



## Double Left Anterior Descending Coronary Artery Originating from Left Main Coronary Stem and Right Coronary Artery

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### ABSTRACT

Double left anterior descending coronary artery originating from left main coronary stem and right coronary artery is a rare congenital coronary anomaly. In this case report, we are describing a patient with double left anterior descending coronary artery, one with normal origin, and the other originating from the right coronary artery. To the best of our knowledge, there are only a few reports resembling such case.

### Introduction

Double left anterior descending (LAD) coronary artery, with one originating from the left main stem and another originating from the right coronary artery or right aortic sinus, is an extremely rare congenital coronary anomaly.<sup>1</sup> The incidence of double LAD ranges from 0.01 to 0.03%.<sup>2</sup> In the present case report, double LAD coronary artery is described in a patient presented by syncope and palpitation.

### Case Presentation

A 67-year-old man was hospitalized for evaluation of syncope and palpitation. He had a past history of NYHA (New York Heart Association) function class II dyspnea, chest pain and also myocardial infarction. Moderate smoking and hypertension were his risk factors of Coronary Artery Disease (CAD). He was on aspirin, beta blocker, anti angina and lipid lowering drugs. On his cardiac physical examination, he had irregular heart rhythm and S3 in cardiac auscultation. His laboratory tests were within normal range, but on echocardiographic study, left ventricular ejection fraction was 35%, and regional wall motion abnormality in inferoposterior wall and also global hypokinesia were detected. His ECG during palpitation revealed fixed coupling interval uniform salvo premature ventricular contractions (PVCs), left axis right bundle branch block (RBBB) and left axis morphology. In addition, baseline ECG showed

Q waves in lead III, AVF and early transition of R wave in lead V2, otherwise there were nonspecific ST-T, T and P wave abnormalities. Documented ECG traces during syncope were not available.

The initial diagnostic examination was typically conventional coronary angiography, which had been performed as asymptomatic CAD was suspected. His coronary angiography was performed using Judkins technique from the right femoral artery which later revealed normal left main coronary (LMC) artery system. Proximal portion of LAD artery had normal origin from LMC system. Left anterior descending artery terminated soon after branching into underdeveloped diagonal artery. Beyond the first diagonal artery, LAD was a diminutive artery and terminated prematurely. Mid and distal segments of LAD was not visualized by collateral vessels. The aberrant LAD was visualized during right coronary artery (RCA) angiography and showed common orifice with RCA (Figure 1). LAD had tortuous course superiorly and inferiorly. After that, aberrant LAD reached to mid and distal portions of left anterior interventricular groove. When LAD started descending path, some non-significant segmental narrowing was detectable. The aberrant LAD did not have obstructive lesions giving out some septal branches. Left circumflex artery (LCX) delivered Obtus marginal (OM) branch and became obstructed after that without ante grade distal filling. Obtus marginal artery had significant segmental obstruction proximally. Ramus

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intermedius artery had significant obstructive lesion proximally. Distal portions of LCX were filled by right coronary artery system. Right coronary artery was atherosclerotic without significant obstructive lesion.

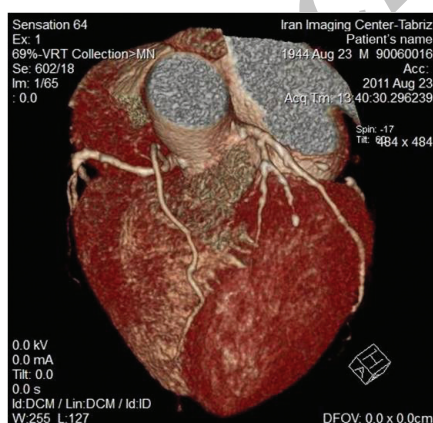
For better understanding of the course of aberrant LAD, 64 multi-detector computed tomographic angiography (MDCT) of coronary arteries was performed which later demonstrated common orifice of aberrant LAD and RCA in right coronary sinus of aorta. The course of aberrant LAD was tortuous superiorly and then inferiorly with small curvature in front of pulmonary artery trunk. After that, the aberrant LAD reached directly to mid and distal portions of left anterior interventricular groove (Figure 2). Because the patient was not a proper case for coronary artery bypass graft, he was discharged from the hospital



Patient's name  
08-44-81 67y 09/12/22  
03/14/1944  
M  
03/13/2011 10:45:49 AM  
Doctor's name  
Shahid Madani Educational-Medical Center

03/13/2011 11:03:21 AM  
A: PAO: 35.1, CRAN: 0.0  
Slice: 9 of 12  
Frame: 29 of 49

**Figure 1.** Right coronary artery (RCA) Angiography of patient



**Figure 2.** Ct Angiography (MS-CT) of patient's coronary arteries

with an acceptable condition and was being followed up every 3-6 months. He did not develop new myocardial infarction or any other problem related to this anomaly.

## Discussion

Malformation during the formation of cardiac sinusoids, coronary budding on aortopulmonary trunk and connection between the 2 systems may lead to development of coronary artery anomalies.<sup>3</sup> Coronary artery anomalies, mostly found in males, are uncommon findings during coronary angiography with incidence rate of 0.6 to 1.3%.<sup>4-7</sup> Dual left anterior descending artery (or dual anterior interventricular artery) is a rare coronary anomaly.<sup>8</sup> Although variations in origin, course and distribution are rare in both right and left coronary arteries, they are fairly rarer in left coronary artery in comparison to the right coronary artery.<sup>9</sup>

Variants of the dual LAD pattern have been identified in 1% of all patients undergoing selective coronary angiography with otherwise normal hearts.<sup>3,9</sup> Spindola-Franco et al. provided an angiographic description of the important variants of dual LAD as follows:

When the short LAD is generally the source of all the major proximal septal perforators and The long LAD also runs in the anterior inter ventricular septum (AIVS), descending on the left ventricular side of the AIVS or the right ventricular side or intra-myocardially, and then reentering the distal AIVS, it is classified as type I or II or III, respectively.

In Type IV, high in the AIVS, a very short vessel is formed by the LAD proper and the short LAD. From this vessel, the major septal perforators, as well as the diagonal branches, originate. The long LAD is unusual in its origin, arising from the right coronary artery.<sup>10</sup>

In this case, the right side LAD originated from proximal part of RCA having tortuous course anterior to pulmonary trunk and then to the left anterior interventricular groove. Therefore, the coronary angiography and CT angiographic findings of our case are consistent with type IV of double LAD in Spindola-Franco's classification.

This patient had two LADs, supplying the anterior wall of the left ventricle. The first one originated from LMC system and terminated prematurely after giving rise to diagonal branches. The second one originated from RCA. It delivered some septal branches and then reached to mid and distal portions of left anterior interventricular septum. The septal branches of the anomalous artery and also its course proved its identity as the LAD.<sup>11</sup> Otherwise this anomalous artery may be a well-developed conus branch which works instead of LAD.

Presence of short main LAD should guide the angiographers to search for the probable second LAD, originating from the RCA. Being aware of such cases can influence patients' management including requirement of CABG surgery.<sup>5</sup>

In the previous reports published on double LAD, the most common symptom of the patients almost always was chest pain, but our case presented with syncope and palpitation in addition to chest pain.

Identification of the presence of the additional LAD artery and its course is important for diagnostic and therapeutic

reasons. The relationship between anomalous coronary artery, aorta, and pulmonary trunk and the possibility of the compression of the aberrant vessel by the two great arteries could be a source of different clinical presentations (i.e., angina, syncope, MI, and sudden cardiac death) sometimes mandating surgical correction.<sup>1,11</sup> In fact, the capability of the aberrant LAD in providing the adequate blood supply to the myocardium affects presentation of the symptoms.<sup>12,13</sup>

In conclusion, we report a double LAD coronary artery, which is a rare finding. It is important for clinicians not to forget considering coronary artery anomalies such as double LAD throughout the management of the patients with complaint of chest pain, palpitation or syncope. Also, it is very important for angiographers and surgeons to be aware of this anomaly as cutting the aberrant artery may lead to catastrophic complications. Based on the angiographic findings on the morphology of the aberrant LAD, surgeons can decide whether CABG is required or not.

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**Competing interests:** The authors had no competing interests to declare in relation to this article.

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