



## Case Report

## A rare anomaly of LAD mimicking CTO



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## ABSTRACT

A 65-year-old man was admitted into our hospital because of the detailed examination for abnormal Q waves in inferior leads on an electrocardiogram. Coronary angiography and 320-row area detector computed tomography (ADCT) revealed “dual left anterior descending artery (LAD)”, which was a rare anomaly of the LAD and chronic total occlusion (CTO) at segment 2 of the right coronary artery (RCA). The course of the anomalous LAD arising from the proximal portion of the RCA was specifically identified between aortic root and right ventricular outflow tract (RVOT) by 320-row ADCT. The anomalous LAD had potential risk of myocardial ischemia because of the compression from aortic root and RVOT during exercise. We performed technetium myocardial perfusion scintigram to evaluate exercise-induced ischemia in the territory of the anomalous LAD and to decide therapeutic strategies including coronary artery bypass grafting surgery to the vessel. The scintigram revealed no exercise-induced ischemia in anteroseptal wall and a constant perfusion defect in posteroinferior wall of the left ventricle. Thus, we decided to treat the patient with pharmacological treatment in the outpatient setting. This report suggests that it is important to recognize the variants of coronary arteries for optimal treatment.

**<Learning objective:** Coronary artery anomalies such as “dual left anterior descending artery” are particularly rare. Anomalous coronary artery may contribute to exercise-induced myocardial ischemia and sudden cardiac death by the compression of the great arteries even when coronary angiography revealed no fixed stenosis in the artery. We have to recognize the types, clinical features and functional properties of the coronary artery anomalies for preventing misdiagnosis of coronary angiogram and deciding the best treatment for patients.>

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## Introduction

“Dual left anterior descending artery (LAD)” is a rare anomaly of the LAD. The variant consists of two branches bifurcating at the proximal portion of the LAD, which are described as “the short LAD” and “the long LAD,” respectively. The former is defined as the vessel that runs in the proximal anterior interventricular sulcus (AIVS) and terminates along the way in the AIVS, while the latter deviates from the proximal AIVS and reenters the middle AIVS for apex. In 1983, Spindola-Franco et al. classified the variant into four categories (type I–IV) according to origins, courses, and distributions of the anomalous vessel [1]. In the type IV dual LAD, the long LAD is exceptionally arising from the right coronary artery (RCA). We present a case of type IV dual LAD with chronic total occlusion

(CTO) of the RCA. In this case, we needed to evaluate the area of myocardial ischemia carefully and to decide the optimal treatment for the patient because of the critical running course of the long LAD between aortic root and right ventricular outflow tract (RVOT).

## Case report

A 65-year-old male patient was referred to our hospital because of the abnormal electrocardiogram of a complete right bundle branch block (CRBBB). He did not present any symptoms including exertional chest discomfort, dyspnea, and syncope even when he was working as a carpenter. He had a history of heavy smoking (30 cigarettes per day, 45 years) and hypertension well treated with an oral calcium channel blocker. Physical examination revealed no heart murmur or chest rales. Laboratory findings showed slight high blood concentrations of low-density lipoprotein cholesterol (145 mg/dl), triglyceride (189 mg/dl), and B-type natriuretic peptide (29.9 pg/ml), whereas the levels of troponin T, creatinine

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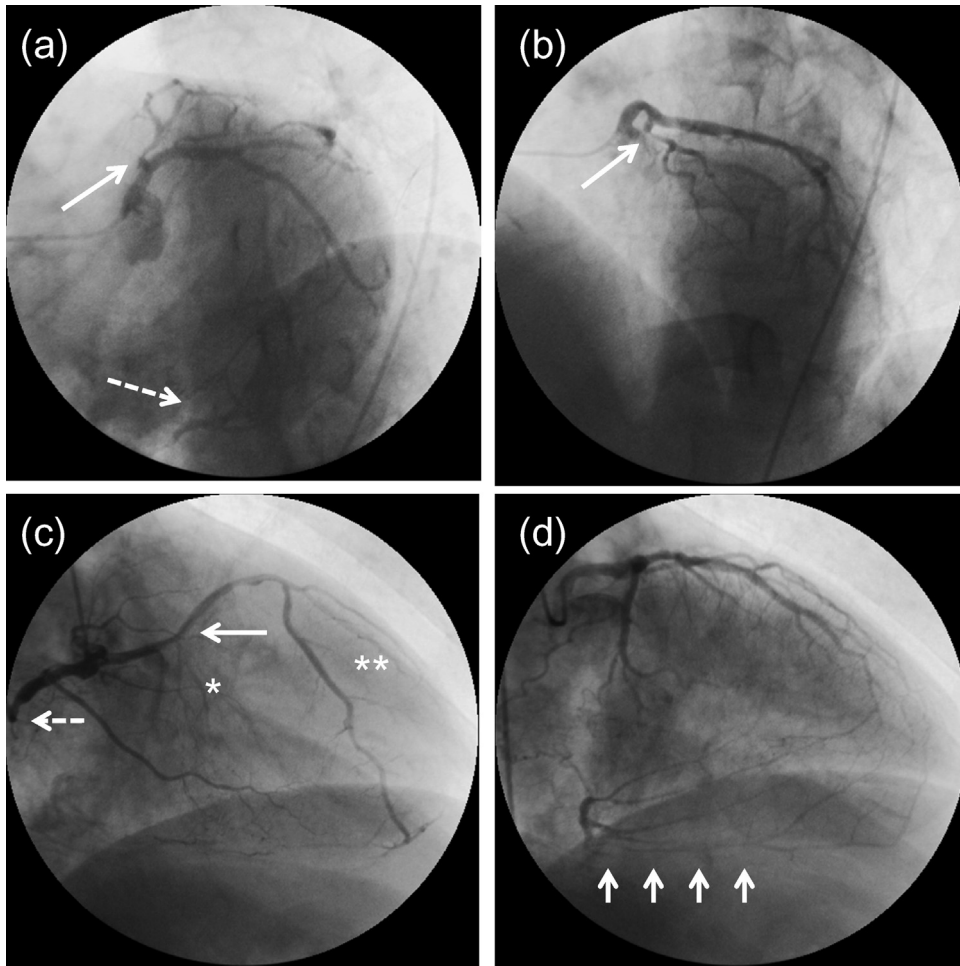
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kinase, fasting blood glucose, and renal function were all normal. The 12-lead electrocardiogram showed normal sinus rhythm (68 beats per minute) with a CRBBB and abnormal Q waves in inferior leads. Echocardiography revealed the hypokinesis of inferior wall of the left ventricle (ejection fraction was 49%) and no significant valvular or congenital heart diseases. On the basis of these findings, the patient was suspected of having ischemic heart disease and cardiac catheterization was performed to examine the presence of coronary atherosclerotic lesions.

Left coronary angiography revealed that the LAD arising from left main coronary trunk (LMT) had an abrupt termination at the proximal portion of segment 6 after branching into small left ventricular diagonal branches. The left circumflex artery (LCx) was also arising from the LMT and coursing along the left atrioventricular groove without clinically significant stenosis (Fig. 1a and b). Right coronary angiography showed that the RCA had CTO at segment 2 and that the territory of distal RCA was perfused by collateral blood flow of Cohen–Rentrop grade 2 from the right ventricular branch and grade 3 from the left obtuse marginal branch. Additionally, the unique vessel that diverged from the proximal portion of RCA was getting across the aortic root toward the left sinus of Valsalva and coursing to a parallel direction with AIVS from base to left

ventricular apex without organic stenosis (Fig. 1c and d). The ostium of the RCA and LMT was at the normal site easily engaged using Judkins' catheters (4 Fr JR 4 and JL 4) in the right and left sinus of Valsalva, respectively. At first glance, we made a diagnosis of CTO of RCA and LAD. However, we noticed strange septal branches separated from the transverse portion of the vessel outside the AIVS (Fig. 1c, white asterisk) after cardiac catheterization. Thus we came to understand the possibility that the patient has an anomalous LAD but not CTO of the LAD.

Three hundred and twenty-row area detector computed tomography (ADCT) was performed to examine the structural aspects of his coronary arteries, indicating the clinically critical course of anomalous LAD between aortic root and RVOT (Fig. 2). Therefore, we decided to perform technetium myocardial perfusion scintigram as a further examination to detect exercise-induced ischemia in the territory of anomalous LAD. During exercise no symptoms including chest pain or shortness of breath, nor morphological change of the electrocardiogram were seen. The results revealed no apparent evidence for ischemia in the area perfused by anomalous LAD despite adequate exercise stress and a constant perfusion defect in the territory of the RCA (Fig. 3). Consequently, we decided to treat the patient with the medication of aspirin, calcium channel



**Fig. 1.** Coronary angiograms. (a and b) Left coronary angiography showed the termination of the left anterior descending artery at segment 6 just after branching into left ventricular 1st diagonal branches (white solid arrow). The left circumflex artery (LCx) provided collateral blood flow to the distal right coronary artery (RCA) (white dotted arrow). (a) Left anterior oblique caudal (spider) view. (b) Left anterior oblique cranial view. (c) Right coronary angiography (right anterior oblique view) showed chronic total occlusion at segment 2 (white dotted arrow) and the transverse vessel separated from the RCA (white solid arrow) branching into 1st septal branches at the transverse portion (white asterisk) and 2nd left ventricular diagonal branches (white double asterisk). The vessel was coursing toward the left ventricular anterior wall and supplying a few branches to the territory of the RCA. (d) Left coronary angiography (right anterior oblique view) showed good collateral blood flow (white solid arrows) from obtuse marginal branch and the distal LCx to the RCA.

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