Journal of Cardiology Cases 20 (2019) 180–182

Contents lists available at ScienceDirect

Journal of Cardiology Cases

journal homepage: www.elsevier.com/locate/jccase

Case Report

A rare case of type X dual left anterior descending coronary artery

H.S. Natraj Setty (MD DM FACC FSCAI FRCP)*, Nagaraja Moorthy (MD DM), Jagadeesh Venkatappa (MD), Rangarajan Ramalingam (MD DM), Shivanand Patil (MD DM), T.R. Raghu (MD DM FACC FSCAI), C.N. Manjunath (MD DM FRCP)

Sri Jayadeva Institute of Cardiovascular Sciences and Research, Bangalore, Karnataka, India

ARTICLE INFO

Article history:
Received 4 February 2019
Received in revised form 11 July 2019
Accepted 30 July 2019

Keywords:
Coronary anomalies
Left anterior descending coronary artery
Coronary angiography

ABSTRACT

A dual left anterior descending (LAD) coronary artery is a rare, and benign congenital anomaly. In this anomaly, there is the presence of two LADs in the anterior inter ventricular sulcus (AIVS). One of the LADs is a short one that ends high in the AIVS. The other longer one enters the distal AIVS and feeds the apex. To date, 9 types of dual LAD variants, and one novel type X has been reported. Herein, we report a case of type X dual LAD with a literature review.

<**Learning objective:** Dual left anterior descending coronary artery (LAD) is an important coronary anomaly to be aware of by interventional cardiologists to avoid misinterpretation of coronary angiography and surgical complications related to coronary interventions. We report a new variation of type X dual LAD with a literature review.>

Introduction

Dual left anterior descending (LAD) artery anomaly is a rarely observed benign congenital anomaly of the coronary artery. Dual LAD is characterized by the presence of two LADs in the anterior inter-ventricular sulcus (AIVS). The short LAD ends high in the AIVS and the longer one enters the distal AIVS and feeds the apex of the heart. Based on classic coronary angiogram and coronary computed tomographic angiography (CCTA) imaging, the condition is traditionally divided into 9 subtypes. Recently, a case of novel LAD was published in the literature, and that was named as class X [1]. We report a case that has the same features as class X.

Case report

A 60-year-old male presented with complaints of effort angina for the previous 2 days. He had a history of chronic smoking with no other risk factors for coronary artery disease (CAD). He had no family history of a CAD. An electrocardiogram showed ST elevation and T wave inversion in inferior leads. This was suggestive of evolved inferior wall myocardial infarction. Two-dimensional-echocardiography showed regional wall motion abnormality in inferior and inferobasal segments with normal left ventricular function. Routine blood investigations were normal. In view of

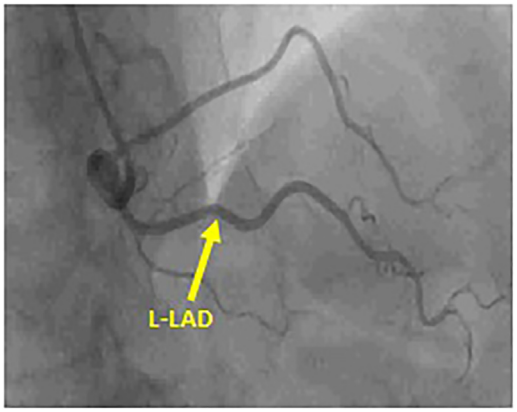

Fig. 1. (A) Left coronary angiogram showed the LAD coronary artery arising from the left main coronary artery short LAD (S-LAD). (B) Right coronary angiogram showed the long LAD (L-LAD) originated from the right coronary sinus separately from the right coronary artery. LAD, left anterior descending artery.

* Corresponding author at: Sri Jayadeva Institute of Cardiovascular Sciences and Research, #493, 4th Cross, 7th Main, J.P. Nagar 3rd Phase, Bangalore – 69, Bangalore, Karnataka, India
E-mail address: drnatrajsetty75@gmail.com (H.S. Natraj Setty).

https://doi.org/10.1016/j.jccase.2019.08.008
1878-5409/

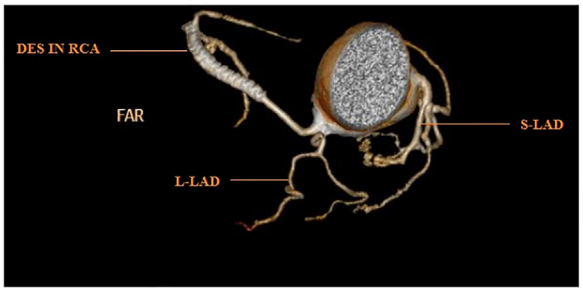

Fig. 2. Right coronary angiogram showed mid-RCA has total occlusion.

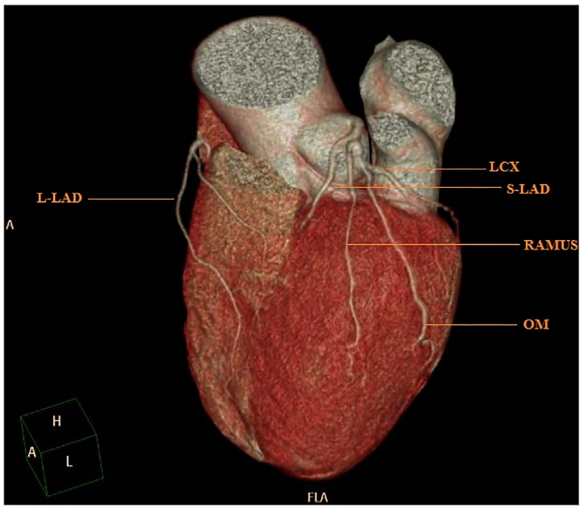

Fig. 3. (A): Colored 3D volume rendered coronary computed tomography angiography (CCTA) showed both the long LAD and right coronary artery (RCA) originating from the right coronary sinus (RCS). (B) Colored 3D volume rendered CCTA showed short LAD originated from the left main coronary artery (LMCA) and terminated in the proximal AIVS.
Abbrivations:
1. LAD: Left anterior descending artery
2. AIVS: Anterior inter ventricular sulcus
3. CCTA: Coronary computed tomographic angiography
4. CAD: Coronary artery disease
5. S-LAD: Short-left anterior descending artery
6. L-LAD: Long-left anterior descending artery
7. RCA: Right coronary artery
8. LMCA: Left main coronary artery

ongoing chest pain, the patient was taken for coronary angiography. The left coronary angiogram showed the LAD coronary artery arising from the left main coronary artery. This LAD was short (S-LAD) and terminated prematurely high in the anterior inter-ventricular groove. This created the suspicion of complete occlusion of the mid-LAD artery. This S-LAD also gave rise to the first diagonal and septal branch (Fig.1A). The left circumflex coronary artery was non-dominant and normal. The long LAD (L-LAD) originated from the right coronary sinus separately from the right coronary artery. This long vessel travelled to the left side and gave diagonal branches, then re-entered the distal anterior inter-ventricular groove to reach the apex of the heart (Fig. 1B). Selective right coronary artery (RCA) angiography showed mid-RCA total occlusion (Fig. 2). CCTA showed both the long LAD and RCA originating from the right coronary sinus (RCS) (Fig. 3A). CCTA also showed short LAD originated from the left main coronary artery (LMCA) and terminated in the proximal AIVS (Fig. 3B).

The patient underwent percutaneous transluminal coronary angioplasty to mid-RCA and was discharged on optimal medical therapy consisting of dual antiplatelet therapy, statins, nitrates, diuretics, beta blockers, and angio tensin-converting enzyme inhibitors. The patient was symptomatically well at subsequent follow-up.

Discussion

Congenital anomalies of the coronary arteries are rare. They occur in 0.64–1.3% of patients undergoing coronary angiography [2]. These coronary anomalies involve a difference in their origin, course, and distribution. They are common with RCA circulation but rare with the LAD artery. Dual LAD has an incidence of 1% [2].In dual LAD, the functional LAD is divided into a short and a long segment [2–5]. The S-LAD typically arises from the LAD proper and terminates high in the inter-ventricular groove [2–5]. The L-LAD takes a more variable course around the short segment and returns to the inter-ventricular groove distally [2–5]. So, whenever a short or hypoplastic LAD is detected, there are other things that deserve attention. There may be a long-dominant posterior descending branch of the RCA that terminates in the AIVS beyond the apex, along parallel diagonal branch or a dual LAD [6]. S-LAD should not be misdiagnosed as total occlusion and a L-LAD should not be misdiagnosed as a conus branch. A paucity of distribution of vessels in the apical LAD territory with a small LAD proper during coronary angiography should alert the cardiologist to dual LAD as one of the likely possibilities. Awareness and recognition of the dual LAD are vital for planning revascularization of the coronary

Table 1 Morphologic features of dual LAD subtypes [9].

	Origin		Course	
	Short LAD	Long LAD	Short LAD	Long LAD
Type 1	Proper LAD	Proper LAD	Proximal AIS	LV side of the proximal AIS, and reenters the distal AIS
Type 2	Proper LAD	Proper LAD	Proximal AIS	RV side of the proximal AIS, and reenters the distal AIS
Type 3	Proper LAD	Proper LAD	Proximal AIS	Intramyocardial course in the septum proximally, and emerges epicardially in the distal AIS
Type 4	LMCA	RCA	Proximal AIS	Prepulmonic course anterior to the RVOT, and enters the distal AIS
Type 5	LCS	RCS	Proximal AIS	Intramyocardial course within the septal crest emerges epicardially and enters the distal AIS
Type 6	LMCA	RCA	Proximal AIS	Between the RVOT and the aortic root and enters the distal AIS
Type 7	Proper LAD	Proper LAD	Proximal AIS	LV side of the proximal AIS, and reenters the distal AIS (*LMCA originates from the RCS and shows inter-arterial malignant course)
A new variant of Type 7 [10]	LMCA	RCS	Proximal AIS	Intramyocardial course within the septal crest emerging epicardially in the distal AIS
Type 8	LMCA	Mid-RCA	Proximal AIS	Inferior wall of the RV turns around the apex and reaches to the distal AIS (*LMCA originates from the RCS and shows retro-aortic course)
Type 9	Proper LAD	Proper LAD	Mid AIS	LV side of the mid-AISreenters the distal AIS and terminates before reaching to the apex (*Posterior descending coronary artery extends distal AIS)
Type 10 (Presented Case)	LMCA	RCS	Proximal AIS	Prepulmonic course anterior to the RVOT, and enters the distal AIS

AIS, anterior interventricular sulcus; LAD, left anterior descending artery; LCS, left coronary sinus; LMCA, left main coronary artery; LV, left ventricle; RCA, right coronary artery; RCS, right coronary sinus; RV, right ventricle; RVOT, right ventricular outflow tract.

artery. Duplication of LAD has been categorized into 4 angiographic subtypes based on the origin, course, and termination of the S- and L-LAD [3]. Based on CCTA imaging, five additional subtypes including a new variant of type X were later published [3,7,8].

In this study, the anomalous LAD origin and the course was consistent with the type X variety of dual LAD as described in the literature, and presented in Table 1 and hence a rare entity [1].

In our case, the patient had two LADs. They were supplying the anterior wall of the left ventricle. The S-LAD originated from the LMCA. It then terminated prematurely after giving rise to the first septal and diagonal branch (Fig.1A). The L-LAD originated from the RCS. It then gave rise to diagonal branches and reached the apex of the heart (Fig. 1B). This is, thus considered a rare type of coronary anomaly. Colored 3D volume rendered CCTA showed both the L-LAD and RCA originated from the RCS with different ostia as shown (Fig. 3A). S-LAD originated from the LMCA and terminated in the proximal AIVS (Fig. 3B). However, it was noticed that L-LAD originated from the RCS with separate ostium and followed an anomalous pre-pulmonic course anterior to the right ventricular outflow tract, and entered distal AIVS. This is consistent with type X dual LAD described in the literature [9].

Conclusion

Coronary angiography plays an essential role to determine dual LAD. And, a vast number of them are detected incidentally on routine angiography for chest pain due to the involvement of other coronary arteries. Computed tomography coronary angiography is advocated for further evaluation of anomalous coronaries, particularly in order to discern the exact course of the L-LAD. Fortunately, most dual LAD runs a benign course. This was indeed the feature of our patient, who became symptomatic only following total occlusion of an atherosclerotic RCA. Our case had a unique variation of dual LAD type X. The patient had a separate origin of a S-LAD. S-LAD originated from LMCA up to first septal and diagonal branch. The L-LAD originated from the RCS. The patient underwent percutaneous transluminal coronary angioplasty and was discharged on optimal medical therapy. However, the long-term prognosis of dual LAD remains unknown, and prospective studies on the susceptibility of these coronary anomalies to CAD are warranted.

Conflict of interest

None.

Ethical committee

Approved.

Funding

None.

References

[1] Celik T, Bozlar U, Ozturk C, Balta S, Verim S, Demir M, et al. A new anomaly of the left anterior descending artery: type X dual LAD. Indian Heart J 2015;67 (Suppl. (3)):S14–7.
[2] Yamanaka O, Hobbs RE. Coronary artery anomalies in 126,595 patients undergoing coronary arteriography. Cathet Cardiovasc Diagn 1990;21:28–40.
[3] Spinaldo-Franco H, Grose R, Solomon N. Dual left anterior descending artery: angiographic description of important variants and surgical implications. Am Heart J 1983;105:445–55.
[4] Dodd JD, Ferencik M, Liberthson RR, Cury RC, Hoffmann U, Brady TJ, et al. Congenital anomalies of coronary artery origin in adults: 64-MDCT appearance. AJR Am J Roentgenol 2007;188:W138–46.
[5] Agarwal PP, Kazerooni EA. Dual left anterior descending coronary artery: CT findings. AJR Am J Roentgenol 2008;191:1698–701.
[6] Oncel G, Oncel D. A rare coronary artery anomaly: double left anterior descending artery. J Clin Imaging Sci 2012;2:83.
[7] Bozlar U, Ugurel MS, Sar S, Akgün V, Örs F, Taar M. Prevalence of dual left anterior descending artery variations in CT angiography. Diagn Interv Radiol 2015;21:34–41.
[8] Manchanda A, Qureshi A, Brofferio A, Go D, Shirani J. Novel variant of dual left anterior descending coronary artery. J Cardiovasc Comput Tomogr 2010;4:139–41.
[9] Maroney J, Klein LW. Report of a new anomaly of the left anterior descending artery: type VI dual LAD. Catheter Cardiovasc Interv 2012;80:626–9.
[10] Saglam M, Ozturk E, Kara K, Kardesoglu E, Mutlu H. A new variation in coronary artery anatomy: type VII dual left anterior descending artery. Kardiol Pol 2015;73:217.