Hyperdominant Left Anterior Descending Artery: A Rare Coronary Artery Anomaly

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ABSTRACT
The posterior descending artery supplying the posterior one-third of the interventricular septum usually arise from the right coronary artery (RCA) or the left circumflex artery (LCx). Posterior descending artery arising from the left anterior descending artery is a rare anomaly. A 66-year man presented with chest pain, ECG changes, and raised biomarkers. A diagnosis of non-ST elevation myocardial infarction was made. Coronary angiogram, done on the next day, revealed the posterior descending artery as a continuation of the left anterior descending artery (LAD) beyond the crux and a rudimentary right coronary artery. The left anterior descending artery had subcritical stenosis in proximal course (confirmed on fractional flow reserve) and was advised medical treatment.

Key Words: Hyperdominant left anterior descending artery. Posterior descending artery. Angina. Rudimentary right coronary artery.

INTRODUCTION
Coronary artery anomalies have an incidence of less than 1.5%. The anomalies can be regarded as benign or malignant, based on their potential to cause myocardial ischaemia. Of the benign anomalies, the three most common are separate origins of left anterior descending (LAD) and circumflex (Cx) in left sinus of Valsalva origin of Cx from the right sinus of Valsalva or from right coronary artery (RCA) and ectopic origin of right coronary artery from aorta.

Anomalies, specific to left coronary artery, are rare. The single left coronary artery is further classified into L1 and L2 groups by the Lipton scheme. In L1 pattern, the right coronary artery is congenitally absent, the Cx is markedly dominant, and provides the posterior descending branch. In the even rarer L2 subtype, the right coronary ostium is congenitally absent and the right coronary artery arises from left main stem or from the proximal branches of left coronary artery.

Hamodraka et al. reported an extremely unusual case of LAD continuing as posterior descending artery in posterior interventricular groove after going around the left ventricular apex in the absence of right coronary ostium – an intriguing variation on the L2 Lipton subtype – where RCA, instead of arising from proximal branches of left coronary artery, arises as a distal continuation of LAD.

Here, we report a case of hyperdominant LAD with rudimentary RCA.

CASE REPORT
A 66-year man, non-diabetic and a chronic smoker presented to the ER with complaints of chest pain of 4 hours duration. On examination, pulse was 90/minute, blood pressure was 120/70 mmHg. The first and second heart sounds were normal on auscultation. ECG revealed deep T-wave inversions in the pre-cordial leads. His cardiac biomarkers were raised and a diagnosis of non-ST elevation MI was made. He was treated overnight with low molecular weight heparin, Aspirin, Clopidogrel, intravenous nitrates and beta-blockers.

Once the patient was stable, he was shifted to Cath Lab for coronary angiography after an informed consent. Coronary angiography revealed that the left main coronary artery was normal and gave off large left anterior descending (LAD) and left circumflex (LCx) arteries. The LCx was a non-dominant artery with no stenosis. The LAD continued in the anterior interventricular groove with 70% stenosis in mid course after origin of the major diagonal branch. Interestingly, the
artery extended into the posterior interventricular groove as well as posterior descending artery (Figure 1). The right coronary artery was a non-dominant, diminutive/ rudimentary vessel arising from the right coronary sinus, ended in the right anterior atroventricular groove, and was free of disease (Figure 2).

Since the patient was stable, fractional flow reserve (FFR) test was done which came out to be 0.90 (non-significant); so it was decided to keep him on medical therapy.

DISCUSSION

According to the literature, the incidence of coronary artery anomalies is approximately 1%; usually detected during a coronary angiogram performed for detecting coronary artery stenosis.5 Banch first described the variation in blood supply of the posterior and inferior walls of the heart; and based on that, the concept of coronary artery dominance was proposed by Schlesinger. Right dominance (seen in 85% of patients) means that posterior descending artery (PDA), AV nodal artery, and the posterolateral branches, all arise from the right coronary artery. Left dominance (in 8% of cases) means that all three vessels (PDA, AV nodal, and the posterolateral branches) arise from left circumflex artery. Co-dominance (seen in 7% of cases) is seen when posterior descending artery arises from the left circumflex artery and the posterolateral branches arise from the right coronary artery.

It is rare for the PDA to originate from the LAD, even though continuation of the LAD around the apex is commonly seen usually referred as wrap around left anterior descending artery.8 Baroldi described a patient whose PDA formed from the LAD and terminated at the crux.7 Clark et al. described 3 patients whose PDA originated from the LAD and in all, the PDA terminated before the crux.8 None of these PDA extended beyond the crux to continue in the posterior interventricular groove.

Musselman et al. was the first to describe PDA arising from the LAD and extending beyond the crux. However, the artery than gave two branches travelling on either side of the posterior interventricular sulcus and gave an AV nodal branch as well.9 Javangula and Kaul described another case in which a hyperdominant LAD continued as the PDA with a diminutive RCA. However, in their report, the LAD continued as the posterior descending artery up to the crux of the heart; and thereafter travelled for a brief distance as the distal right coronary artery.10 However, in this case, the left anterior descending artery was hyperdominant in the true sense that it did travel for a considerable distance into the posterior interventricular sulcus beyond the crux as the PDA and the RCA was diminutive. To the best of the authors' knowledge, it is only the third case reported worldwide and first from Pakistan, in which the hyperdominant LAD continued as PDA beyond the crux into the posterior interventricular sulcus.

The clinical importance of this anomaly is that if it is occluded, it will cause an extensive infarct affecting the anterior wall, septum, and inferior wall and can lead to cardiogenic shock with high morbidity and mortality without intervention. The clinician should be aware of such an anomaly if the infarct has involved anterior wall, septum, and inferior wall as prompt intervention in such rare instances can be life-saving.

REFERENCES


Figure 2: Angiogram showing rudimentary diminutive right coronary artery.