Dual left anterior descending coronary artery (type IV): a rare coronary artery anomaly

Manish Ruhela*, Vijay Pathak and Anoop Jain

Department of Cardiology, S.M.S Medical College and Hospital, Jaipur 302012, India

*Correspondence address. 7 B, Jagdish Vihar II, Prem Nagar, Jagatpura, Jaipur 302004, India.
Tel: +91 9460641871; Fax: +91 1412755580; E-mail: dr.manishruhela@gmail.com

Received 17 March 2014; revised 11 May 2014; accepted 13 May 2014

The variants of the left anterior descending (LAD) coronary artery are important in interpretation of coronary angiogram and in interventional procedures. The double LAD coronary artery originating from the left main coronary stem and the right coronary artery is a rare congenital coronary anomaly. In this case report, we are describing a patient with the double left anterior descending coronary artery (type IV), one with normal origin, and the other originating from the right coronary artery. Anatomical knowledge of this rare variant of LAD is important for novice interventional cardiologists during interpretation of coronary angiogram. To the best of our knowledge, there are ~28 cases of dual LAD (including type IV) reported in the literature.

INTRODUCTION

The dual left anterior descending coronary artery (LAD) is a rare coronary anomaly. Dual LAD is defined as the presence of two LADs in the anterior interventricular sulcus (AIVS). It consists of a short LAD that ends high in the AIVS and a longer LAD that enters the distal AIVS and feeds apex. Dual LAD is a benign coronary anomaly, but should be recognized especially before interventional procedure and all novice cardiologists must be aware of variants of dual LAD. Herein, we report a rare case of type IV dual LAD with the literature review.

CASE REPORT

A 66-year-old male presented to us with complaints of three episodes of typical chest pain in last 2 days, and was diagnosed as having unstable angina. He was a long-standing hypertensive controlled on beta-blockers and chronic smoker with no other risk factors for coronary artery disease (CAD) including no family history of CAD. An electrocardiogram (ECG) showed dynamic ST-T changes in anterior precordial leads. Cardiac enzymes were within normal limits and two-dimensional-echocardiography showed no regional wall motion abnormality with normal left ventricular function. Routine blood investigations were normal. Because of recurrent angina episodes during hospitalization, patient was taken for coronary angiography. The left coronary angiogram (LCA) showed the LAD coronary artery arising from the left main coronary artery. This LAD was short and terminated prematurely in the AIVS, creating the suspicion of complete occlusion of the mid-LAD artery. This short LAD gave rise to the first diagonal branch which showed an 80% discrete stenosis in its proximal segment (Fig. 1A). The left circumflex coronary artery was dominant giving rise to the posterior descending artery. Selective right coronary (RCA) angiography showed non-dominant RCA and another vessel arising from the proximal segment of the non-dominant RCA (Fig. 1B). This long vessel traveled to the left side and gave septal and diagonal branches, then re-entered the distal AIVS to reach the apex suggestive of it being the (long) LAD (Fig. 1B). This was consistent with the type IV variety of dual LAD as per the Spindola-Franco classification (see discussion), a rare entity. The patient was discharged on optimal medical therapy because the patient was refused for stenting in the diagonal branch of short LAD.

DISCUSSION

Congenital coronary anomalies are rare and reported to occur in 0.64–1.3% of patients undergoing coronary angiography
Coronary anomalies involving their origin, course and distribution are common with right coronary artery (RCA) circulation but rare with the LAD artery. Dual LAD had been reported to occur with an incidence of 1% by Spindola-Franco et al. [2]. Dual LAD may be associated with Congenital heart disease as the tetralogy of Fallot and transposition of great arteries, where it has surgical importance at the time of corrective surgery [3]. The dual LAD coronary anomaly, consisting of two branches short and long that supply the usual distribution of the LAD. While the short-LAD terminates in the proximal aspect of the AIVS, the long LAD has a variable course outside the AIVS and returns to the inside distally. The first description of a type IV LAD was given in 1939, by Waterson et al. [4] in the case of Sir James Mackenzie, who had this coronary anomaly in addition to ischemic heart disease. Since then, similar cases of this anomaly with an aberrant vessel from the proximal RCA have been reported [5, 6]. Oncel and Oncel reported a similar case in a young patient presented with atypical chest pain and CT coronary angiography showed type IV dual LAD with no significant stenosis, in our case, an older patient presented with typical chest pain with ST-T changes on ECG and coronary angiogram showed stenosis of the diagonal branch of short LAD [7]. Talanas et al. [8] reported the similar case of dual LAD in which patient presented with acute ST elevation MI. Puranik et al. reported a case of dual LAD in which they initially misinterpreted the short LAD as a critical stenosis of mid-LAD [9]. First angiographic classification of dual LAD was given in 1983 by Spindola-Franco et al. According to this classification, dual LAD consists of a short LAD that ends high in the AIVS and a long LAD that most commonly originates as an early branch of the LAD proper (types I–III) and rarely originates anomalously from the RCA (type IV).

Angiographic classification of dual LAD (Spindola-Franco et al.):

Type I: short LAD runs in the AIVSAIVS, long LAD also runs in AIVS, descends on the left ventricular side of AIVS, then re-entering the distal AIVS in order to reach the apex.

Type II: short LAD is same as in type I, long LAD runs on the right ventricular side of AIVS to re-enter AIVS.

Type III: short LAD is same as in types I and II. Long LAD travels intra-myocardially in the ventricular septum.

Type IV: short LAD forms a very short vessel, travels in AIVS and gives off septal perforators and diagonal branches. Long LAD arises from the RCA or right sinus of valsalva, courses anteriorly to the infundibulum of the right ventricle and turns sharply down the AIVS to give septal and diagonal branches.

So, whenever a short or hypoplastic LAD is detected, possible differential diagnosis includes a long-dominant posterior descending branch of the RCA, terminating in the AIVS beyond the apex; a long parallel diagonal branch; or a dual LAD [7]. Short LAD should not be misdiagnosed as total occlusion and a long 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 is vital for planning revascularization of the coronary artery. In our case, the patient had two LADs, supplying the anterior wall of the left ventricle. The short LAD originated from the left main coronary artery and terminated prematurely after giving rise to the first diagonal branch (Fig. 1A). The long LAD originated from the proximal part of RCA and give rise to septal and diagonal branches and reaches to the apex (Fig. 1B) suggestive of type IV dual LAD, a rare type of coronary anomaly.

In conclusion, we report a type IV dual LAD coronary artery, which is a rare coronary anomaly. It is important for novice cardiologists to be aware of this anomaly when...
interpreting the coronary angiogram of these patients and making the decision regarding management.

**FUNDING**

None.

**CONFLICT OF INTEREST**

None declared.

**REFERENCES**

1. Yamanaka O, Hobbs RE. Coronary artery anomalies in 126,595 patients undergoing coronary arteriography. *Cathet Cardiovasc Diagn* 1990; 21:28–40.

2. Spinaldo-Franco H, Grose R, Solomon N. Dual left anterior descending artery: angiographic description of important variants and surgical implications. *Am Heart J* 1983;105:445–448.

3. Sajja LR, Farooqi A, Shaik MS, Yarlagadda RB, Baruah DK, Pothineni RB. Dual left anterior descending artery. *Tex Heart Inst J* 2000;27:292–296.

4. Waterson O, Orr J, Cappell DF. Sir James Mackenzie’s heart. *Br Heart J* 1939;1:237–238.

5. Kosar F. An unusual case of double anterior descending artery originating from the left and right coronary arteries. *Heart Vessels* 2006;21:385–387.

6. Durmaz T, Metin MR, Keleş T, et al. A case with type IV dual left anterior descending coronary artery detected by multidetector computed tomography. *Turk J Med Sci* 2012;42:173–176.

7. Oncel and Oncel. A rare coronary artery anomaly: double left anterior descending artery. *J Clin Imaging Sci* 2012;2:83.

8. Talanas G, Delpini A, Casu G, Bilotta F, Pes R, et al. A double left anterior descending coronary artery emerging from the right valsalva sinus: a case report and a brief literature review. *J Cardiovasc Med* 2009;10:64–67.

9. Puranik AD, Gopinathan N, Vijayraghavan RL. A rare scenario of stenosed type IV dual LAD with normal myocardial perfusion scan. *World J Nucl Med* 2012;11:28–29.