as chest pain, arrhythmias, syncope, and heart failure. This article explores two cases of single coronary artery anomalies. Unlike the usual surgical interventions seen in the literature, we chose coronary stent implantation in the first case and medical management in the second, based on anatomical considerations. The cases emphasize the importance of an individualized approach to diagnosing and treating patients with single coronary artery anomalies, factoring in anatomical differences and the potential for percutaneous intervention [2].

CASE 1

A 56-year-old male with a five-year history of hypertension presented with substernal chest pain, described as pressure and burning, which had persisted for three months. The pain typically occurred during exertion and subsided with rest. He was on perindopril and amlodipine for hypertension and had a smoking history. His family history included renal failure, cardiovascular disease, and kidney transplantation. On examination, there was a left-deviated apical sound and a firm S1 heart sound, but no additional murmurs. Electrocardiography showed normal sinus rhythm at 75 bpm with nonspecific T wave negativity in leads V1-V6. Transthoracic echocardiography revealed an ejection fraction (EF) of 60%, left ventricular hypertrophy, mild aortic regurgitation, and ascending aortic dilatation (41 mm). Given the symptoms and normal lab results, coronary angiography was performed, revealing that all coronary arteries arose from the right coronary artery. There was severe (90%) stenosis in the proximal left anterior descending artery, which crossed over aorta and the pulmonary artery before continuing normally (Figure 1). Due to the lesion's accessibility and favorable catheter engagement, a decision was made for coronary intervention. A right 6F guiding catheter was used to access the single coronary artery, and after crossing the lesion with a floppy wire, a 2.75x18 drug-eluting stent (Mitigator) was deployed at 16 atm in the proximal left anterior descending artery. The procedure was successful, with full patency and no complications. The following day, the patient showed no electrocardiographic changes, no chest pain, and normal troponin levels. His treatment plan was adjusted, and he was discharged on the third day with a follow-up coronary CT angiography scheduled, as no further issues were observed during the follow-up. Ct angiography was performed one month later and showed a single coronary artery and patent stent (Figure 2 and 3).

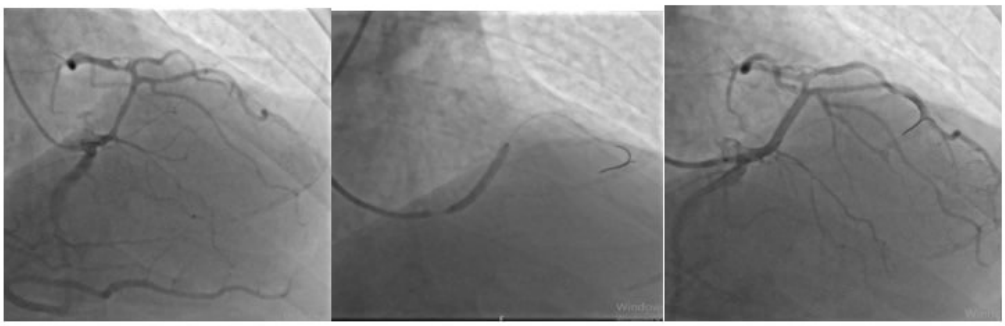

Figure 1. A) Single coronary artery with right sinus of valsalva origin and critical stenosis in the proximal left anterior descending artery B)Insertion of a 2.75x24mm drug-eluting stent after 2x20 balloons after JR4 guiding catheter placement C) Final image of the left anterior descending artery after successful stent implantation

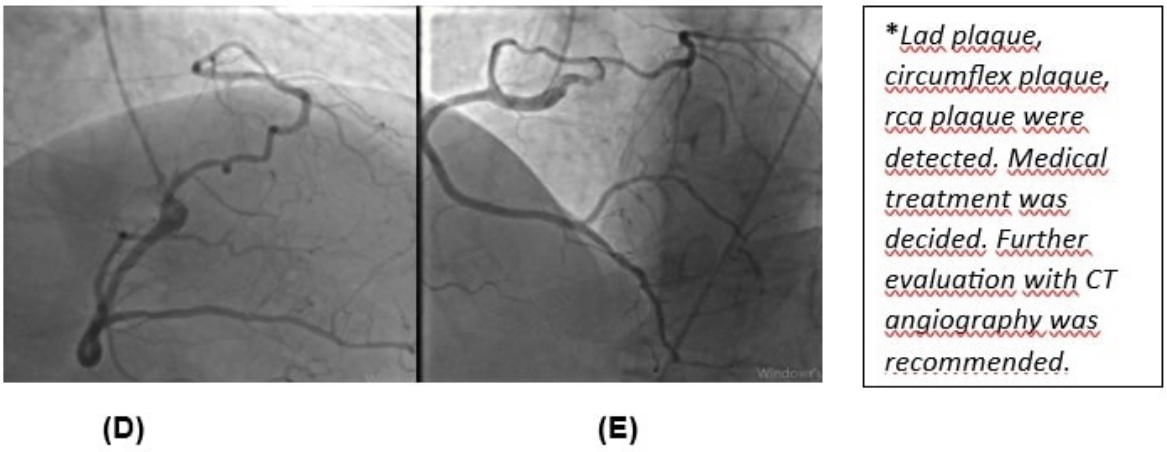

Figure 2. D) Image of single coronary artery exiting right sinus valsalva (AP cranial) E) Image of single coronary artery exiting right sinus valsalva (left oblique) *

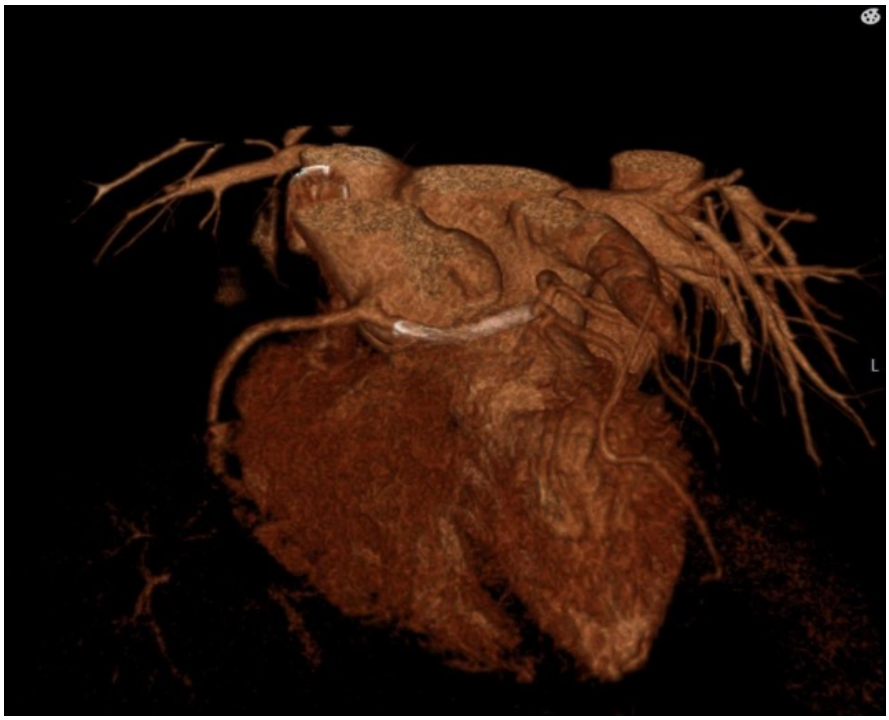

Figure 3. Case 1 – Coronary CT 3D ViEW Type R-1-A Single Coronary Artery ve Patent Stent in Left Main Coronary Artery

CASE 2

A 45-year-old male presented to the cardiology clinic with intermittent chest pain and tightness that worsened with exertion over the past month. His electrocardiogram was normal, and echocardiography showed normal valve structures and an EF of 60%, with no other abnormalities. He had a smoking history and recently diagnosed diabetes mellitus, but no significant family history. Following a high-risk result on an exertional stress test and normal blood tests, he underwent coronary angiography. The results revealed a single coronary artery arising from the right sinus of Valsalva, with the left anterior descending artery crossing the pulmonary artery and continuing normally. No significant lesions were found, though plaques were noted in the left anterior descending and right coronary arteries (Figure 2). The patient's symptoms improved with medical treatment, and he was discharged with plans for follow-up and a coronary CT angiography. And in the control he refused to have a CT scan due to risk of contrasyt nephropathy.

Discussion

The term "coronary anomaly" encompasses a wide

variety of conditions, the most common being the separate origins of the left anterior descending and circumflex arteries from the left sinus of Valsalva, the origin of the circumflex artery from the right sinus of Valsalva, and coronary artery fistulas. An isolated single coronary artery anomaly is one of the rarest, accounting for only 2-4% of all coronary anomalies. The prognosis for patients with a single coronary artery depends on its anatomical path. For example, when the left coronary artery originates from the right coronary sinus, the mortality rate before age 20 is alarmingly high at 59%. While some individuals may have a favorable prognosis, others are at significant risk of sudden death, with up to 15% developing severe cardiac issues before the age of 40. A particularly dangerous variant occurs when the coronary artery passes between the aorta and pulmonary artery in anomalies originating from the right sinus of Valsalva. Patients with this condition may remain asymptomatic for years, only showing symptoms when atherosclerotic changes occur [3].

Lipton et al.'s 1979 classification system for single coronary arteries, which builds upon earlier work by Smith (1950) and Ogden and Goodyer (1970), uses 'R' and 'L' to indicate the right or left sinus of Valsalva origin, along with 'A', 'P', and 'B' to describe the artery's path relative to the pulmonary artery: 'A' for anterior, 'P' for posterior, and 'B' for between the aorta and pulmonary artery (Table -1) [4].

Currently, there is no universally accepted guideline for managing patients with single coronary artery anomalies. Surgical intervention is recommended for those unresponsive to medical therapy or those with coronary arteries passing between the aorta and pulmonary artery, as these carry a higher mortality risk. Some cases in the literature, however, show that single coronary arteries—when not fitting these high-risk categories—can be treated with coronary stenting, as seen in studies by Raddino et al. (2006) and more recently by Altun et al. Moreover, Mirchandani et al. (2005) explored both surgical and medical management of single coronary arteries in children [5-6]. Therefore, for patients with myocardial ischemia due to atherosclerosis, a single coronary artery might present as a benign congenital anomaly, and percutaneous coronary angioplasty with stenting could be an effective solution.

Table 1: Single Coronary Artery Classification Lipton et al.

Classification of single coronary arteries		
Osteal placement	r	Right sinus valsalva
	l	Left sinus valsalva
Anatomic distrubution	1	Single coronary artery follows right or left coronary course
	2	Crosses the basal part of heart in a broad transverse body
	3	The cx and lad arise seperately from a single coronary trunk
Course of transverse part of coronary vessel	a	İn front of the big vessels
	b	Between aorta and pulmonary artery
	p	Behind to big vessels
	s	Septal type
		Combined type

İn a case presentation by Canbay and colleagues(2008), they presented three cases of single coronary artery, which were classified as R-1, R-1, and R-2-B. Surgical intervention was decided for two of the cases, while medical treatment was chosen for one case [7].

However, it's essential to thoroughly define the morphology of the anomalous artery before initiating treatment to rule out other potential causes of myocardial ischemia, such as vascular compression. Imaging techniques like coronary CT or MRI can provide crucial insights into the origin and path of the anomalous coronary arteries [5]. In the cases discussed here, we opted for follow-up coronary CT angiography to classify the single coronary artery, despite the patients being symptom-free during follow-up and still under observation.

The optimal treatment approach for single coronary artery remains uncertain. Management should be tailored based on the anatomical course of the artery and the presence of associated coronary atherosclerosis. Coronary artery bypass surgery may be advantageous for patients with an anomalous coronary artery that passes between

the aorta and the main pulmonary artery, as well as for those with significant atherosclerosis, who might benefit from revascularization. Additionally, successful outcomes with percutaneous coronary intervention have been documented in certain cases [5,6].

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Ethics Committee Approval: : The study followed the ethical principles outlined in the 1964 Declaration of Helsinki and its later amendments. Informed consent form for case presentation was obtained from the patient and/or his/her relatives.

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