


CASE REPORT

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# Surgical revascularization of a rare type IV dual left anterior descending artery—a case report

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## Abstract

**Background:** Type IV dual left anterior descending artery (LAD) is a rare congenital coronary anomaly. Though benign with most of the patients being asymptomatic, knowledge of its existence and identification during coronary angiography is important during coronary interventions and surgical revascularization.

**Case presentation:** We present a rare case of type IV dual left anterior descending artery (LAD) with anomalous origin of one of the two vessels from the right coronary sinus. A 49-year-old female presented with inferior wall infarction and she underwent coronary angiography. Coronary angiogram showed triple vessel coronary artery disease. This rare variant of dual LAD was identified and was confirmed intra-operatively. The patient underwent coronary revascularization with grafts to both the LAD systems.

**Conclusions:** Proper assessment of the angiogram and knowledge of the coronary anomalies is required during surgical revascularization and percutaneous coronary interventions. This rare anomaly can be missed due to the anomalous origin of the LAD from the right coronary sinus. The identification of the dual LAD and grafting of both the LAD systems is required to achieve complete revascularization.

**Keywords:** Coronary anomalies, Coronary artery disease, Coronary angiogram, Coronary artery bypass

## Background

The left anterior descending artery (LAD) has the most constant course among all coronary vessels. Duplication of the LAD is a rare coronary anomaly [1, 2]. Here, we present a rare case of type IV dual LAD who presented with infarction and was treated with surgical revascularization.

## Case presentation

A 49-year-old female presented to the cardiology department with complaints of chest pain. She was a diabetic and hypertensive of 10 years duration. Electrocardiogram

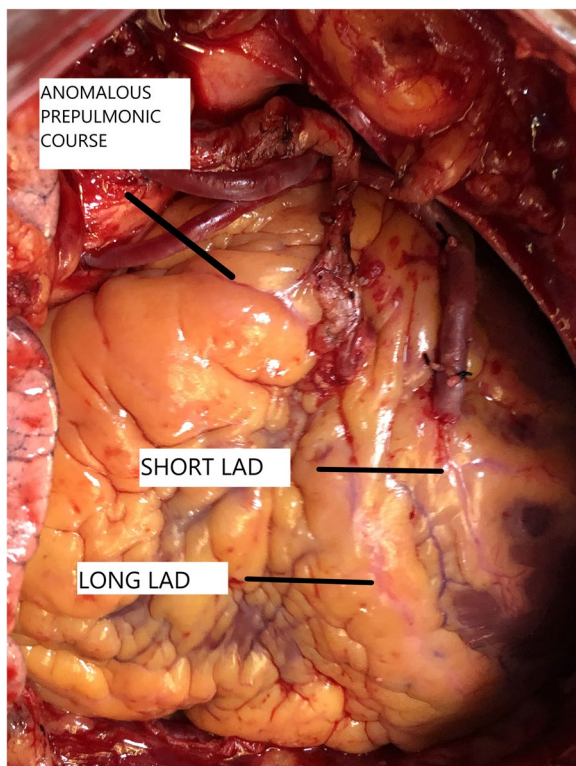
was taken and she was diagnosed to have inferior wall myocardial infarction. Echocardiogram showed inferior wall hypokinesia and the ejection fraction was 47%. After stabilization coronary angiogram was planned. Coronary angiogram showed significant stenoses in left anterior descending artery (LAD), left circumflex artery (LCX), and right coronary artery (RCA) territories. The mid LAD seemed to be occluded and there was no retrograde filling of the distal LAD through collaterals. The patient did not have any wall motion abnormalities in the anterior segments. The patient was planned for coronary artery bypass grafting.

On further perusal of the angiogram, it was noted that an aberrant vessel was originating from the right coronary sinus running towards the interventricular groove and mimicking the course of the left anterior

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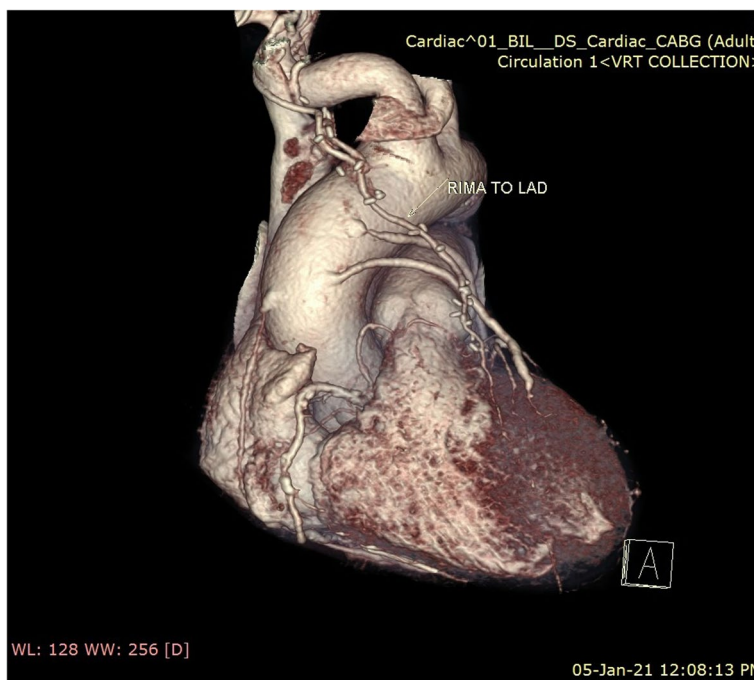
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**Fig. 1** Photograph showing the anomalous pre-pulmonic course of the long left anterior descending artery and the short artery running parallel to it laterally. Right internal mammary artery and saphenous vein are anastomosed to the long and short LAD respectively

descending artery (Supplementary Video 1). The septals and diagonals seemed to arise from the presumed diagonal (Supplementary Video 2). This was consistent with the anatomy that has been described as type IV dual LAD. The aberrant vessel was the long LAD which entered the anterior interventricular groove and the presumed diagonal was in fact the short LAD. These findings were confirmed after pericardiectomy. The RIMA was harvested as she had significant proximal left subclavian artery stenosis. Saphenous veins were harvested from the left leg. After systemic heparinization Octopus stabilizer was used to immobilize the heart. Distal anastomosis of the RIMA was done to the long LAD using 8-0 propylene. Saphenous vein grafts were anastomosed to the short LAD, major Obtuse Marginal artery and Posterior Descending Artery using 7-0 propylene sutures. After completion of the distal anastomoses, partial clamp was applied to the aorta and proximal anastomoses were completed with 6-0 propylene sutures. The entire procedure was completed off-pump (Fig. 1). Protamine reversal was given and hemostasis was achieved. The post-operative course was uneventful and the patient is on regular follow-up for the past 2 years.

Post operatively the patient underwent computed tomography with contrast to clearly visualize the coronary anatomy and the same findings were observed with patents grafts in situ (Fig. 2). The patient is on regular follow-up and is symptom-free.



**Fig. 2** Contrast computed tomography showing the various patent grafts

## Discussion

Coronary artery anomalies are often observed on angiography. Their incidence ranges from 0.6% to 1.3% in various case series [1, 3]. Most of these anomalies are benign and do not necessitate any form of intervention [4].

Dual LAD is a rare coronary anomaly. Spindola-Franco et al. first described and classified dual LAD into four types [5]. With newer anomalies being reported it was reclassified into six types by Lee et al. [6, 7]. The classification is based on the origin and course of the short and long LAD and gives details with regards to the origin of the septal perforators and diagonals. Types IV, V, and VI have one of the LADs arising from the right coronary circulation.

Identifying the presence of these anomalous arteries is integral in the planning for myocardial revascularization. Type IV variant of dual LAD is very rare and can be missed on angiography [8, 9]. As the short LAD may give rise to the diagonals and septals the long LAD may be mistaken for an aberrant vessel/collateral. If both the short and long LADs are severely stenosed, grafts to both the vessels may be needed because the major supply to the septum and the anterior ventricular wall may come from both the vessels.

It is important that surgeons have a clear perspective about the origin and course of the LAD when these anomalies are observed. This will ensure that the surgeon avoids an incorrectly placed arteriotomy and that no territory is left without revascularization [10]. It is also emphasized that when there is a disparity between the angiographic anatomy and the coronary course seen intra-operatively, the angiogram should be reviewed again and a second perspective should be sought.

Careful review of the angiogram prior to surgery helped us to identify this coronary anomaly. The long LAD was visualized running an abnormal course and found lying in the mid to distal anterior interventricular groove. The short LAD was seen running lateral to the groove almost mimicking the course of a diagonal artery. Both the LADs were grafted separately and the myocardial revascularization was complete.

## Conclusions

Proper assessment of the angiogram and knowledge of the coronary anomalies is required during surgical revascularization and percutaneous coronary interventions. This rare anomaly can be missed due to the anomalous origin of the LAD from the right coronary sinus. The identification of the dual LAD and grafting of both the LAD systems is required to achieve complete revascularization.

## Abbreviations

LAD: Left anterior descending artery; LCX: Left circumflex artery; RCA: Right coronary artery; OM: Obtuse marginal artery; PDA: Posterior descending artery; RIMA: Right internal mammary artery.

## Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s43057-021-00062-3>.

**Additional file 1: Figure S1.** Angio sketch diagram 1—The position of the short LAD as seen in the angiogram.

**Additional file 2: Figure S2.** Angio sketch diagram 2—A pictorial representation of position of normal LAD in the anterior interventricular groove which is not seen in the angiogram of this patient.

**Additional file 3: Video 1.** Coronary angiogram RAO cranial view showing the short LAD. Due to the anomalous long LAD running in the distal interventricular groove the proximal LAD seems to be cut-off at the mid segment.

**Additional file 4: Video 2.** Coronary angiogram of the right coronary artery shows the anomalous long LAD arising from the right coronary sinus running towards anterior interventricular groove.

**Additional file 5.** Left coronary injection showing the position of the short LAD running lateral to the anterior interventricular groove.

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None

## Authors' contributions

All the authors contributed to the editing and publishing of this case report. All authors read and approved the final manuscript.

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## Declarations

### Ethics approval and consent to participate

Not applicable.

### Consent for publication

Written informed consent was obtained from the patient for publication of this case report and accompanying images.

### Competing interests

The authors declare that they have no competing interests.

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