

## Single coronary artery arising from the right sinus of Valsalva

### Sağ Valsalva sinüsünden çıkan tek koroner arter

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Single coronary artery (SCA) is a rare congenital anomaly in which the entire coronary system arises from a solitary ostium. A 65-year-old male with a history of diabetes mellitus, hypertension, and hyperlipidemia was admitted with exertional angina pectoris of new onset. His physical examination, hemogram, thyroid function tests, chest X-ray, electrocardiogram, and transthoracic echocardiogram were normal. In treadmill exercise test, the patient could not reach submaximal heart rate due to fatigue. Coronary angiography revealed an SCA arising from the right sinus of Valsalva (type R-IIA). The left coronary artery (LCA) coursed anteriorly in front of the right ventricular outflow tract and gave off branches for the left anterior descending and left circumflex (LCx) arteries. A mild diffuse nonobstructive atherosclerotic lesion was also detected in the LCx. The entire SCA and the anterior course of the LCA in relation to the great vessels were further displayed by 16-row multislice computed tomography. The atherosclerotic lesion was not eligible for percutaneous intervention and the patient was scheduled for medical therapy with recommendation of risk factor modification.

**Key words:** Coronary angiography; coronary vessel anomalies/diagnosis; sinus of Valsalva/abnormalities.

Single coronary artery (SCA) is a rare congenital anomaly in which the entire coronary system arises from a solitary ostium. As an isolated finding, its incidence is 0.024% to 0.066% in the general population undergoing coronary angiography.<sup>[1-3]</sup> However, it is encountered more frequently with other congenital cardiac malformations such as persistent truncus arteriosus, tetralogy of Fallot, transposition of the great arteries, or pulmonary atresia.

In this report, we present a case of isolated SCA arising from the right sinus of Valsalva.

Tek koroner arter (TKA) tüm koroner sistemin aorttaki tek bir koroner ostiyumdan çıktığı nadir bir doğuştan anomalidir. Diyabet, hipertansiyon ve hiperlipidemi öyküsü olan 65 yaşında erkek hasta, yeni başlayan egzersiz anginası ile yatırıldı. Fizik muayene, hemogram, tiroit fonksiyon testleri, göğüs radyografisi, elektrokardiyografi ve transtorasik ekokardiyografi bulguları normal olan hastaya yürüme egzersiz testi yapıldı, ancak hastanın aşırı yorgunluğu yüzünden hedef kalp hızına ulaşamadı. Koroner anjiyografide sağ Valsalva sinüsünden çıkan R-IIA tipte bir TKA saptandı. Sol koroner arter, sağ ventrikül çıkış yolunun önünde seyrederek, sol ön inen arter ve sol sirkümfleks arter dallarını veriyordu. Ayrıca, sol sirkümfleks arterde tıkaçıcı olmayan aterosklerotik lezyona rastlandı. Tek koroner arterin tamamı ve sol koroner arterin büyük arterlerle ilişkili olarak anteriyor seyri 16-kesitli bilgisayarlı tomografi ile de gösterildi. Sirkümfleks arterdeki lezyon perkütan girişime uygun olmadığı için, hastanın tıbbi tedavi ile izlenmesine karar verildi ve kendisine yaşam biçimi değişiklikleri önerildi.

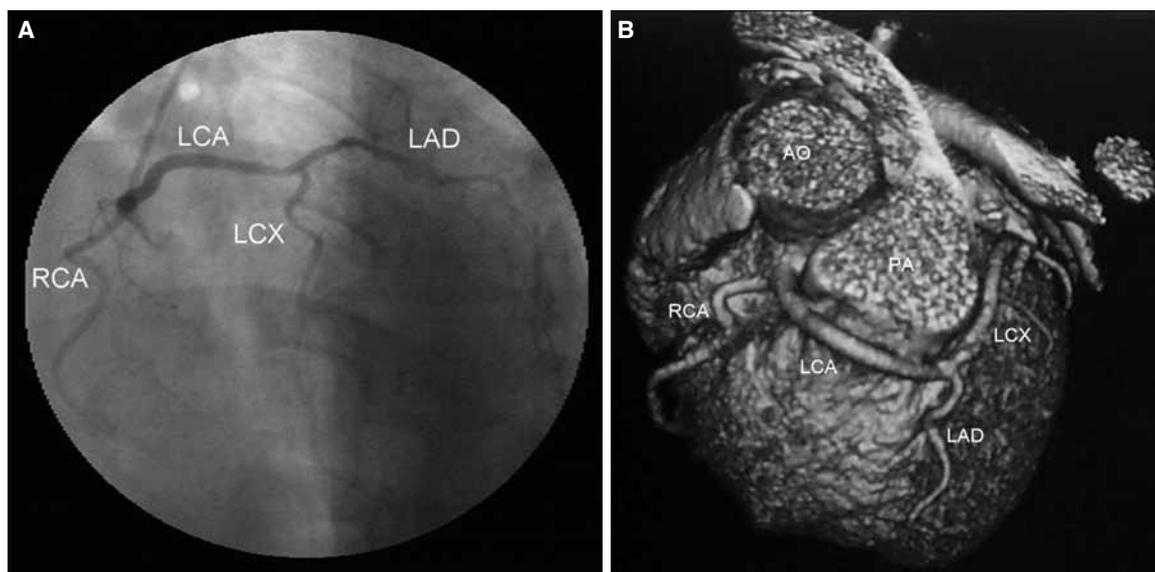
**Anahtar sözcükler:** Koroner anjiyografi; koroner damar anomalisi/tanı; Valsalva sinüsü/anormallik.

### CASE REPORT

A 65-year-old male with a history of diabetes mellitus, hypertension, and hyperlipidemia was admitted to our clinic with exertional angina pectoris of new onset. He was not on any regular medications. His physical examination, hemogram, thyroid function tests, chest X-ray, electrocardiogram (ECG), and transthoracic echocardiogram were normal. On admission, blood levels of glucose and lipid profile were as follows: fasting blood glucose 461 mg/dl, total cholesterol 198 mg/dl, triglycerides 277 mg/dl,

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**Figure 1.** (A) Coronary angiogram showing a single coronary artery arising from the right sinus of Valsalva. (B) Multislice computed tomography shows anterior course of the single coronary artery in relation to the aorta. RCA: Right coronary artery; LCA: Left coronary artery; LAD: Left anterior descending coronary artery; LCX: Left circumflex coronary artery; AO: Aorta; PA: Pulmonary artery.

and LDL cholesterol 131 mg/dl. Renal and hepatic function tests were normal. A treadmill exercise ECG was performed using the Bruce protocol; however, the patient could not reach submaximal heart rate due to fatigue. Due to the high coronary risk profile, coronary angiography was performed via the right femoral artery by the Judkins technique, which revealed an SCA arising from the right sinus of Valsalva (Fig. 1a). The left coronary artery (LCA) coursed anteriorly in front of the right ventricular outflow tract and served as a conduit to supply the left anterior descending and the left circumflex (LCx) arteries. A mild diffuse nonobstructive atherosclerotic lesion was detected in the LCx. The entire SCA and the anterior course of the LCA in relation to the great vessels were further displayed by 16-row multislice computed tomography (MSCT) (Fig. 1b). Coronary calcium score was 206 Agatston units. The mild atherosclerotic lesion in the LCx was also demonstrated by MSCT. The lesion was not eligible for percutaneous intervention and the patient was managed with medical therapy and risk factor modification. He was symptom free and doing well during a year follow-up.

## DISCUSSION

The anomalous origin of the LCA from the right sinus of Valsalva is an uncommon entity accounting for 0.15% of the cases.<sup>[4]</sup> This case provides a unique example of ectopic origin of the LCA from the right sinus of Valsalva. The SCA arising from the right sinus of Valsalva had an initial common trunk that

gave rise to both the right coronary artery and a long LCA which followed a prepulmonic course.

Angiographic classification of single coronary arteries includes the following:<sup>[1,2]</sup> 'R' and 'L' denote the origin of the SCA as the right and left sinus of Valsalva, respectively. Then, the anatomical course of the anomalous coronary artery is designated: type I denotes an anatomical course of either a right or left coronary artery; type II denotes one coronary artery arising from the proximal part of a normally located coronary artery; and type III denotes the condition where the left anterior descending and LCx arteries arise separately from the proximal part of the normal right coronary artery; thus, this type can only be true for the 'R' type of SCA. Finally, the course of the anomalous artery in relation to the great vessels is designated with the letters 'A' (anterior), 'P' (posterior), 'B' (interarterial course between the aorta and the pulmonary artery), 'S' (part of the route is through the interventricular septum), and 'C' (a combination of diverse routes). In our case, the SCA was type R-IIA according to this classification.

Identification of the interarterial course of an arterial segment is important, since this type represents the highest risk for sudden cardiac death. Mechanical compression of the vessel between the aorta and the pulmonary artery or kinking are potential causes of ischemia and sudden cardiac death.<sup>[5,6]</sup> Although the majority of patients are asymptomatic, an SCA can present with recurrent ischemia, acute myocar-

dial infarction, heart failure, syncope, and nonfatal ventricular fibrillation.<sup>[7]</sup> In 15% of patients with ischemia, no atherosclerotic lesion was found accompanying the SCA.<sup>[8]</sup> Impaired coronary flow reserve, acute aortocoronary angulation, slit-like ostium, ostial tissue flaps, initial course of the coronary artery within the aortic wall, or spasm are other mechanisms that cause ischemia in the absence of atherosclerosis. An anomalous SCA does not appear to be associated with an increased risk for the development of coronary atherosclerosis.<sup>[9]</sup> In our case, an atherosclerotic plaque was encountered in the LCx, but the patient had multiple coronary risk factors including old age, male sex, diabetes mellitus, and hypertension. The Coronary Artery Surgery Study reported an increase in stenosis of the anomalous LCx, but survival was not adversely affected within seven years.<sup>[10]</sup>

Conventional X-ray coronary angiography is the gold standard method for the detection of SCAs. However, as it provides a two-dimensional image projection, it may not accurately delineate the origin and course of the SCA with respect to the great vessels. This can further be evaluated by transesophageal echocardiography,<sup>[11]</sup> MSCT,<sup>[12]</sup> or magnetic resonance imaging (MRI).<sup>[13]</sup> Transesophageal echocardiography has two disadvantages: it is a semi-invasive technique and gives limited information. The accuracy of identifying proximal coronary arteries with MSCT is similar to that of coronary MRI, and it has drawbacks of exposure to ionizing radiation and nephrotoxic iodinated contrast agents. Finally, coronary MRI is a noninvasive alternative method for imaging SCAs, eliminating the use of contrast media or ionizing radiation. Moreover, it can provide three-dimensional reconstructions of the vessel which better delineate the proximal course of the coronary artery with respect to the great vessels. During the same session, adenosine perfusion imaging and dobutamine stress testing can also be performed to evaluate the functional significance of detected coronary lesions.<sup>[14,15]</sup> However, MRI is expensive, requires experience, and is not widely available as conventional X-ray coronary angiography or MSCT. In our case, we diagnosed the SCA by conventional X-ray coronary angiography and further delineated the route of the anomalous coronary artery with respect to the aorta and pulmonary artery by MSCT.

Although SCA is usually benign unless associated with other congenital heart defects, it still has significance for interventionists and cardiothoracic surgeons. Every interventionist should be familiar with

the existence and anatomical types of this anomaly. A detailed description of the anomalous vessel should be given to the cardiothoracic surgeon in order to avoid iatrogenic injuries.

No definite treatment strategy has been defined for SCAs. Our patient had irregularities in the LCx and was scheduled for medical follow-up, with recommendation to avoid strenuous physical activity. Coronary artery bypass grafting is the treatment of choice whenever an interarterial coronary artery is detected in order to prevent sudden death.<sup>[16]</sup> Percutaneous intervention can also be performed in appropriate cases.<sup>[17,18]</sup>

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