CASE REPORT

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Successful Implantation of Two Stents in the Right Coronary Artery in a Patient with a Single Coronary Artery Anomaly

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ABSTRACT Single coronary artery is a congenital cardiac anomaly in which the right coronary artery or left main coronary artery arises from a single aortic ostium. This coronary anomaly is rare and may lead to a wide range of clinical manifestations from asymptomatic to sudden cardiac death, depending on its association with great vessels. In addition, proven treatment strategies for this anomaly have not yet been established. In this report; we presented a single coronary artery originating from the right sinus of valsalva, and successful two stents implantation of the middle and distal right coronary artery in a patient with acute coronary syndrome.

Keywords: Percutaneous coronary intervention; single coronary artery anomaly

A single coronary artery (SCA) is defined as a single orifice or origin that provides perfusion of the whole myocardium.[1,2] SCA may be single or coexist with congenital heart diseases.[3] The clinical presentation may vary its association with great vessels.[4] In this case, we reported a 67-years-old man with a SCA anomaly arising from the right sinus of valsalva and successful two stents implantation into right coronary artery (RCA).

CASE REPORT

A 67-years-old patient was admitted to our emergency department with a typical new onset of chest pain and shortness of breath. He had hypertension and past smoking history. His vital signs and the physical examination findings were normal.

Electrocardiogram revealed sinus rhythm with nonspecific ST-T wave changes in limb leads. In transthoracic echocardiography, the left ventricular ejection fraction was 60% without abnormal wall motion. In biochemical parameters; high sensitivity cardiac Troponin I (cTnI) level was 968.2 ng/mL (normal range: 0-34.2 ng/mL), creatine kinase-myocardial band level was 54.1 IU/L (normal range: 54.1 IU/L) and serum creatinine kinase level was 119 IU/L (normal range: 30-200 IU/L). Due to symptoms and high cTnI levels, cardiac catheterization was performed via a right transfemoral approach. Many attempts were performed to cannulate the left coronary ostium, but failed. The right coronary angiogram revealed a SCA arising from the right sinus of valsalva. SCA originating from the normal position of the RCA ostium proceeded as a large RCA in the right atrioventricular groove and divided into a posterior descending artery and a posterolateral branch at the crux. The middle of the RCA had a significant lesion and distal RCA was totally occluded. The left main coronary artery (LMCA) coursed at the atrioventricular junction and served as a conduit to supply the dimitive left anterior descending (LAD) coronary artery and the left circumflex (LCx) coronary artery. In left coronary circulation system, there was a significant lesion in LAD artery, LCx artery was normal and the obtus marginalis branch of LCx artery had non-

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critical lesion (Figure 1, Figure 2). The culprit vessel was considered RCA due to presence of two significant lesions and having larger myocardial irrigation perfusion. Then the percutaneous coronary intervention (PCI) was planned. After predilation with a 2.0x15 mm balloon (Simpass plus, Simeks Medical, İstanbul, Turkey), a 3.5x32 mm bare metal stent (Rebel, Boston Scientific MN, USA) was implanted into distal RCA and a 4.0x12 mm bare metal stent (Rebel, Boston Scientific MN, USA) was implanted into middle RCA (Figure 3).

Coronary computed tomographic (CT) angiography was performed for further evaluation. In imagings, LMCA was separated from SCA in the first 1 cm segment after its origin and extended to left atrioventricular junction, showing a retroaortic course, where divided into the LCx and LAD branches. RCA had normal course and two stents were shown in its middle and distal segments (Figure 4, Figure 5). Additionally, the middle segment of the LAD artery had a subpulmonic transseptal course (Figure 6).

He was discharged without any complications. and followed up with medical therapy including aspirin, ticagrelor, beta blocker and statin.

DISCUSSION

Anomalous origin of coronary artery (AOCA) is a rare congenital disorder. The studies have determined its prevalence as around 5% and the prevalence of LMCA originating from the right coronary sinus of valsalva was around 0.15% (anterior to pulmonary artery outflow tract or pre-cardiac, retro-aortic, between aorta and pulmonary artery, intraseptal, a posterior-anterior interventricular groove, posterior atrioventricular or retrocardiac groove).[5,6]

SCA is a less common type of AOCA, first described in 1903. Its incidence has been reported between 0.024% to 0.066%.[1,2] A retrospective study of 12,844 patients who underwent coronary angiography in the Turkish population showed that 95 patients had AOCA, 8 of them (0.062%) had SCA.[7] This study's findings confirmed the previous reports.[8] Similar to ours, SCA was seen as an isolated anomaly.

Lipton et al. classified SCA into 3 groups. In the Type I form, SCA follows the course of RCA and gives the LCx artery branch firstly and then gives the LAD artery branch, or continues as a single left main artery branching into the LAD and LCx arteries, the latter of which extends across the crux form the RCA. Type II is the most common form and the main trunk of SCA divides into the right and left main coronary arteries after its origin, and then the LMCA branch into the LAD and LCx arteries. In Type III, RCA, LAD artery and LCx arteries originate separately from the main trunk of SCA. The association of anomalous artery course with the great vessels is indicated by the letters "A" (anterior) "P" (posterior), "B" (between aorta and pulmonary artery).[1] However Yamanaka and Hobbs modified this classification by adding two new groups, "S" and "C", representing transseptal and

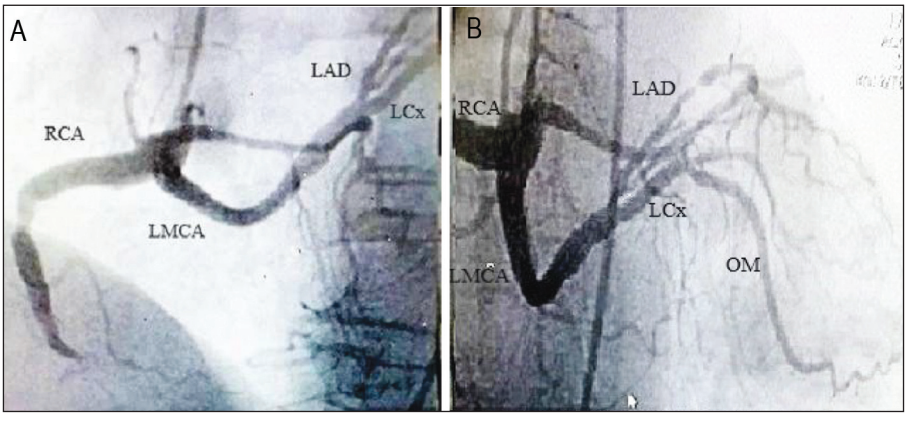

FIGURE 1: Coronary angiography imagings in anterioposterior (A) projection and right oblique 24° cranial projection (B).
LMCA: Left main coronary artery; LAD: Left anterior descending; LCx: Left circumflex coronary artery; OM: Obtus marginalis branch; RCA: Right coronary artery.

FIGURE 2: Images of a single coronary artery and significant stenosis in the middle right coronary artery in the right oblique 27° caudal projection on coronary angiography.
LMCA: Left main coronary artery; IMA: Intermediate coronary artery; RCA: Right coronary artery.

combined courses in 1990.[9] Our patient had RII-P type according to modified Lipton classification.

Most patients have asymptomatic in this anomaly. But the course of the anomalous artery between the aorta and the pulmonary artery may cause myocardial ischemia, syncope or sudden cardiac death. In coronary anomalies including SCA, many factors such as cleft-like ostium, acute angulation, coronary spasm, hypoplastic artery, interatrial course and intramural course or exercise-related narrowing play a role in the development of ischemia. Therefore, this anomaly should be considered in patients who are unlikely to have CAD, but who have a positive non-invasive stress test.[10,11] We agree that CAD in our patient was associated with predisposing atherosclerosis process such as advanced age, prolonged exposure to hypertension and smoking history. The mid segment of LAD had subpulmonic transseptal course but the disappearance of symptoms after RCA stenting, the absence of new symptoms during follow-up and the presence of significant lesions in different coronary arteries confirm our idea. If the lesions in RCA did not cause symptoms, we would not be able to detect this anomaly due to its benign course.

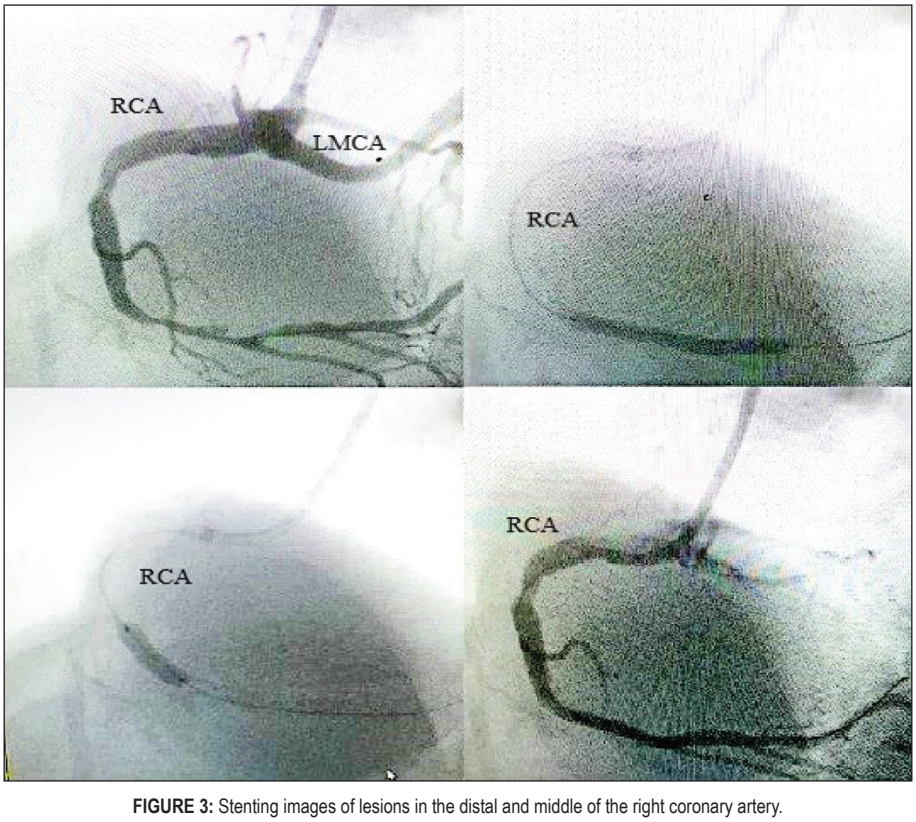

FIGURE 3: Stenting images of lesions in the distal and middle of the right coronary artery.
LMCA: Left main coronary artery; RCA: Right coronary artery.

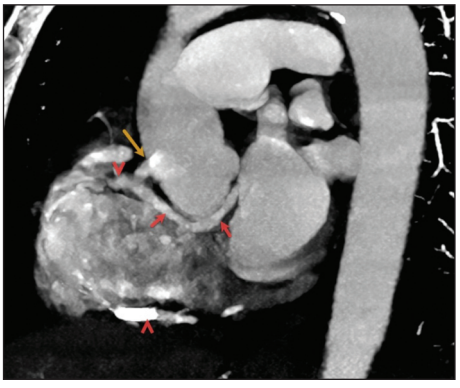

FIGURE 4: The sagittal plane image of single coronary artery on contrast-enhanced computed tomographic angiography.
This image shows the origin of a single coronary artery from the right sinus valsalva and the course of the coronary arteries. The left main coronary artery extends retroaortically. The right coronary artery follows its natural course and the stents implanted in the right coronary artery are seen as white opaque. Orange arrow, single coronary artery; red arrow, left main coronary artery; red arrowhead, right coronary artery.

Coronary angiography is the most widely used method for detecting SCA. However it may be insufficient in showing the origin, the course and, the relationship of coronary anomaly with large vessels. For further evaluation, the use of transesophageal echocardiography, multislice CT or magnetic resonance imaging may be required.[12] In this case, we used coronary CT angiography to better evaluate this anomaly and found that SCA had a benign nature due to retroaortic course.

There is no proven treatment strategy for SCA and a multidisciplinary approach should be considered. Beta-blocker therapy and lifestyle changes are recommended for patients without ischemia. However, surgery approach including reimplantation of the anomalous artery to aorta, coronary artery bypass grafting, and pulmonary artery translocation is inevitable in patients with an interatrial course.[13,14] It has been also reported that PCI was performed in limited cases. Altun and Erdogan showed a SCA originating from the right coronary sinus on coronary angiography in a 50-year-old patient.[15] In this case, SCA gave rise to LMCA and RCA after a short segment and there was a significant stenosis in the middle of RCA. Similar to ours, they successfully stented the RCA and did not interfere with the course of LMCA due to disappearance of ischemic symptoms.

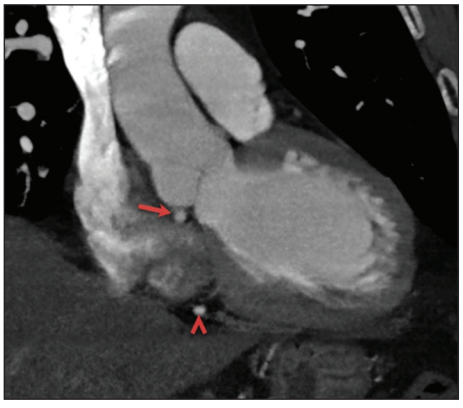

FIGURE 5: The coronal plane image of the course of the coronary arteries on contrast-enhanced computed tomographic angiography.
Red arrow, left main coronary artery; red arrowhead, right coronary artery.

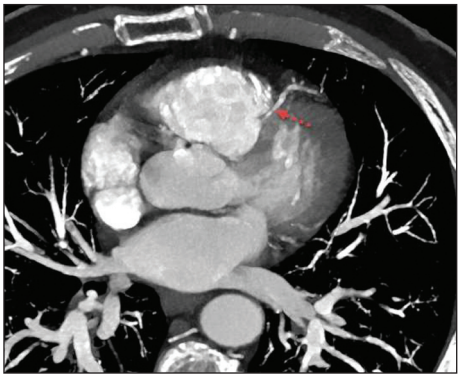

FIGURE 6: The image of left anterior descending coronary artery on contrast-enhanced computed tomographic angiography.
Left anterior descending coronary artery shows a subpulmonic transseptal course. Red dashed arrow; left anterior descending coronary artery.

Informed Consent

There is no need for a consent form in this paper, since no personal information belonging to the patient was disclosed as all data and figures were anonymized.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Sara Çetin Şanlıalp;* ***Design:*** *Sara Çetin Şanlıalp;* ***Control/Supervision:*** *Sara Çetin Şanlıalp, Gökay Nar;* ***Data Collection and/or Processing:*** *Ömer Çağlıyan, Musa Şanlıalp, Furkan Ufuk;* ***Analysis and/or Interpretation:*** *Sara Çetin Şanlıalp, Musa Şanlıalp, Ömer Çağlıyan, Furkan Ufuk, Gökay Nar;* ***Literature Review:*** *Sara Çetin Şanlıalp;* ***Writing the Article:*** *Sara Çetin Şanlıalp;* ***Critical Review:*** *Gökay Nar, Sara Çetin Şanlıalp;* ***References and Fundings:*** *Ömer Çağlıyan, Musa Şanlıalp.*

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