Anomalous Origin of the Left Anterior Descending Artery: A Report of Two Cases with Different Course of Target Vessels

Yigit Canga,1 Tahir Bezgin,2*, Mehmet Baran Karatas,1 Ali Nazmi Calik,1 Sinan Sahin,1 and Osman Bolca1

1Siyami Ersek Thoracic and Cardiovascular Surgery Center, Training Research Hospital, Istanbul, Turkey
2Kartal Ko¸suylu Heart Research Hospital, Istanbul, Turkey
*Corresponding author: Tahir Bezgin, Kartal Ko¸suylu Heart Research Hospital, Istanbul, Turkey . Tel: +90-5054424712, E-mail: bezgintahir3@yahoo.com

Abstract

Introduction: Anomaly of the left anterior descending (LAD) coronary artery arising from the right sinus of Valsalva is infrequently seen.

Case Presentation: We described two cases of anomalous origin of the LAD from the right sinus of Valsalva. The circumflex coronary artery (CX) was originated from the left coronary sinus in the first case. There was a superdominant right coronary artery with absent CX artery in the second case.

Conclusions: Absence of the CX artery was proven by coronary computed tomography angiography.

Keywords: Coronary Anomaly, Absent CX, Superdominant RCA

1. Introduction

Coronary artery anomalies (CAAs) are encountered incidentally in 0.6% - 1.3% of coronary angiograms and 0.3% of autopsy series (1). Indeed, the actual prevalence is unknown because it is estimated in patients who undergo coronary imaging with the suspicion of coronary artery disease. Approximately 80% of these anomalies are benign and do not cause signs or symptoms. The remaining patients have increased risks of myocardial ischemia, malignant arrhythmias, and sudden cardiac death, depending on the origin and course of the anomalous vessel. Anomalous origin of coronary artery from the opposite sinus (ACAOs) of the aorta has been recognized as a potentially serious coronary anomaly, with a prevalence estimated to be approximately 0.15% - 1.0% of all CAAs (2). Left main stem (LMS) or left anterior descending (LAD) arteries arising from the right aortic sinus and associated with anomalous interarterial or intramural aortic courses are considered potentially serious anomalies. An anomalous LAD artery originating from the right sinus of Valsalva (RSV) is one of the rarest anomalies and is generally associated with congenital heart disease, including tetralogy of Fallot (TOF).

We describe two cases of ACAOs in which the LAD artery originated with a separate ostium from the RSV near the orifice of the right coronary artery (RCA). In the first case, the left circumflex (LCX) artery was located in its usual expected position at the left sinus of Valsalva (LSV). In the second case, the LCX artery arose as a terminal extension of a superdominant RCA. To the best of our knowledge, the coronary anomaly mentioned in the latter case is one of the rarest in the literature and does not fit into the taxonomy of coronary artery anomalies.

2. Case Presentation

2.1. Case 1

A 60-year-old woman was admitted to our outpatient clinic for effort dyspnea (NYHA functional class III). Her past medical history included hypertension and cerebrovascular accident. Physical examination revealed a mid-diastolic rumbling murmur with a loud first heart sound. She had atrial fibrillation with a rapid ventricular rate on electrocardiogram (ECG). Transthoracic echocardiogram (TTE) revealed rheumatic mitral valve disease. High transmitral gradients (maximum 20 mmHg, mean 15 mmHg) with a valve area of 1.3 cm² and moderate- to severe-degree mitral insufficiency were identified. Coronary angiography was performed for routine preoperative evaluation. The left coronary angiogram showed that the LCX coronary artery originated from the left sinus through a separate ostium with normal peripheral distribution (Figure 1A). The LAD artery could not be viewed despite several attempts. It was believed there was a total occlusion of the LAD artery from the ostium at first sight. While performing selective right coronary angiography, a second coronary ostium was engaged. Contrast injection showed the LAD artery to arise from the right aortic sinus (Figure 1B-C). This vessel travelled to the left and entered into the
mid-anterior interventricular sulcus (AIVS) with tortuosity throughout its entire length. This anomaly was considered benign because of the LAD artery’s course. The prepulmonic course of the LAD artery was not confirmed by CT angiogram due to the patient’s financial situation. Mitral valve replacement was performed without any coronary intervention.

2.2. Case 2

A 75-year-old man with a history of hypertension presented to the emergency room with acute pulmonary edema. His medical history revealed no established coronary heart disease. He described 2 months of increasing shortness of breath and dyspnea on exertion. He also complained of increasing orthopnea and paroxysmal nocturnal dyspnea over the preceding 2 months, and at presentation he could sleep only if sitting upright in bed. His blood pressure was 200/120 mm Hg. Physical examination revealed jugular vein distention and bilateral basilar rales. A 12-lead ECG showed sinus tachycardia with right bundle branch block. TTE showed global hypokinesia of the left ventricle with an ejection fraction of 35%. The patient was transported to the intensive care unit for initiation of diuretics and vasodilator therapy. He underwent coronary angiography after medical stabilization. The ostium of the LMS artery could not be intubated. Nonselective injection of the ascending aorta showed no coronary ostia at the LSV. On the right side, coronary artery injection revealed a superdominant RCA and also an anomalous coronary artery arising close to the origin of the RCA (Figure 2A-B). The anomalous vessel ran to the left side and coursed in front of the pulmonary trunk. The RCA showed a superdominant pattern, with various posterior descending branches, extending beyond the crux cordis and circling the atrioventricular groove almost completely, following the expected path of the absent CX artery. Plaque formation in the mid-segment of the right-sided anomalous CX artery was considered to be non-critical (Figure 2B, arrow), and the procedure was terminated without any intervention. The coronary computed angiography revealed an absent LCX artery, likely congenital, and an anomalous LAD artery originating from the RSV near the RCA ostium with a prepulmonic course toward the AIVS (Figure 2C). There was no significant stenosis in the anomalous LAD artery. The superdominant RCA arising from the RSV was on a normal course, with extensive atherosclerotic plaques.

3. Discussion

Investigators have tried to classify and describe CAAs in various studies for many years. Yamanaka and Hobbs classified CAAs anatomically and clinically. Anatomical CAAs are divided into two major groups: those with anomalies of origin and distribution, and those with coronary artery fistulæ. Clinically, CAAs have also been divided into benign and potentially serious types. Benign coronary anomalies were absent LMS artery, absent LCX artery, LCX artery originating from the RCA or RSV, and ectopic origin of coronary arteries from the posterior sinus of Valsalva or ascending aorta. Ectopic coronary origin from the pulmonary artery, ectopic origin of the left coronary artery or LAD artery from the RCA or RSV, ectopic origin of RCA from the LSV, single coronary artery, and coronary artery fistulæ with large intracardiac shunts were classified as potentially serious coronary anomalies according to Yamanaka and Hobbs (3). An LAD artery arising from the RSV is a form of ACAOS that is potentially serious, classified under the title of origination and course anomalies. As a rule, patients with this anomaly have a normal courseing LCX artery originating from the LSV.

An LAD artery arising from the RCA or RSV is generally associated with congenital heart disease, including TOF (4), and has been very rarely reported as an isolated anomaly. Yamanaka and Hobbs showed that the incidence of isolated anomalies of the LAD coronary artery originating from the RSV was 0.03%. Herein, we described two cases of the LAD artery originating from the RSV without concomitant congenital heart disease. In the first patient, the LAD artery arose from the RSV near the RCA ostium and traveled through the LAD territory with a prepulmonic course. The LCX in the first patient was in the proper sinus and coursed as it should. The LAD artery originated from the RSV in the second patient, as well; however, there was a great difference between two cases. No arteries could be visualized in the LSV in the second case, and the LCX artery arose as an extension of the posterolateral branch of the RCA.

Congenital absence of the LCX artery is a very rare anomaly with an incidence of 0.003% in patients undergoing coronary angiography (1). Absent LCX artery was classified as benign in nature according to Yamanaka and Hobbs, and was considered in the group of intrinsic coronary arterial anatomy anomalies according to Angelini (5). Some authors believe that this condition is not a real congenital-absence anomaly, so it is defined as anomalous origin of the LCX artery from distal the RCA (6, 7). There have been only two cases reported in the literature similar to our second case (8, 9). This anomaly may be the combination of two very rare coronary anomalies (LAD artery from the RSV and absent LCX artery) or a new coronary anomaly that was undefined before now.
Figure 1. Left circumflex coronary artery arising from the left sinus of Valsalva and its branches (A). The LAD arising from the right coronary sinus, near to the RCA ostium (B) and reaching the anterior intraventricular course of the LAD (C, from LAO 45° projection). RCA: right coronary artery; LAD: left anterior descending artery.

Figure 2. Right coronary angiogram showing a separate LAD origin (A) from the right coronary sinus and continuation of the RCA beyond crux as circumflex artery (B). Coronary computed angiography demonstrating common origin of the left anterior descending and right coronary arteries from the right sinus of Valsalva without a visible left circumflex artery (C).

Footnotes

Authors’ Contribution: Yigit Canga performed the cases and drafted the manuscript; Tahir Bezgin performed
the cases; Mehmet Baran Karatas performed critical re-
vision of the manuscript for important intellectual con-
tent; Ali Nazmi Calık provided technical and material 
support, Sinan Sahin performed cardiac CT angiography, 
and Osman Bolca performed the cases and drafted the 
manuscript.

Conflict of Interest: All authors declare that there is no 
conflict of interest.

References

2. Angelini P, Velasco JA, Flamm S. Coronary anomalies: incidence, patho-
[PubMed: 12021235].
3. Yamanaka O, Hobbs RE. Coronary artery anomalies in 126,595 pa-
4. Kervancioglu M, Tokel K, Varan B, Yildirim SV. Frequency, origins and 
courses of anomalous coronary arteries in 607 Turkish children with 
5. Angelini P. Coronary artery anomalies: an entity in search of an 
identity. Circulation. 2007;115(10):1296-305. doi: 10.1161/CIRCULATION- 
AHA.106.618082. [PubMed: 17353457].
6. Erol C, Seker M. Coronary artery anomalies: the prevalence of origina-
tion, course, and termination anomalies of coronary arteries detected 
by 64-detector computed tomography coronary angiography. J Com-
[PubMed: 21926859].
7. Shriki JE, Shinbane JS, Rashid MA, Hindoyan A, Wityeg JY, DeFrance 
A, et al. Identifying, characterizing, and classifying congenital anomali-
[PubMed: 22410942].
8. Oliveira MD, de Fazzio FR, Mariani Junior J, Campos CM, Kajita IJ, 
Ribeiro EE, et al. Superdominant Right Coronary Artery with Absence 
of Left Circumflex and Anomalous Origin of the Left Anterior Descend-
ning Coronary from the Right Sinus: An Unheard Coronary Anomaly. 
[PubMed: 26240763].
9. Vijayvergiya R, Kumar Jaswal R. Anomalous left anterior descend-
ing, absent circumflex and unusual dominant course of right coro-