

Coronary Intervention in Separate Origin of Left Anterior Descending and Left Circumflex Coronary Artery

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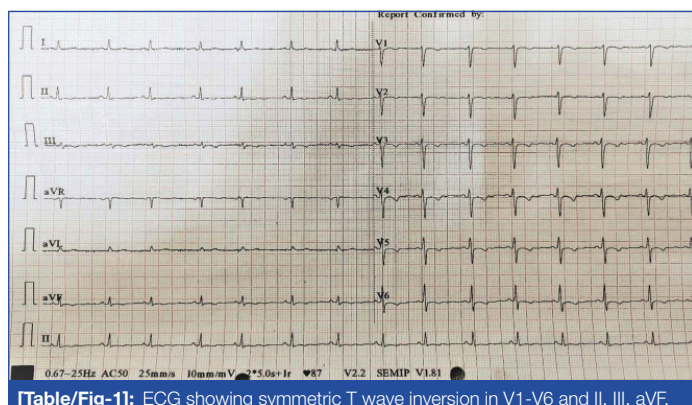
ABSTRACT

Coronary anomalies are not commonly encountered in routine clinical practice. This case report is of a 55-year-old female who presented with effort angina, Canadian Cardiovascular Society (CCS) class II, since last six months with shortness of breath. Echocardiography (ECG) revealed the presence of Non ST Elevation Myocardial Infarction (NSTEMI) and the presence of no Regional Wall Motion Abnormality (RWMA), with normal left ventricular systolic function. Right transradial coronary angiogram revealed the presence of separate origin of Left Anterior Descending (LAD) and Left Circumflex (LCX) coronary artery. Although separate origin of LAD and LCX is the most common benign coronary anomaly noted in clinical practice, interestingly both coronary arteries in this case were harboring significant atherosclerotic occlusion and were successfully revascularised with Drug Eluting Stents (DES). Coronary intervention in separate origin of LAD and LCX requires special maneuvers during guide catheter management for percutaneous intervention. Clockwise rotation of the guide catheter to selectively engage the LCX and anticlockwise rotation of the guide catheter to selectively engage the LAD is the key for procedural success during coronary intervention. This case is unique and the first to describe the separate origin of LAD and LCX presenting as NSTEMI with critically obstructive Coronary Artery Disease (CAD) in both of them and age being the only conventional cardiac risk factor behind it.

Keywords: Angiogram, Angina, Anomalies, Myocardial infarction

CASE REPORT

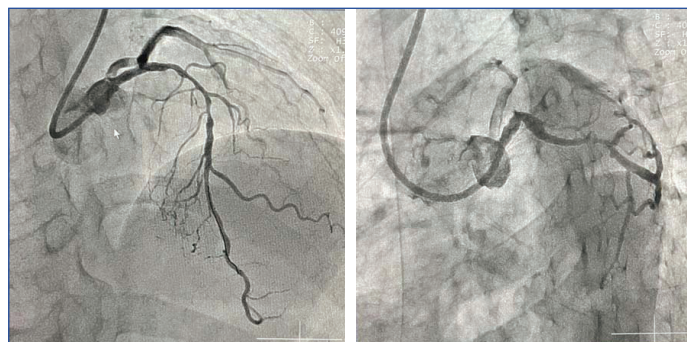
A 55-year-old female presented with effort angina with shortness of breath (New York Heart Association (NYHA) Class II) since last six months; without any history of palpitation, presyncope or syncope. She was non diabetic, non hypertensive and normolipidemic. She had no family history of CAD. She revealed no history of effort angina or exertional shortness of breath in her young age. On clinical examination, she had blood pressure of 130/80 mmHg in right arm (supine position), with pulse rate of 80 beats per minute (regular in nature). Cardiac auscultation was within normal limit. ECG revealed symmetric T wave inversion in leads V1-V6, and II, III, aVF [Table/Fig-1] and no RWMA with normal left ventricular systolic function. She was being treated as chronic stable angina CCS Class II and was on aspirin 75 mg once daily, atorvastatin 80 mg once daily, metoprolol 50 mg twice daily, nitroglycerine 2.6 mg twice daily, nicorandil 5 mg twice daily with ranolazine 500 mg twice daily, since last three months. Her symptoms were refractory to Optimal Medical Therapy (OMT). She had elevated high sensitive troponin I (114 ng/mL, cut off 14 ng/mL).



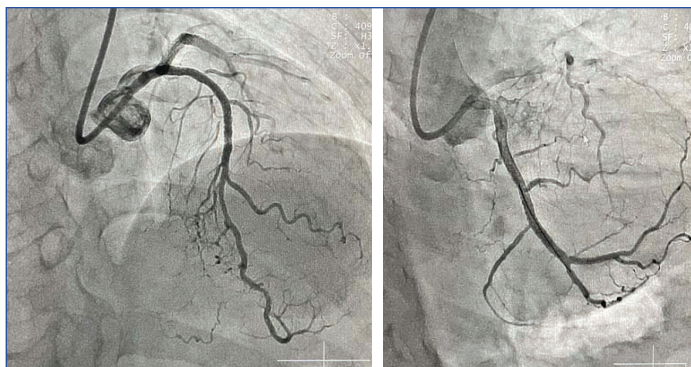
[Table/Fig-1]: ECG showing symmetric T wave inversion in V1-V6 and II, III, aVF.

In view of presentation with NSTEMI with high troponin and history of drug refractory angina in spite of OMT, she was subjected to

right transradial coronary angiogram which revealed the separate origin of LAD and LCX from the left coronary sinus [Table/Fig-2,3]. Left main coronary artery was absent. Both LAD and LCX harbored significant obstructive CAD and Right Coronary Artery (RCA) was having chronic total occlusion from the proximal segment. It was difficult to engage the LAD with Extra Back Up (EBU) 6F3.5 as it was selectively engaging and deeply hooking the LCX. In order to overcome this issue, LCX was wired with the BMW wire, the catheter was gently pulled back and with a counter clockwise torque and forward push in a different plane LAD was hooked. The lesion in LAD was crossed with a Balanced Middle Weight Wire (BMW) wire and it was directly stented with 2.75×28 mm Drug Eluting Stent (DES) with good angiographic result [Table/Fig-4] and Thrombolysis in Myocardial Infarction (TIMI) III flow. Then the EBU guide catheter was rotated clockwise and slightly lifted up to selectively engage the LCX, the lesion in LCX was crossed with a BMW guide wire and directly stented with a 3×36 mm DES with good angiographic result [Table/Fig-5] with TIMI III flow. Due to percutaneous intervention in two major coronary arteries, patient was discharged with aspirin 75 mg once daily, ticagrelor 90 mg twice daily, atorvastatin 80 mg once daily and metoprolol 50 mg twice daily. Patient was followed-up in the out-patient department after one month, was not having



[Table/Fig-2]: Separate origin of LAD and LCX in anteroposterior cranial view.
[Table/Fig-3]: Separate origin of LAD and LCX in left anterior oblique caudal view or spider view. (Images from left to right)



[Table/Fig-4]: Post revascularisation TIMI III flow in LAD in anteroposterior cranial view.
[Table/Fig-5]: Post revascularisation TIMI III flow in LCX in anteroposterior caudal view.
 (Images from left to right)

exertional angina or shortness of breath. ECG during follow-up revealed no ST-T changes and follow-up ECG revealed no RWMA with normal left ventricular systolic function.

DISCUSSION

The incidence of anomalous coronary artery among patients undergoing invasive coronary angiography is approximately 1% [1]. One of the anatomical variants of coronary artery origin comprises the LAD and LCX which arise separately from the left coronary sinus. Hence, there is no common left main coronary artery (LCA/LMCA) in those cases. The incidence of separate origin of LAD and LCX is approximately 0.58% [2]. It is most often a benign coronary anomaly which causes no haemodynamic impairment or ischemic consequences as the proximal course of this anomalous coronary artery is normal. But interestingly the index case was with separate origin of LAD and LCX which presented with significant atherosclerotic obstruction in both of them which were successfully revascularised with DES. In these patients, revascularisation was difficult due to difficulty in engaging the guide in separate coronary ostia, particularly in the emergency setting of primary Percutaneous Coronary Intervention (PCI). Separate origin of LAD, LCX and ramus intermedius may be there [2]. This benign and most common coronary anomaly can also harbor malignant atherosclerotic lesion in some cases and land up in acute coronary syndrome mandating emergency intervention, as described by Hong MY et al., in a 59-year-old male presenting with acute anterior wall myocardial infarction with need of emergent revascularisation [3]. Age was the risk factor besides hypertension and diabetes mellitus behind development of obstructive CAD in this benign coronary anomaly [3].

Three-dimensional course of those separate origin of LAD and LCX cannot be well delineated in routine invasive coronary angiography. Multidetector Computed Tomography (MDCT) angiography provides better delineation of the separate origin with their respective course. Basic knowledge of the coronary anatomy is utmost essential during anomalous coronary artery intervention. Left main coronary artery originates from the anteroinferior aspect of the left coronary sinus, LAD originates from the anterosuperior aspect of the left main coronary artery and LCX originates from the posteroinferior aspect of the left main coronary artery. Hong MY et al., described a case of separate origin of LAD and LCX presenting with ST Elevation Myocardial Infarction (STEMI) and the culprit vessel was revascularised with DES [3]. Guide wire could not pass the completely occluded LAD after which they noted the separate origin of LAD and LCX. They demonstrated the angiographic orientation of LAD and LCX during coronary intervention. LAD originates anterosuperiorly and LCX originates posteroinferiorly. During coronary intervention, selective anticlockwise rotation of the guide catheter engages the LAD and clockwise rotation of the guide catheter engages the LCX. Patient with short LMCA or no LMCA, selective hooking of the LAD and LCX is done with this special technique. Due to posterior origin

of LCX, clockwise turn of the EBU guide catheter engages the LCX and anticlockwise turn of the EBU guide catheter selectively engages the LAD and same principle was adopted in the present case. Clockwise rotation of the EBU guide selectively engages the LCX and anticlockwise rotation the EBU guide selectively engages the LAD. Engaging the separate origin of LAD and LCX during primary PCI always remains a challenge but this simple concept of clockwise rotation for LCX and anticlockwise rotation for LAD overcomes the difficulty in guide catheter engagement and smoothens the procedure with successful outcome. Postcoronary intervention, the ischemic symmetric T wave inversion from V1-V6 and II, III, aVF normalised in the index patient. She was free from rest angina and shortness of breath.

This most common benign coronary anomaly interestingly had severe obstructive CAD which is not commonly seen in routine clinical practice; age (>55 years) was the predisposing factor to acquire atherosclerotic obstructive CAD in this benign anomaly. Hong MY et al., described a case of separate origin of LAD and LCX presenting with acute STEMI [3] which was successfully revascularised with PCI. The CT coronary angiogram was not done in this case as obstructive atherosclerotic CAD was well evident in invasive coronary angiography.

The incidence of separate origin of the LAD and LCX in legendary Angelini P et al., series was 0.41% [1]. Coronary anomalies are the second most common cause of death among young athletes [4]. The most common anomaly associated with sudden cardiac death is the Anomalous Origin of a Coronary Artery (AOCA) with a course between the aorta and the pulmonary artery [4].

Based on the functional relevance, Coronary Artery Anomalies (CAA) can be classified as [5]:

- Anomalies causing obligatory ischemia like anomalous origin of LMCA from pulmonary artery, coronary ostial atresia or severe stenosis.
- Anomalies without coronary ischemia like separate origin of LAD and LCX.
- Anomalies with exceptional ischemia and individuals can lead a normal life with even athletic training.

Although invasive coronary angiogram can primarily delineate coronary anomalies, CT coronary angiography better delineates the three-dimensional route of those anomalous arteries which may be interarterial (between aorta and pulmonary artery), retro aortic or interstitial in which one part of the artery may be embedded inside the cardiac muscle [6]. Only disadvantage of coronary CT angiography is the ionising radiation, particularly in young patients. Invasive coronary angiography underestimates the prevalence of CAAs as those are better picked up with MDCT [6]. Separate ostia for LAD and LCX represent a technical difficulty during coronary angiography and intervention, but it imparts a benefit as it may allow alternate collateral sources in patients with proximal CAD.

This case was an interesting presentation of separate origin of LAD and LCX with critically obstructive CAD; age may be the cardiovascular risk factor for developing CAD. Major hurdle during coronary intervention is selective hooking the separate origin of both arteries. A simple dictum overcomes this difficulty: "Clockwise rotate to engage the LCX and anticlockwise rotate to engage the LAD" [7]. With this simple technique successful revascularisation of both arteries are done and this is the key message to the budding young interventionists during intervention of separate origin of LAD and LCX. Tedeschi C et al., reported a case of separate origin of LAD and LCX in a 59-year-old woman presenting with atypical chest pain and MDCT delineated severe proximal stenosis in both arteries for which CABG was done later [8]. Abramowitz Y et al., described separate origin of LCX and RCA from the right coronary sinus [9]. Mavi A et al., concluded that in cases of anomalous origin of LAD

and LCX, it is the LCX anomaly that decides the grave outcome [10]. Separate origin of LCX from left coronary sinus, right coronary sinus, RCA or its absence are considered as benign anomalies where origin of the LCX from the pulmonary artery is considered a serious anomaly having risk of sudden cardiac death [10]. Oncel D and Oncel G described a case of double LAD coronary artery, one arising from the left coronary sinus and other arising from the RCA and the diagnosis was done in Multislice CT Scan (MSCT) [11]. It indicates the fact that even if one finds absolutely normal left system, it may happen that another LAD may originate from the opposite side. Chung J et al., described a rare anomaly in which two right coronary arteries originated from two separate ostia from right coronary sinus [12]. Sohrabi B et al., described a slightly higher incidence of separate origin of LAD and LCX from the left coronary sinus in Iranian population with angiographic incidence of 0.69% [13]. Yildiz A et al., described the highest incidence (0.9%) of absent left main trunk with separate origin of LAD and LCX in Turkey [14]. Although separate origin of LAD and LCX is the most common coronary anomaly encountered in clinical practice, this case illustrates an interesting association with critically obstructive CAD and presented as NSTEMI requiring intervention.

CONCLUSION(S)

This case is the first illustration of separate origin of LAD and LCX presenting as NSTEMI with critically obstructive CAD mandating intervention. Simple concept of clockwise rotation for LCX and anticlockwise rotation for LAD overcomes the difficulty during coronary intervention and achieves good periprocedural outcome.

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